

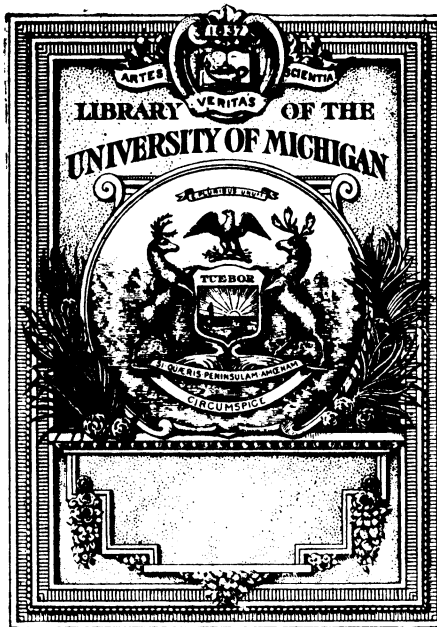
C 380799

PHILIPPINE  
WEATHER  
BUREAU  
BULLETIN  
1916



QC  
990  
.P55





THE GIFT OF  
*Philippine Weather Bur.*

QC  
990  
P55







55-1.5919  
P556

DEC 26 1916

UNIV. OF PHILIPPINES  
LIBRARY

THE GOVERNMENT OF THE PHILIPPINE ISLANDS

# WEATHER BUREAU

MANILA CENTRAL OBSERVATORY

---

BULLETIN FOR JANUARY, 1916

---

PREPARED UNDER THE DIRECTION OF

REV. JOSÉ ALGUÉ, S. J.

DIRECTOR OF THE WEATHER BUREAU

MANILA  
BUREAU OF PRINTING  
1916





THE GOVERNMENT OF THE PHILIPPINE ISLANDS

# WEATHER BUREAU

MANILA CENTRAL OBSERVATORY

---

MONTHLY BULLETIN, 1916

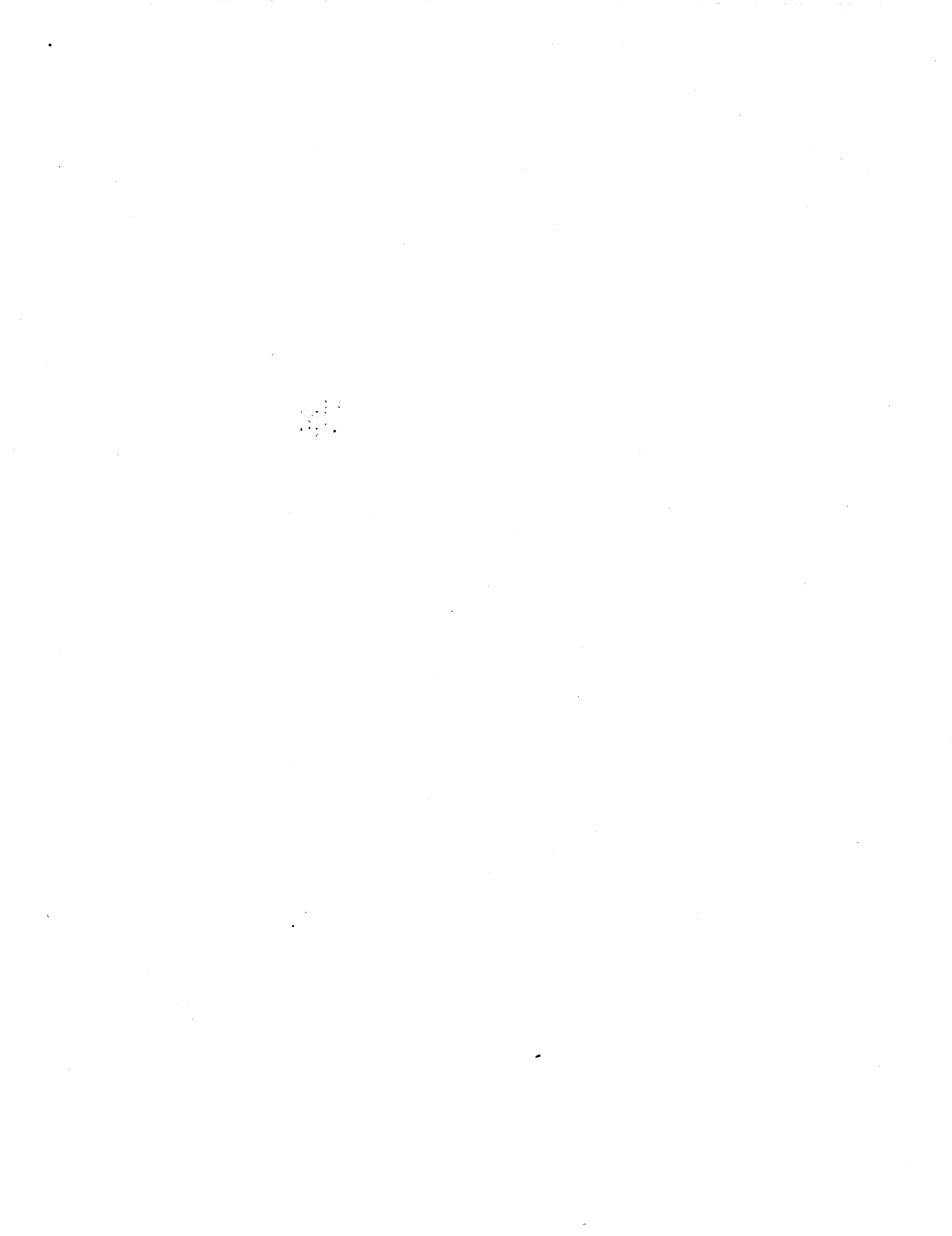
---

PREPARED UNDER THE DIRECTION OF

REV. JOSÉ ALGUÉ, S. J.

DIRECTOR OF THE WEATHER BUREAU

MANILA  
BUREAU OF PRINTING  
1916



## INTRODUCTION.

The form of our Monthly Bulletin as adopted in 1907 and modified in 1914 will be retained. The following is a list of all the meteorological stations of the Weather Bureau together with the names of the respective observers, who are in a great measure responsible for the accuracy of the observations published in this Bulletin:

### SECONDARY STATIONS AND OBSERVERS OF THE WEATHER BUREAU.

Station.	North latitude,		East longitude.		Observer.	Class.
	°	'	°	'		
Jolo	6	03	121	00	Rufino de la Cruz	III
Isabela, Basilan	6	42	121	58	Inocencio Rodriguez	IV
Zamboanga	6	54	122	05	Ramon Ortega	III
Davao	7	01	125	35	Lamberto Garcia	III
Cotabato	7	13	124	15	Rafael P. Albano	III
Cagayan, Misamis	8	29	124	38	Juan Hernandez	III
Dapitan	8	40	123	25	Agaton Alingal	IV
Butuan	8	56	125	32	Generoso Copin	III
Dumaguete	9	18	123	19	Matias Ordiales	III
Tagbilaran	9	38	123	51	Francisco Burgos	II
Iwahig	9	44	118	38	Filemon C. Bulaong	III
Surigao	9	48	125	29	Francisco Tiangco	II
Maasin	10	08	124	50	Aguedo Espina	III
Cebu	10	18	123	54	Domingo de los Angeles	I
Iloilo	10	42	122	34	Ricardo A. Luna	I
San Jose Buenavista	10	44	121	55	Teodoro Peñero	III
Cuyo	10	51	121	01	Roman Kabigting	III
Ormoc	11	00	124	36	Pedro Baltasar	I
Guiuan	11	02	125	44	Patricio Yabao	III
Tacloban	11	15	125	00	Deogracias Tablan	II
Capiz	11	35	122	45	Juan Lugod	II
Borongon	11	37	125	26	Cesareo Montes	III
Catbalogan	11	47	124	51	Clemente M. Letaba	III
Calbayog	12	04	124	36	Segundo Peñaflorida	II
Masbate	12	22	123	36	H. L. Heath	IV
Romblon	12	35	122	16	Pedro M. Asturias	III
Batag	12	40	125	04	Placido A. Edroso	IV
Gubat	12	55	124	08	Victorio Ramos	IV
Legaspi	13	09	123	45	Bernardino Costa	I
Sumay, Guam	13	24	144	38	Herbert Taylor	III
Calapan	13	25	121	11	Aquilino Nokom	III
Virac	13	35	124	14	Eusebio Talion	III
Nueva Caceres	13	37	123	11	Eduardo Ontengco	III
Batangas	13	45	121	03	Jose N. Cabrera	III
Lucena	13	56	121	37	Vicente Valderrama	III
Atimonan	14	00	121	55	Leon G. Guinto	I
Ambulong, Tanauan	14	07	121	04	Gregorio Peralta	II
Canlubang, Calamba	14	13	121	07	Nicolas Princena	IV
Paracale	14	17	122	47	Benito Pelaez	II
Santa Cruz, Laguna	14	18	121	25	Doroteo Eusebio	III
Antipolo	14	36	121	10	Valeriano Garcia	IV
Iba	15	20	119	58	Apolonio Perez	III
San Isidro	15	22	120	53	Bernardo Pecache	II
Tarlac	15	30	120	35	Valeriano Magat	IV
Baler	15	40	121	34	Santiago Palmero	IV
Dagupan	16	03	120	20	Jose M. Sison	I
Bolinao	16	24	119	53	Ezequiel Reinoso	II
Baguio	16	25	120	36	Pastor P. Daroy	I
San Fernando, Union	16	37	120	19	Estanislao F. Feraren	III
Echagüe	16	41	121	39	Benito Maramba	III
Candon	17	12	120	26	Luis Quismorio	IV
Vigan	17	34	120	23	Jose de Jesus	II
Tuguegarao	17	36	121	40	Jose C. de Leon	II
Laog	18	12	120	35	Jose Saez	II
Aparri	18	22	121	38	Manuel Delgado	I
Santo Domingo, Batanes	20	28	121	59	Claudio Castillejos	III

The signs and symbols employed in this publication are the following:

Symbol.	Equal to—	Symbol.	Equal to—
Ci.	Cirrus.	o	Overcast.
Ci.-S.	Cirro-stratus.	p	Passing showers of rain.
Ci.-Cu.	Cirro-cumulus.	q	Squally weather.
A.-Cu.	Alto-cumulus.	u	Ugly or threatening.
A.-S.	Alto-stratus.	v	Visibility of distant objects.
S.-Cu.	Strato-cumulus.	w	Wet or heavy dew.
N.	Nimbus.	●	Rain.
Cu.	Cumulus.		Fog or mist.
Cu.-N.	Cumulo-nimbus.	b	Dew.
S.	Stratus.	⊕	Solar halo.
Fr.-Cu.	Fracto-cumulus.	⊖	Lunar halo.
Fr.-N.	Fracto-nimbus.	⊙	Lunar corona.
Fr.-S.	Fracto-stratus.	⊕	Solar corona.
S.-cf.	Stratus-cumuliformis.	⊖	Heat lightning.
N.-cf.	Nimbus-cumuliformis.	⊙	Thunderstorm.
M.-Cu.	Mammato-cumulus.	⊕	Thunder without lightning.
b	Bright, clear sky.	⊖	Strong wind.
c	Cloudy weather.	⊙	Rainbow.
d	Drizzling, light rain.	⊕	Dry mist.
g	Gloomy or stormy-looking weather.		

NOTE.—A small <sup>o</sup> or <sup>2</sup> used as an exponent to the above symbols indicates, respectively, that the intensity of the meteor denoted by the symbols thus affected was small or very great.

## INTRODUCCIÓN.

Conservaremos en esta publicación la misma forma adoptada en 1907, y modificada en 1914.

Damos en el texto inglés una lista de todas nuestras estaciones con los nombres respectivos de los observadores, los cuales son en gran parte responsables de las observaciones que se publican en estos boletines.

Los signos y símbolos usados en esta publicación son los siguientes:

Símbolos.	Significado.	Símbolos.	Significado.
Ci.	Cirrus.	o	Cubierto.
Ci.-S.	Cirro-stratus	p	Lluvia pasajera.
Ci.-Cu.	Cirro-cumulus.	q	Achubascado.
A.-Cu.	Alto-cumulus.	u	Tiempo feo o amenazador.
A.-S.	Alto-stratus.	v	Trasparencia del aire.
S.-Cu.	Strato-cumulus.	w	Húmedo.
N.	Nimbus.	●	Lluvia.
Cu.	Cumulus.	⦿	Niebla o neblina.
Cu.-N.	Cumulo-nimbus.	⦿	Rocio.
S.	Stratus.	⦿	Halo solar.
Fr.-Cu.	Fracto-cumulus.	⦿	Halo lunar.
Fr.-N.	Fracto-nimbus.	⦿	Corona lunar.
Fr.-S.	Fracto-stratus.	⦿	Corona solar.
S.-cf.	Stratus-cumuliformis.	⦿	Relámpago sin trueno.
N.-cf.	Nimbus-cumuliformis.	⦿	Tempestad de trueno.
M.-Cu.	Mammato-cumulus.	⦿	Trueno sin relámpago.
b	Despejado.	⦿	Viento duro.
c	Nublado.	⦿	Arco-iris.
d	Llovizna o lluvia ligera.	⦿	Niebla seca.
g	Mal cariz; tiempo cerrado, fosco.		

NOTA.—Un <sup>o</sup> o un <sup>2</sup> puestos como exponentes de los signos, indican respectivamente una muy débil o una muy fuerte intensidad en el meteoro que representan.



---

---

**BULLETIN FOR JANUARY, 1916.**

---

---





# METEOROLOGICAL BULLETIN FOR JANUARY, 1916.

By Rev. JOSÉ CORONAS, S. J.,  
Chief, Meteorological Division of the Weather Bureau.

## GENERAL WEATHER NOTES.

**Pressure and temperature.**—Owing to the unusual frequency of depressions and typhoons that visited the Islands during this month, the monthly mean atmospheric pressure is remarkably lower than that of the preceding year and than the January's normal. The highest pressures were observed on the 9th to 11th, whilst the lowest took place generally either on the 2d to 3d or on the 15th to 16th.

The monthly mean temperature is almost identical with that of the preceding year in the Visayas and Mindanao, and somewhat lower, generally, in Luzon. The extreme temperatures for Manila were 32.8°C. on the 9th, and 17.4°C. on the 18th. The absolute maximum and minimum temperatures for Baguio were 26.1°C., 8.6°C. on the top of Mirador, and 26.2°C., 7.4°C. in the valley.

PRESSURE AND TEMPERATURE AT THE FIRST AND SECOND CLASS STATIONS FOR JANUARY, 1916.

Station.	Pressure.						Temperature.					
	Mean.	Departure from January, 1915.	Highest mean.	Day.	Lowest mean.	Day.	Mean.	Departure from January, 1915.	Highest.	Day.	Lowest.	Day.
	mm.	mm.	mm.		mm.		°C.	°C.	°C.		°C.	
Tagbilaran	757.68	- 3.24	760.69	9	754.16	15	25.4	0	32.3	11	19.8	1
Surigao	57.28	- 3.81	60.56	10	53.78	16	25.5	- 0.1	33.7	15	19.5	1
Cebu <sup>b</sup>	58.11		60.73	10	52.86	15	26.2				20.5	1
Iloilo	58.02	- 2.90	60.68	9	53.86	2	25.7	- .5	32.4	31	21.7	1
Ormoc	57.73	- 3.71	60.96	10	50.68	15	25.4	- .1	32.8	5	21.4?	15
Tacloban	57.61	- 3.96	60.92	10	50.61	15	25.5	+ .1	32.3	5	21.6	14
Capiz	58.63	- 3	61.50	10	53.30	2	25.8	- .3	31.6	4	21.7	17, 18
Calbayog	58.08	- 3.64	61.22	10	52.10	15	25.2	+ .1	32.7	9	21.3	18
Legaspi	58.57	- 3.24	61.64	9	54.21	15	26.1	- .2	32.1	4	21.8	17
Atimonan	59.58	- 2.50	62.47	11	55.22	2	25.2	- .7	31	5	22	16
Ambulong, Tanauan	58.88	- 2.77	61.63	10	54.94	2	25	- 1.1	31.2	4, 6, 8	18.7	21
Paracale	59.76	- 2.72	62.65	10, 11	55.18	2	25.7	+ .2	30.8	7	21	18
Manila	59.64	- 2.52	62.36	10	55.86	2	24.8	0	32.8	9	17.4	18
San Isidro	60	- 2.43	62.68	10	56.32	2	24.6	- .9	31.4	12	15.5	18
Dagupan	59.13	- 2.32	61.90	10	55.47	3	25.6	- .4	34.7	1	16.4	19
Bolinao	59.38	- 2.59	62.16	10	55.62	3	25.9	- .5	33.5	4	18.4	18
Baguio <sup>d</sup>	636.88	- 1.99	639.65	9	634.41	3	16.5	- .7	26.1	27	8.6	18
Vigan	759.53	- 2.40	762.17	10	755.58	3	25.8	+ .7	33.1	27	16	17
Tuguegarao	61.59	- 1.64	64.51	11	58.10	3	23.2	- 1.1	32.5	8, 9	16	17
Aparri	61.90	- 1.54	65.18	11	58.38	2	23.4	- .1	30.2	9	18.3	21

<sup>a</sup> This minimum temperature seems to be too low by about 0.6°C.

<sup>b</sup> 20 days of observation.

<sup>c</sup> 29 days of observation.

<sup>d</sup> The barometric readings of this station are not reduced to sea level.

**Rainfall.**—With a very few exceptions, the total rainfall for this month as recorded in all our stations throughout the Philippines is much greater than that of the preceding year and than the normal for January. Floods occurred in several parts of the Islands, but particularly in Mindanao. We shall speak about them further on. Total daily amounts of rain of over 100 mm. were recorded in six stations of Mindanao, ten stations of the Visayas, one station of Luzon, and one of Masbate. This is to be considered very remarkable for the month of January.

RAINFALL AT VARIOUS STATIONS OF THE WEATHER BUREAU DURING THE MONTH OF JANUARY, 1916.

Station.	Total.	Departure from Jan., 1915.	Departure from normal.	Rainy days.	Departure from Jan., 1915.	Greatest rainfall in a single day.	Day.	Station.	Total.	Departure from Jan., 1915.	Departure from normal.	Rainy days.	Departure from Jan., 1915.	Greatest rainfall in a single day.	Day.
	mm.	mm.	mm.		mm.	mm.			mm.	mm.	mm.		mm.	mm.	
Jolo	273.9	+215.2	+175.8	16	+9	125.2	25	Calapan	227	+132.6	+124.8	26	+8	71.6	2
Isabela, Basilan	298.2	+276.1	+229.9	13	+9	108.7	23	Virac	373.2	+256.6	+187.2	25	+4	65.5	15
Zamboanga	302	+300.2	+247.3	12	+11	123	23	Naga	208.8	+196.1	+93.8	21	+17	56.4	15
Davao	132.7	+92.8	+47.1	10	+2	74.2	22	Batangas	88.9	+50.5	+62.1	13	+10	43.2	2
Dapitan	245.2	+145.7	+123	23	+9	61	27	Atimonan	411.6	+254.7	+205.7	27	+14	52.3	26
Butuan	526.6	+290.1	+315.9	25	+9	162.8	21	Ambulong, Lanao	60.2	+57.4	-----	11	+9	25.6	2
Dumaguete	179.8	+99.2	-----	20	+13	29	12	Paracale	367.3	+4.6	-----	29	+14	44.5	25
Tagbilaran	93.7	+72.1	+14.9	14	+5	35.6	14	Santa Cruz, Laguna	118.8	+100.9	-----	18	+10	53.1	2
Iwahig	188.4	+176.1	-----	17	+13	50.3	30	Manila	38.2	+32.6	+11.1	7	+2	20.8	2
Surigao	1,064.2	+673.4	+674	27	+12	119.1	25	Antipolo	47.3	+46.3	-----	10	+9	22.1	2
Maasin	572.7	+375.2	+397.8	15	+8	120.9	14	Iba	16.2	+13.7	+8.5	6	+5	7.7	5
Iloilo	154	+90.8	+101.1	17	+12	39.1	1	San Isidro	43	+40.9	+26.4	8	+5	18.4	3
San Jose Buenavista	168.3	+166	+131.3	17	+15	37.6	2	Tarlac	21.9	+1.1	+12.9	5	+4	8.9	5
Cuyo	80.8	+80.8	+65.5	8	+8	40.9	2	Baler	232.1	-171.9	+14.7	18	+3	73.9	3
Ormoc	549	+405	+358.8	23	+9	181.4	14	Dagupan	9.3	+4.4	-----	2	+3	3.6	8
Guianan	1,608.7	+1,254.4	-----	27	+4	344.9	29	Bolinao	7.9	-25.1	-2.4	6	+4	3.6	31
Tacloban	835.9	+530.2	+560.1	27	+8	246.7	14	Baguio	23.2	+20.1	-----	8	+6	8.9	31
Capiz	627	+575.9	+458.9	25	+15	370.2	1	San Fernando, Union	23.6	+23.6	+13.6	3	+3	12.6	30
Borongan	1,210.5	+801.1	+697.3	29	+6	130.1	29	Echague	149.4	+142.5	+101	21	+17	45.2	5
Catbalogan	637.4	-----	-----	25	-----	115.6	1	Candon	38.7	+38.7	+32.3	5	+5	26.7	4
Calbayog	680.3	+627.5	+511.5	27	+13	158.7	1	Vigan	14.2	+13.9	+13.3	3	+2	9.7	4
Masbate	511.9	+489.7	+359.5	22	+13	163	1	Tuguegarao	101.1	+81	+70.1	11	+5	28.4	3
Romblon	226.7	+176.8	+116.5	16	+5	105.1	2	Laog	37	+37	+31.8	6	+6	28.4	5
Batag	745.7	+559.2	-----	29	+16	138.2	15	Aparri	151.8	+37.8	-50.7	22	+10	29.4	3
Gubat	604	+443	+290.7	27	+14	66	14	Santo Domingo, Batanes	143.9	-256	-97.4	20	-2	40.9	12
Legaspi	606.7	+462.3	+240.5	27	+8	105.6	15								
Sumay, Guam	58.3	-	+1.9	12	-3	15.3	27								

DEPRESSIONS AND TYPHOONS.

It is very unusual to have four depressions or typhoons very near or over the Philippines in the month of January. And we consider it even more unusual to have two of these depressions or typhoons over the northern part of the Visayas as we had this year: the general track of typhoons for this month runs across Mindanao and the southern part of the Visayas.

A DEPRESSION OVER THE NORTHERN VISAYAS, DECEMBER 28, 1915, TO JANUARY 4, 1916.

Judging from the observations of Guam and from those taken on board the U. S. A. Transport *Sheridan* on her trip from Guam to the Philippines, it can be stated with great probability that this depression formed on December 27 to 28 to the SSW of Guam, in about 10° latitude N and 143° longitude E. Then it moved almost due west until the early morning of January 1 when it inclined northwest keeping this direction for only half a day.

Our weather map for 6 a. m. of January 1 shows perfectly well the center of the depression to the ENE of Surigao near 10° latitude N, while the weather map for 2 p. m. of the same day situates it very close to the southern coast of Samar. Again, the observations made at Tacloban with a clear backing of the winds from NW to W and SW leave no doubt as to the passing of the depression to the north, in the afternoon of January 1. Hence the supposed direction of the track to NW from 6 a. m. of the 1st until the vortex passed north of Tacloban in the afternoon of the same day. Yet, from the north of Tacloban the depression inclined again west, moving WNW or W by N to the S of Masbate and Romblon, the center being shown by our weather map for 6 a. m. of January 2 as situated half way between Masbate and Romblon Islands. It probably filled up on the 4th over the China Sea, to the W of southern Luzon, near 115° longitude E and 14° latitude N.

The barometric minimum recorded in all our stations near the center of this depression was no lower than 751 mm.

THE TYPHOON OF BILIRAN AND NORTHERN LEYTE; JANUARY 10 TO 16, 1916.

This typhoon was probably formed on the 10th over the Western Carolines, between 7° and 9° latitude N and in about 143° or 144° longitude E. This statement is based on the observations of Guam where a moderate falling of the barometer was observed on the 10th with a strong breeze from ENE. The typhoon must have moved almost due W until the 14th when it inclined WNW toward the southern part of Samar and the northern part of Leyte.

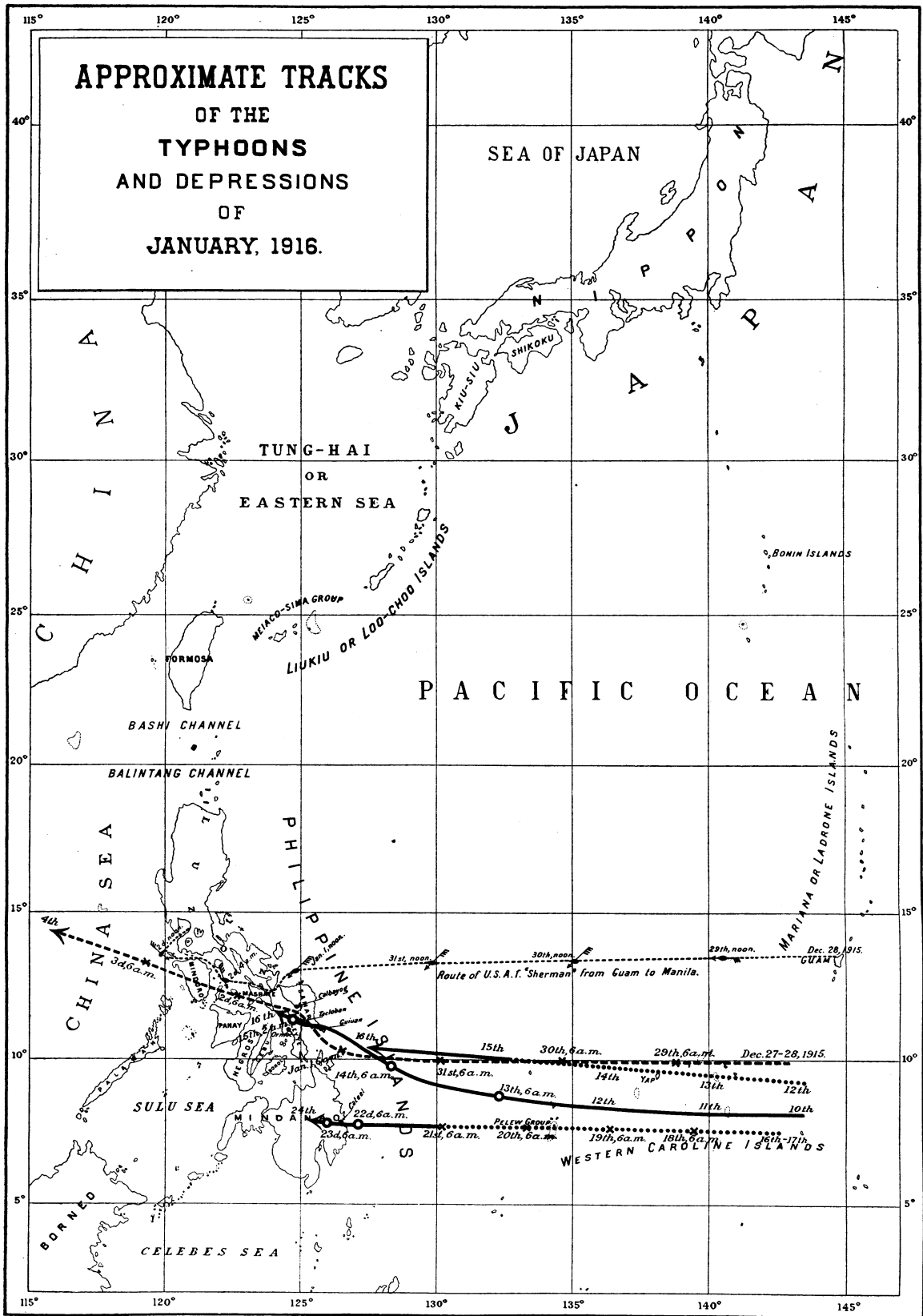
The first definite signs of a depression or typhoon east of the southern part of the Philippines were shown in our weather map of 2 p. m., January 13. This map, however, had to be prepared later, as we had no communication for several days with the Visayas and Mindanao. Hence it was impossible at the time to give the exact position of this typhoon, although it was announced on the 14th as raging over the Visayas or Mindanao. Now, in order to allow our readers to follow by themselves the track of the storm when it entered the Philippines, we offer in Plate II the isobars for 2 p. m. of the 14th, 2 a. m. of the 15th, and 6 a. m. of the 16th. The isobars for 2 p. m. of the 16th are added also, but they refer to the next typhoon.

It will be noticed in Plate I that the center of the typhoon passed very close to Guianan, to the N, and very close to Tacloban, to the S, moving almost due W: then it moved again WNW toward the Biliran Island. In the following table we give a very complete series of observations taken during this typhoon by our diligent observer at Tacloban, Mr. Deogracias Tablan. It is to be regretted that the observations made at Ormoc are very incomplete and very deficient as compared with those of Tacloban.

METEOROLOGICAL OBSERVATIONS MADE AT TACLOBAN, JAN. 13 TO 16, 1916.

Date and hour.	Pres- sure.	Wind.		Rain- fall every 4 hrs.	Remarks.	Date and hour.	Pres- sure.	Wind.		Rain- fall every 4 hrs.	Remarks.
		Direc- tion.	Force.					Direc- tion.	Force.		
Jan. 13:	<i>mm.</i>		0-12.	<i>mm.</i>		Jan. 15:	<i>mm.</i>		0-12.	<i>mm.</i>	
6 a. m. ....	758.58	NW	3			2.15 a. m. ....	745.70	SE	6		} Rain squalls, extra- ordinary noise of the sea.
2 p. m. ....	57.19	NW	3	1	Drizzle.	2.30 a. m. ....	45.37	SE	6		
Jan. 14:						2.45 a. m. ....	45.05	SE	3		
6 a. m. ....	55.59	NNW	3	30	Rainy.	3 a. m. ....	46.72	SE	5		Do.
2 p. m. ....	52.66	NW	4	41.9	Do.	3.30 a. m. ....	47.83	SE	4		Squally.
6 p. m. ....	50.79	NW	7	57.4	Heavy thundershow- ers.	4 a. m. ....	47.55	SE	5		Squalls at intervals.
6.30 p. m. ....	49.98	NW	7		Heavy rain.	4.30 a. m. ....	48.34	SE	5		Do.
7 p. m. ....	50.83	NW	9		Rain squalls.	5 a. m. ....	48.87	SE	5		Drizzle.
7.30 p. m. ....	50.73	NW	7			5.30 a. m. ....	49.34	SE	6		Do.
8 p. m. ....	50.06	NW	7		Heavy rain squalls.	6 a. m. ....	49.71	SE	5	2.3	Do.
8.30 p. m. ....	49.78	NW	6		Thundershowers.	7 a. m. ....	50.89	SE	7		Do.
9 p. m. ....	49.09	NW	5		Rainy.	8 a. m. ....	52.12	SE	6		Do.
9.30 p. m. ....	48.45	WNW	3		Slight rain, 9.10 p. m.	10 a. m. ....	52.90	SE	7	1.5	Do.
10 p. m. ....	48.14	WNW	3	140.5	winds abating, tend- ing to veer east- ward, but still var- iable.	Noon	52.36	SE	6		Do.
10.30 p. m. ....	48.08	E	2		Wind veered to E with tendency to calm.	2 p. m. ....	51.14	SE	5	3	Rain and drizzle.
11 p. m. ....	48.07	E	2			4 p. m. ....	50.94	SE	6	4.8	Gusty wind.
11.30 p. m. ....	47.80	Calm			Calm about 4 min- utes, sky clearing up, stars visible among Ci.-S. veil.	6 p. m. ....	51.48	SE	6	4.8	Do.
Midnight	47.27	ESE	3			10 p. m. ....	52.93	SSE	5	25.9	Squally.
Jan. 15:						Jan. 16:					
12.30 a. m. ....	47.23	ESE	3		Drizzle, extraordi- nary noise of the sea.	2 a. m. ....	50.84	SE	4	22.9	Squally.
1 a. m. ....	46.29	ESE	2		Do.	4 a. m. ....	50.35	SE	5		Do.
1.30 a. m. ....	45.84	SE	4		Do.	6 a. m. ....	51.01	SSE	3	3.3	Thunderstorm to NW quad.
1.45 a. m. ....	44.94	ESE	5		Do.	8 a. m. ....	53.39	E	3		Rain.
2 a. m. ....	45.49	SE	4	4.6	Rain squalls.	10 a. m. ....	54.10	NW	3	5	Do.
					Rain squalls, extraor- dinary noise of the sea.	Noon	53.33	NW	3		Rain squalls.
						2 p. m. ....	53.02	NW	4	49.3	Heavy rain.
						4 p. m. ....	53.33	NW	4		Slight rain.
						6 p. m. ....	54.69	NW	4	20.1	Do.
						8 p. m. ....	56.10	NW	3		Do.
						10 p. m. ....	56.81	NW	4	1	Do.

We call the attention of our readers to the remarkable fact that the barometric minimum took place at Tacloban about two hours after the calm had been observed, the atmospheric pressure being nearly three millimeters lower two hours after the calm than during the calm. Such an anomaly had not been observed after the center of the typhoon had



passed close to Guiuan. Again, it is surprising to see that the barometric minimum was registered practically at the same time in Ormoc as in Tacloban or rather fifteen minutes earlier in Ormoc; in other words, if the minimum was observed at Ormoc when the vortex was nearest to that place, then it follows that the same was observed at Tacloban about two hours after the vortex had passed at its least distance from that city. Would all this mean that the center of this typhoon deepened more within the Island of Leyte, the atmospheric vacuum being more pronounced than it was while passing close to Tacloban?

The attention of our readers is also called to the winds from NW observed again at Tacloban since 9 a. m. of the 16th: they were due to the influence of the next typhoon of which we shall say a few words later. It is to be remarked likewise that the barometer was kept below 753 mm. from 2 p. m. of the 14th until 7 a. m. of the 16th, as the typhoon remained almost stationary for over a day near or over the Biliran Island or the northernmost part of Leyte, where it finally filled up in the morning of the 16th.

As to the effects of this typhoon, we shall only say that they were particularly destructive in Biliran Island and in some of the towns on the Camotes Islands and on the coast of Leyte to the S and SSW of Ormoc. Following is a copy of a report furnished to our observer at Tacloban by the senior inspector of the Constabulary, Leyte:

In the evening of the 14th instant this section was struck by a typhoon which lasted until the 16th. The typhoon was not very strong but it did considerable damage most specially in the Island of Biliran. The plants most affected were rice, corn, bananas, and hemp. Other plants were injured but little.

In the municipality of Biliran there were one person, five carabaos, four cows, twenty goats, five sheep and thirty pigs killed by the baguio. About ten houses were partly destroyed and the loss in plants, according to the estimate of the municipal president thereof, were: Coconuts 40 per cent; hemp 50 per cent; other plants of food value 80 per cent. The total estimated loss in the municipality is ₱19,000.

In the municipality of Caibiran there were 19 persons, 3 carabaos, and 4 cows killed. Seven houses including the market of the municipality were carried away by the water. In some places in the town of Caibiran the water rose to a height of 50 centimeters from the ground.

All the persons killed in the storm were living in the mountains. The strong wind in conjunction with water and great avalanches were responsible for their death. According to information, the houses with their respective families inside, were lifted by the wind up-high and then dropped to the slopes with such a force that rendered them senseless, if not killed. On reaching the slopes from the space above, the persons, if yet alive, were finished by the on-rushing avalanches. Some of them were covered by the earth, some were knocked by the rolling stones and others were carried by the current to the valley where in the augmented water they were drowned. Patrol commander in the Island of Biliran reported that they found the corpses of those who perished greatly mutilated, and there was one whose body was cut in two.

A report received from our observer at Ormoc describes the effects of the typhoon in the Camotes Islands and in Merida, a town of Leyte very near to the Camotes, as so destructive, that one may be inclined to suspect whether a secondary center was formed near those islands. This report says in part as follows:

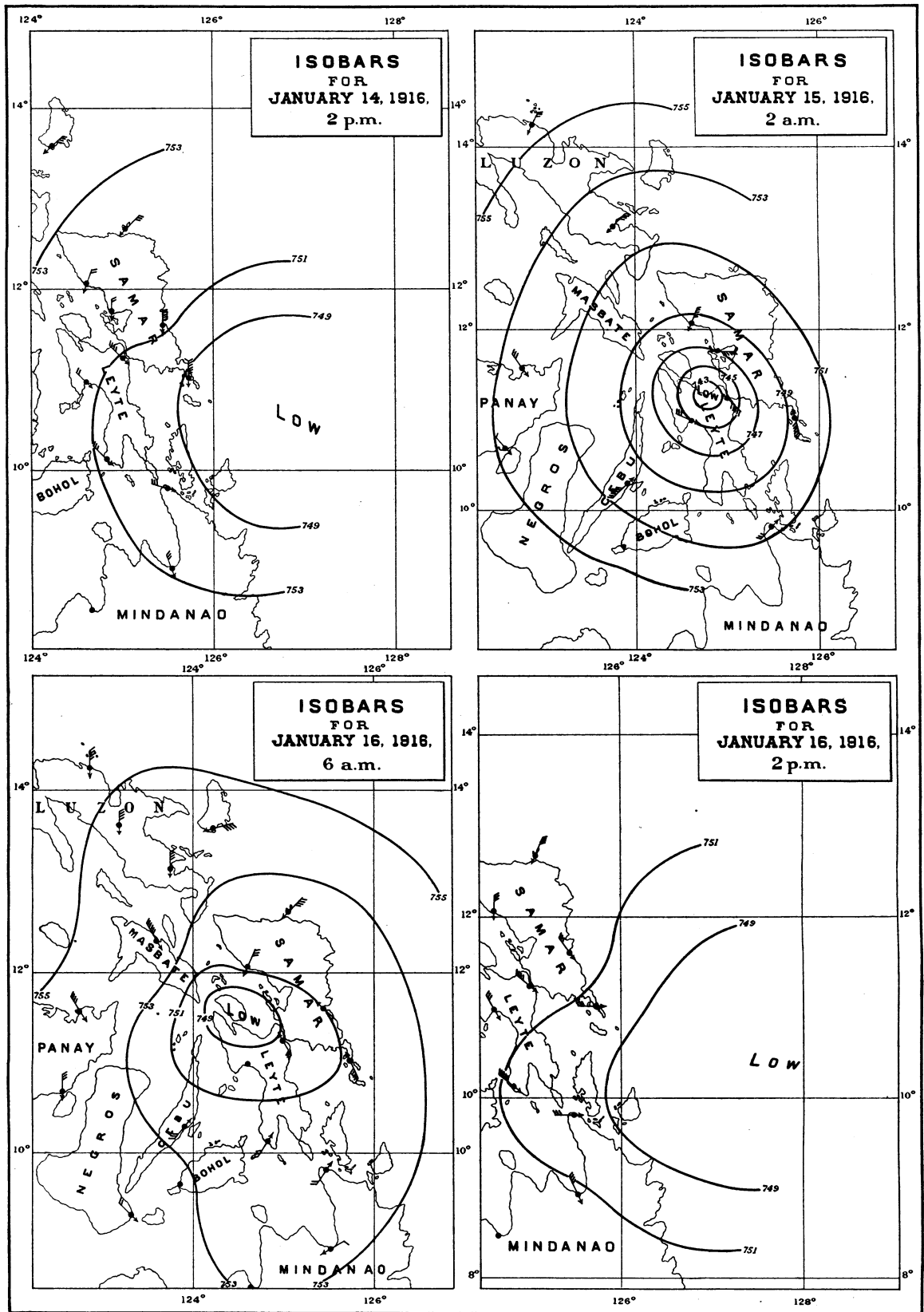
According to a letter from the parish priest of Pilar, Camotes Islands, Rev. Juan Miroy, hurricane winds were observed there with great destruction, 75 per cent of the houses having been blown down, among them the convent and the church. The crops were a complete loss. The town of Merida was practically swept by the winds, the sea waves, and the rain water rushing from the mountains and carrying away great trees and large plantations of sugar cane and abacá. In the lowest parts of the town the water rose to about two meters: as the people took refuge on time in the nearby mountains, no person was killed during the storm. The crops were also a complete loss in this town.

#### THE TYPHOON OF JANUARY 12 TO 16, 1916.

The existence of this typhoon is clearly shown by the isobars for 2 p. m. of January 16 (see Plate II). The barometers of the easternmost stations of Mindanao and the Visayas had fallen again while those of the other stations were rising decidedly owing to the

ISOBARS FOR THE TYPHOONS OF JANUARY, 1916.

Plate II.



N B - The barometric readings have been reduced to standard gravity.

filling up of the preceding typhoon. Again the direction of the winds had changed in Leyte and southern Samar, from S or SE to N or NW. There is no doubt, then, that at 2 p. m. of the 16th there was a new typhoon to the E of the southern part of the Visayas near  $10^{\circ}$  latitude N and  $128^{\circ}$  longitude E. Yet, this typhoon did not approach more to the Philippines, but filled up on the 17th or during the night of the 16th. It is very probable that this was the same typhoon which was shown by the observations of Guam of the 12th as situated on that day over the Western Carolines, SSW of Guam, near  $144^{\circ}$  longitude E and  $9^{\circ}$  latitude N. There was a moderate falling of the barometer in Guam on the 12th with a fresh breeze from ENE and E. The barometers rose up again on the next day. The direction of the typhoon from the Carolines to the Philippines must have been almost due west with a very small inclination to the north.

#### THE TYPHOON OF CATEEL, EASTERN MINDANAO, JANUARY 16 TO 24, 1916.

We have a very few data on this typhoon although it was the main cause of the great floods which wrought so much havoc throughout the greatest part of the Island of Mindanao. From a moderate falling of the barometer observed in Guam on the 16th, with winds from E and ESE, we deduce that this typhoon was probably formed on that day over the Western Carolines to the SSW of Guam. Hence it must have moved W toward Mindanao, with a rather low rate of progress, as it reached the eastern coast of that island very close or over Cateel ( $7^{\circ} 49'$  latitude N,  $126^{\circ} 26'$  longitude E) shortly after midnight of the 22d. It had been almost stationary on the 22d but was apparently moving rapidly when it passed over Cateel at about 1 or 2 a. m. of the 23d; then it became stationary again within Mindanao, where it finally filled up gradually on the 24th.

There was no telegraphic communication at that time with the southern part of the Philippines: yet Manila Observatory was able to announce in the afternoon of the 22d the existence of a depression over the Pacific to the E of Mindanao, and to situate it near or over the eastern part of that island in the morning of the 24th.

Thanks to the kindness of Rev. Jose Grimal, S. J., missionary at Cateel, we are in possession of some interesting details referring to the passing of this typhoon over that place. The barometer had fallen to 752 mm. at 1 a. m. of the 22d, the winds blowing strong and gusty from the NW quadrant, veering later to N and increasing more in intensity. The typhoon was moving so slowly that the barometer remained at 752 mm. for 22 hours until 11 p. m. when it began to fall rapidly, reaching the minimum 747 mm., probably at about 2 a. m. of the 23d. The winds were blowing violently from ENE at 1 a. m.; then there was absolute calm, and afterwards winds from E and ESE were observed, the height of the storm being practically over at 5 a. m. of the 23d.

Much damage was done to the houses and to the crops by the force of the winds and much more by the heavy rains with the corresponding rising of the Cateel River. The floods were now greater than during the famous Mindanao typhoon of November, 1912.

#### EXTRAORDINARY FLOODS IN MINDANAO, JANUARY, 1916.

It is to be regretted that we have rainfall observations only from a few stations on the northern and southern coast of Mindanao, and none from the interior of the island or from the eastern and western coast. In all probability the rains that fell in the interior of the island must have been much heavier than those reported from our stations on the coast, and they have to account for so unusual and destructive floods as were experienced during the last decade of the month in practically all the provinces of Mindanao and Sulu Department.

Our station at Cagayan is the one that reported a greater amount of rainfall for the 23d and 24th; but unfortunately the observer became sick after 4 p. m. of the 24th, his illness lasting for three or four days, and thus we were deprived of further rainfall observations after that hour. The total amount of rain for the 23d was 131.1 mm., and for the

24th, from 6 a. m. to 4 p. m. (10 hours only), 109 mm. It is to be remarked, moreover, that there had been in Cagayan constant daily rains more or less abundant since the 12th of this month, the greater daily amounts being 41.4 mm. for the 19th, 40.4 mm. for the 21st, and 65.9 mm. for the 22d. The greatest rain amount for one day in Zamboanga was 128.0 mm. on the 23d, while 81.3 mm. fell on the 24th. This is very extraordinary for that place even in any month of the year. In Davao, on the contrary, there was no rainfall recorded on the 23d, and only 74.2 mm. of rain had fallen on the 22d: yet to the north of Davao the rains must have been very heavy and abundant on the 23d and probably also on the 24th, as it can be deduced from the report of Cateel mentioned above. In Butuan the rains began on the 11th and continued until the 24th, the greatest daily amounts being: 50.0 mm. on the 13; 43.5 mm. on the 17; 58.7 mm. on the 18th; 162.8 mm. on the 21st, and 69.4 mm. on the 24th. In Surigao there were only four rainless days during the month, the heaviest rainfalls having occurred on the following days: The 12th with 65.1 mm.; the 13th with 102 mm.; the 14th with 84.3 mm.; the 16th with 65.3 mm.; the 17th with 67.5 mm.; the 20th with 76.5 mm.; the 21st with 98.9 mm.; the 22d with 70.1 mm.; the 24th with 62.5 mm., and the 25th with 119.1 mm.

The floods that occurred in Mindanao as an effect of the heavy rains observed there, are generally considered as the worst and most destructive experienced in many years in that island. The losses were enormous, particularly in the Agusan Province, where all the rivers rose as an average about 25 feet (7 to 8 meters) above their ordinary level, all the towns having been 3 to 4 feet (one meter or more) under the water, and some of them 10 to 16 or even 17 feet (3 to 5 meters.)

It can be surely stated that the immense region from Ebro and Los Martires to Veruela and Gracia was transformed into a great lake where only the top of the trees was visible. The crops were a complete loss in many of the towns, a great number of labor animals were killed, and many houses, wharfs, and bridges were practically swept by the rushing waters.

In the provinces of Lanao and Bukidnon many strong bridges were washed away, a great number of roads were destroyed or greatly damaged, and the crops, particularly in the low valleys, were either totally or partially lost. In the Misamis Province there were enormous losses caused by the floods to the crops, bridges, and roads. The rivers throughout the province rose to a height of about 21 to 22 feet (6 to 7 meters) above their ordinary level. In the Davao Province a great deal of damage was done to roads and bridges, some of them having been totally destroyed: in the town of Moncayo the water was 20 feet (6 meters) high in the streets, and all the houses and bridges were practically destroyed. In the Province of Zamboanga the bridges between the Capital and the Penal Colony of San Ramon were destroyed by the torrential rains.

We shall finish these notes on the Mindanao floods by copying here part of the official reports received from the provinces which suffered most from them.

Lanao Province.—According to a letter of the provincial governor, Hon. H. Gilsheuser, the lake Lanao rose approximately  $7\frac{1}{2}$  feet above its normal level, rising 5 feet in about 24 hours. The following is part of the report sent by said governor to the secretary of the Mindanao and Sulu Department:

On January 12, general rains set in, throughout the province, and continued until the 25th of that month. The 22d to 25th the rain was constant and accompanied by heavy winds. As a consequence of these rains a general flood occurred which caused considerable damage.

I had left Dansalan on the 21st for Iligan, where I intended to take a launch for Kolambugan to inspect that place. Upon arrival at Iligan I found the sea so rough that it was impossible to leave for Kolambugan as I had intended. I stayed at Iligan hoping that the weather would calm down, but instead of calming down, the weather became worse, and I was therefore at Iligan during the height of the storm and the flood.

Iligan and the surrounding country suffered more from the storm than any other place in the province, and in fact the town was at one time in danger of being wiped out. This was due to the



peculiar location of the town, the Iligan River running along the southern edge of the town and the Mandulag River about one mile to the north. Both of these rivers overflowed their banks, the Iligan River spreading to the north, while the Mandulag was spreading to the south; thus both rivers were extending toward the town eating away the banks and destroying practically everything in their path. As the town is located on a flat piece of land, only about 7 feet above sea level, the town was in imminent danger of being entirely flooded and wiped out.

On the afternoon of the 22d when the Iligan River began to rise very rapidly and the current became very swift and destructive, I had notice served on all people, who live in houses dangerously situated to be prepared to leave them and move to the municipal building; and later on in the evening of the same day, I had every body so situated moved into the municipal building. All of the houses from which I had gathered the people were later on flooded, destroyed and the majority carried to sea. Approximately two hundred people, including men, women and children, were housed in the municipal building, and were fed at government expense until the morning of the 25th when the rain let up and the water began to recede.

As a consequence of the storm, part of the town lying along the north bank of the Iligan River was washed away—several houses, including one of strong materials, were carried to sea. All municipal bridges within the town were destroyed, and the provincial suspension bridge across the Iligan River was carried away. This latter was carried away owing to the rise of the Iligan River and the large number of trees which this river carried. The trees and other material banked up against the bridge, which latter, finally gave way under the tremendous pressure.

The entire country between the Iligan and Mandulag rivers was flooded and the damage to sugar cane, abaca and coconuts is considerable. Young coconut plantations were laid entirely flat, the trees being uprooted and in many instances carried to sea. Sixteen large Boholano trading *paraos*, which were anchored in the Iligan River at the time of the storm, were carried to sea and lost. The Kolambugan launch *Joy* was carried to sea and lost, while one 5-ton lighter loaded with rice was carried to sea, but washed ashore again.

There was some loss to pigs, chickens, and goats, but no horses or carabaos were lost as far as I could determine, nor was there any loss of life.

On the provincial road between Iligan and Overton two culverts were washed out, but the road only slightly damaged, with the exception of near the Overton end, where a stream cut through the road, necessitating the construction of a bridge or fill.

At Balut the low-lying country in the immediate vicinity of Mumungan, along the Agus River, the country was flooded causing some loss in palay and several houses. One child was reported as having been carried away at this place by the river.

In the Lake region the lower Taraka valley and Raman valley were flooded. There was considerable loss in palay in this region and a large number of houses were either damaged or destroyed. A total loss of six lives is reported from these regions. The Constabulary stations at Ganasi and Taparan were flooded and are still under water. They will probably remain so for another month. (This is the time it is estimated it will take for the lake to recede to its normal level.)

From figures available I estimate that the damage sustained in the province, exclusive of the damage to the Overton-Keitheley Road, is ₱150,000. These figures include both Government and private losses.

**Bukidnon Province.**—The following communication was received from the provincial governor, Hon. Manuel Fortich:

The heaviest rains began on the 23d up to 24th accompanied by a strong wind. It was then the time that our strong bridges were broken and about 75 per cent of our road destroyed. Plantations to the estimated value of ₱100,000 have been washed away by land slides. Twenty persons died (so far known) and many lost cattle, horses, goats and pigs. The rain, during the 20th, 21st, 22d, 23d, 24th, and 25th soaked to the ground as far as 61 inches as shown in the rain gauge.

**Agusan Province.**—The official report sent by the provincial governor, Hon. Teopisto Guingona, to the governor of the Department of Mindanao and Sulu, is very interesting and abundant in details. Only part of it will be copied here for the information of our readers:

**Heavy rains.**—On January 11 abundant rains, which lasted for many days, began to fall throughout the province. They were accompanied at intervals by strong winds, especially on the 19th and 21st.

**Floods.**—As a consequence of these heavy and constant rains, all the rivers overflowed their banks and then the floods began as follows.

**Provincial division of Sumilao.**—On January 22 the Sumilao river overflowed its banks and covered with about 3 feet of water the towns of San Isidro, Tudela, and Libertad, with 2 feet of water, those

of Baza and Bunawan, and with 4 feet that of Mambalili. This river rose to a height of 28 feet above its normal level.

The Bahayan river overflowed also, and consequently the towns of Trento and Cuevas were 3 feet under the water. The river had risen 18 feet above its normal level.

On the 22d the high Agusan, rising to a height of 21 feet above its normal level, flooded with 3 feet of water the towns of Santa Josefa and Veruela.

Provincial division of Humayan.—On January 23 the Humayan river rose to a height of 30 feet above the normal level and flooded with 3 feet of water the towns of Santo Tomas and Violanta, and with 16 feet that of Gracia. The town of Loreto was completely flooded, with the exception of its central part.

On the same day the Adgauan river, rising to a height of 21 feet above its normal level, flooded with 4 feet of water the towns of Halapitan and Sagunto. La Paz was almost completely flooded.

Provincial division of Gibung.—On January 18 the Gibung river rose to a height of 30 feet above its normal level and flooded with 10 feet of water the towns of Borbon and Ebro, and one-third of Prosperidad.

On the same day the Suribao river, rising to a height of 19 feet above its normal level, flooded with 3 feet of water the towns of Mabtay, Rosario, and Nobeles.

Provincial division of Wawa-Ojot.—On January 24, the Agusan river rising to a height of 35 feet above its normal level, flooded the towns of Martires with 15 feet of water, and those of San Luis, Santa Ines and Santa Fe with 7 feet.

Two-thirds of Talacogon were flooded with 2 feet of water.

On January 30, Butuan, which up to that time had only one-third of the town flooded, was covered with water, except in a few places like the plaza and two or three high streets. This was due to the fact that the Agusan river while receding on that date did not meet the same resistance offered by the water from transversal rivers as it did on the preceding days, and hence found a free outlet to discharge its enormous deposit of water accumulated in the lake regions, thus causing these floods in the low towns near the seashore.

In the municipality of Cabadbaran, the barrios of Santiago and Tubay and one-third of the town of Jabonga, were flooded, owing to the enormous amount of water deposited in the Mainit Lake.

The water begins to recede.—The water of the Sumilao, Bahayan, Gibung, Suribao, Humayan and Adgauan rivers began to recede almost on the fourth day after they had overflowed their banks: but the towns of Gracia, Mambalili, Martires, San Luis, Santa Ines and Santa Fe, owing to the great amount of water accumulated in the lakes, were flooded for a period of fifteen days, during which the Agusan river was receding slowly.

At Butuan the water remained at its maximum height during six days.

Effects of the floods.—These effects were greatly disastrous. With the exception of the high region of Gibung, Sumilao, and Bahayan, all the plantations of hemp, camote, corn, rice, banana, gabi, etc., were lost. Young coconuts, cocoa, and coffee plants were also greatly damaged.

At Veruela twelve houses, one of them being of strong materials, were washed away by the rushing waters. Seven houses were destroyed at Violanta, and eight at Sagunto. The town of Martires lost four houses, the rest being very greatly damaged. The same can be said of the town of Gracia where the houses were under the water for many days.

The wharfs of twelve districts as well as the fences of most of the towns of the interior, were washed away by the current.

At Tubay four houses were blown down, and the barrios of Santiago and Jabonga suffered enormous losses.

The losses of the province are estimated at ₱340,035.

Years of flood in Agusan.—I beg to state here the years in which this province has been flooded, since the American occupation. They are: 1903, 1909, and 1916.

These floods occurred, almost always, during the northeastern monsoon, in the months of December to January, which is regularly the rainy season in this province.

Among these floods, the last one from which the province suffered very much, was the greatest and the most extraordinary.

Misamis Province.—Through our observer at Cagayan, we received a copy of the report of the provincial governor, Hon. Jose Reyes, to the Governor-General. Part of this report reads as follows:

On account of heavy and continuous rains that have fallen in the province for many days, the rivers overflowed their banks, the waters having risen as high as 21 feet and 8 inches above their natural level. The town of Cagayan was flooded by the waters coming from the river of the same name which entered it. Only a small part of the town and its neighborhood was free from the flood.

The low barrios were completely washed away by the rushing water of the river. The houses destroyed are estimated to be about 1,250.

On the first-class road from Cagayan to Tagaloan, of about 20 kilometers, enormous logs and a great amount of mud were deposited, which made it altogether impassable. Three bridges on this road were washed away by the waters.

The collapsible bridge over the Iponan river was destroyed. On the first-class road from Cagayan to Caayan Dock, of 4 kilometers, a portion of two kilometers was destroyed. One concrete bridge which joined the wharf with the town, was turned into pieces.

The losses caused by these floods were enormous. There is no precedent in fifty-three years of flood so destructive as the present.

**Davao Province.**—The following report was received from our observer at Davao:

In the morning of January 22 the Davao river began to rise above its ordinary level, and in the afternoon the waters had overflowed its banks and reached this town.

On the 23d the waters rose to their maximum height, and in the evening began to recede. On the 24th the river resumed its normal conditions.

The rushing waters had destroyed everything they found on their way, while many trees were uprooted and washed away to the gulf. All the plantations situated within the flooded area were completely or seriously damaged; and it can be surely stated that the losses in such an extended region were very great.

This flood is the most destructive ever experienced in this town. It is known that in 1912 there was a great flood here, but it was scarcely half as bad as this one.

It is said that at Moncayo, one of the municipal districts situated to the north of the province, as well as at Tagum and Macgum, the water rose to a height of about 35 feet above its ordinary level. The town of Moncayo it is said to have been practically destroyed.

Some of the roads leading to Tigatto Estate were completely destroyed. The wooden bridge over the Davao river, recently constructed, was destroyed and washed away to the sea.

The total losses in the Province can be estimated at ₱50,000.

**Cotabato Province.**—Our observer at Cotabato furnished us with the following information concerning these floods:

Cotabato was not in the flooded area. But colonists and residents at some of the barrios such as Lubungan, Pikit, Kударanga, Talitay, Reina Regente, etc., state that the flood was the greatest ever experienced there. In the evening of the 23d the river began to rise so rapidly that every body decided to leave their houses, and those who lived in the lower places were forced to embark in a canoe. About 120 houses were carried away by the waters.

**Zamboanga Province.**—The following remarks are copied from the Quarterly Bulletin of the Bureau of Public Works, April 1916:

One of the most destructive floods ever experienced in this province occurred on January 23 and 24. During a similar flood in 1910 water from the Tumaga River swept down the Santa Maria Canal in such quantities that the entire city was flooded. To prevent a repetition of this, a 15-foot diameter dyke of circular mesh reinforcing filled with large rocks and boulders was constructed in 1911 across the intake of the Santa Maria Canal. During the recent flood this dyke, or "sausage" as it is locally termed, fully justified its construction by preventing the flooding of the canal. The Tumaga River reached such a height, however, that it overflowed its banks to the east of the city with the result that many streets in this section were again flooded to a depth of from 1 to 3 feet. The surfacing on these streets was practically washed away and the street embankment at the Calle Magay Bridge was cut through and the entire street badly gutted. The Ayale Bridge, a 110-foot wooden pile structure on the San Ramon Road, and the Isabela Bridge, a 120-foot structure of a similar type on the Island of Basilan, were both lost. The surfacing on nearly all the provincial roads also suffered severe injury. The total estimated damage to roads and bridges in the province amounted to ₱43,000.

## NOTAS GENERALES DEL TIEMPO.

**Presión y temperatura.**—Debido a la extraordinaria frecuencia de depresiones y tifones que visitaron las Islas durante este mes, la presión atmosférica media mensual es notablemente inferior que la del año pasado y que la normal de enero. Las presiones más altas se observaron del 9 al 11, mientras que las más bajas tuvieron lugar generalmente del 2 al 3 o del 15 al 16.

La temperatura media mensual es casi idéntica a la del año pasado en las Visayas y Mindanao, y algo menor, generalmente, en Luzón. Las temperaturas extremas de Manila fueron 32.8° C. el día 9, y 17.4° C. el 18. Las temperaturas máximas y mínimas absolutas de Baguio fueron 26.1° C., 8.6° C. en la cumbre del Mirador, y 26.2° C., 7.4° C. en el valle.

**Precipitación acuosa.**—Con muy pocas excepciones, la lluvia total de este mes registrada en nuestras estaciones de Filipinas es mucho mayor que la del año pasado y que la normal de enero. Hubo inundaciones en diferentes partes de las Islas, pero principalmente en Mindanao. Cantidades diarias de lluvia de más de 100 mm. fueron observadas en seis estaciones de Mindanao, diez estaciones de Visayas, una estación de Luzón y una de Masbate. Consideramos esto como muy notable para el mes de enero.

## DEPRESIONES Y TIFONES.

Es muy extraordinario que en enero ocurran cuatro depresiones o tifones en o muy cerca de Filipinas. Y lo es todavía más que dos de estas depresiones o tifones atraviesen la parte septentrional de las Visayas como sucedió este año. La trayectoria general de tifones de este mes pasa a través de Mindanao y de la parte meridional de las Visayas.

## UNA DEPRESIÓN EN EL N DE VISAYAS, DICIEMBRE 28, 1915, A ENERO 4, 1916.

A juzgar por las observaciones de Guam y por las hechas a bordo del Transporte Americano *Sheridan* en su viaje de Guam a Filipinas, puede decirse con gran probabilidad que esta depresión se formó del 27 al 28 de diciembre al SSW de Guam, en los alrededores de 10° latitud N y 143° longitud E. De allí se movió casi directamente al W hasta la madrugada del 1.º de enero en que se inclinó al NW, conservando esta dirección sólo por medio día.

Nuestro mapa del tiempo de 6 a. m. del 1.º de enero indica perfectamente el centro de la depresión al ENE de Surigao cerca de 10° latitud N, al paso que el mapa del tiempo de 2 p. m. del mismo día lo sitúa muy cerca de la costa meridional de Sámar. Además, según las observaciones hechas en Tacloban con role muy claro de los vientos del NW al W y SW, no se puede dudar de que la depresión pasó por el N de dicha estación la tarde del 1.º de enero. De ahí la supuesta inclinación de la trayectoria al NW desde 6 a. m. del 1.º hasta que pasó la depresión por el N de Tacloban. Esta volvió entonces a inclinarse al W, moviéndose al WNW o W $\frac{1}{4}$ NW hacia el S de Masbate y Romblón, según se ve por nuestro mapa del tiempo de 6 a. m. del 2 de enero, el cual sitúa el centro casi a la mitad de distancia entre las Islas Masbate y Romblón. Probablemente la depresión se deshizo el día 4 en el Mar de China, al W del sur de Luzón, cerca de 115° longitud E y 14° latitud N.

La mínima barométrica registrada en todas nuestras estaciones que se hallaron cerca del centro de la depresión no fué menor de 751 mm.

## EL TIFÓN DE BILIRAN Y N DE LEYTE; 10 A 16 DE ENERO, 1916.

Este tifón se formó probablemente el día 10 en las Carolinas Occidentales, entre 7° y 9° latitud N y en los alrededores de 143° ó 144° longitud E. Nos fundamos al decir esto en las observaciones de Guam donde se observó un regular descenso del barómetro el día 10 con vientos frescos del ENE. El tifón debió moverse casi exactamente al

W hasta el día 14 en que se inclinó al WNW en dirección a la parte meridional de Sámar y septentrional de Leyte.

Los primeros indicios bien definidos de una depresión o tifón al E de la parte sur de las Filipinas se observaron en nuestro mapa del tiempo de 2 p. m. del 13. Este mapa, sin embargo, hubo de prepararse más tarde, ya que por muchos días no tuvimos comunicación con las Visayas ni con Mindanao. Por esto no fué posible entonces determinar la exacta situación de este tión, si bien el día 14, con solas las observaciones de Luzón, se anunció la existencia de una depresión ó tifón sobre las Visayas o Mindanao. Ahora, con el fin de que nuestros lectores puedan seguir por sí mismos la trayectoria del baguio al entrar en las Filipinas, ofrecemos en la Lámina II las isobaras de 2 p. m. del 14, 2 a. m. del 15 y 6 a. m. del 16. También incluimos en la misma lámina las isobaras de 2 p. m. del 16, las cuales, sin embargo, se refieren al tercer tifón de este mes, de que hablaremos más abajo.

Se observará en la Lámina I que el centro del tifón pasó muy cerca de Guiuan por el N, y muy cerca de Tacloban por el S, moviéndose casi directamente al W: después volvió a moverse al WNW hacia la Isla de Biliran. En una tabla publicada en el texto inglés damos una completísima serie de observaciones hechas durante el baguio por nuestro diligente observador de Tacloban, Sr. Deogracias Tablán. Es de sentir que las observaciones hechas en Ormoc sean muy incompletas y deficientes comparadas con las citadas de Tacloban.

Invitamos la atención de nuestros lectores al hecho notable de que la mínima barométrica tuvo lugar en Tacloban unas dos horas después de haberse observado la calma, habiendo sido la presión atmosférica casi 3 milímetros más baja dos horas después de la calma que durante la calma. Semejante anomalía no se había observado después de haber pasado el centro del tifón cerca de Guiuan. Además, es también notable que la mínima barométrica se registrase prácticamente al mismo tiempo en Ormoc que en Tacloban: de donde, si suponemos que la mínima barométrica se observó en Ormoc cuando el vórtice se hallaba a su menor distancia, se sigue que la misma fué observada en Tacloban unas dos horas después de haber pasado el vórtice a la menor distancia de dicho pueblo. ¿Indicaría todo esto que el centro de este tifón se profundizó más dentro de la Isla de Leyte, siendo entonces más pronunciado el vacío atmosférico, que cuando pasaba por encima de Tacloban?

Llamamos asimismo la atención de nuestros lectores sobre los vientos del NW observados de nuevo en Tacloban desde 9 a. m. del 16, los cuales eran debidos, según veremos luego, a la influencia de otro tifón. Es de notar también que el barómetro se conservó más bajo de 753 mm. desde 2 p. m. del 14 hasta 7 a. m. del 16 por haber permanecido el tifón casi estacionario por más de un día en, o cerca de, la Isla de Biliran o la parte más septentrional de Leyte, donde por último se deshizo la mañana del 16.

En cuanto a los efectos de este tifón, sólo diremos que fueron especialmente destructores en la Isla de Biliran y en algunos pueblos de las Islas Camotes y en la costa de Leyte al S y SSW de Ormoc. A continuación damos la copia del informe facilitado a nuestro observador de Tacloban por el jefe inspector de la Constabularia en Leyte:

Esta región fué en la tarde del 14 de los corrientes azotada por un tifón que duró hasta el día 16. El tifón no fué muy violento pero causó considerable daño sobre todo en la Isla de Biliran. Las plantaciones que más han sufrido fueron las de palay, maíz, plátano y abacá.

En el municipio de Biliran murieron víctimas del baguio una persona, cinco carabaos, cuatro vacas, veinte cabras, cinco ovejas y treinta cerdos. Unas diez casas fueron en parte destruídas. Según el cálculo del presidente municipal, la pérdida en las plantaciones fué: 40 por ciento en cocos, 50 por ciento en abacá, y 80 por ciento en otras plantas alimenticias. La pérdida total en el municipio se calcula en ₱19,000.

En el municipio de Caibiran murieron 19 personas, 3 carabaos y 4 vacas. Siete casas, incluso el mercado municipal, fueron arrastradas por el agua. En algunos sitios de la población de Caibiran el agua subió hasta 50 centímetros sobre el suelo.

Todas las personas muertas durante el baguio vivían en las montañas. Su muerte fué debida a los vientos fuertes junto con las grandes avenidas de las aguas que se desprendían de las montañas precipitándose sobre los valles. Dícese que las casas, con sus habitantes dentro de ellas, fueron levantadas en alto por el viento y lanzadas luego a los lados del monte con tanta fuerza que los dejaron sin sentido, si no muertos. Los que todavía vivían al caer, eran rematados por la impetuosa corriente de las aguas. Algunos fueron encontrados cubiertos de tierra, otros aplastados por enormes peñascos, y los demás habían sido arrastrados por la corriente al valle donde perecieron ahogados. Algunos cadáveres se encontraron notablemente mutilados, y aun se halló uno partido en dos.

En la relación enviada por nuestro observador de Ormoc se describen los efectos del tifón en las Islas Camotes y pueblos cercanos, como tan destructores, que uno se inclina a sospechar si se formó acaso un centro secundario cerca de dichas islas. La citada relación es, en parte, del tenor siguiente:

Según una carta del cura párroco de Pilar, Islas Camotes, Rev. Juan Miroy, se observaron allí vientos huracanados, habiendo sido derribadas unas 75 por ciento de las casas, entre ellas el convento y la iglesia. Las cosechas se perdieron por completo. El pueblo de Mérida (pueblo de Leyte muy cerca de las Camotes) fué materialmente barrido por los vientos, por las olas del mar y por el agua de lluvia que se precipitaba desde las montañas llevando grandes troncos de árboles y plantaciones de caña dulce y abacá. En las partes más bajas del pueblo el agua se elevó a unos 2 metros: como la gente se refugió a tiempo en las montañas vecinas no hubo ninguna desgracia personal. Las cosechas se perdieron también completamente en este pueblo.

#### EL TIFÓN DE 12 A 16 DE ENERO, 1916.

La existencia de este tifón queda claramente indicada por las isobaras de 2 p. m. del 16 de enero (véase Lámina II). Los barómetros de las estaciones más orientales de Mindanao y de Visayas habían bajado de nuevo, al paso que los de las otras estaciones subían francamente por haberse deshecho el tifón anterior. La dirección de los vientos había cambiado completamente en Leyte y S de Sámar, del S o SE al N o NW. No hay, pues, duda de que a 2 p. m. del 16 existía un nuevo tifón al E de la parte meridional de Visayas cerca de 10° latitud N y 128° longitud E. Sin embargo, este tifón no se acercó más a Filipinas, sino que se deshizo el día 17 o durante la noche del 16. Es muy probable que fuera este el mismo tifón que el día 12 indicaban las observaciones de Guam como situado en las Carolinas Occidentales, al SSW de Guam, cerca de 144° longitud E y 9° latitud N. En dicho día 12 se observó allí un regular descenso del barómetro con vientos fresquitos del ENE y E. El barómetro volvió a subir el día siguiente. La dirección del tifón desde las Carolinas a las Filipinas debió haber sido casi directamente al W con una ligerísima inclinación al N.

#### EL TIFÓN DE CATEEL, COSTA ORIENTAL DE MINDANAO, 16 AL 24 DE ENERO, 1916.

Poseemos muy pocos datos referentes a este tifón, el cual fué la causa principal de las grandes inundaciones que tanto estrago causaron en casi toda la Isla de Mindanao. De un regular descenso del barómetro observado en Guam el día 16, con vientos del E y ESE, deducimos que este tifón se formó probablemente en dicho día en las Carolinas Occidentales, al SSW de dicha estación. Por tanto, debió de moverse el tifón al W y con poca velocidad, ya que llegó a Mindanao muy cerca o por encima de Cateel (7° 49' latitud N, 126° 26' longitud E) poco después de media noche del día 22. Durante este día había permanecido casi estacionario cerca de Mindanao: pero se movió de nuevo con mayor velocidad al pasar por Cateel en las primeras horas del 23, volviendo luego a estacionarse dentro de la isla, donde al fin se deshizo el día 24.

En aquellos días no teníamos comunicación telegráfica con la parte sur de Filipinas: sin embargo, el Observatorio de Manila pudo anunciar en la tarde del 22 la existencia de una depresión en el Pacífico al E de Mindanao, y situarla en o cerca de la parte oriental de dicha isla en la mañana del 24.

Gracias a la amabilidad del Rev. José Grimal, S. J., misionero de Cateel, poseemos

algunos datos interesantes referentes al paso de este baguio por aquel pueblo. El barómetro había bajado a 752 mm. a la 1 a. m. del 22, soplando vientos fuertes y racheados del cuadrante del NW, los cuales rolaron después al N y aumentaron aún más en fuerza. El baguio se movía tan lentamente que el barómetro se conservó en 752 mm. durante 22 horas hasta 11 p. m. en que empezó a bajar rápidamente, alcanzando la mínima 747 mm. probablemente hacia las 2 de la madrugada del día 23. Los vientos soplaron con violencia del ENE a la 1 a. m.; luego hubo calma absoluta, y después se observaron vientos del E y ESE, habiendo pasado prácticamente lo fuerte del baguio a eso de las 5 a. m. del 23.

Las casas y las cosechas fueron considerablemente perjudicadas por la fuerza de los vientos, y mucho más por las copiosas lluvias y correspondiente crecida del río Cateel. Las inundaciones fueron esta vez mayores que cuando el célebre baguio de Mindanao del mes de noviembre, 1912.

#### EXTRAORDINARIAS INUNDACIONES EN MINDANAO, ENERO, 1916.

Es de sentir que no tengamos más observaciones de lluvia que de unas cuantas estaciones de la costa norte y sur de Mindanao, y ninguna del interior de la isla o de su costa oriental y occidental. Con toda probabilidad las lluvias que cayeron en el interior de la isla debieron haber sido mucho más torrenciales que las observadas en nuestras estaciones de la costa y hubieron de ser la causa principal de tan extraordinarias y devastadoras inundaciones como las que se experimentaron durante la última década del mes en casi toda la extensión de aquella grande isla.

Nuestra estación de Cagayán es la que registró las más grandes cantidades diarias de lluvia los días 23 y 24; pero desgraciadamente el observador cayó enfermo después de 4 p. m. del 24, durando su enfermedad tres o cuatro días, con lo cual nos quedamos privados de ulteriores observaciones de lluvia después de aquella hora. La cantidad total de lluvia del día 23 fué 131.1 mm., y la del 24, de 6 a. m. a 4 p. m. (sólo 10 horas), 109 mm. Es de notar, además, que hubo en Cagayán diariamente constantes lluvias más o menos abundantes desde el día 12 de este mes, siendo las cantidades diarias más grandes 41.4 mm. el 19, 40.4 mm. el 21, y 65.9 mm. el 22. La mayor cantidad de lluvia en un día en Zamboanga fué 128.0 mm. observada el 23, al paso que el 24 cayeron además 81.3 mm. Esto puede considerarse como muy extraordinario para aquella ciudad, no sólo para el mes de enero, pero aún para cualquier mes del año. En Dávao, por el contrario, no se registró lluvia caída el día 23, y sólo 74.2 mm. de lluvia se habían recogido el 22: sin embargo, al N de Dávao las lluvias debieron haber sido muy abundantes el día 23 y probablemente también el 24, como puede deducirse del informe de Cateel arriba mencionado. En Butúan las lluvias empezaron el 11 y continuaron hasta el 24, siendo las mayores cantidades diarias: 50.0 mm. el día 13; 43.5 mm. el 17; 58.7 mm. el 18; 162.8 mm. el 21 y 69.4 mm. el 24. En Surigao sólo hubo durante el mes cuatro días sin lluvia, habiéndose registrado las lluvias más abundantes en los siguientes días: el 12 con 65.1 mm.; el 13 con 102 mm.; el 14 con 84.3 mm.; el 16 con 65.3 mm.; el 17 con 67.5 mm.; el 20 con 76.5 mm.; el 21 con 98.9 mm.; el 22 con 70.1 mm.; el 24 con 62.5 mm. y el 25 con 119.1 mm.

Las inundaciones que ocurrieron en Mindanao, como efecto de las copiosas lluvias allí observadas, son generalmente consideradas como las peores y más destructoras de las experimentadas por muchos años en aquella isla. Las pérdidas fueron enormes, particularmente en la Provincia de Agusan, en que todos los ríos se elevaron por término medio a unos 25 pies (7 a 8 metros) sobre su nivel ordinario, habiendo quedado todos los pueblos a 3 ó 4 pies (un metro o más) debajo del agua, y aún algunos de ellos de 10 a 16 ó 17 pies (3 a 5 metros). Puede decirse con seguridad que la inmensa región desde Ebro y los Mártires hasta Veruela y Gracia se transformó en un gran lago donde sólo se podían distinguir las copas de los árboles. Las cosechas se perdieron por completo en muchos de dichos pueblos, animales de labor murieron en gran número, y muchas casas, muelles y puentes fueron prácticamente barridos por la impetuosa corriente de las aguas.

En las Provincias de Lanao y Bukidnon muchos puentes fueron arrastrados por las aguas, gran número de caminos quedaron destrozados o gravemente perjudicados, y las cosechas, especialmente en las llanuras bajas, se perdieron del todo o en gran parte. En la Provincia de Misamis hubo enormes pérdidas causadas por las inundaciones en las cosechas, puentes y caminos. Los ríos de toda la provincia se elevaron a una altura de 21 a 22 pies (6 a 7 metros) sobre su nivel ordinario. En la Provincia de Dávao sufrieron mucho los caminos y puentes, habiendo sido algunos de ellos completamente destruídos: en el pueblo de Moncayo el agua llegó a 20 pies (6 metros) de altura en las calles, y todas las casas y puentes quedaron prácticamente destruídos. En la Provincia de Zamboanga los puentes entre la Cabecera y la Colonia Penal de San Ramón fueron destruídos por las torrenciales lluvias.

Terminaremos estas notas sobre las inundaciones de Mindanao copiando parte de los informes oficiales recibidos de las provincias que más daño han sufrido por dichas inundaciones.

**Provincia de Lanao.**—Según una carta del gobernador provincial, Hon. H. Gilsheuser, la laguna de Lanao subió 7.5 pies sobre su nivel normal, elevándose a 5 pies en unas 24 horas. Lo que sigue es parte del informe enviado por dicho gobernador al secretario del Departamento de Mindanao y Joló:

El 12 de enero comenzaron a caer lluvias generales en toda la provincia, las cuales continuaron hasta el 25. Desde el 22 al 25 fueron estas lluvias constantes y acompañadas de fuertes vientos. Como consecuencia de estas lluvias ocurrió una inundación general que causó daños considerables.

Salí de Dansalan el 21 para Iligan con intención de tomar una lancha en este último punto para Kolambugan e inspeccionar dicho lugar. Al llegar a Iligan ví la mar tan gruesa que era imposible partir para Kolambugan como había intentado. Permanecí en Iligan esperando que el tiempo mejorase; pero en vez de mejorar empeoró, y así me tuve que quedar en Iligan durante el baguio y la inundación.

Iligan y las comarcas vecinas sufrieron más por el baguio que ningún otro lugar de la provincia, y de hecho el pueblo estuvo en peligro de desaparecer. Esto se debe a la situación peculiar de dicho pueblo: el río Iligan corre a lo largo del extremo meridional del mismo, y el río Mandulag una milla próximamente al norte. Los dos ríos salieron de madre, extendiéndose el Iligan hacia el norte y el Mandulag hacia el sur, dirigiéndose de esta suerte ambos hacia el pueblo, arruinando sus diques y destruyendo prácticamente cuanto encontraban a su paso. Como el pueblo se halla situado en una llanura de solos 7 pies de alto sobre el nivel del mar, estuvo en inminente peligro de quedar por completo sumergido y destruído.

La tarde del 22, cuando el río Iligan empezó a crecer rápidamente y las corrientes se pusieron impetuosas y devastadoras, envié aviso a toda la gente que vivía en casas que se hallaban en peligro para que se preparasen a abandonarlas y se trasladasen a la casa municipal. Y más tarde al anoecer del mismo día, había yo conseguido trasladar a dicha casa municipal a todos los que se hallaban en tan peligrosa situación. Todas las casas de donde recogí aquella gente, fueron más tarde inundadas, destruídas y las más de ellas arrastradas al mar. Próximamente doscientas personas, entre hombres, mujeres y niños, fueron hospedadas en la casa municipal, y alimentadas a expensas del gobierno hasta la mañana del 25 en que la lluvia cesó y el agua empezó a retirarse.

Todos los puentes municipales dentro del pueblo quedaron destruídos y el puente colgante provincial sobre el río Iligan fué arrastrado al mar. Esto último fué debido a la crecida del río Iligan y al gran número de árboles y otros materiales que arrastraba en su corriente, los cuales se amontonaron contra el puente, que acabó por ceder bajo tan tremenda presión.

Toda la comarca entre los ríos Iligan y Mandulag quedó inundada y el daño causado a la caña dulce, abacá y coco es considerable. Nuevas plantaciones de coco quedaron completamente arrasadas, habiendo sido arrancados de cuajo muchos árboles, y no pocos arrastrados al mar. Diez y seis grandes *paraos* comerciales boholanos, que estaban anclados en el río Iligan, fueron arrastrados al mar y se perdieron. La lancha *Joy* de Kolambugan fué arrastrada al mar y se perdió, en tanto que una gabarra de 5 toneladas cargada de arroz fué también arrastrada al mar, pero arrojada otra vez a la playa.

El camino provincial entre Iligan y Overton quedó sólo ligeramente dañado, excepción hecha del extremo próximo a Overton, en que la corriente lo cortó de parte a parte, habiendo sido necesario construir un puente.

En Balut la comarca baja que se extiende en las proximidades de Mumungan, a lo largo del río



Agus, fué inundada, perdiéndose algo el palay y varias casas. Se ha dicho que un niño de este pueblo fué arrastrado por el río.

En la región del lago se inundaron los valles de Taraca y de Ramain, habiéndose perdido considerablemente el palay y deterioradas o destruidas gran número de casas. Hubo en estas regiones una pérdida total de seis vidas. Las estaciones de la Constabularia en Ganasi y Taparan estuvieron inundadas y continúan aún (feb. 7, 1916) debajo del agua, y probablemente continuarán así durante otro mes. (Este es el tiempo que se calcula empleará el lago para volver a su nivel normal).

Según cifras obtenidas, calculo que el daño sufrido por la provincia, sin incluir el causado al camino de Overton a Keithley, asciende a ₱150,000, comprendiendo las pérdidas tanto del Gobierno como de los particulares.

**Provincia de Bukidnon.**—Del gobernador provincial, Hon. Manuel Fortich, se recibió la siguiente comunicación:

Abundantes lluvias cayeron del 23 al 24 acompañadas de viento fuerte. Entonces fué cuando nuestros sólidos puentes quedaron destruidos, y 75 por ciento próximamente de nuestro camino destruido. Plantaciones, cuyo valor se calcula en ₱100,000, fueron arrastradas por la corriente. Murieron veinte personas y muchos ganados, caballos, cabras y cerdos. La cantidad de lluvia caída durante los días 21, 22, 23, 24, y 25 llegó a 61 pulgadas, según los registros de los pluviómetros.

**Provincia de Agusan.**—La relación oficial enviada por el gobernador provincial Hon. Teopisto Guingona, al gobernador del Departamento de Mindanao y Joló es muy interesante y abunda en detalles. Copiaremos a continuación parte de ella para información de nuestros lectores:

**Las grandes lluvias.**—El día 11 de enero de este año, comenzaron a caer en toda la provincia abundantes lluvias que duraron por muchos días. Estas lluvias fueron, a ratos, acompañadas de rachas de vientos fuertes, especialmente en los días 19 a 21 de enero.

**Inundación.**—Con las grandes y constantes lluvias, saliéronse de madre todos los ríos, comenzando entonces la inundación.

**División provincial de Sumilao.**—El día 22 de enero, el río Sumilao inundó con 3 pies de agua los pueblos de San Isidro, Tudela y Libertad; con 2 pies de agua los pueblos de Baza y Bunawan, y con 4 pies de agua el pueblo de Mambalili. Este río subió de su nivel ordinario a una altura de 22 pies.

El río Bahayan inundó también en dichos días los pueblos de Trento y Cuevas con 3 pies de agua sobre el suelo, alcanzando una altura de 18 pies sobre su nivel ordinario.

El día 22, el alto Agusan salió de madre, inundando con 3 pies de agua los pueblos de Santa Josefa y Veruela, y alcanzando una altura de 21 pies sobre su nivel ordinario.

**División provincial de Humayan.**—El día 23 de enero, el río Humayan salió de madre, inundando con 3 pies de agua los pueblos de Santo Tomás y Violanta, y con 16 pies el pueblo de Gracia, alcanzando una altura de 30 pies sobre su nivel ordinario. El pueblo de Loreto fué totalmente inundado, con excepción del casco de la población. En Waloe el agua alcanzó hasta un sitio que dista 10 yardas de la casa comandancia.

En la misma fecha salió de madre el Adgauan, inundando con 4 pies de agua los pueblos de Halapitan y Sagunto, y alcanzando una altura de 21 pies sobre su nivel ordinario. La Paz fué todo inundado, excepto algunas calles de la población.

**División provincial de Gibung.**—El día 18 de enero el río Gibung salió de madre, inundando con 10 pies de agua los pueblos de Borbón y Ebro, y un tercio de la población de Prosperidad, alcanzando una altura de 30 pies sobre su nivel ordinario.

En la misma fecha el Suribao salió de madre, inundando con 3 pies de agua los pueblos de Mab-tay, Rosario y Novele, alcanzando una altura de 19 pies sobre su nivel ordinario.

**División provincial de Wawa-Ojot.**—El día 24 de enero el río Agusan salió de madre, inundando los pueblos de Mártires con 15 pies de agua; San Luis, Santa Inés y Santa Fe con 7 pies, y alcanzando una altura de 35 pies sobre su nivel ordinario.

Dos terceras partes de Talacogon fueron inundadas con 2 pies de agua.

El día 30 de enero, Butúan, que no tenía hasta entonces más que un tercio de su población inundada, se llenó casi de agua, quedándose únicamente algunos sitios, como eran la plaza del pueblo y dos o tres calles elevadas. Este fenómeno se debe al hecho de que al bajarse el Agusan en esas fechas, no encontrando ya la misma resistencia del agua de los ríos transversales que con su corriente en días pasados le cerraban el paso, halló una salida libre de su enorme depósito de agua acumulada en la región de los lagos, y por esto vino la inundación de estos pueblos de abajo.

En el municipio de Cabadbaran fueron inundados los barrios de Santiago y Tubay y un tercio de la población de Jabonga, debido a la enorme cantidad de agua depositada en el lago Mainit.

Estado lastimoso de algunos pueblos durante la inundación.—El pueblo de Mártires tenía el agua hasta el mismo techo de las casas, y sus habitantes se refugiaron en la vecina montaña que se encontraba a una milla del pueblo. En Gracia, en donde el agua se hallaba a unos 3 pies sobre el suelo de las casas, la mayor parte de la gente vivía en barotos y balsas, y a veces encima de grandes troncos de árboles que amarraban al lado de sus ventanas. En los pueblos de Santa Fe, Santa Inés y San Luis el agua había llegado a cubrir el suelo de las casas, habiendo tenido que trasladarse sus habitantes a las vecinas montañas.

Del 22 al 27 de enero, el pueblo de Veruela tuvo que sostener una titánica lucha contra la terrible corriente que amenazaba destruir todo el pueblo. Por las noches las mujeres y los niños eran alojados en las balsas de caña que los hombres tenían que sostener, trasladándolas de un lado a otro para evitar el choque con los grandes troncos de árboles que se precipitaban con la corriente.

Navegando por el río Agusan, veíanse de cuando en cuando bajar techos enteros de las casas juntamente con los árboles y montones de caña arrastrados por la corriente. Veíanse también, de trecho en trecho, en las orillas del río, casas tumbadas y enganchadas en los árboles.

Principio de la bajada del agua.—El agua de los ríos de Sumilao, Bahayan, Gibung, Suribao, Humayan y Adgauan comenzó a bajar al cuarto día después que los mismos habían salido de madre; pero los pueblos de Gracia, Mambalili, Mártires, San Luis, Santa Inés y Santa Fe, por la gran cantidad de agua acumulada en los lagos, estuvieron inundados por espacio de quince días, durante los cuales el Agusan registraba diariamente un lento descenso.

En Butúan el agua permaneció en su máxima altura por espacio de seis días.

Los pueblos en los ríos de Casilayan, Maasam, Libang, Ojot y Fusilao estuvieron bajo el agua por espacio de tres días.

Efectos de la inundación.—Estos son grandemente desastrosos. Con excepción de la región alta de Gibung y de la de Sumilao y Bahayan, todas las siembras de abacá, camote, maíz, palay, plátano, gabi y otros tubérculos se perdieron. Quedáronse también muy afectados los cocos nuevos, el cacao y el café.

En Veruela fueron arrastradas por la corriente doce casas, una de ellas de materiales fuertes. En Violanta fueron destruidas por la corriente siete casas, y en Sagunto ocho. El pueblo de Mártires perdió cuatro casas, y las otras se quedaron con desperfectos grandísimos. Lo mismo se puede decir de las casas del pueblo de Gracia que estuvieron debajo del agua por espacio de muchos días.

Los pantalanos de doce distritos fueron arrastrados por la corriente, así como los cercos de la mayor parte de los pueblos del interior.

En Tubay cuatro casas quedaron tumbadas, y los barrios de Santiago y Jabonga sufrieron también grandes pérdidas.

Se calculan las pérdidas de la provincia en ₱340,035.

Años de inundación en Agusan.—Para lo que puedan valer estos datos, me permito consignar aquí los años en que esta provincia ha sufrido una inundación, y estos son: 1903, 1909 y 1916.

Estas inundaciones han venido, casi siempre, durante la monzón del norte, en los meses de diciembre a enero, que suelen ser la época de aguas en la provincia.

De estas inundaciones, la más grande y extraordinaria es la que la provincia acaba de sufrir.

Provincia de Misamis.—Por conducto de nuestro observador de Cagayán, recibimos una copia del informe del gobernador provincial, Hon. José Reyes, al Gobernador General. Parte de este informe es del tenor siguiente:

Efecto de las lluvias abundantes y continuas que han caído en la provincia por espacio de muchos días los ríos se desbordaron de su cauce ordinario llegando a subir las aguas 21 pies y 8 pulgadas sobre su nivel natural. La población de Cagayán fué anegada por las aguas procedentes del río de su mismo nombre que se metió en ella por dos cauces y la aisló del resto del territorio. Sólo una pequeña parte de la población y sus alrededores se libró de la inundación.

Los barrios bajos fueron completamente barridos por la corriente del río. Se calculan en 1,250 las casas destruidas.

En la carretera de primera clase de Cagayán a Tagoloan, de unos 20 kilómetros, quedaron troncos enormes y barro que la hicieron completamente intransitable. Tres puentes de esta carretera fueron arrastrados por las aguas, habiéndose abierto tres nuevos cauces de ríos que cortan el camino. Este era atravesado después de la inundación por nueve ríos a cual más grande.

El puente levadizo sobre el río Iponan fué destrozado. En el camino de primera clase de Cagayán a Caayan Dock, de 4 kilómetros, una porción de 2 kilómetros fué destrozada por la corriente. Un puente de cemento armado que comunica el muelle con la población se encontró hecho pedazos.

Las pérdidas causadas por estas inundaciones fueron enormes. No se tiene precedente en cincuenta años de inundación tan asoladora como la presente.

**Provincia de Davao.**—De nuestro observador de Dávao recibimos la siguiente relación:

El día 22 por la mañana el agua del río de Dávao empezó a elevarse de su nivel ordinario, y por la tarde las aguas llevadas por una corriente impetuosa, se habían desbordado llegando a la altura de este pueblo.

El día 23 las aguas habían llegado a su mayor elevación, y por la noche ya empezaron a decrecer. El día 24 el río comenzaba a volver a su estado normal.

La corriente de las aguas había destrozado todo cuanto había encontrado a su paso, y muchos árboles fueron arrancados de cuajo y llevados hacia el golfo. Todas las plantaciones comprendidas dentro del área inundada, fueron perjudicadas grandemente, y puede asegurarse que la pérdida en dicha extensión ha sido muy considerable.

Esta inundación ha sido la más desastrosa de las muy pocas que se han conocido en este pueblo. Se sabe que el año 1912 hubo una gran inundación en esta localidad, pero no llegó siquiera a la mitad de la última ocurrida.

Se dice que en Moncayo, uno de los distritos municipales que se halla situado hacia el norte de la provincia, el agua subió unos 35 pies sobre el nivel ordinario, así como en Tagum y Macgum. El pueblo de Moncayo dicen haber sido prácticamente destruído.

Algunos caminos que se dirigen a la Hacienda de Tigatto fueron por completo destrozados. El puente de madera del río de Dávao, recientemente construído, fué arrancado por la corriente y llevado todo el maderamen hacia el mar.

La pérdida total se puede calcular en unos ₱50,000.

**Provincia de Cotabato.**—Nuestro observador de Cotabato nos facilitó la siguiente información relativa a estas inundaciones:

Esta población de Cotabato estuvo fuera del área inundada. Pero los colonos y residentes de algunos barrios como Lubungan, Pikit, Kudaranga, Talitay, Reina Regente, etc., dicen que la inundación allí experimentada es la más grande de que se tiene memoria. En la noche del 23 el río empezó a crecer desenfrenadamente, diciéndose todos a abandonar sus moradas y viéndose obligados a embarcarse en vinta los que vivían en los lugares más bajos. Las casas llevadas por la corriente ascienden poco más o menos a 120.

**Provincia de Zamboanga.**—Del Boletín Trimestral de la Oficina de Obras Públicas, abril, 1916, tomamos las siguientes notas:

Una de las más devastadoras inundaciones nunca experimentada en la provincia ocurrió el 23 y 24 de enero. Durante otra semejante inundación de 1910 las aguas del río Tumaga se acumularon en el canal de Santa María en tal cantidad que todo el pueblo se inundó. Para prevenir la repetición de esto, se construyó en 1911 en la embocadura del citado canal de Santa María un gran dique de 15 pies de diámetro. Durante esta última inundación este dique justificó plenamente su construcción impidiendo que rebosase el canal. El río Tumaga, sin embargo, alcanzó tal altura que desbordó sus riberas al este del pueblo, resultando inundadas de nuevo muchas calles de esta sección con una altura de agua de 1 a 3 pies. La superficie de estas calles quedó prácticamente destruída. El puente Ayala, en el camino de San Ramón, y el puente Isabela, en la Isla de Basilan, desaparecieron por completo. La superficie de casi todos los caminos provinciales sufrieron también graves perjuicios. Se calcula que las pérdidas debidas a los destrozos y daños causados a los caminos y puentes de la provincia ascienden a ₱43,000.



METEOROLOGICAL DATA FOR MIRADOR OBSERVATORY, BAGUIO.<sup>a</sup>

[ $\phi=16^{\circ} 25' N$ ;  $\lambda=120^{\circ} 36' E$ ; barometer above sea, 1,512.5 meters; gravity correction not applied, -1.65 mm.]

Day.	Pressure <sup>b</sup> (mean).	Air temperature at Mirador (on the top of the mountain).					Air temperature in the valley (near the city hall).				Relative humidity (mean).	Vapor pressure (mean).	Radiation.		Evaporation.	
		Mean.	Maximum.	Hour.	Minimum.	Hour.	Maximum.	Hour.	Minimum.	Hour.			Minimum on grass.	Maximum in sun. Black bulb in vacuo. <sup>c</sup>	Free ex- posure (total)	Shel- ter (total)
	mm.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	Per ct.	mm.	°C.	°C.	mm.	mm.	
1	636.16	17.4	24	Noon	15.3	9.30p.	24.3	Noon	13.3	4.25a.	88.8	13.1	13.5	2.6	1.9	
2	34.54	18.1	21.3	1.20p.	15.4	2.00a.	22.5	1.15p.	14.5	4.45a.	81.3	12.4	12.7	4	2.9	
3	34.41	18	22.7	1.45p.	16.4	6.35a.	23	1.50p.	16.3	7.15a.	85	13	12.2	3.1	2.3	
4	36.66	17.7	23.6	1.45p.	15.5	12m.n.	23.1	0.25p.	16	12m.n.	90.2	13.5	15.3	2.4	1.9	
5	37.54	17.4	22.6	10.40a.	15	12m.n.	23.3	11.35a.	15.4	12m.n.	89.7	13.2	13.8	3.9	3.4	
6	37.48	17.7	23.8	0.35p.	14.7	6.45a.	24.3	1.10p.	14.3	6.10a.	71.7	10.4	12.9	7.5	4.1	
7	37.66	18.4	24.4	11.00a.	15	3.10a.	25.1	0.15p.	13.7	4.15a.	83.8	13.1	12.9	2.5	2	
8	38.67	18.2	24.3	11.55a.	15.3	6.25a.	24.8	0.30p.	14.4	5.40a.	87.5	13.6	13.9	3	2.5	
9	39.65	18.7	24.2	11.00a.	15.1	2.35a.	25	1.40p.	13.4	6.00a.	78.5	12.5	12.3	3.6	2.7	
10	39.64	18.3	23.6	2.00p.	15.3	12m.n.	24	10.15a.	13.4	6.40a.	76	11.9	10.9	5.6	3.4	
11	39.56	18.1	23.7	11.50a.	14.5	3.15a.	25.3	0.20p.	12.6	3.55a.	70.5	10.8	12.8	5.2	3.5	
12	38.79	17.8	23.6	11.20a.	14.1	3.40a.	24.5	Noon	12.5	4.15a.	72.7	11.1	11.4	5.3	3.5	
13	38.23	16.9	23.2	1.20p.	13.6	10.30p.	24.2	0.15p.	13	12m.n.	70.7	9.9	12.2	7.2	4.5	
14	37.37	17.1	22.5	11.15a.	13.4	2.40a.	24.2	11.45a.	12	5.45a.	75.5	11	10.9	4.5	3.2	
15	35.70	17.2	21.8	0.30p.	14.2	12m.n.	22.8	0.35p.	12.8	2.20a.	78	11.4	12.7	3	2	
16	35.30	14.6	20.4	11.20a.	10.4	12m.n.	22.3	11.50a.	10.5	12m.n.	81.7	10.1	11.2	3.9	2.6	
17	35.97	12.4	19.2	11.30a.	9.7	6.40a.	19.4	Noon	9.3	7.20a.	71.2	7.6	8.5	4.9	2.8	
18	36.72	13.1	20.2	0.20p.	8.6	2.35a.	20.4	1.30p.	7.4	6.00a.	76.3	8.6	6.2	4.6	2.6	
19	37.40	13.6	19.1	1.55p.	10.1	4.55a.	21.1	11.55a.	7.8	6.15a.	75.2	8.6	7.2	4.6	2.5	
20	36.61	13.7	19.3	11.30a.	10.1	4.00a.	19.4	2.30p.	8.7	5.50a.	83.2	9.6	8.5	3	1.9	
21	35.98	13.3	18.8	Noon	9.7	6.00a.	20.2	2.10p.	8.3	6.40a.	82.8	9.4	7	3.3	2.6	
22	35.86	16.6	23.3	1.20p.	11.5	2.10a.	24.2	2.00p.	10.4	2.15a.	78.5	10.9	10	4	2.8	
23	36.11	15.9	21.1	9.20a.	13.2	6.00a.	23.3	10.25a.	12.8	7.00a.	93.7	12.6	12.5	1.1	.9	
24	36.64	16.8	23.2	0.20p.	13.2	12m.n.	23.3	0.20p.	12.6	11.40p.	78.7	11	13.7	6	3.5	
25	37.51	16.1	23.6	1.55p.	12.6	2.00a.	24.1	2.50p.	12.1	3.55a.	78.7	10.6	11.5	5.4	3.5	
26	37.53	16.8	23.7	11.05a.	12.7	1.05a.	25	11.25a.	12.6	3.10a.	81.5	11.5	11.5	3.9	2.4	
27	36.96	18.3	26.1	1.35p.	14.5	1.50a.	26.2	1.35p.	13.6	1.55a.	81	12.5	12.8	5.2	3.4	
28	36.42	17.8	24.6	11.30a.	15	6.00a.	25.4	0.25p.	14.3	6.30a.	81.7	12.3	13.6	4.1	3.3	
29	35.68	17.5	24.3	1.25p.	13.8	6.00a.	25.1	2.15p.	13.5	6.45a.	72.5	10.6	12.3	8.1	5.1	
30	35.64	14.4	16.1	4.00p.	12.4	9.20a.	18.3	4.40p.	12.8	9.25a.	77	9.4	11.3	5.3	2.6	
31	35.04	14.6	16.4	10.40a.	12.2	7.10a.	17.2	3.00p.	12.4	8.25a.	90.3	11.2	11.2	.5	1.1	
Mean	636.88	16.5	22.2		13.3		23.1		12.5		80.1	11.2	11.6	4.2	2.8	
Total															131.3	87.4

Day.	Wind.				Amount (mean).	Clouds.		Sun- shine.	Rain, 24 hours begin- ning 6 a. m.	Miscellaneous.
	Prevailing direction. <sup>a</sup>	Total move- ment.	Maxi- mum hour- ly veloc- ity.	Direction at the time of the maximum velocity.		Form and direction.				
						Upper.	Lower.			
1	E	270	17.5	W	7.1	Cl-S.	Cu-N.	2 55	mm.	☉ a. ☉ p.
2	E	330.6	30.4	E	9.4	Cl-S.	Cu-N. EbyN.E	0 00	0.5	d <sup>2</sup> a.
3	E	606.9	51.8	E	8.4	Cl-S.	Cu-N. ESE	0 25	.8	☉ a. ☉ a. p. d <sup>2</sup> ☉ p.
4	SE, E	535.7	43.3	SE	8.9	A-Cu. SSE	Cu-N. ESE	1 10	4.8	d <sup>2</sup> a. ☉ a. p. ☉ p.
5	E	580	47	E	6.1	Cl-S.	Cu-N. SE	2 30	2.6	☉ d <sup>2</sup> a. ☉ a. p. ☉ p.
6	E	446.3	32	E	1.6	Cl	Cu.	5 30		☉ p.
7	E	263.1	21.1	SE	4.9	Cl.	Cu. ESE	3 35		☉ p.
8	E	343.2	21.5	E	5.1	Cl.	Cu-N. SW	3 40	1.6	☉ a. ☉ ☉ ☉ p.
9	E	281.7	23.1	E	3	Cl.	Cu.	5 15		☉ p.
10	SE	248.7	18.8	SW	2.7	Cl.	Cu-N. SW	5 10		☉ p.
11	SE	258.2	16.9	SE	2	Cl.	Cu. SEbyS	7 25		☉ p.
12	SE	257.7	18.3	SE	2	Cl.	Cu. E, SSW	5 25		☉ p.
13	E	424.2	24.1	SE, E	3.1	Cl-S.	Cu. E, SSW	6 05		☉ a. ☉ p.
14	E quad.	294.4	21.5	E	7.3	Cl-S.	Cu. ENE	2 35		☉ a. ☉ p.
15	E, W	214.1	21.7	E	10	Cl-S.	Cu-N. sebyS, E	0 00		☉ a. ☉ p.
16	E	407.4	21.7	E	7.3	Cl-S.	Cu-N. SSW	2 40		☉ p.
17	SE	398.5	22	E	7.9	Cl.	Cu-N. ssw, NE	2 50		☉ p.
18	E, W	306	21.5	W	5	Cl-S.	Cu. SSE	4 15		☉ p.
19	E	378.2	25.7	E	3.1	Cl.	Cu-N. S	2 25		☉ p.
20	E	332.1	24.9	E	8	Cl-S.	Cu. SSW	1 30		☉ p.
21	SE, E	314.8	31.1	E	8.1	Cl-S.	Cu. E	2 05		☉ a. p. ☉ p.
22	E	368.9	23.3	SE	1.6	Cl-S.	Cu. S	7 35		☉ p.
23	E quad.	294.8	20.1	SE	6	Cl.	Cu. SSE	3 15		☉ a. ☉ a. p.
24	SE, E	378.8	28.4	SE	6.9	A-Cu.	S-Cu. SE	4 30		☉ a. ☉ p.
25	E, SE	438.2	25.5	SE	2.7	Cl-S.	Cu. SEbyE	5 15		☉ a.
26	E	327	21.1	E	3.9	Cl.	Cu. SSE	3 25		☉ p.
27	E	364.3	26.4	E	6.3	A-Cu.	Cu. E, ENE	4 40	.3	d <sup>2</sup> a. d ☉ p.
28	E, SE	310.4	22.8	SE	7.9	Cl-S.	Cu. E	1 55	.3	☉ a. ☉ p.
29	E	427.2	28.8	SE	4.7	Variable	Cu. E, S	5 40		☉ a. ☉ p.
30	E, SE	575.5	35.2	E	9.9	Cl-S.	Fr-N. SSE	0 00	3.4	☉ a. d p.
31	NE quad.	322.2	22.2	NE	10		N.	0 00	8.9	☉ a. p.
Mean		364.3	26.1		5.8			3 21		
Total		11,294.1						108 40	23.2	

<sup>a</sup> All the mean values given in this table are deduced from six daily observations taken at 2, 6, 10 a. m. and 2, 6, 10 p. m.  
<sup>b</sup> The barometric readings of this station are not reduced to sea level.  
<sup>c</sup> The black bulb actinometer was broken during a typhoon on October 29.  
<sup>d</sup> This element is based on hourly observations taken from a quadruple register, which gives only eight possible directions of the wind.

## Daily rainfall at the stations of the Weather Bureau, January, 1916.

Station.	Day of month.															
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.
	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.
Jolo		9.7	7.9		0.8	4		24.4	3.8					7.6	6.1	9.4
Isabela, Basilan	28.2	29.2		1.8								1		1	15.5	11.7
Zamboanga	9.6	12	1.5										6.1	6	3.6	
Davao				2.3					25.9		3.8	6.9				
Cagayan, Misamis	6.7		1									6.1	20.1	12.5	10.7	7.4
Dapitan	6.8	6.9	8.9	21.8	4.6	8.9	5.1				13.2	9.4	4.1	14.7	11.2	.8
Butuan	1.5		1	2.3	5.4		8.2	.8	.5		13.5	17	50	7.4	4.1	12.7
Dumaguete	19.1	8.4			.8		1.5		6.2	.9	13.7	29		19.8	13.5	3.3
Tagbilaran	20.6	35.6			3.8	1.8		1	4.9			8.9		11		
Iwahig	.7	9.6	.9	26.9						1.3	4.5				.8	.3
Surigao	54.8			8.4	22.1	8.4	11.9	10.9	14.4	8.6	19.6	65.1	102	84.3	.5	65.3
Maasin	64.7					12.7					11.2	60.4	51.6	120.9	24.9	61.8
Cebu	56.6	1.5		3.8	19.8		1.3	4.8	5	38.9	1	11.4	9.4	67.5	14	
Iloilo	39.1	7.4	1					10.2		6.9	.5	2.5	3.8	10.4	10.7	
San Jose Buenavista	33.8	37.6	24.3	.3				3.1	.3	1.3		3.3	4.1	.3	10.2	
Cuyo	5.3	40.9			.8					4.8	.8			1.5	25.4	
Ormoc	61.2	.5		.8	5.7	.3		5.4	3		1.5	21.4	2.3	181.4	66.3	50.1
Guiuan	134.1			7.6	12.4	4.6	1.8	5.3	16	8.4	15.5	28.5	80.5	190.8	14	171.1
Tacloban	57.4	.6	4.8		5.2	6.3	10.7	4.2	4.3	3.9	4	45.2	31	246.7	61.4	75.8
Capiz	370.2	29.6	12.8	16.8	.3			.3	1	5	23.8	1.3	5	45.2	44.4	1.4
Borongan	64.8	1	3.3	2.3	11.9	40.3	10.4	13.2	12.5	7.9	2.3	35.1	64	111.2	26.5	84.9
Catbalogan	115.6	.5		14.6		10.5	.5	3.1	.2	.3	1.9	7.4	16	70.7	82.3	49.8
Calbayog	158.7			10.9		2	2.5	3.6	2.6	8.9	5.1	10.7	13.8	92.9	113.4	48.9
Masbate	163	9.4						7.1	2.6	3.3	13.7	3.9	7.6	66.1	68.8	3.6
Romblon	37	105.1						.5		6.6	11.7	1.5		2.1	12.9	
Butag	101.3			7.4	2	15.3	1.5	9.9	1.3	27.2	6.1	3.5	9.7	67.3	138.2	14.6
Gubat	65.8			17.8	13.7	31.8	4.6	5.3	2.8	24.1	15.2	11.7	26.6	66	47.8	13.2
Legaspi	59.2	2.5	4.8	3	14.3	14.4	8.9	6.6	4.1	3.6	29.2	25.4	15	73	105.6	40.6
Sumay, Guam	3.8	5			2.5	2.5				2.5	6.3		5.1	5.1		
Calapan	9.4	71.6	9.2			.3	2	1	2.5	11.4	8.9	7.6	7.1	10.6	2.6	.8
Virac	17.5	1.3		22.6	2.8	8.9	5.6	3.3	2.5	6.6	16.8	7.9	11.9	51.1	65.5	3.6
Nueva Caceres	8.9	1.5		3.6		1				7.4	6.7	4.2	17.5	28.3	56.4	5.4
Batangas	12.7	43.2	4.4								.5			1.3	.3	
Lucena (a)	*	*	*	*	*	*	*	*	*	*	*	*	*	41.6	3.6	.8
Atimonan	31.3	37.1	12.2	18.8		3.6	1.5	3	6.8	7.4	5.1	10.4	18.2	11.1	9.4	8.6
Ambulong, Tanauan	7.4	25.6									2.3	1.5	11.9			
Paracale	26.1	5.6	2.3		2.3	9.2	3.3	3.8	4.3	14.5	6.1	13.5	17	15.2	8.1	1.3
Santa Cruz, Laguna	19.3	53.1	6.8			.3				1.3	3.1	.8	4.8	14.5		
Manila	2.8	20.8	9								.5					
Antipolo	6.1	22.1	2		1.5						2.5			3.6		
Iba		2.5	1.1		7.7			3.3								
San Isidro	1.5	17	18.4	.5	1.3		3	.3								
Tarlac		5.1	4.1	3.5	8.9											
Baler	7.6	53.8	73.9	35.6	46.7	8.1	16	7.4			3.3	.5	1.5			
Dagupan			2.8				1.3	3.6								
Bolinao					.5		.5									
Baguio		.5	.8	4.8	2.6			1.6								
San Fernando, Union				8.6												
Echague	2.3	5.6	31.2	3.6	45.2		1.3	.8		1		7.7	6.3	2.5		
Candon				26.7	3.3			2.3								
Vigan				9.7	1.5											
Tuguegarao		16.7	23.4	12.5	1.3											
Laoag		2	1.5		28.4											
Aparri	4.8	10.1	29.4	.8	.5						16.3	.3	2.3	3	7.4	15.7
Santo Domingo, Batanes	2.3	18.3	11	8.7	9.9	17.3	1.5	.4		5.3	5.8	40.9	.6		1.1	.1

\* No observation.

\* This station was opened on the 13th instant.

Daily rainfall at the stations of the Weather Bureau, January, 1916—Continued.

Station.	Day of month.															Total.
	17.	18.	19.	20.	21.	22.	23.	24.	25.	26.	27.	28.	29.	30.	31.	
	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.
Jolo							3	13	125.2	52.1	3.3	0.3	2.8			273.9
Isabela, Basilan						0.8	108.7	73.4		5.6	18.3	3				238.2
Zamboanga							128	81.3	2.1	1.6	39.8	10.4				302
Davao			4.1		27.9	74.2		6.6		12.7	18.3					182.7
Cagayan, Misamis	9.6	22.6	41.4	8.9	40.4	65.9	131.1	109 <sup>a</sup>		*	*	2.5		0.8		496.7 <sup>b</sup>
Dapitan	.8				3.5	8.6	15.2	8.7	3.1		61	24.9	.5	2.5		245.2
Butuan	43.5	58.7	13	18.8	162.8	11.7	14.8	69.4	3.3	.3	.3	5.6				526.6
Dumaguete				8.4	1.3		4.5	2.5	3.3		9.9	14.2	15.7	3.8		179.8
Tagbilaran					.8	1.1	1.6	.8			.8	1				93.7
Iwahig		1.3					.5	7.1		4.4	4.6	31.5	31.7	50.3	12	188.4
Surigao	67.5	25	10.9	76.5	98.9	70.1	4.6	62.5	119.1	22.6	21.6	6.6	2			1,064.2
Maasin				15.2	19.6	17.5	19.8	33	32.5	26.9						572.7
Cebu																
Iloilo						1.8		2.5	3.8	17.8			2.5	20.4	12.7	154
San Jose Buenavista						5.3	3.3	6.3		4.8	.3			29.7		168.3
Cuyo							1.3									80.8
Ormoc				1.8	9.7	22.6	10.6	20.4	4.4	8.8	12.5	3.6	54.7			549
Guiuan	16.3	16	14.7	115.4	31.3	97.5	72.1	131.4	11.4	21.1	33.6	12.4	344.9			1,608.7
Tacloban	1.8	.3		1.8	10.6	26	12.4	76.1	4.8	25.9	14.9	9.5	90.3			835.9
Capiz	11.7				.3	6.6	2.5	11.4	3	4.6	.3	20.9	4.3	6.4	2.9	627
Borongan	27.4	34	5.6	26.9	53.9	92.7	64.3	112.2	33.5	49.3	69.9	19.1	130.1			1,210.5
Catbalogan	2.3			.6	7.2	16	20.6	24.6	15.1	39.6	20.1	6.1	111.8			637.4
Calbayog	2.3	1.3	1	2.8	9.9	6.6	4.1	8.4	4.3	36.1	1.3	3.6	123.8	.8		680.3
Masbate	.5				4.1	4.1	14.2	15	14.2	86.9	5.1	12.2	5	1.5		511.9
Romblon		.5				2.8		1.8		14.5	5.1	21.8	2.5	.3		226.7
Batag	5.8	4.3	9.1	14.5	34.3	29.4	2.5	47	25.1	63	2.5	6.4	81.3	2.5	12.7	745.7
Gubat		8.9		3.1	22.8	15.8	16.3	25.2	9.6	47.5	10.2	33.2	54.1	9.1	1.8	604
Legaspi	3.9				.3	23.7	6.2		11	88.2	5.9	29.7	20	2.5	5.1	606.7
Sumay, Guam					2.5					5.1	15.3				2.6	58.3
Calapan		1.8		3.6		1.4	21.6	1.3	2.3	21.6	1	1	22.4	2	2	227
Virac					4.6	7.2	5.6		17.2	23.6	3.8	62.2	6.9	13.2	1	373.2
Nueva Caceres		1.3			2.5	15.2	2.1	19.2	13.1	10.7	1.5		1.3	1		208.8
Batangas						3.6	9.4	.5	2.1	2.8			2.5		5.6	88.9
Lucena		2.3				3	5.3	3.5	12.2	27.9	2.6	.5	4	.3		
Atimonan	1.8	6.4				8.9	34.3	40.8	23.7	52.3	10.4	6.1	14.6	24.5	3.3	411.6
Ambulong, Tanauan							1.5		1.3	1.8	2.3	1.8	2.8			60.2
Paracale	2.5	2	1		5.1	15	26.1	22.1	44.5	41.9	6.9	12.9	25.2	27	2.5	367.3
Santa Cruz, Laguna	.3	.6					2.5		.5	1	.3	1.6	7.7	.3		118.8
Manila							2.8				1		1.3			38.2
Antipolo						.8	6.9				1		.8			47.3
Iba												1.3			.3	16.2
San Isidro						1										43
Tarlac												3				21.9
Baler		1	2.8	1						2.8	5.3	14.3	.5			282.1
Dagupan													.5	1.1		9.3
Bolinao													.3	2.5	3.6	7.9
Baguio											.3	3		3.4	8.9	23.2
San Fernando, Union														12.6	2.4	23.6
Echague	.8	2.3	5.1	1.8			8.4	1.3		9.7	6.1	4.9			1.5	149.4
Candon														5.1	1.3	38.7
Vigan														3		14.2
Tuguegarao		4.6	1.5								9	1	.8	21.5	3.8	101.1
Laog													.8	2.3	2	37
Aparri	.3	3.3					22.9	8.2	3.8	.3	4.3	1.5	2	11.7	2.9	151.8
Santo Domingo, Batanes	1.1						1	.4	1.1	.1						143.9

\* No observation.

<sup>a</sup> Rain until 4 p. m. only.

<sup>b</sup> 23 days of observation.









Maximum and minimum temperatures at the stations of the Weather Bureau, January, 1916—Continued.

Day.	Echagtie.		Candon.		Vigan.		Tuguegarao.		Laoag.		Aparri.		Santo Domingo, Batanes.	
	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.
	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.
1	22	30	24	30	23.2	30.2	21.5	33.5	21.5	27.7	22.8	23.3	20.5	
2	22	30	23	32.8	22.5	26.2	21.4	35.1	21	26.3	22.2	26.2	21.7	
3	21.8	29.5	25	29.6	23.8	24.5	22	29.2	24.2	25.6	22.8	26	22	
4	21.8	30.8	24.9	30	24.7	30.8	22.2	32.7	22.7	27.9	22.8	26.2	21.9	
5	23	29	23.5	30.5	23	28.1	22.5	34	22.8	27.5	22.4	24.8	22.7	
6	21.7	29.2	22.6	30.4	21.7	30.5	21.3	31.2	22	28.6	22.2	25.5	21.1	
7	21.7	29.7	21.8	30.6	21.8	32	21.6	30.5	21.6	29.5	21.8	28.9	23	
8	21	29.8	23.5	30.2	22.4	32.5	21.5	31.3	21.6	29.5	22.3	29.6	25.2	
9	21.3	30	23.4	30.8	24	32.5	21.2	32.4	22.4	30.2	22.3	28.6	24.7	
10	20.9	30	23.4	29.9	23.2	31.1	20.2	34	22.3	29.2	22.3	28.4	22.5	
11	21.5	30	22.2	32	22.8	30.2	20.4	32.5	21.4	27.3	22.1	24.2	20.9	
12	22	31	21.2	31	22.1	29	21.5	31.6	21.5	27.3	22.3	25.7	21.6	
13	20.9	31	23.5	32.1	23.3	29.2	20.3	32.9	19.4	26.8	23.3	25.5	20.9	
14	20.4	30.6	22.1	30.2	22.5	28.5	20.3	33.7	18.1	27.5	22.2	26.9	22	
15	20.8	28.2	23.5	26.3	21.2	27.6	21.2	26.8	22.9	25.9	21.2	22.5	19.7	
16	18.8	28.1	21.5	27	18.3	24.2	17	26.7	20	21.9	19.3	22.1	18.7	
17	17	28.2	19.9	27.2	16	25.4	16	28.3	18.5	24.4	18.8	22.2	18	
18	17	28.1	18.9	29.7	19	24.2	16.6	29.5	13.6	24.7	19	23	17.9	
19	18	28.3	18.2	27.5	18.2	23.8	18	29.3	15.5	23.3	18.5	24.5	19.5	
20	18.4	27.5	18.5	28.2	19.7	27.5	18	30.7	14	25.2	19.3	24.9	18.7	
21	18.3	27.6	19.5	27.3	20	25.4	17.8	29.9	14.1	23.5	18.3	24	20.3	
22	18.8	28.3	18.5	27.8	19.3	30.4	17.5	30.2	15.5	26.6	19.1	27.3	17.3	
23	19.9	29.1	18.5	28.7	19.7	29.5	19.6	32.4	18.3	26.8	19.8	26.1	17.4	
24	20	30.6	24	27.2	21.5	25.4	18.3	29.3	21.4	22.5	19	22.4	17	
25	18.4	29.5	21.4	30.1	23.3	25.8	18.2	33.3	19.4	23.4	19.4	21.9	18.3	
26	20	29.2	22.5	31.1	21.6	27	19.3	35	18.8	26.2	20.8	26.5	20	
27	20.2	29.5	22.9	33.1	22	27.4	21.5	35.3	19.5	26.3	22.3	26.4	20.4	
28	21.5	29	23.4	32.5	24.6	28.2	21.7	35.5	23.9	25.7	22.3	26.1	20.1	
29	21.4	30	24	30.8	24	27.4	20.3	34.7	22.5	24.5	21.6	24.3	20	
30	21	26.1	23	27.5	21.2	24.4	19.8	28.9	21.9	24	21.3?	24.7	19.9	
31	20.6	26.5	21.6	28.2	20.6	24.3	19.4	29.6	20.6	23.2	19.8	25.9	21.2	
Mean		20.4	29.2	22.1	29.7	21.7	27.8	20	31.6	20.1	26.1	21.1	25.3	20.5



## SEISMOLOGICAL BULLETIN FOR JANUARY, 1916.

By Rev. MIGUEL SADERRA MASÓ, S. J.,  
*Assistant Director of the Weather Bureau.*

### EARTHQUAKES FELT IN THE PHILIPPINES.<sup>1</sup>

1, 7<sup>h</sup> 24<sup>m</sup> 55<sup>s\*</sup> [1, 15<sup>h</sup> 24<sup>m</sup> 55<sup>s</sup>]. **Batangas** (S Luzon). Oscillatory earthquake, direction S-N, intensity III, duration 4 seconds.

3, 19<sup>h</sup> 12<sup>m</sup> [4, 4<sup>h</sup> 52<sup>m</sup>]. **Guam** (Mariana Islands). Earthquake shocks of intensity II-III.

4, 3<sup>h</sup> 12<sup>m</sup> 54<sup>s\*</sup> [4, 11<sup>h</sup> 12<sup>m</sup> 54<sup>s</sup>]. **Panay Island**. Earthquake of intensity VIII, originated within the southeastern part of that island at a distance of some 25 kilometers from the coast. It had an epicentral area rather small, about 20 kilometers in diameter. The town more affected by the earthquake was Maasin, where the bell tower fell down, the church was cracked out of repair, and many other old buildings sustained similar damage. In the neighbouring towns and barrios some smokestacks of sugar mills were thrown down and old buildings lightly damaged. This earthquake had its origin in a region known as the most instable of the whole island of Panay: short descriptions of its physiography and geologic conditions have been given not only in this bulletin<sup>2</sup> but also in other publications. Almost all the strong earthquakes which occur in the same region show the rockfall character, developing great intensity within a very small area. In the last one the isoseismal V ran at a distance of some 30 kilometers from a place near Maasin taken as epicenter, while the III-IV comprised the whole island of Panay and the northwestern part of Negros. The limit of perceptibility of the shocks, corresponding to the isoseismal II-III, reached eastwards to the island of Leyte, 250 kilometers distant. Toward the western direction the shocks were felt with intensity III in Cuyo islands, the only considerable extension of land within a distance of 200 kilometers from the western coast of Panay. It seems probable that the waves did not keep their amplitude at such great distances toward the N, the reason being that they were not felt neither in Romblon island nor in the southern part of Mindoro, less than 200 kilometers far away. This earthquake was not registered by any seismograph outside of the Archipelago.

6, 4<sup>h</sup> 30<sup>m</sup> [6, 12<sup>h</sup> 30<sup>m</sup>]. **Iloilo** (E Panay). Earthquake shocks of intensity II-III. It is not known if these shocks may be considered as aftershocks of the earthquake occurred on the 4th.

6, 17<sup>h</sup> 54<sup>m</sup> [7, 1<sup>h</sup> 54<sup>m</sup>]. **Naga** (SE Luzon). Earthquake of intensity II-III. On the early morning of the same date earthquake shocks were also felt in the neighborhood of the Isarog Volcano, situated at a distance of about 20 kilometers to the ENE of Naga: in all probability it was the same disturbance reported from Naga.

<sup>1</sup> The intensity of earthquakes is given in the notation known as the Rossi-Forel scale. The time is that indicated by the seismographs at the Central Observatory whenever the disturbance has been registered by them. This fact is denoted by an asterisk (\*). Otherwise the time is that noted by the observer who sent the report. All time indications are in Greenwich mean time (midnight=0<sup>h</sup>), insular time being added in brackets for the convenience of Philippine readers.

<sup>2</sup> Bulletin for August, 1902.

7, 17<sup>h</sup> 38<sup>m</sup> 12<sup>s\*</sup> [8, 1<sup>h</sup> 38<sup>m</sup> 12<sup>s</sup>]. **Bolinao (W Luzon)**. Oscillatory earthquake direction W-E, intensity III, short duration. Its origin lay in the China Sea, close to the Zamboales coast.

9, 22<sup>h</sup> 16<sup>m</sup> [10, 6<sup>h</sup> 16<sup>m</sup>]. **W Samar and N Leyte**. Earthquake of intensity III-IV. It probably originated near the small volcanic islands, N of Leyte.

10, 7<sup>h</sup> 30<sup>m</sup> [10, 15<sup>h</sup> 30<sup>m</sup>]. **Consocep (SE Luzon)**. Earthquake shocks of moderate intensity. On the 12th at 10<sup>h</sup> 20<sup>m</sup> [18<sup>h</sup> 20<sup>m</sup>] another shock was felt, which seems to have been the last of a series of seismic disturbances which occurred in the region of the old Isarog Volcano, as reported in the Bulletin for December, 1915.

13, 6<sup>h</sup> 23<sup>m</sup> 34<sup>s\*</sup> [13, 14<sup>h</sup> 23<sup>m</sup> 34<sup>s</sup>]. **Manila**. The seismographs registered a distant earthquake, the origin of which seems to have been in the western part of New Guinea. There followed two similar disturbances at 8<sup>h</sup> 26<sup>m\*</sup> [16<sup>h</sup> 26<sup>m</sup>] and 10<sup>h</sup> 56<sup>m\*</sup> [18<sup>h</sup> 56<sup>m</sup>]. All these disturbances were recorded all over the world, but in the Philippines besides being registered by the seismographs at Manila, Baguio, Ambulong and Butuan, the two first disturbances seem to have been perceptible in the islands of Mindanao and Samar. The observer at Butuan reported that although neither he personally nor any other person of the town within his knowledge did feel any shock, nevertheless he thinks that the two said disturbances were perceptible. He gives as a reason the fact that they were recorded by a simple pendulum seismograph intended for perceptible earthquakes, which pendulum never gives any record unless the shocks reach II-III degree of intensity. Consequently it is credible that these two disturbances were noticed more distinctly along the southeastern and eastern coasts of Mindanao, from which Butuan is more than 70 kilometers distant.

At Borongan, on the eastern coast of Samar, there occurred two perceptible shocks at 6<sup>h</sup> 24<sup>m</sup> [14<sup>h</sup> 24<sup>m</sup>] and about 8<sup>h</sup> 30<sup>m</sup>, these shocks seem to correspond to the two principal disturbances registered elsewhere by the seismographs.

From these facts we may infer that the seismic waves of the two first earthquakes felt at New Guinea retained at a distance of nearly 2,000 kilometers sufficient amplitude to make themselves felt: unless we suppose the occurrence of a secondary earthquake. The special conditions of instability of the eastern coasts of Mindanao and Samar make any of these two suppositions not at all surprising; they really form the western border or edge of the Great Pacific Deep which, as it is known, runs in a NNW-SSE direction between the meridians 125.5° and 128° E, and extends itself from the 14° to the 5° N parallel.

16, 9<sup>h</sup> 59<sup>m</sup> [16, 17<sup>h</sup> 59<sup>m</sup>]. **Butuan (N Mindanao)**. Oscillatory earthquake, direction NNE-SSW, intensity IV, duration 10 seconds.

21, 19<sup>h</sup> 45<sup>m</sup> [22, 3<sup>h</sup> 45<sup>m</sup>]. **Naga (SE Luzon)**. Earthquake of intensity III.

27, 17<sup>h</sup> 24<sup>m</sup> 12<sup>s\*</sup> [28, 1<sup>h</sup> 24<sup>m</sup> 12<sup>s</sup>]. **Naga (SE Luzon)**. Oscillatory earthquake, direction NNE-SSW, intensity IV, duration 5 seconds.

29, 16<sup>h</sup> 55<sup>m</sup> [30, 0<sup>h</sup> 55<sup>m</sup>]. **Samar Island**. Earthquake of intensity III-IV felt in the central part of the island. Apparently its origin lay within the said island or in some place very near to its western coast.

RECORDS OF THE MICROSEISMOGRAPH.

[Time: Greenwich mean. Midnight=0<sup>h</sup>. Instrument: Wiechert seismograph; 1,000 kilograms. A<sub>N</sub>: T<sub>0</sub>=6.1, ε=3.89,  $\frac{r}{T_0^2}$ =0.023;  
A<sub>E</sub>: T<sub>0</sub>=6.6, ε=2.32,  $\frac{r}{T_0^2}$ =0.050. Alluvium. 2.40 meters above sea level.]

No.	Date.	Character.	Phase.	Hour.			Period.	Amplitude.		Remarks.
								A <sub>N</sub> μ	A <sub>E</sub> μ	
1	1	IIv	eP	6	22	24				
			L	22	40					
			M <sub>E</sub>	22	45	4		398		
			M <sub>N</sub>	23	07	3	259			
			F	33						
2	1	Iv	eP	7	24	55				Batangas (S Luzon).
			L	25	10					
			M <sub>E</sub>	25	14	4		300		
			M <sub>N</sub>	25	34	3	193			
			F	35						
3	1	IIr	eP	13	27	54				
			iS	36	27	6-8				
			iL	46	00	7-9				
			M <sub>N1</sub>	49	41	13	247			
			M <sub>E1</sub>	52	12	11		235		
			M <sub>E2</sub>	53	03	13		234		
			M <sub>N2</sub>	54	22	13	313			
			F	16	48					
4	2	Iv	eP	8	11	52				
			L	12	17					
			M <sub>E</sub>	12	26	2		13		
			F	15						
5	3	Iv	eP	8	26	50				
			F	30						
6	4	IIv	eP	3	12	54				Panay Island.
			L	13	42					
			M <sub>E</sub>	14	28	7		699		
			M <sub>N</sub>	15	14	7	627			
			F	52						
7	4	Iv	eP	12	11	55				
			F	14						
8	4	Iv	eP	12	56	22				
			F	59						
9	7	Iv	eP	17	38	12				Bolinao (W Luzon).
			L	38	40					
			F	40						
10	9	Iv	eP	8	02	28				
			F	06						
11	9	Iv	eP	16	24	05				
			F	26						
12	10	Iv	eP	7	04	38				
			F	07						
13	10	Iv	eP	13	28	54				
			F	31						
14	13	IIr	eP	6	23	34				New Guinea? Felt in the eastern coasts of Samar and Mindanao. The maxima are difficult to be measured on account of the superimposed following earthquake.
			S	27	49					
			L	32	00					
			M <sub>N1</sub>	33	22	7	349			
			M <sub>N2</sub>	35	08	8	345			
			F	8	01					
15	13	IIr	eP	8	25	46				New Guinea? Felt in the eastern coasts of Samar and Mindanao. L and maxima in N-S component lost by the force of the shock and the same phases in E-W component hidden by the preceding quake.
			S	30	00					
			F	10	25					
16	13	Ir	eP	10	56	02				New Guinea?
			S	11	00	07				
			L	04	12					
			M <sub>E</sub>	05	22	7		43		
			M <sub>N</sub>	06	01	6	39			
			F	46						
17	13	Ir	e(PS)	21	52	13				
			L	56	15					
			M <sub>N</sub>	56	27	6	32			
			M <sub>E</sub>	56	42	7		20		
			F	22	17					

## Records of the microseismograph—Continued.

No.	Date.	Character.	Phase.	Hour.			Period.	Amplitude.		Remarks.
								A <sub>N</sub> μ	A <sub>E</sub> μ	
18	14	Iv	eP F	h. 11	m. 11	s. 19				
19	17	Iv	eP F	19	05	53				
20	17	Iv	eP F	19	17	23				
21	18	I	e F	14	06					
22	19	Ir	e S L M <sub>E</sub> M <sub>N</sub> F	19	04					
					10	20				
					17	20				
					21	56	11		11	
					22	37	19		13	
					54					
23	21	Iv	eP L M <sub>E</sub> M <sub>N</sub> F	14	39	53				
					40	52				
					41	42	3		8	
					41	43	3		9	
					44					
24	22	Iv	eP F	12	51	54				
					54					
25	24	Iu	e S? L? M <sub>E</sub> M <sub>N</sub> F	7	07	07				
					15	18				
					39	12				
					46	28	15		18	
					46	52	15		32	
					8	30				
26	25	Iv	eP F	6	11	24				
					13					
27	25	Iv	e? S L M <sub>E</sub> M <sub>N</sub> F	11	43	06				
					44	53				
					47	06				
					47	12	6		41	
					48	44	6		24	
					58					
28	25	Iv	eP L M <sub>N</sub> M <sub>E</sub> F	14	29	36				
					30	41				
					31	36	5		13	
					32	12	5		9	
					37					
29	26	Ir	e M <sub>E</sub> M <sub>N</sub> F	8	25					
					29	50	20		5	
					31	42	15		6	
					47					
30	26	I	e F	12	36					
					13	31				
31	26	Iv	eP L F	20	26	48				
					27	24				
					33					
32	27	Iv	eP L M <sub>N</sub> F	17	24	12				
					24	40				
					24	52	3		27	
					29					
33	28	Iv	eP F	19	08	24				
					13					
34	30	Iv	eP F	18	37	29				
					40					
35	30	I	e L M <sub>E</sub> M <sub>N</sub> F	20	48					
					57	40				
					21	01	6		5	
					02	56	7		7	
					24					
36	31	Iu	e F	18	19					
					19	17				
37	31	Iv	eP F	23	01	55				
					05					

Naga (SE Luzon).



TEMBLORES DE TIERRA SENTIDOS EN FILIPINAS.<sup>1</sup>

1, 7<sup>h</sup> 24<sup>m</sup> 55<sup>s\*</sup> [1, 15<sup>h</sup> 24<sup>m</sup> 55<sup>s</sup>]. Batangas (S de Luzón). Temblor oscilatorio, dirección S-N, intensidad III, duración 4 segundos.

3, 19<sup>h</sup> 12<sup>m</sup> [4, 4<sup>h</sup> 52<sup>m</sup>]. Guam (Islas Marianas). Temblor de tierra de intensidad II-III.

4, 3<sup>h</sup> 12<sup>m</sup> 54<sup>s\*</sup> [4, 11<sup>h</sup> 12<sup>m</sup> 54<sup>s</sup>]. Isla de Panay. Terremoto de intensidad VIII originado dentro de la parte SE de la isla a unos 25 kilómetros de la costa meridional. El área epicentral fué muy poco extensa, menos de 20 kilómetros de diámetro. El pueblo principalmente afectado fué el de Maasin, donde el terremoto derribó la torre de la iglesia y dejó a ésta malamente agrietada y amenazando ruina, con daños semejantes en todas las demás obras de mampostería algo antiguas: en los pueblos y barrios vecinos derribó algunas chimeneas de los ingenios de azúcar y quebrantó los edificios viejos. La región epicentral de este terremoto es ya conocida de antiguo como la más inestable de la Isla de Panay: tanto en este Boletín como en otros escritos hemos ya hablado de sus condiciones fisiográficas y geológicas, al describir otros terremotos modernos, como por ejemplo el del 26 de julio de 1902. El carácter de los terremotos en ella originados ha sido siempre de los de hundimiento, desarrollando grande intensidad en una extensión muy reducida, como sucedió también en este último. La isosisma V distaba solamente unos 30 kilómetros del epicentro que suponemos estaba muy cerca de Maasin, mientras que la isosisma III-IV encerraba toda la Isla de Panay y la parte NW de la Isla de Negros. El límite de perceptibilidad correspondiente a la isosisma II-III se extendía por el E a distancias de más de 250 kilómetros, siendo bien perceptible en las Islas de Cebú, Bohol y en la parte occidental de Leyte. Hacia el W sintióse con intensidad III en las Islas de Cuyo, únicas tierras existentes dentro de un radio de más de 200 kilómetros. Probablemente hacia el N las ondas no se propagaron a tan grandes distancias, pues no parece fué perceptible en Romblón ni en la parte S de Mindoro distantes unos 200 kilómetros. No fué registrado fuera del Archipiélago.

6, 4<sup>h</sup> 30<sup>m</sup> [6, 12<sup>h</sup> 30<sup>m</sup>]. Iloilo (E de Panay). Temblor de tierra de intensidad II-III.

No consta si este temblor fué una réplica del terremoto del día 4.

6, 17<sup>h</sup> 54<sup>m</sup> [7, 1<sup>h</sup> 54<sup>m</sup>]. Naga (SE de Luzón). Temblor de tierra de intensidad II-III.

Este mismo día muy de mañana se sintió también un temblorcito en la región del antiguo volcán Isarog situado a unos 200 kilómetros al ENE de Nueva Cáceres: es probable se trate del mismo sentido en Naga a 1<sup>h</sup> 54<sup>m</sup>.

7, 17<sup>h</sup> 38<sup>m</sup> 12<sup>s\*</sup> [8, 1<sup>h</sup> 38<sup>m</sup> 12<sup>s</sup>]. Bolinao (W de Luzón). Temblor oscilatorio, dirección W-E, intensidad III, duración corta. Su origen se hallaba en el Mar de la China cerca de la costa de Zambales.

9, 22<sup>h</sup> 16<sup>m</sup> [10, 6<sup>h</sup> 16<sup>m</sup>]. W de Sámar y N de Leyte. Temblor de tierra de intensidad III-IV. Su origen se hallaba probablemente en las islas volcánicas situadas al N de Leyte.

10, 7<sup>h</sup> 30<sup>m</sup> [10, 15<sup>h</sup> 30<sup>m</sup>]. Consocep (SE de Luzón). Temblor de tierra de mediana intensidad. El 12 a 10<sup>h</sup> 20<sup>m</sup> [18<sup>h</sup> 20<sup>m</sup>] se sintió otro, que parece fué el último de la serie de movimientos sísmicos experimentados en la región del antiguo volcán Isarog, mencionada en el Boletín de Diciembre, 1915.

13, 6<sup>h</sup> 23<sup>m</sup> 34<sup>s\*</sup> [13, 14<sup>h</sup> 23<sup>m</sup> 34<sup>s</sup>]. Manila. Los aparatos registraron un terremoto lejano, cuyo epicentro parece se hallaba en la parte occidental de Nueva Guinea. A

<sup>1</sup> La intensidad de los terremotos se indica conforme a la conocida escala de Rossi-Forel. Cuanto a la hora de su ocurrencia, adoptamos la indicada por los sismógrafos de este Observatorio siempre que los hayan registrado, distinguiéndola por medio de un asterisco (\*). En caso contrario copiamos la apuntada por los observadores que nos envían las notas. Todas las indicaciones del tiempo se refieren al tiempo medio de Greenwich (medianoche = 0<sup>h</sup>). Para conveniencia de los lectores de Filipinas se añade también el tiempo insular.

este primer terremoto siguieron otros a 8<sup>h</sup> 26<sup>m</sup>\* [16<sup>h</sup> 26<sup>m</sup>] y 10<sup>h</sup> 56<sup>m</sup>\* [18<sup>h</sup> 56<sup>m</sup>]. Todos fueron registrados por los sismógrafos de todo el globo. En Filipinas además de haber sido registrados por los sismógrafos de Manila, Baguio, Ambulong y Butúan parece que los dos primeros llegaron a ser perceptibles en las Islas de Mindanao y Sámar. El observador de Butúan asegura que si bien él personalmente no sintió movimiento alguno, ni sabe que otra persona percibiese algo, sin embargo cree que los debió haber perceptibles para personas en perfecto reposo, puesto que ambas perturbaciones se registraron también en un péndulo muy sencillo y poco sensible, adaptado a terremotos perceptibles, el cual según muestra la experiencia tan sólo es sensible a los del grado II-III de la escala. Es por consiguiente muy creíble que en la parte SE de Mindanao y a lo largo de su costa oriental, de la que Butúan dista más de 70 kilómetros, fuesen también mucho más perceptibles.

El observador de Borongan, en la costa oriental de Sámar, señala dos temblores de intensidad II-III, uno a 6<sup>h</sup> 24<sup>m</sup> [14<sup>h</sup> 24<sup>m</sup>] y otro hacia las 8<sup>h</sup> 30<sup>m</sup>, los cuales creemos que corresponden a las dos perturbaciones principales registradas por los sismógrafos de las otras estaciones citadas.

Según esto las ondas sísmicas de estos terremotos habrían conservado a la distancia de cerca de 2,000 kilómetros del epicentro, la amplitud suficiente para ser perceptibles a los sentidos. Juzgamos que conviene tener presentes las singulares condiciones en que se encuentran las costas orientales de Mindanao y de Sámar, pues constituyen el borde del grande Abismo del Pacífico, el cual, como es sabido, se abre entre los 125.°5 E donde está su extremo septentrional, y los 128°, donde tiene el meridional, y se extiende desde el paralelo 14° al paralelo 5° N.

16, 9<sup>h</sup> 59<sup>m</sup> [16, 17<sup>h</sup> 59<sup>m</sup>]. Butúan (N de Mindanao). Temblor oscilatorio, dirección NNE-SSW, intensidad IV, duración 10 segundos.

21, 19<sup>h</sup> 25<sup>m</sup> [22, 3<sup>h</sup> 45<sup>m</sup>]. Naga (SE de Luzón). Temblor de tierra de intensidad III.

27, 17<sup>h</sup> 24<sup>m</sup> 12<sup>s</sup>\* [28, 1<sup>h</sup> 24<sup>m</sup> 12<sup>s</sup>]. Naga (SE de Luzón). Temblor oscilatorio, dirección NNE-SSW, intensidad IV, duración 5 segundos.

29, 16<sup>h</sup> 55<sup>m</sup> [30, 0<sup>h</sup> 55<sup>m</sup>]. Isla de Sámar. Temblor de tierra de intensidad III-IV sentido en la parte central de la isla. Su origen estaba al parecer dentro de la misma isla o muy cerca de sus costas occidentales.





DEC 27 1916  
1 1/2

THE GOVERNMENT OF THE PHILIPPINE ISLANDS

# WEATHER BUREAU

MANILA CENTRAL OBSERVATORY

---

BULLETIN FOR FEBRUARY, 1916

---

PREPARED UNDER THE DIRECTION OF

REV. JOSÉ ALGUÉ, S. J.

DIRECTOR OF THE WEATHER BUREAU

MANILA  
BUREAU OF PRINTING  
1916



---

---

**BULLETIN FOR FEBRUARY, 1916.**

---

---





# METEOROLOGICAL BULLETIN FOR FEBRUARY, 1916.

By Rev. JOSE CORONAS, S. J.,  
Chief, Meteorological Division of the Weather Bureau.

## GENERAL WEATHER NOTES.

Pressure and temperature.—The mean atmospheric pressure for this month is considerably lower than the February's normal and than that of the preceding year. Thus the monthly mean for Manila differs by  $-2.43$  mm. from the normal, and by  $-2.66$  mm. from the mean of February, 1915. The highest pressures were generally observed in the Philippines on the 12th to 14th, and the lowest on the 4th or 7th in Luzon, and on the 1st or 20th in the Visayas and Mindanao.

The mean monthly temperature is almost identical with that of the preceding year in the Visayas and Mindanao, and somewhat lower in Luzon. The absolute maximum and minimum for Manila were  $33.2^{\circ}$  C. on the 23d, and  $16.9^{\circ}$  C. on the 8th. The extreme temperatures for Baguio were  $24.4^{\circ}$  C.,  $10.2^{\circ}$  C. on the top of Mirador, and  $25.3^{\circ}$  C.,  $7.8^{\circ}$  C. in the valley.

### PRESSURE AND TEMPERATURE AT THE FIRST AND SECOND CLASS STATIONS FOR FEBRUARY, 1916.

Station.	Pressure.						Temperature.					
	Mean.	Departure from Feb., 1915.	Highest mean.	Day.	Lowest mean.	Day.	Mean.	Departure from Feb., 1915.	Highest.	Day.	Lowest.	Day.
	mm.	mm.	mm.		mm.		$^{\circ}$ C.	$^{\circ}$ C.	$^{\circ}$ C.		$^{\circ}$ C.	
Tagbilaran	758.03	-2.69	759.93	13	756.41	20	25.7	+0.3	33.2	9	19.5	10
Surigao	57.99	-3.09	60.13	14	56.47	19	25.7	+ .3	33.1	1	19	10
Cebu	58.06	-3.05	60.05	13	56.55	20	26.7	+ .1	32.5	5	20.9	13
Iloilo	58.05	-2.54	60.25	13	56.46	20	26	- .5	33	6	18.9	10
Ormoc	58.35	-2.91	60.48	14	56.90	1	25.5	0	32.7	6	14.8	9
Tacloban	58.18	-3.15	60.36	13	56.74	1	25.9	+ .2	32.1	8	20	9
Capiz	58.64	-2.66	60.76	13, 14	57.14	21	26	- .1	32.4	5	19.3	9
Calbayog	58.42	-3.04	60.65	14	56.97	1	25.4	+ .5	33.77	6	17	9
Legaspi	58.49	-2.98	60.92	12	56.91	1	26.5	+ .1	33.1	16	16.7	9
Atimonan	58.83	-2.63	61.44	14	57.20	7	25.5	- .5	31.9	5	16.1	8
Ambulong, Tanauan	58.27	-2.82	60.54	14	56.77	1	25.6	- .8	34.4	29	14.9	8
Paracale	59	-2.91	61.31	12	57.25	7	25.6	+ .2	31.8	8	17.2	9
Manila	58.82	-2.66	61.15	14	57.38	2	25.3	- .4	33.2	23	16.9	8
San Isidro	59.04	-2.63	61.40	14	57.66	7	25.6	- .3	33.8	23	17	9
Dagupan	58.25	-2.45	60.83	14	56.86	4	26.1	- .5	35.2	23, 27	17.6	9
Bolinao	58.57	-2.63	61.20	14	57.18	4	25.6	-1.2	33.6	22, 23	16.4	8
Baguio <sup>a</sup>	636.14	-2.16	637.90	11	634.26	7	16.6	- .9	24.4	21	10.2	8
Vigan	758.62	-2.44	761.40	13	757.13	4	25.3	- .7	31.5	20, 28	18.5	7, 9
Tuguegarao	59.54	-2.26	63.46	14	56.97	7	24	-2	35	23	18.2	9
Aparri	59.85	-2.15	63.98	14	57.04	7	23.7	-1.1	31.7	23	19	8, 9

<sup>a</sup> The barometric readings of this station are not reduced to sea level.

Rainfall.—The rains of this month throughout the Archipelago were quite abundant if compared with the normal rainfall for February, only a few stations having reported a total amount of rain below the normal. As the winter of the preceding year was unusually dry for the Philippines, it is not surprising to see in the following table so great differences between the total monthly rainfall of this month and that of February, 1915.

RAINFALL AT VARIOUS STATIONS OF THE WEATHER BUREAU DURING THE MONTH OF FEBRUARY, 1916.

Station.	Total.	Departure from February, 1915.	Departure from normal.	Rainy days.	Departure from February, 1915.	Greatest rainfall in a single day.	Day.	Station.	Total.	Departure from February, 1915.	Departure from normal.	Rainy days.	Departure from February, 1915.	Greatest rainfall in a single day.	Day.
	mm.	mm.	mm.		mm.	mm.			mm.	mm.	mm.		mm.	mm.	
Jolo	63.8	+ 57.7	- 20.8	7	+ 6	20.6	16	Calapan	96.6	+ 66.1	+ 18.9	8	+ 2	51.1	22
Isabela, Basilan	63	+ 61.7	- 11.8	7	+ 6	17.2	20	Virac	205.5	+ 191.5	+ 3.8	13	+ 7	65.6	20
Zamboanga	48.7	+ 47.4	- 7	7	+ 6	21.6	13	Naga	34.6	+ 32.8	- 1.7	6	+ 5	17	19
Davao	188.7	+ 188.7	+ 62.6	13	+ 13	50.8	8	Batangas	41.1	+ 41.1	+ 18.5	6	+ 6	25.9	20
Dapitan	181.4	+ 178.1	+ 66.7	14	+ 11	38.6	29	Lucena	60.5	+ 41.1	- 1.7	10	-	18.3	22
Butuan	138.2	+ 134.5	60.6	17	+ 13	39.5	17	Atimonan	79.3	+ 79.3	- 32.2	14	+ 13	26.3	27
Dumaguete	261.2	+ 261.2	-	11	+ 11	105.9	20	Paracale	26.4	+ 26.4	-	7	+ 7	8.9	20
Tagbilaran	90.3	+ 90.3	- 11	7	+ 7	31	22	Ambulong, Tanauan	149.6	+ 132.6	-	11	+ 3	46.7	15
Iwahig	146.4	+ 145.3	-	7	+ 5	105.5	1	Santa Cruz, Laguna	58.4	+ 56.6	-	10	+ 8	15.5	20
Surigao	270.4	+ 211.9	- 77.2	15	+ 9	56.1	28	Manila	23.6	+ 19.8	+ 13	4	+ 3	20.7	15
Maasin	224.5	+ 224.5	+ 64.3	8	+ 8	78.7	29	Antipolo	58.1	+ 58.1	-	11	+ 11	19.6	17
Cebu <sup>a</sup>	102.8	-	-	-	-	-	-	Iba	27.8	+ 27.5	+ 21.3	7	+ 6	11.2	12
Iloilo	209.4	+ 209.4	+ 174.7	12	+ 12	55.9	2	San Isidro	15.9	+ 13.8	+ 10.5	8	+ 6	7.9	4
San Jose Buenavista	114.4	+ 114.4	+ 95.1	10	+ 10	43.7	21	Tarlac	27.7	+ 22.6	+ 17.8	5	+ 4	19.3	3
Cuyo	106.3	+ 106.3	+ 86.8	6	+ 6	68.1	21	Baler	244.2	+ 93	+ 99.8	17	+ 6	35.5	15
Ormoc	253.5	+ 250.4	+ 155.7	13	+ 11	78.7	29	Dagupan	68.9	+ 58.2	+ 48.4	7	+ 6	21.3	22
Guiuan	451.6	+ 422.7	-	15	+ 4	90.4	28	Bolinao	60.7	+ 60.4	+ 49.8	8	+ 7	23.1	12
Tacloban	241.3	+ 227.3	+ 48.5	15	+ 6	49.3	18	Baguio	46.4	+ 46.4	+ 31	8	+ 8	18	3
Capiz	129.8	+ 110.1	+ 33.9	10	+ 5	45.8	22	San Fernando, Union	34.5	+ 12.1	+ 25.9	9	+ 8	14.8	4
Boronagan	335.9	+ 301.1	- 39.7	14	+ 2	68.1	18	Echagüe	44.6	+ 40.3	+ 9.2	13	+ 11	8.6	15
Catbalogan	184.2	-	-	11	-	41.9	14	Candon	43.6	+ 43.6	+ 34.4	6	+ 6	19.3	3
Calbayog	120.8	+ 92.3	- 30.2	13	+ 5	41.1	18	Vigan	68.6	+ 63.6	+ 59.1	6	+ 6	17.5	3
Masbate	68.4	+ 52.6	- 62.1	9	+ 3	25.9	18	Tuguegarao	70.2	+ 67.9	+ 50.3	10	+ 9	17.9	3
Romblon	98.2	+ 79.4	+ 33.1	10	+ 4	32.6	22	Laoad	17.2	+ 14.9	+ 8.9	3	+ 2	8.1	3
Batag	234.2	+ 197.6	-	10	+ 5	58.2	20	Aparri	250.5	+ 242.9	+ 154.1	16	+ 10	47.8	26
Gubat	133	+ 88.6	- 101.8	11	+ 2	46	16	Santo Domingo, Batanes	86.9	+ 10.9	- 28.1	16	+ 9	15.2	9
Legaspi	168.3	+ 122.9	- 88.7	12	+ 3	53.5	20								
Sumay, Guam	167.8	+ 152.4	+ 87.8	13	+ 7	86.4	2								

<sup>a</sup> 26 days of observation only.

DEPRESSIONS AND TYPHOONS.

There was no depression or typhoon over the Philippines during this month. Yet there can be distinguished in our weather maps three depressions over the Pacific: one in a low latitude to the east of the southern part of the Archipelago, and the other two in higher latitudes to the northeast of Luzon. The approximate tracks of these depressions shall be published later on in the Bulletin for April or May.

The first of these depressions appeared clearly in the weather map of Tokio for 6 p. m. of January 31st to the south of the Loochoo Islands in about 23° latitude N and 128° longitude E. It moved E or E by N and passed south of the Bonins in the evening of February 1. The second depression is shown by our weather map for 6 a. m., February 7, as situated to the east of Balintang Channel in about 20° latitude N and 125° longitude E. The observations taken at Santo Domingo, Batanes Islands, gave very clear signs of this depression with a moderate falling of the barometer and a persistent moderate breeze from NW. The depression seems to have moved ENE on the 7th, and to have filled up on the 8th to the southeast of the Loochoos. The third depression was probably formed on the 24th to 25th over the Western Carolines, to the SSW of Guam, where a moderate easterly breeze was observed on these days. It seems to have moved W until the 28th, when it probably inclined somewhat to the north. Our weather map for 2 p. m. of February 28 showed clearly the existence of this depression to the east of the southern Visayas between 10° and 11° latitude N and in about 128° longitude E. According to our weather maps for the 29th, the depression had filled up about 100 miles to the east of the southern part of Samar.

## NOTAS GENERALES DEL TIEMPO.

**Presión y temperatura.**—La presión atmosférica media de este mes es considerablemente inferior que la normal de febrero y que la del año pasado. Así la media mensual de Manila difiere en  $-2.43$  mm. de la normal, y en  $-2.66$  mm. de la media de febrero, 1915. Las presiones más altas se observaron generalmente en Filipinas del 12 al 14, y las más bajas el 4 o el 7 en Luzón, y el 1.º o el 20 en las Visayas y Mindanao.

La temperatura media mensual es casi idéntica a la del año pasado en las Visayas y Mindanao, y algo menor en Luzón. Las máximas y mínimas absolutas de Manila fueron  $33.2^{\circ}$  C. y  $16.9^{\circ}$  C. registradas respectivamente los días 23 y 8. Las temperaturas extremas de Baguio fueron  $24.4^{\circ}$  C.,  $10.2^{\circ}$  C. en la cumbre del Mirador, y  $25.3^{\circ}$  C.,  $7.8^{\circ}$  C. en el valle.

**Precipitación acuosa.**—Las lluvias de este mes fueron bastante abundantes en todo el Archipiélago, siendo muy pocas las estaciones que han dado una cantidad mensual de lluvia inferior a la normal de febrero. Como el invierno del año pasado fué extraordinariamente seco en Filipinas, no es extraño que en la tabla que publicamos en el texto inglés aparezcan tan grandes diferencias entre la cantidad total de lluvia de este mes y la de febrero de 1915.

## DEPRESIONES Y TIFONES.

Durante este mes no hubo depresión ni tifón alguno en Filipinas. Con todo, aparecen en nuestros mapas del tiempo tres depresiones en el Pacífico: una en bajas latitudes al E de la parte meridional del Archipiélago, y las otras dos en más altas latitudes al NE de Luzón. Las trayectorias aproximadas de estas depresiones se publicarán más tarde en el Boletín de abril o mayo.

La primera de estas depresiones apareció claramente en el mapa del tiempo de Tokio de 6 p. m. del 31 de enero al S de las Islas Liukiu en los alrededores de  $23^{\circ}$  latitud N y  $128^{\circ}$  longitud E. Se movió al E o E $\frac{1}{4}$ NE y pasó por el S de Bonins la noche del 1.º de febrero. La segunda depresión la indica nuestro mapa del tiempo de 6 a. m. del 7 de febrero, situándola al E del Canal de Balintang en los alrededores de  $20^{\circ}$  latitud N y  $125^{\circ}$  longitud E. Las observaciones hechas en Santo Domingo, Islas Batanes, dieron muy claros indicios de esta depresión con un regular descenso del barómetro y vientos bonancibles persistentes del NW. La depresión parece haberse movido al ENE el día 7, y haberse deshecho el 8 al SE de Liukiu. La tercera depresión se formó probablemente del 24 al 25 en las Carolinas Occidentales, al SSW de Guam, donde se observaron vientos bonancibles del E en dichos días. Parece haberse movido al W hasta el día 28, en que probablemente se inclinó algo al N. Nuestro mapa del tiempo de 2 p. m. del 28 de febrero señalaba evidentemente la existencia de esta depresión al E del sur de Visayas, entre  $10^{\circ}$  y  $11^{\circ}$  latitud N y en los alrededores de  $128^{\circ}$  longitud E. Según los mapas del tiempo del día 29, la depresión se había deshecho a unas 100 millas al E de la parte meridional de Sámar.

METEOROLOGICAL DATA FOR MANILA CENTRAL OBSERVATORY.\*

[φ=14° 34' 41" N; λ=120° 58' 33" E; barometer above sea, 14.2 meters; gravity correction not applied, -1.72 mm.]

Table with columns for Day, Air temperature (Mean, Maximum, Minimum), Underground temperature (0.25 meter, 0.50 meter, 1.50 meters, 2.50 meters), Relative humidity, Vapor pressure, Radiation (Minimum on grass, Maximum in sun), Evaporation (Free exposure, Shelter), Wind (Prevailing direction, Total movement, Maximum hourly velocity, Direction), Clouds (Amount, Form and direction), Sunshine, Rain (24 hrs. beginning 6 a. m.), and Miscellaneous.

\* All the mean values given in this table are deduced from hourly observations.
b These values are taken from instruments mounted in the Observatory Park, 1.5 meters above ground.

METEOROLOGICAL DATA FOR MIRADOR OBSERVATORY, BAGUIO.\*

[φ=16° 25' N; λ=120° 36' E; barometer above sea, 1,512.5 meters; gravity correction not applied, -1.65 mm.]

Table with columns for Day, Air temperature at Mirador (on the top of the mountain), Air temperature in the valley (near the city hall), Radiation, and Evaporation. Includes sub-columns for Mean, Maximum, Hour, and Minimum for both temperature locations, and further sub-columns for Relative humidity, Vapor pressure, Minimum on grass, Maximum in sun, Black bulb in vacuo, Free exposure (total), and Shelter (total).

Table with columns for Day, Wind (Prevailing direction, Total movement, Maximum hourly velocity, Direction at the time of maximum velocity), Clouds (Form and direction, Upper, Lower), Sunshine, Rain, 24 hours beginning 6 a. m., and Miscellaneous. Includes sub-columns for Km. and Amount (mean).

\* All the mean values given in this table are deduced from six daily observations taken at 2, 6, 10 a. m. and 2, 6, 10 p. m.
b The barometric readings of this station are not reduced to sea level.
c The black bulb actinometer was broken during a typhoon on October 29, 1915.
d This element is based on hourly observations taken from a quadruple register, which gives only eight possible directions of the wind.

## DAILY RAINFALL AT THE STATIONS OF THE WEATHER BUREAU, FEBRUARY, 1916.

Station.	Day of month.															
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.
	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.
Jolo													1.8		4.8	20.6
Isabela, Basilan		9.1											16			
Zamboanga												3.6	21.6			
Davao	9.9	3		6.6	2	2.5	6.1	50.8								
Cagayan, Misamis	(*)	(*)	(*)	(*)												
Dapitan	23.1	7.1	0.8									3.6				
Butuan	1.8										8.6	1	.3	1	1.8	
Dumaguete		3									.8	4.1	9.4			
Tagbilaran												.3				9.9
Iwahig	105.5	.3	1.5	8.1												
Surigao										8.2	21.3	2.4		7.7	13	5.1
Maasin											24.4					
Cebu	(*)	(*)	(*)							2	13.5	10.2				
Iloilo		55.9			2							20.6	5.3			
San Jose Buenavista		6.6		7.9	.3								2			
Cuyo																
Ormoc											17.3	4.3	2.3	9.4		1.5
Guiuan										17.8	46.2	15.5	1		1.3	1.8
Tacloban		3.6		.5							12.1	10	11.1	4.9		13.6
Capiz											.3	16.5	1.8			
Borongan	5.3			1.5							15.2	18.8				23.1
Catbalogan	5.1											.8		41.9		1.8
Calbayog	17											.5				.8
Masbate	4.3	.8			3.3		.3									
Romblon	.5	.3														
Batag		22.1														32.2
Gubat	15.8	9.4									.8				3.3	46
Legaspi	2.3				2.5						1.6			2.5		10.2
Sumay, Guam	6.3	86.4				6.4			35.5	2.6	5.1				2.6	7.6
Calapan	2.8			6.6										3	1.8	
Virac	4.6		.3											16.5	16.5	59.4
Naga												1.1				
Batangas				8.6								5				
Lucena				1.5						4.6			1.5	6.6	2.8	
Atimonan		4.1		.8						5.1	1	.5	8.9	7.4	.8	
Ambulong, Tanauan		1.6		7.1							.3		4.1			
Paracale	.5			3.1						28.5		5.5		8.4	46.7	
Santa Cruz, Laguna				12.7					1.8			9.9		3	.8	
Manila				2.3											20.7	
Antipolo				6.6						.3	9.4	1.3		1.8	13.2	
Iba		.8	6.4	5.8								11.2	.3			
San Isidro		.8	.3	7.9							.5	1.8			2.3	
Tarlac			19.3	5.1							1.8	.5	1			
Baler	2.3	.8	9.7	9.9							34.5	22.6	12.2		35.5	10.5
Dagupan		.6	21.3	3.6									3			
Bolinao	.6	12.5	16	1.3							5.1	23.1				
Baguio		8	18	9.1							.3	2.8				
San Fernando, Union	1	9.9	2	14.8								.8	.3			
Echague		1.3	8.4								6.9	7.1	3.3	1.5	8.6	3.3
Candon		2	19.3	12.7								2.5	3.8			
Vigan		13.5	17.5	14.7								3.9				
Tuguegarao		9.1	17.9								8.6	12.8			3.8	8.4
Laog		6.1	8.1									3				
Aparri		1.5	14.7							15	4.3	21.2	30.8	6.6	.5	24.2
Santo Domingo, Batanes	.1					4.6	6.6	8.4	15.2	.1		11.2	1.8	2.1	2.5	9.4

\* No observation.

Daily rainfall at the stations of the Weather Bureau, February, 1916—Continued.

Station.	Day of month.													Total.
	17.	18.	19.	20.	21.	22.	23.	24.	25.	26.	27.	28.	29.	
	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.
Jolo		6.1	16.8	4.8	8.9									63.8
Isabela, Basilan			10.2	17.2	5.6	4.1							0.8	63
Zamboanga		.8	3.3	9.8	4.3								5.3	48.7
Davao	23		16.5	3.8	30.5	22.6						6.4		188.7
Cagayan, Misamis	25.9	1	.5	40.6	11.4	.3						8.9	36.3	124.9
Dapitan	8.9	28.2	18.8	9.9	23.3	.5			1.3	0.5		16.8	38.6	181.4
Butuan	30.5	2.5	19	18.6	2.3	8.6		2.3		6.1	5.1	24.6	4.1	138.2
Dumaguete		4.8	1.2	105.9	13.2	11.4						11.4	96	261.2
Tagbilaran		30.7	11.3	3.6		31							3.5	90.3
Iwahig				3.4	17	10.6								146.4
Surigao	40.1	28.5	43.1	14.5	13.4					1.5	9.1	56.1	6.4	270.4
Maasin	6.4	18.8	23.6	47		9.9						15.7		224.5
Cebu	16.5		14.2	1.5	12.1	15							17.8	102.8
Iloilo		33.8	9.6	5	13.5	26.1	27.9		1.3				8.4	209.4
San Jose Buenavista		25.4	3.6	17.3	43.7	7.1								114.4
Cuyo		1.8	1.3	20.3	68.1	14	.8							106.3
Ormoc	2.5	19.6	26.4	67	13.5	6.9						4.1	78.7	253.5
Guiuan	19	85.6	47.5	18.8	12.2				.3		5.3	90.4	88.9	451.6
Tacloban	17.3	49.3	18.4	45.6	15.6	27.9						9.4	2	241.3
Capiz		11.4	7.9	42.7	.6	45.8		1.5					1.3	129.8
Borongan	23.7	68.1	33.8	46	54.4	1.8					3.3	14.2	26.7	335.9
Catbalogan	7.6	40	21.4	35.3	14							7.4	8.9	184.2
Calbayog	2.1	41.1	10.1	13.8	13.9		2	1.8			1	9.1	7.6	120.8
Masbate	.5	25.9	17.5	11.7	4.1									68.4
Romblon		7.6	19.6	29.4	6.1	32.6		.8			1	.3		98.2
Batag		15.3	55.3	58.2	10.9	3.6					2	27	7.6	234.2
Gubat		14.2	12	12	7.6							2.3	9.6	133
Legaspi		23.9	47.8	53.5	9.9						8.4	1.6	4.1	168.3
Sumay, Guam	3.8				1.3		1.3				6.4	2.5		167.8
Calapan				6.6	18	51.1	9.4							96.6
Virac	.5	3.8	23.1	65.6	.3	.5						4.5	9.9	205.5
Nueva Caceres			17	1.4	9.8	5							.3	34.6
Batangas				25.9	1.3	4.3							.5	41.1
Lucena				11.4	8.9	13.3				.8	9.1			60.5
Atimonan	3.6		1.8		.5	13.7	5.1				26.3			79.6
Ambulong, Tanauan				8.9		3.6							.8	26.4
Paracale			38.3	.8	9.4	4.6					3.8			149.6
Santa Cruz, Laguna				15.5	14.2	.8					1.1		1.3	58.4
Manila			.3										.3	23.6
Antipolo	19.6			1.5		.8					8		2.8	58.1
Iba			1.5				1.8							27.8
San Isidro			1.8	.5										15.9
Tarlac														27.7
Baler	2.8	9.7	14.2	33.3	17.8	1				1	26.4			244.2
Dagupan			1.8			21.3					17.3			68.9
Bolinao			.8	1.3										60.7
Baguio			1.3	1.3			5.6							46.4
San Fernando, Union			2.9	2							.8			34.5
Echague	.8		1.3	.5							3	1.3		44.6
Candon				3.3										43.6
Vigan											10.2	3.8		63.6
Tuguegarao	.8		2.3	4			2.5							70.2
Laog														17.2
Aparri	6.9	6.1	2.5	19.8					18.3	47.8	30.3			250.5
Santo Domingo, Batanes	3		10.1	5.1	5.2								1.5	86.9

\* 25 days of observation.









Maximum and minimum temperatures at the stations of the Weather Bureau, February, 1916—Continued.

Day.	Echagüe.		Candon.		Vigan.		Tuguegarao.		Laoag.		Aparri.		Santo Domingo, Batanes.	
	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.
	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.
1	20.8	29	20.2	28.5	19.6	26.6	20	30.2	20.6	26.3	21.4	24.7	19.6	
2	20.9	27.9	20.1	29.5	22.5	27	20.5	31.7	20.8	25.7	21	23.3	20	
3	20.6	26.6	23.5	26.4	21.8	23.5	20.1	26	21.5	23.4	20.3	25.9	20	
4	21.3	28.2	23.5	28.6	21.6	28.2	19.6	30.6	21.9	26.6	20.3	27.2	17.9	
5	22.1	27.8	21	27.5	20.8	31.2	19.3	29.7	19.1	27.3	19.8	26.1	17.6	
6	21.3	27.5	19.5	28	19.3	31.4	19.4	30	18	29.2	20.6	26	19.4	
7	21.1	27.8	19.6	27.4	18.5	31	18.5	29.8	17.9	27.4	20.9	25.6	16.5	
8	19.6	28	19	27.9	18.8	31.2	18.4	29.7	17.3	28	19	25	22.8	
9	20.2	27.9	18.8	27.5	18.5	30	18.2	28.6	17.2	27.2	19	26	19.4	
10	20.4	29.2	20.2	28	20.1	29.7	19.5	30.1	18.9	24.5	21.5	24.8	18	
11	21.2	28.5	21	29.4	20.5	28.9	19.6	29.9	18.4	27.3	22.4	25	18.9	
12	20.6	27.5	23	28.9	20.4	25.6	19.5	33.5	19	24.2	19.6	25.3	19.3	
13	20.2	28.2	22.8	26.3	20.5	25.6	19.5	28	20.1	23.3	20	22.5	19	
14	19.3	28.1	21	27	19	26.1	19	30.8	19.9	23.3	19.6	23	18.4	
15	19.5	28.9	20.5	29.5	20.1	27.1	19.3	33.6	18.2	24	19.8	23	18	
16	19.9	29.1	21.7	29.8	20.6	25.6	20.6	34.5	18.3	24.8	21.2	23.1	18.9	
17	19.9	29.6	21.7	30.7	22.5	29.6	21.6	34.2	19.8	25.2	22	22.6	18.8	
18	23.2	30	22.4	29.2	21.8	29.2	22.5	33.1	20.7	26.1	22.3	24.9	19	
19	23.1	30.2	23.2	29.9	21.4	30.2	22.7	33.2	19.8	27.8	22.9	24.7	20.6	
20	23.8	30.5	24.5	31.5	23.1	32.7	21.8	33	22.9	29.3	22.5	27.5	22.1	
21	22.5	29.3	24	29	24	33	21.3	33.6	23	30	21.5	27.7	23.3	
22	22.3	31.5	24.4	31	24.5	33.3	21.6	33.8	22.5	28.8	22.3	28	21.2	
23	21.3	30.5	25	30.8	24.2	35	21.4	33.2	21.6	31.7	23.2	29	22	
24	22.3	30.5	24.6	30.8	23	34.5	23.2	32.5	21.5	29.2	23.4	29	22.2	
25	20	30.5	24.2	30	23	32	22.4	33.3	22.4	29.1	23.2	27.2	20.8	
26	22.6	30.6	24	30.5	22.3	29.9	21.7	33.4	23	26	21.8	25.2	21.2	
27	22.7	30.1	23	31.3	22	27.4	20.4	33.1	23.1	24.8	21.3	24.7	24.5	
28	21.5	30.5	24.5	31.5	22.1	32.6	20.7	33.5	23.3	30.3	20.9	26.3	22.4	
29	20.3	30.5	22.5	29.9	22?	31.4	21.3	32.5	21.8	28.1	22.8	26	21	
Mean	21.2	29.1	22.2	29.2	21.3	29.6	20.5	31.7	20.4	26.9	21.3	25.5	20.1	



## SEISMOLOGICAL BULLETIN FOR FEBRUARY, 1916.

By Rev. MIGUEL SADERRA MASÓ, S. J.,  
Assistant Director of the Weather Bureau.

### EARTHQUAKES FELT IN THE PHILIPPINES.<sup>1</sup>

1, 6<sup>h</sup> 53<sup>m</sup> [1, 14<sup>h</sup> 53<sup>m</sup>]. Samar and Leyte Islands. Earthquake shocks of intensity III-IV, felt in the northern part of Leyte and western Samar; duration 5 seconds. They were registered by the Wiechert seismograph of Butuan about 300 kilometers distant.

1, 17<sup>h</sup> 51<sup>m</sup> [2, 1<sup>h</sup> 51<sup>m</sup>]. Naga (SE Luzon). Earthquake of intensity II-III.

2, 13<sup>h</sup> 43<sup>m</sup> [2, 21<sup>h</sup> 43<sup>m</sup>]. Butuan (N Mindanao). Oscillatory and subsultory earthquake, direction E-W, intensity III-IV, duration 4 seconds.

4, 8<sup>h</sup> 09<sup>m</sup> [4, 16<sup>h</sup> 09<sup>m</sup>]. Ormoc (W Leyte). Oscillatory earthquake, direction SW-NE, intensity III, duration about 5 seconds.

4, 19<sup>h</sup> 04<sup>m</sup> 28<sup>s\*</sup> [5, 3<sup>h</sup> 04<sup>m</sup> 28<sup>s</sup>]. Eastern Mindanao. Earthquake of intensity IV, felt in the eastern part of Mindanao. It originated in the Pacific, probably SSE of the Davao Gulf and District, where it had greater intensity. The seismographic records of Manila and Butuan place the origin at distances of 1,150 and 350 kilometers, respectively. All the seismographs in operation in the Far East recorded this earthquake.

5, 8<sup>h</sup> 09<sup>m</sup> 40<sup>s\*</sup> [5, 16<sup>h</sup> 09<sup>m</sup> 40<sup>s</sup>]. Aparri (NE Luzon). Earthquake of intensity III. The records of Manila and Taihoku (Formosa) show that its origin was under the Pacific Ocean, some distance from the NE end of Luzon.

6, 16<sup>h</sup> 58<sup>m</sup> [7, 0<sup>h</sup> 58<sup>m</sup>]. Naga (SE Luzon). Oscillatory earthquake, direction N-S, intensity III-IV, duration 4 seconds.

11, 9<sup>h</sup> 17<sup>m</sup> [11, 17<sup>h</sup> 17<sup>m</sup>]. Western Samar. Earthquake shocks felt with intensity III-IV. Their epicenter was apparently in the small volcanic islands situated in front of the western coast of Samar. They were feebly registered by the seismograph of Butuan.

14, 10<sup>h</sup> 04<sup>m</sup> 37<sup>s\*</sup> [14, 18<sup>h</sup> 04<sup>m</sup> 37<sup>s</sup>]. Butuan (N Mindanao). Earthquake of intensity II-III. The records of Butuan, Manila, and other seismic stations of the Far East indicate that the origin of the disturbance was in the Pacific, off the southeastern coasts of Mindanao.

16, 3<sup>h</sup> 56<sup>m</sup> 00<sup>s\*</sup> [16, 11<sup>h</sup> 56<sup>m</sup> 00<sup>s</sup>]. Catbalogan (W Samar). Oscillatory earthquake, intensity III, duration 4 seconds. This light earthquake probably originated E of Samar in the *Philippine Deep* of the Pacific.

18, 1<sup>h</sup> 15<sup>m</sup> [18, 9<sup>h</sup> 15<sup>m</sup>]. Ormoc (W Leyte). Earthquake shocks of intensity III, duration 6 seconds.

18, 7<sup>h</sup> 16<sup>m</sup> [18, 15<sup>h</sup> 16<sup>m</sup>]. Laoag (NW Luzon). Earthquake of intensity II-III.

21, 10<sup>h</sup> 10<sup>m</sup> [21, 18<sup>h</sup> 10<sup>m</sup>]. Naga (SE Luzon). Oscillatory earthquake, intensity III.

26, 2<sup>h</sup> 13<sup>m</sup> 50<sup>s\*</sup> [26, 10<sup>h</sup> 13<sup>m</sup> 50<sup>s</sup>]. Iba (W Luzon). Oscillatory earthquake, direction NW-SE, intensity III-IV, duration 5 seconds.

26, 23<sup>h</sup> 35<sup>m</sup> [27, 9<sup>h</sup> 15<sup>m</sup>]. Guam (Mariana Islands). Earthquake shock, intensity III-IV.

<sup>1</sup> The intensity of earthquakes is given in the notation known as the Rossi-Forel scale. The time is that indicated by the seismographs at the Central Observatory whenever the disturbance has been registered by them. This fact is denoted by an asterisk (\*). Otherwise the time is that noted by the observer who sent the report. All time indications are in Greenwich mean time (midnight = 0), insular time being added in brackets for the convenience of Philippine readers.

## RECORDS OF THE MICROSEISMOGRAPH.

[Time: Greenwich mean. Midnight=0h. Instrument: Wiechert seismograph; 1,000 kilograms.  $A_N$ :  $T_0=6.1$ ,  $\epsilon=3.89$ ,  $\frac{r}{T_0^2}=0.023$ ;  
 $A_E$ :  $T_0=6.6$ ,  $\epsilon=2.32$ ,  $\frac{r}{T_0^2}=0.050$ . Alluvium. 2.40 meters above sea level].

No.	Date.	Character.	Phase.	Hour.	Period.	Amplitude.		Remarks.
						$A_N$ $\mu$	$A_E$ $\mu$	
38	1	Ir	eP	h. m. s.				
			S	2 25 48				
			L	28 30				
			ME	31 15				
			MN	35 08	10		4	
39	1	IIr	F	3 01	8	6		
			e	7 40 33				
			S	44 00	5-7			
			L	48 24	6-8			
			MN	51 38	10	227		
40	1	Ir	ME	51 44	10		332	
			F	9 52				
			eP	21 50 32				
			S	53 48				
			L	57 00				
41	2	I.	ME	58 22	7	13		
			MN	22 01 06	7		9	
			F	41				
			e	14 53				
			F	15 08				
42	2	Iv	e	19 42				
			F	20 01				
			eP	21 28 33				
			S	31 18				
			L	33 05				
43	2	Ir	ME	34 38	8		39	
			MN	36 03	13	27		
			F	22 17				
			eP	2 56 08				
			F	3 02				
44	3	Iv	eP	10 06 14				
			L	10 28				
			ME	12 02	7		12	
			MN	12 13	6	15		
			F	32				
45	3	Iv	eP	19 08 10				
			S	10 13				
			L	12 16				
			ME	12 58	6		22	
			MN	12 02	6	11		
46	3	Ir	F	12 27				
			e	19 04 28				
			F	12				
			eP	4 31 22				
			L	32 53				
47	4	Iv	ME	33 20	5		49	
			MN	33 38	5	39		
			F	44				
			eP	8 09 40				
			L	10 33				
48	5	Iv	MN	12 30	6	79		
			ME	13 13	5		60	
			F	29				
			eP	9 15 52				
			L	16 16				
49	5	Iv	MN	16 19	2	30		
			F	23				
			eP	14 35 16				
			S	38 12				
			L	40 31				
50	5	Ir	ME	47 42	17		3	
			F	15 18				

Eastern Mindanao.

Aparri (NE Luzon).

Records of the microseismograph—Continued.

No.	Date.	Character.	Phases.	Hour.			Period.	Amplitude.		Remarks.
								A <sub>N</sub> μ	A <sub>E</sub> μ	
52	6	I <sub>r</sub>	e	h.	m.	s.				
			S	11	00	00				
			L		03	27				
			M <sub>N</sub>		06	44				
53	6	I <sub>v</sub>	M <sub>E</sub>		07	43	6	29		
			F		08	05	7		33	
					46					
54	6	I <sub>u</sub>	e	12	43					
			F	13	08					
55	7	I <sub>v</sub>	e	22	01	34				
			S		09	39				
			L		17	06				
			M <sub>E</sub>		20	26	16		10	
56	8	I	M <sub>N</sub>		20	50	15	10		
			F		0	08				
57	8	I	eP	0	26	00				
			F		33					
58	10	I <sub>r</sub>	e	0	31					
			F	1	02					
59	10	I <sub>r</sub>	e	15	54					
			S	16	21					
			L							
			M <sub>E</sub>	2	10	40				
60	11	I	S		14	27				
			L		19	15				
			M <sub>N</sub>		20	19	14	21		
			F		20	27	12		14	
61	11	I <sub>v</sub>	M <sub>E</sub>		56					
			F							
62	14	II <sub>r</sub>	eP	11	01	18				
			S		05	32				
			L		09	53				
			M <sub>E</sub>		16	00	13		4	
63	14	I <sub>r</sub>	F		39					
64	15	I <sub>v</sub>	e	8	49	37				
			S		9	21				
			L							
			M <sub>N</sub>	16	42	19				
65	15	I <sub>r</sub>	F		45					
66	16	I <sub>v</sub>	eP	10	04	37				
			S		07	18	4-5			
			L		09	38	5-6			
			M <sub>E</sub>		12	04	15	178		
67	16	I <sub>v</sub>	M <sub>N</sub>		12	49	11		76	
			F		11	32				
68	18	I <sub>v</sub>	e	17	54					
			S		18	06	10		17	
			L		18	06	12	15		
			M <sub>E</sub>		35					
69	20	I <sub>u</sub>	F							
70	21	I <sub>r</sub>	eP	8	49	48				
			S		52					
			L							
			M <sub>N</sub>	11	56					
71	21	I <sub>r</sub>	F		12	49				
72	21	I <sub>v</sub>	e	3	56	00				
			S		57	14				
			L		59	17	5	7		
			M <sub>E</sub>		4	08				
73	21	I <sub>v</sub>	F							
74	21	I <sub>u</sub>	eP	12	29	37				
			S		31					
			L							
			M <sub>E</sub>	15	36	17				
75	21	I <sub>r</sub>	F		38					
76	21	I <sub>v</sub>	e	17	58	54				
			S		18	07	39			
			L		16	26	8-9			
			M <sub>E</sub>		39	44	18		9	
77	21	I <sub>r</sub>	M <sub>N</sub>		39	50	18	6		
			F		19	33				
78	21	I <sub>r</sub>	e	13	59	00				
			F	14	35					

Butuan (N Mindanao).

Catbalogan (W Samar).

Sumatra.

Records of the microseismograph—Continued.

No.	Date.	Character.	Phase.	Hour.	Period.	Amplitude.		Remarks.
						A <sub>N</sub> μ	A <sub>E</sub> μ	
71	22	I <sub>r</sub>	e	h. m. s.				
			L	9 17 06				
			M <sub>E</sub> F	22 06 24 44 46	6	7		
72	22	I	e F	15 39 51				
73	25	I <sub>v</sub>	eP	7 00 05				
			L	00 22				
			M <sub>N</sub> F	00 24 06	3	21		
74	25	I <sub>v</sub>	eP F	7 07 41 09				
75	25	I <sub>v</sub>	eP F	15 27 24 31				
76	26	I <sub>v</sub>	eP	2 13 50				
			L	14 07				
			M <sub>N</sub> F	14 19 19	1	76		Iba (W Luzon).
77	26	I <sub>v</sub>	eP	4 13 50				
			L	14 07				
			M <sub>N</sub> F	14 16 17	1	24		
78	26	I <sub>v</sub>	eP F	13 24 24 27				
79	27	I <sub>v</sub>	eP F	5 57 23 59				
80	27	I <sub>v</sub>	eP F	6 19 16 21				
81	27	I <sub>u</sub>	e	20 40 49				
			M <sub>E1</sub>	21 39 51	22		7	
			M <sub>N1</sub>	44 56	21	8		
			M <sub>N2</sub>	58 49	19	7		
			M <sub>E2</sub> F	59 00 22 56	20		7	
82	28	I <sub>v</sub>	eP F	15 14 57 17				
			83	28	I <sub>v</sub>	eP F	23 08 10 10	



TEMBLORES DE TIERRA SENTIDOS EN FILIPINAS.<sup>1</sup>

1, 6<sup>h</sup> 53<sup>m</sup> [1, 14<sup>h</sup> 53<sup>m</sup>]. **Islas de Sámar y Leyte.** Temblor de tierra de intensidad III-IV sentido en la parte N de Leyte y W de Sámar, duración 5 segundos. Registrólo el sismógrafo Wiechert de Butúan distante unos 300 kilómetros.

1, 17<sup>h</sup> 51<sup>m</sup> [2, 1<sup>h</sup> 51<sup>m</sup>]. **Naga (SE de Luzón).** Temblor de tierra de intensidad II-III.

2, 13<sup>h</sup> 43<sup>m</sup> [2, 21<sup>h</sup> 43<sup>m</sup>]. **Butúan (N de Mindanao).** Temblor oscilatorio y susultorio, dirección E-W, intensidad III-IV, duración 4 segundos.

4, 8<sup>h</sup> 09<sup>m</sup> [4, 16<sup>h</sup> 09<sup>m</sup>]. **Ormoc (W de Leyte).** Temblor oscilatorio, dirección SW-NE, intensidad III, duración 5 segundos.

4, 19<sup>h</sup> 04<sup>m</sup> 28<sup>s\*</sup> [5, 3<sup>h</sup> 04<sup>m</sup> 28<sup>s</sup>]. **E de Mindanao.** Temblor de tierra de intensidad IV, sentido en toda la parte oriental de Mindanao. Su origen se hallaba en el Pacífico probablemente al SSE del Golfo de Dávao, siendo esta provincia donde tuvo mayor intensidad. Los registros de Manila y de Butúan lo colocan a unos 1,150 y 350 kilómetros de distancia respectivamente. Registráronlo todos los sismógrafos del Extremo Oriente.

5, 8<sup>h</sup> 09<sup>m</sup> 40<sup>s\*</sup> [5, 16<sup>h</sup> 09<sup>m</sup> 40<sup>s</sup>]. **Aparri (NE de Luzón).** Temblor de tierra de intensidad III. Los registros de Manila y de Formosa indican que el origen se hallaba en el Pacífico a poca distancia del extremo NE de Luzón.

6, 16<sup>h</sup> 58<sup>m</sup> [7, 0<sup>h</sup> 58<sup>m</sup>]. **Naga (SE de Luzón).** Temblor oscilatorio, dirección N-S, intensidad III, duración 4 segundos.

11, 9<sup>h</sup> 17<sup>m</sup> [11, 17<sup>h</sup> 17<sup>m</sup>]. **W de Sámar.** Temblor de tierra de intensidad IV, sentido en toda la parte occidental de la Isla de Sámar; probablemente tuvo el epicentro en las pequeñas islas volcánicas que se hallan frente a la costa W de Sámar. Fué débilmente registrado por el sismógrafo de Butúan.

14, 10<sup>h</sup> 04<sup>m</sup> 37<sup>s\*</sup> [14, 18<sup>h</sup> 04<sup>m</sup> 37<sup>s</sup>]. **Butúan (N de Mindanao).** Temblor de intensidad II-III. Los registros sismográficos de Butúan, Manila y otras estaciones sísmicas del Extremo Oriente indican que el origen de este temblor se hallaba en el Mar Pacífico hacia el SE de la Isla de Mindanao.

16, 3<sup>h</sup> 56<sup>m</sup> 00<sup>s\*</sup> [16, 11<sup>h</sup> 56<sup>m</sup> 00<sup>s</sup>]. **Catbalogan (W de Sámar).** Temblor oscilatorio, intensidad III, duración 4 segundos. Este temblor sentido débilmente en Sámar parece que tenía su origen al E de la isla en el abismo submarino del Pacífico.

18, 1<sup>h</sup> 15<sup>m</sup> [18, 9<sup>h</sup> 15<sup>m</sup>]. **Ormoc (W de Leyte).** Temblor de tierra de intensidad III, duración 6 segundos.

18, 7<sup>h</sup> 16<sup>m</sup> [18, 15<sup>h</sup> 16<sup>m</sup>]. **Laoag (NW de Luzón).** Temblor oscilatorio, intensidad II-III.

21, 10<sup>h</sup> 10<sup>m</sup> [21, 18<sup>h</sup> 10<sup>m</sup>]. **Naga (SE de Luzón).** Temblor oscilatorio, intensidad III.

26, 2<sup>h</sup> 13<sup>m</sup> 50<sup>s\*</sup> [26, 10<sup>h</sup> 13<sup>m</sup> 50<sup>s</sup>]. **Iba (W de Luzón).** Temblor oscilatorio, dirección NW-SE, intensidad III-IV, duración 5 segundos.

26, 23<sup>h</sup> 35<sup>m</sup> [27, 9<sup>h</sup> 15<sup>m</sup>]. **Guam (Islas Marianas).** Temblor de tierra de intensidad III-IV.

<sup>1</sup> La intensidad de los terremotos se indica conforme a la conocida escala de Rossi-Forel. Cuanto a la hora de su ocurrencia, adoptamos la indicada por los sismógrafos de este Observatorio siempre que los hayan registrado, distinguiéndola por medio de un asterisco (\*). En caso contrario copiamos la apuntada por los observadores que nos envían las notas. Todas las indicaciones del tiempo se refieren al tiempo medio de Greenwich (medianoche=O<sup>h</sup>). Para conveniencia de los lectores de Filipinas se añade también el tiempo insular.

100

RECORDED  
MAY 10 1916  
LIBRARY

THE GOVERNMENT OF THE PHILIPPINE ISLANDS

# WEATHER BUREAU

MANILA CENTRAL OBSERVATORY

---

BULLETIN FOR MARCH, 1916

---

PREPARED UNDER THE DIRECTION OF

REV. JOSÉ ALGUÉ, S. J.

DIRECTOR OF THE WEATHER BUREAU

MANILA  
BUREAU OF PRINTING  
1916



---

---

**BULLETIN FOR MARCH, 1916.**

---

---



# METEOROLOGICAL BULLETIN FOR MARCH, 1916.

By Rev. JOSÉ CORONAS, S. J.,  
Chief, Meteorological Division of the Weather Bureau.

## GENERAL WEATHER NOTES.

Pressure and temperature.—The mean atmospheric pressure for this month is considerably lower than that of the preceding year, and moderately lower than the normal for March. The highest pressures were recorded in the Philippines on the 24th, and the lowest on the 7th or 31st.

The monthly average temperature is either identical with, or somewhat lower than, that of March, 1915. The extreme monthly temperatures for Manila were 34.9° C. on the 29th, and 20.0° C. on the 3d. The absolute maximum temperature for Baguio was 26.1° C. on the top of Mirador, and 26.8° C. in the valley; while the absolute minimum was 11.7° C. at Mirador and 11.4° C. in the valley.

PRESSURE AND TEMPERATURE AT THE FIRST AND SECOND CLASS STATIONS FOR MARCH, 1916.

Station.	Pressure.						Temperature.					
	Mean.	Departure from March, 1915.	Highest mean.	Day.	Lowest mean.	Day.	Mean.	Departure from March, 1915.	Highest.	Day.	Lowest.	Day.
	mm.	mm.	mm.		mm.		°C.	°C.	°C.		°C.	
Tagbilaran	758.86	- 2.43	760.88	24	757.61	7	25.8	- 0.6	33.5	27	21	26
Surigao	58.97	- 2.76	61	24	57.60	31	25.9	- .1	32.1	13	21.8	11
Cebu	59.01	- 2.60	60.89	24	57.68	7	26.8	- .6	32	8	21.6	4
Iloilo	58.92	- 2.07	61.05	24	57.50	7	26.6	- 1.3	32.9	7	21.9	1
Ormoc	59.28	- 2.38	61.24	24	57.85	7	26.3	- .4	33.5	22	19.2	8
Tacloban	59.31	- 2.60	61.28	24	57.75	31	26.1	- .3	32.8	9, 23	20.1	8
Capiz	59.71	- 2.03	61.82	24	57.99	7	26.7	- .7	32.6	8, 27	22.9	3
Calbayog	59.57	- 2.44	61.71	24	58.01	7	25.8	0	34.5	29	20.6	18
Legaspi	59.83	- 2.07	61.98	24	57.96	7	27	- .3	32.5	31	20.4	5
Atimonan	60.12	- 1.75	62.68	24	58.04	7	26.6	- .2	31.8	17	21.3	11
Ambulong, Tanauan	59.34	- 2.30	61.80	24	57.37	7	27.2	0	35.8	31	21	11
Paracale	60.43	- 1.99	62.95	24	58.25	7	26.4	+ .1	31.5	30	21.9	19
Manila	59.80	- 2.12	62.27	24	57.88	7	26.4	- .4	34.9	29	20	3
San Isidro	60.06	- 2.02	62.42	24	58.06	7	27	- .5	36.9	31	19.1	2
Dagupan	59.13	- 1.97	61.26	24	57.36	7	27.3	- .3	37.2	30	21	2
Bolinao	59.48	- 2.10	61.55	24	57.82	7	27.4	- .1	35.2	19	19.9	12
Baguio <sup>a</sup>	637.33	- 1.55	639.02	24	635.75	7	17.7	- .4	26.1	13	11.7	2
Vigan	759.52	- 1.98	761.65	24	757.80	7	26.4	- .2	32.3	26	19.1	1
Tuguegarao	60.74	- 1.78	64.30	24	58.05	31	25.6	- .9	37.5	31	19.3	2
Aparri	61.13	- 1.70	65.19	24	58.43	31	24.7	+ .1	32.7	21	19.3	3

<sup>a</sup> The barometric readings of this station are not reduced to sea level.

Rainfall.—With a few exceptions the total amount of rainfall for this month in the Philippines is greater than that of the preceding year: and in a great number of stations it is also greater than the March's normal. The Manila rainfall of this month is 11 mm. above the normal, and 25.8 mm. above the monthly rainfall of March, 1915. The amount of rain collected during the month in the gauges of Mirador, Baguio, is 97.2 mm. above that of the preceding year, and 63.0 mm. above the normal for this month.

## RAINFALL AT VARIOUS STATIONS OF THE WEATHER BUREAU DURING THE MONTH OF MARCH, 1916.

Station.	Total.	Departure from March, 1915.	Departure from normal.	Rainy days.	Departure from March, 1915.	Greatest rainfall in a single day.	Day.	Station.	Total.	Departure from March, 1915.	Departure from normal.	Rainy days.	Departure from March, 1915.	Greatest rainfall in a single day.	Day.
	mm.	mm.	mm.		mm.	mm.			mm.	mm.	mm.		mm.	mm.	
Jolo	75	- 17.9	+ 3	14	+ 5	24.6	16	Calapan	36.5	- 35.17	- 35.17	12	- 35.17	8.1	23
Isabela, Basilan	31.3	+ 28.2	- 18	9	+ 4	16	25	Virac	113.5	+ 47.6	- 20.2	18	+ 2	43.2	4
Zamboanga	32.1	+ 18.4	+ 5.8	6	+ 1	19.8	16	Naga	109	+ 72.7	+ 47	9	+ 2	34.5	5
Davao	136.6	+ 64	- 9.2	10	+ 4	38.9	26	Batangas	5.6	+ 1.7	.5	2	- 1	4.3	5
Cagayan, Misamis	62.8	+ 62.8	-----	9	+ 9	23.6	21	Lucena	25	-----	-----	8	-----	16.3	23
Dapitan	201.4	+ 201.4	+ 133.1	17	+ 17	57.2	9	Atimonan	54.7	- 14.8	- 20.4	8	- 1	12.4	23
Butuan	298	-----	+ 136.9	21	-----	92	2	Ambulong, Tanauan	13.5	+ 8.1	-----	3	0	6.6	18
Dumaguete	67.3	+ 65.2	-----	7	+ 5	27.2	25	Canlubang, Calamba	4.9	-----	-----	5	-----	3	23
Tagbilaran <sup>a</sup>	155.7	+ 152.1	+ 82.8	9	+ 8	80.8	1	Paracale	178.4	+ 89.4	-----	20	+ 6	94.2	5
Iwahig	76	+ 61.4	-----	9	+ 8	33.7	20	Santa Cruz, Laguna	18.2	- 9	-----	8	- 1	11.7	23
Surigao	588.5	+ 501.4	+ 314.3	24	+ 8	221	3	Manila	29.1	+ 25.8	+ 11	5	+ 1	16.8	18
Maasin	379.5	+ 372.4	+ 271.3	13	+ 12	113.8	3	Antipolo	26.2	+ 10.6	-----	3	- 1	18.3	23
Cebu	77.4	+ 69.1	+ 22.5	10	+ 5	23.1	3	Iba	11.2	+ 11.2	- 11.6	3	+ 3	6.4	18
Iloilo	75.6	+ 74	+ 45.2	5	+ 4	57.7	1	San Isidro	2	- 3.9	- 9.8	3	0	1	3
San Jose Buenavista	16	+ 15.7	0	2	+ 1	15.5	1	Tarlac	.3	- 1.5	- 19.3	1	- 1	3	18
Cuyo	.5	+ .5	-----	1	+ 1	.5	17	Baler	225.8	+ 37.6	+ 37.6	22	-----	44.4	2
Ormoc	140.7	+ 121.9	+ 64.3	19	+ 13	28.7	3	Dagupan	2.1	- 3.3	- 25	2	- 1	1.3	18
Guiuan	432.9	+ 317.3	-----	26	+ 7	121	1	Bolinao	1.5	+ .1	- 10.8	1	- 2	1.5	18
Tacloban	221.3	+ 113.3	+ 96.9	21	+ 9	61.2	3	Baguio	102.3	+ 97.2	+ 63	8	+ 7	49.6	16
Capiz	76.4	+ 69.3	+ 50	12	+ 10	19.8	3	San Fernando, Union	22.4	+ 19.9	+ 13.7	2	+ 1	22.1	18
Borongon	381.4	+ 169.6	+ 152.7	23	+ 4	56.1	16	Echague	46.1	+ 38	+ 12.8	9	+ 6	18.8	23
Catbalogan	125.1	-----	-----	18	-----	32.5	4	Candon	36.8	+ 36.8	+ 25	4	+ 4	29.2	3
Calbayog	86.1	+ 41	- 17.3	17	+ 6	24.6	15	Vigan	46.5	+ 41.2	+ 41.1	1	0	46.5	3
Maabate	95.6	+ 88.5	+ 45.6	15	+ 10	25.1	4	Tuguegarao	19.8	+ 17.5	- 7.2	6	+ 3	6.9	27
Romblon	69.4	+ 38.6	+ 19.9	15	+ 8	18.8	28	Laog	6.6	- 6.9	+ 1.6	1	- 1	6.6	3
Bagtag	294.6	+ 260.8	-----	19	+ 11	83.8	24	Aparri	21.8	- 53.7	- 29	10	- 1	5.3	17
Legaspi	103.9	+ 48.6	- 52.8	14	+ 2	32.4	4	Santo Domingo, Batanes	36.9	- 49	- 77.4	19	+ 4	8.9	3
Sumay, Guam	27.9	+ 3.9	- 55.3	8	- 1	6.4	18								

<sup>a</sup> 30 days of observation.

## DEPRESSIONS AND TYPHOONS.

This month was entirely free from depressions or typhoons near the Philippines. Some distant depressions were observed in higher latitudes, which rather belong to the type of Continental depressions.



## NOTAS GENERALES DEL TIEMPO.

Presión y temperatura.—La presión atmosférica media de este mes es considerablemente inferior a la del año pasado y bastante menor que la normal de Marzo. Las presiones más altas tuvieron lugar en Filipinas el día 24, y las más bajas el 7 o el 31.

La temperatura media mensual es casi la misma o ligeramente menor que la de Marzo, 1915. Las temperaturas extremas de este mes en Manila fueron 34.9° C. y 20.0° C. registradas el 29 y 3 respectivamente. La temperatura máxima absoluta de Baguio fué 26.1° C. en la cumbre del Mirador, y 26.8° C. en el valle; en tanto que la mínima absoluta fué 11.7° C. en Mirador, y 11.4° C. en el valle.

Precipitación acuosa.—La cantidad total de lluvia de este mes en Filipinas, es, con pocas excepciones, mayor que la del año pasado: y en gran número de estaciones es también mayor que la normal de Marzo. La lluvia caída en Manila durante este mes es 11 mm. mayor que la normal, y 25.8 mm. mayor también que la lluvia mensual de Marzo, 1915. La cantidad mensual de lluvia recogida en los pluviómetros de Mirador, Baguio, es 97.2 mm. mayor que la del año pasado, y 63.0 mm. mayor que la normal de este mes.

## DEPRESIONES Y TIFONES.

Este mes estuvo completamente exento de depresiones o tifones cerca de Filipinas. Algunas depresiones lejanas se observaron en más altas latitudes, las cuales pertenecen más bien al tipo de depresiones continentales.

METEOROLOGICAL DATA FOR MANILA CENTRAL OBSERVATORY.<sup>a</sup>

[φ=14° 34' 41" N; λ=120° 58' 33" E; barometer above sea, 14.2 meters; gravity correction not applied, -1.72 mm.]

Day.	Pressure (mean).	Air temperature. <sup>b</sup>				Underground temperature.				Relative humidity (mean).	Vapor pressure (mean).	Radiation.		Evaporation. <sup>b</sup>		
		Mean.	Maximum.	Minimum.	0.25 meter.		0.50 meter.		1.50 meters.			Minimum on grass.	Maximum in sun. Black bulb in vacuo.	Free exposure (total).	Shelter (total).	
					8 a.m.	2 p.m.	8 a.m.	2 p.m.	8 a.m.							8 a.m.
1.	759.91	25.9	32.1	22.6	27.8	29.3	28.5	28.7	28.2	27.8	73.6	18	21.4	57.4	6.1	4.4
2.	60.08	25	30.7	21	27.6	28.9	28.5	28.5	28.2	27.8	70.1	16.2	18	56.7	5.6	4
3.	60.38	24.9	31.4	20	27.2	28.6	28.2	28.3	28.2	27.8	71.9	16.5	17	51.5	6	4.2
4.	60.77	25.9	31.9	20.6	27	28.8	28.1	28.5	28.2	27.8	73.8	18.1	17.7	53	5.5	3.9
5.	59.94	25.9	31.8	21.8	27.5	29.2	28.2	28.6	28.3	27.8	76.8	18.8	19.2	52.8	3.2	2.7
6.	58.91	26.3	32	23.3	27.6	29.1	28.3	28.6	28.3	27.8	75.4	19	20.7	52.5	4.7	3.2
7.	57.88	26.2	32.5	21.2	27.5	29.5	28.5	28.8	28.3	27.8	77.8	19.5	19	54.3	4.7	3.2
8.	58.47	26.9	32.1	22.1	27.9	29.7	28.6	28.8	28.3	27.8	78.7	20.4	19.7	52.5	5.3	3.6
9.	59.41	26.7	33.4	21.7	28	30	28.5	28.9	28.3	27.8	74.6	19.2	19.1	54.4	5.4	3.7
10.	58.89	26.4	33	20.8	27.9	29.8	28.8	29	28.3	27.8	75.1	19	17.8	53.5	4.9	3.3
11.	58.85	26.8	32.9	22.7	28.3	29.7	28.8	29.1	28.3	27.8	70.9	18.2	19.8	48.3	6.2	4.5
12.	59.62	26.6	33.7	20.2	27.8	29.4	28.8	28.9	28.3	27.8	68	17.2	17	56.1	6.7	4.8
13.	60.18	27.2	33.8	22.1	28.1	29.7	28.8	28.9	28.3	27.8	69.7	18.3	19.5	50.7	6.2	4.5
14.	59.38	26.8	32.4	21.3	28.1	29.8	28.8	29	28.3	27.8	72.3	18.6	18.5	51.4	5.2	3.8
15.	58.76	26.7	34	21.2	27.9	29.7	28.8	29.1	28.4	27.8	69.9	17.9	18.5	55.9	6.4	4.5
16.	59.39	26.2	32.5	20.4	27.6	29	28.9	28.9	28.4	27.9	71.3	17.7	17.4	53.2	5.6	4.3
17.	60	26.4	32.6	20.9	27.6	29	28.6	28.8	28.4	27.8	72.8	18.3	18	51.6	5.8	4.3
18.	60.06	24.8	30.2	22.2	27.5	28.5	28.6	28.6	28.4	27.8	84.4	19.6	19.1	48.8	2.1	1.9
19.	59.43	27.1	33.5	22.3	27.6	29.3	28.5	28.7	28.5	27.9	72	18.8	19.6	57.5	6.6	4.8
20.	59	26.9	33.5	21.9	27.7	29.1	28.6	28.8	28.4	27.9	73.8	19.1	19.5	57	5.6	4.2
21.	59.51	27.2	33.3	21.9	27.7	29.4	28.7	28.9	28.4	27.9	72.2	18.9	19	59	6	4.3
22.	60.43	26.6	34.2	20.3	27.6	29.5	28.7	29	28.4	27.9	71.3	17.9	17.3	53.1	6.2	4.5
23.	61.10	26.7	33.9	21.1	27.8	29.3	28.8	29	28.4	27.9	72.6	18.6	18.3	56	5	4.1
24.	62.27	25.8	30.6	22.7	27.9	29.2	28.8	28.9	28.4	27.9	78.3	19.2	21.8	45.4	4	3.3
25.	61.93	25.6	30.8	21.9	27.9	28.7	28.8	28.8	28.5	27.9	74.4	18	19.3	50.5	4.5	3.4
26.	61.36	26.2	32.4	20.7	27.8	28.7	28.6	28.8	28.4	27.9	72.2	18	18.2	55	6.2	4.4
27.	61.17	26.4	32.3	22.6	27.8	28.9	28.7	28.8	28.4	27.9	74.3	18.8	20.5	53.9	4.4	3.5
28.	60.44	26.5	33.1	20.7	27.3	29.1	28.4	28.8	28.5	27.9	75	18.9	18.3	54.1	5.6	4.1
29.	59.25	26.9	34.9	21.6	27.8	29.9	28.6	29	28.5	27.9	72.6	18.7	19.2	57.2	6.5	4.8
30.	58.87	27	34.3	20.3	27.8	29.8	28.8	28.9	28.4	27.9	69.9	18	17.8	56.5	7.5	5.3
31.	58.21	27.5	34	22.1	28.1	29.8	28.8	29	28.5	27.9	70	18.8	19.6	54.4	6.1	4.2
Mean Total	759.80	26.4	32.7	21.5	27.7	29.3	28.6	28.8	28.4	27.8	73.4	18.5	18.9	53.8	5.5	4
Departure from normal	-0.74	-0.2	+0.2	+0.2							+1.9	+0.4			169.8	123.7

<sup>a</sup> All the mean values given in this table are deduced from hourly observations. <sup>b</sup> These values are taken from instruments mounted in the Observatory Park, 1.5 meters above ground.

METEOROLOGICAL DATA FOR MIRADOR OBSERVATORY, BAGUIO.<sup>a</sup>

[φ=16° 25' N; λ=120° 36' E; barometer above sea, 1,512.5 meters; gravity correction not applied, -1.65 mm.]

Table with columns: Day, Pressure (mean), Air temperature at Mirador (Mean, Max., Hour, Min., Hour), Air temperature in the valley (Max., Hour, Min., Hour), Relative humidity (mean), Vapor pressure (mean), Radiation (Min., Max.), Evaporation (Free exposure, Shelter). Rows 1-31 and Mean/Total.

Table with columns: Day, Wind (Prevailing direction, Total movement, Max. hourly velocity, Direction), Clouds (Amount, Form and direction: Upper/Lower), Sunshine (h. m.), Rain (24 hours beginning 6 a. m.), Miscellaneous. Rows 1-31 and Mean/Total.

<sup>a</sup> All the mean values given in this table are deduced from six daily observations taken at 2, 6, 10 a. m. and 2, 6, 10 p. m.

<sup>b</sup> The barometric readings of this station are not reduced to sea level.

<sup>c</sup> Maximum of hourly observations taken from 6 a. m. to 6 p. m.

<sup>d</sup> This element is based on hourly observations taken from a quadruple register, which gives only eight possible directions of the wind.

## DAILY RAINFALL AT THE STATIONS OF THE WEATHER BUREAU, MARCH, 1916.

Station.	Day of month.															
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.
Jolo	1.3	2.8	14.2	2.5	1.8			1	2			0.8				24.6
Isabela, Basilan	.8	2						1.3		0.5						16
Zamboanga	2.3									1.3		4.3				19.8
Davao	8.6				2.5		10.2	6.4	21.6	9.1					21.3	14.2
Cagayan, Misamis	22.1	.5	1.8		2.3							.5		0.8	9.9	
Dapitan	8.9	6.9	7.9	10.1	8.6	1.3			57.2	22.1		5.8	0.5		6.6	2.8
Butuan	17	92	54.3	10.7		1.5			2.8	5.8		6.9		26.7	5.8	4.6
Dumaguete	25								2.3	2				8.8		
Tagbilaran	80.8		2.4									1.8		.5		
Iwahig		26.3			1.8		3.7			1.8					2.3	4.8
Surigao	12.7	38.9	221			4.6			24.1	4		.5	2.3	27.8	19.5	46.2
Maasin	51.3		113.8		10.2	48.3						7.9		28	43.7	10.2
Cebu	7.1		23.1			5.1						1.8			2.1	1
Iloilo	57.7														11.7	1.3
San Jose Buenavista	15.5														.5	
Cuyo																
Ormoc	.5		28.7	3.5	14.5	.3				18.5	8.2	4.8			14.3	9.4
Guiuan	121	1.8	48.5	31		2.5			1.3	1.5	6.4	5.1		.8	2	16.8
Tacloban	2.6	.1	61.2	18.2	11.5	1.6				1.3	28.7	3.7				8.9
Capiz	11.3	1.5	19.8		1.5	.8							19			9.7
Borongan	14.8	30.7	51.3	49.5	10.2	7.1				.8	16	11.2		1.3	22.6	56.1
Catbalogan	.8		5.8	32.5	2.1	6.8				8.6	8.7	3.6	14.7		19.8	9.2
Calbayog	4.8		1.8	17	1.5	5.1				1	2.5	6.9			24.6	1.8
Masbate	5.3			25.1	1.5						.5	6.1		1	1.5	9.7
Romblon			1.3		5.8	.5				.8			4.6	9.9	.3	1.8
Batag	26.9		9.7	44.5	2.3	2.3					13.5	4.1			46	13.2
Legaspi			2.5	32.4	15.8	17.4					3	7.1			4.1	2.8
Sumay, Guam			1.3							2.5						6.4
Calapan		3.8	.3	2.3	2.5	2.3	1.3						1.5	6.8	.3	6.8
Virac			4.8	43.2	4.1	13.5	5.6	3	1.6		.8	21.4	1		2	1
Naga				12.7	34.5	1.8	23.4					7.9				
Batangas					4.3					1.3						
Lucena		1.3	.5		2									1		
Atimonan					7.1	.8		12.2	3					4.8		
Ambulong, Tanauan	.5															
Canlubang, Calamba	.5	.3														
Paracale	.5	3.3	3.3	1	94.2	9.5	13					.8	9.4	6.9	7.4	3.8
Santa Cruz, Laguna		.6			.5								.5			
Manila	.6				3.3											
Antipolo	.3															
Iba														3.3		
San Isidro		.5	1													
Tarlac																
Baler		44.4	36.6	.2		1.8	6.9	.5	4.6		9.7	8.1	12.7		4.8	
Dagupan																
Bolinao																
Baguio													13		1.8	49.6
San Fernando, Union																
Echague	.3	.3	.5	1											18.3	
Candon			29.2	2.5												
Vigan			46.5													
Tuguegarao		1.5													5.8	
Laoag			6.6													
Aparri	2.6	2.8				1.1										1.8
Santo Domingo, Batanes	.5	5.3	8.9			2.5	.8				2.5	.1			.1	3.3

Daily rainfall at the stations of the Weather Bureau, March, 1916—Continued.

Station.	Day of month.															Total.	
	17.	18.	19.	20.	21.	22.	23.	24.	25.	26.	27.	28.	29.	30.	31.		
Jolo.....	mm. 18.8	mm. 0.3	mm. 0.3	mm.	mm. 4.3	mm.	mm.	mm.	mm. 0.3	mm.	mm.	mm.	mm.	mm.	mm.	mm.	75
Isabela, Basilan.....	6.9	1.3	1.5	1													31.3
Zamboanga.....								1.8				2.6					32.1
Davao.....		3.8								38.9							136.6
Cagayan, Misamis.....					23.6							1.3					62.8
Dapitan.....	2.5	3.8	8.9		47									0.5			201.4
Butuan.....	1.6	2.8	5.6		4.6	2.5		3.3	19	27.9	1.8	.8					298
Dumaguete.....									27.2	1.5			5				67.3
Tagbilaran.....			54.9		3.1	1			9.9	1.3							155.7
Iwahig.....		.9	7	33.7													76
Surigao.....	13.2	16.4	9.2	5.1	2.3	35.6	7.9	10.2	30.2	28.8		5.1	18.8	4.1			588.5
Maasin.....	3		7.4						22.4	20.9			12.4				379.5
Cebu.....			2						9.6	21.8			3.8				77.4
Iloilo.....									.3			4.6					75.6
San Jose Buenavista.....																	16
Cuyo.....	.5																.5
Ormoc.....	.3			.3	11.9	1			11			1	11.2			.5	140.7
Guiuan.....	1.3	5.6	5.8	.5	1.3	1	4.6		95.7	1		24.6	6.1	6.6			432.9
Tacloban.....			7.9		.6				4.3	10.4	1.9	9.6	.4	1.5	6.2	.1	221.3
Capiz.....	4.6								.3	.5					4.4		76.4
Borongan.....			7.9	.3	1.5	1			25.4	41.4	.3	1.5	.5	15.8	14.2		381.4
Cathalogan.....			3.3		1	1.5			3.3	3				1.3	1.8		125.1
Calbayog.....	.5		8			3.3			1.5					7.4	4.8	.8	86.1
Masbate.....	7.9		2.5			2.3	3		18.8	3.3					7.1		95.6
Romblon.....	3		3				.5	6.9	13.9				18.8		1		69.4
Batag.....	3.8	7.9	13		10.9	2.8	1.8	83.8					1.5	2.8	3.8		294.6
Legaspi.....		2.5	8.4	4.5		2.1			.3			1					103.9
Sumay, Guam.....		6.4	2.5									2.5			2.5	3.8	27.9
Calapan.....							8.1	.5									36.5
Virac.....			1	.3			3				3	3.3			3.6		113.5
Naga.....			5.8	21.8		.8											109
Batangas.....																	5.6
Lucena.....	1.8						16.3	1.3		.8							25
Atimonan.....	5.3						12.4	9.1									54.7
Ambulong, Tanauan.....		6.6					6.4										13.5
Canlubang, Calamba.....		.8					3	.3									4.9
Paracale.....	9.1	6.1	5	.5			.5	6.1	2						.5		178.4
Santa Cruz, Laguna.....	.5	3.6					11.7	.3									18.2
Manila.....		16.8					7.6	.8									29.1
Antipolo.....		7.6					18.3										26.2
Iba.....		6.4						1.5									11.2
San Isidro.....		.5															2
Tarlac.....		.3															.3
Baler.....	4	36.8	1	5.8			3	.8	3.3	13.7	6.6	18	2.5				225.8
Dagupan.....	.8	1.3															2.1
Bolinao.....		1.5															1.5
Baguio.....	.3					.8	13.5	20.3	3								102.3
San Fernando, Union.....		22.1	3														22.4
Echagüe.....		6.1					18.8	.3					5				46.1
Candon.....							3.8	1.3									36.8
Vigan.....											6.9						46.5
Tuguegarao.....		1		2.8			1.8										19.8
Laog.....																	6.6
Apurri.....	5.3					.5	4.8	2.1	.3		.5						21.8
Santo Domingo, Batanes.....	.8	2.3				.8	2.9	.1	2	.2	3.6	.1	.1				36.9

MAXIMUM AND MINIMUM TEMPERATURES AT THE STATIONS OF THE WEATHER BUREAU, MARCH, 1916.

Day.	Jolo.		Isabela, Basilan.		Zamboanga.		Davao.		Cagayan, Misamis.		Dapitan.		Butuan.		Dumaguete.	
	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.
1	28.2	23.4	32.1	22.6	28.4	23.8	32.7	24.8	27.5	22.9	28.4	21.8	26.7	23.9	26.4	22
2	29	23.7	31.6	23.1	30.8	21.9	32.2	21.9	28.8	23	31	24.4	29.3	22.7	28	23.8
3	29.8	22.8	33.1	22.6	31.5	23.8	32.2	22.6	26.5	23.4	27.7	23.2	24.6	22.4	27.8	24
4	29.2	21	32.6	23.8	30.2	21.8	33.5	21	29.3	20.4	31.5	22.9	31.6	21.6	29.5	24
5	30.6	21.3	33.6	23.5	29	22	32.7	21	29.7	22	32.5	22.5	32	22.1	30	23.1
6	28.5	21.3	30.1	22.1	28.7	22.7	32.8	22.8	30.5	22	33.5	22.8	31.5	22.8	30.4	24.5
7	30.7	21.4	31.1	21.6	29.5	21.5	32.7	22.2	30.3	22.1	31.6	22.5	33.5	22.8	29.6	23.1
8	30.6	20.8	30.6	22.3	29.6	22.4	32.7	22.2	30.7	22	31.9	22	34.1	22	30.9	23.4
9	29.7	20.5	30.8	22.6	29.8	22.2	33.1	22	30.7	22.5	33.2	22.1	31.6	23.7	29.7	22.9
10	31.8	21.3	32.4	23.6	28.3	22.2	31.7	22.8	28.1	23	28.5	22.6	29.3	23.7	28.7	24.6
11	29.5	23	33.1	23.1	30.4	22.3	31.2	21.5	30.3	22.9	31.5	21.1	31.6	21.5	29.8	23.5
12	29.2	23.2	32.1	22.5	31.3	22.5	31.7	22	30.5	22.7	32	21	31.5	22.3	31	25.2
13	28.4	21.8	32.6	22.3	30	22.9	31.2	22.9	31	22.3	32.2	23.5	32.3	22.2	30.8	24.8
14	29.1	21.4	33.1	22.7	30	22.3	27	21.5	30.9	20.6	31	24.7	29.9	21.8	30.3	23.7
15	29.1	23.5	32.1	22.6	30	23.1	32.2	22.5	28.2	23.5	30.5	23.5	29.2	22.4	28.7	24
16	28.2	24	33.1	23.1	30.9	23.5	28.4	22.1	29.9	23.5	28.8	23.1	26.2	23	28.4	23.8
17	27.4	21.7	31.4	23.6	29.4	22.4	31.2	21.7	30.9	22	31.5	23.6	31.3	22	28.7	24
18	28.5	20.9	33.1	22.6	30.2	23.2	33.2	21.5	31.3	22	31.8	25	31	21.2	30.4	24.8
19	29.8	20.9	32.2	21.7	29	22	33.3	21.4	30.5	22.2	32.5	23.4	30.5	22.1	29	24
20	30.8	21.3	32.8	22.1	31.5	21.8	33.7	21.5	32.1	23	31.3	23.4	32.6	22.5	29.3	24.1
21	30.5	21.3	32.6	21.6	29.5	22.3	32.7	22.1	30.2	23	31.1	23.5	29.1	23.4	30.3	23.8
22	29.8	21.5	33.1	22.6	30.2	23.5	33.2	23	29.9	20.9	32.1	22.8	31.4	22.2	29.9	25.3
23	31.6	20.8	33.8	22.5	30.8	23.2	33.7	21.3	31.2	21.4	32.5	25.3	32.6	23.3	29	25.3
24	30.5	22	33.4	22.1	31.8	23.7	31.9	23	30.7	21.3	29.4	24.7	31.7	21.4	28.5	24
25	29.2	21.3	33.4	22.1	30.4	23	32.8	21.1	31.6	22.9	31.1	25	32.5	23.1	30.4	23.7
26	29.4	23.5	33.2	22.1	31.5	23	32.7	21	29.6	22.4	31.6	24	29	22.4	30.4	23.1
27	28.9	21.3	32.6	22.3	31.7	23.5	32.7	21.2	30.5	22.9	32.5	24.6	31.3	22.7	29.8	25.2
28	31.2	20.9	32.1	22.6	30	23	32.2	21.5	31	22.4	32.5	25.2	31.5	22.3	30.7	25
29	29.2	21.6	32.8	22.5	31.4	23	33.5	21.1	31.8	22.2	32.8	24.6	32.5	21.8	29.5	23.8
30	30.9	21.3	31.6	21.6	31	23	32.5	21.2	31.3	22.4	33	23.8	33	22.9	29.3	24.2
31	30.2	21.5	31.4	22.6	30.7	24.3	32.3	22.3	31.4	22.5	34.3	22.2	33	22.8	30.4	23.4
Mean	29.7	21.8	32.3	22.5	30.2	22.8	32.3	21.9	30.2	22.3	31.5	23.4	30.9	22.5	29.5	24

Day.	Tagbilaran.		Iwahig.		Surigao.		Maasin.		Cebu.		Iloilo.		San Jose Buenavista.		Cuyo.	
	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.
1	25.4	21.2	31	22.4	28	23.6	31.3	21.5	28	22.8	27.1	21.9	30.7	23.5	29.8	26
2	29.5	21.5	31.2	23.6	26.9	23.3	30.8	21.8	29.1	23	28	22.9	32.2	20.6	29.5	25
3	28.4	22.4	30.2	21.6	27	22.5	31	21.6	28.1	22.8	29.7	23.2	31.7	21	30	24.9
4	30.4	21.8	32	21.9	28.2	22.6	32.1	21.8	29.6	21.6	26.5	22.8	30.3	22.6	30.5	25
5	30.3	21.9	31.4	22.1	29.1	23	32.5	22	30.9	22.1	29.6	22.3	31.9	22.2	30.3	24.9
6	30.9	22.4	30.6	22	30.1	23.1	32.6	22.2	31.8	22.7	30.6	23.5	32.1	21.6	30.1	25.3
7	30.9	23.6	31.9	22	31.6	22.9	33	23	29.7	23.5	32.9	23.9	32.2	22.1	31.7	25.5
8	30.5	22.2	31.3	23.4	31.5	21.9	32.8	22.5	32	23.8	32.5	24.9	32.9	23.3	32	24.4
9	31.4	22.7	31.8	22.8	30.6	23.1	30	21.8	31.1	22.9	31.5	23.8	33.2	23.1	30.7	23.9
10	29.4	23.4	32	22.4	28.2	22.8	29.5	21.9	31	24	30.4	23	32.3	21.2	30.7	25.7
11	30.4	21.6	32.6	21.4	30.9	21.8	32	21.5	31	23	31.5	23.2	32.5	22.5	31	25
12	32.4	23.2	31.8	21.9	31	24.4	31.8	22	31.1	24.1	31.1	23.6	33.6	22	30.6	25.9
13	32.9	22.5	32	24.1	32.1	23	32.7	23.6	31.5	24	31.2	24.6	32.7	23	30.6	26
14	31.9	22.3	32.3	22.3	30.5	23.6	31.5	22.4	30.9	23.8	31	23.5	33.8	20.5	31.5	25.5
15	26.9	22.8	32.7	20.3	26.4	23.3	29.6	22.8	27.8	23.4	31	22.4	33.2	19.9	30.5	25.6
16	30.6	23.2	32.2	21.5	27	23	30.1	22.6	28.6	23.4	29.9	23.2	33.7	22.4	30.3	25.6
17	32.9	22.6	30.4	22.4	30.9	22.8	31	22.8	30.8	23.2	30.5	22.9	33.7	23.6	31	25.9
18	30.8	22.4	30.8	23.3	30.4	23.8	32.5	22.2	30.5	23	31.1	23.3	33.6	21.6	32.2	25.6
19	30.5	22.7	31.6	20.5	28.9	23.5	30.4	23.4	29	22.8	30.5	23.9	32.7	21.1	31.5	25.4
20	31.5	23	31.5	24	31.3	22.8	32	23.8	30.8	23.4	31.1	24.4	33.7	24.1	32	26.4
21	29.8	22.7	31	23.7	29.8	23.3	31.5	23.6	30.6	24.3	31.5	23.3	34.2	20.6	32	25.4
22	30.7	23.1	31.3	22.3	31.4	23.6	33	24	31.3	24.4	31.9	24	34.3	24.1	32	26.3
23	31.4	23.3	31.5	22.4	30.7	23.6	33	23.3	30.8	24.5	31.1	24.5	33.8	22.2	32	26.2
24	30.9	22.6	31.3	23.9	29.7	23.8	32.5	23.6	31.6	24.5	30.5	23.9	33.7	21.8	30.3	25.9
25	31.1	22	31.6	22.5	30.1	23.8	31	23.5	30	23	30	23.4	34.7	23	29.2	25.1
26	30.8	21	31.7	23.8	29.9	23.5	31.2	23	30.1	22.7	30.9	23.7	36	25.5	31	25.6
27	33.5	23.2	31.6	22.4	30.5	23.8	31.8	23.2	30.3	23.9	31.6	23.4	34	22	31.7	25.4
28	32.2	22.4	32	22.1	31.5	24	33	22.5	31.1	23.5	31.9	23.6	33.8	22.3	31.3	25.6
29	30.7	21.6	32.1	21.5	32	22.9	32.5	22.6	31.2	23	31.7	24.4	34.8	22.5	32.5	25.9
30	31	22.5	31.9	22.3	31.3	24.2	32.8	23.6	31	23.9	31.8	24.3	33.8	22.5	31.5	26.3
31	30.9	22.8	32.5	22.5	30.9	23.5	31.8	23	31.5	23.5	32	24	34	21.1	31.9	25.7
Mean	30.7	22.5	31.6	22.4	29.9	23.3	31.7	22.7	30.4	23.4	30.7	23.5	33.2	22.2	31	25.5

Maximum and minimum temperatures at the stations of the Weather Bureau, March, 1916—Continued.

Day.	Ormoc.		Guiuan.		Tacloban.		Capiz.		Borongan.		Catbalogan.		Calbayog.		Masbate.	
	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.
	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.
1	28.5	23.5	27.9	24.1	27.2	22.9	28.5	24.1	26	22.3	27.5	22.8	26.5	22.8	27.6	23.5
2	29.2	24.9	28.9	23.4	26.3	23	29.9	24.2	26.5	22.3	27.9	22.5	29.2	22.8	28.2	24.6
3	29.4	23.8	29.8	24.5	26.6	23.1	29.8	22.9	27.1	22.1	28.7	23.1	30.1	22.6	30.4	25
4	27.7	21.4	28.3	22.7	26	21.4	26.9	23.8	27.1	21.7	25.2	21.7	24	21.7	28.4	22
5	30.6	20.4	31	22.4	30.2	21.9	31.5	23.6	30.4	20.7	28.7	20.8	32	20.7	31.2	23.4
6	29.5	21.6	31.7	24	29.5	23.2	30.8	23.7	29.5	22.9	28.3	22.1	31.1	22.3	30.2	23
7	31.4	20.8	33.4	21.5	30.6	21.7	31.3	24.5	30.2	20.9	31	20.9	31	21.2	30.8	23
8	30.8	19.2	31.9	20.1	31.4	20.1	32.6	23.7	30.3	20	30.6	21.6	30.9	20.9	33.2	23.4
9	32.1	19.4	31.8	21.9	32.8	22.4	32.2	23.2	30.5	20.6	31.1	20.9	33.1	20.9	31.8	23.2
10	28.9	21.2	31.9	24.7	29.5	23.2	31.9	23.5	31	22.3	28.9	21.1	29.9	22.5	33.2	22.5
11	30.6	20.7	32.2	23.3	29.9	23	32.5	23	30.5	22	29.4	21.2	32.8	21.6	32.4	23.6
12	32.2	23.6	31.2	24.5	31	23.5	31.5	25.2	29.8	23.8	31.6	22.8	32.8	23.4	31.4	24.8
13	33.4	23.6	31.3	25.5	31.9	23.3	31.4	25	31.4	23.9	32	23.1	32.9	23.9	33.6	22.4
14	33	21.1	31.1	24.5	31.5	23	31.5	23.9	30.7	25.4	31	22	32.1	21.4	32	24.4
15	26.3	23	28	24.1	26.4	23.1	31.2	24.7	26.9	23	27.3	22.2	28.7	22.7	30.8	25.2
16	29.6	22.8	27.9	24.2	29.8	23	30.1	24.5	27.8	22.3	30	22	29.3	22.1	29.4	21.6
17	32.3	22.9	30.7	23.3	31.2	22.1	31.2	23	30.7	22.8	31.1	23	32.4	22.4	30.6	21.4
18	32.7	21.4	30.8	25.4	31.5	22.1	31.1	23	30.5	21.7	31	21.5	32.4	20.6	32.6	23.4
19	31.1	24.2	30.6	25.5	30.6	23.8	31.9	23.4	30.4	25.4	31	22.3	33.1	21.7	32.2	23.4
20	32.9	22.9	31.6	24.6	31.2	23.6	31.9	24.9	30.8	23.4	31.9	22.6	31.1	22.7	32.8	24.4
21	31.5	21.9	31.7	25.7	30.4	23	32.2	24.4	30.5	22.9	32	20.6	33.9	21	32.6	24.2
22	33.5	22.7	32.5	24	32	23.9	31.9	25.4	31.1	24.3	30.5	22.6	32.3	23.6	30.2	23.6
23	33.1	23.4	31.5	24.7	32.8	24	32.3	25.2	31.1	24.5	31.9	22.2	33.7	23.1	32.2	24.4
24	33.1	22.1	32.1	24.5	32.7	23.6	31.5	23.9	31	25.4	30.5	20.7	30.3	21.4	33	24.6
25	30.8	23.5	30.8	24.1	28	23.8	29.9	23.5	29.6	23	31	22.7	32.1	22.9	31.2	22
26	31.5	23.4	30.9	23.1	30.8	23.1	31.8	24.7	30.5	23.8	30.9	21.9	33.6	22.7	33.5	24.6
27	33	25	31.6	25.8	31.3	23.5	32.6	23.9	31	25.8	31.9	25.2	34.2	22.3	32.8	24.5
28	33.1	21.8	31.2	25.5	31.8	23.4	31.9	24.6	30.6	23.4	31.2	21.3	33	22.2	33	23.8
29	31.1	23.2	31.1	24	31.6	23.7	32	24.5	30.4	24.4	30.4	23.2	34.5	23	33.6	24.6
30	33.4	22.9	31.6	25.2	32	23.5	31.8	25.2	30.8	24.4	31.5	21.6	32.9	23.1	31.6	24
31	31.4	23.1	31.6	24.1	32	23.5	31.2	23.6	30.6	22.9	30.2	22.8	32.1	22	31.2	23.5
Mean	31.2	22.4	30.9	24	30.3	23	31.3	24.1	29.8	23	30.2	22.1	31.5	22.2	31.5	23.6

Day.	Romblon.		Batag.		Legaspi.		Sumay, Guam.		Calapan.		Virac.		Naga.		Batangas.	
	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.
	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.
1	34.3	24.7	27.4	22	28.1	23.8	30.6	22.8	30.8	21.4?	29.4	23	29.1	22	28.6	21.8
2	32.6	23.8	25.7	21.2	28.1	23.2	30.2	21.8	30	23	27.1	21.5	28.3	21.6	29.3	21.7
3	32.1	23.5	27.7	22	28.2	22.8	30	23.6	29	22	30.7	21.9	31.9	19.2	31.5	19.4
4	30.7	23	25.8	22.8	25.7	21.3	29.4	23.8	31	22	29	21.1?	29	19.9	34.3	19.4
5	33.7	22.4	29.6	21.5	30.1	20.4	29.6	23.6	31.5	21	30	20	29.7	20.6	30.5	21.2
6	32	23.4	29.3	23.2	29	23.5	30.2	23.8	30	22.6	31.3	21.4	29.5	21.1	31.3	22.1
7	32.3	23.4	29.7	22.9	30.2	21.5	29.6	23.4	30	23	30.8	21.2	31.6	21.4	32.4	21.7
8	33	21.8	29.5	23	31.2	22.6	30	24	31.5	21.8	31.9	22.1	32.5	19.7	32.6	20.1
9	33.1	22.3	29.9	23	31.2	24.3	29.8	23.8	31.6	22.8	31.7	21.6	31	20.4	33.2	22.1
10	34.2	23.2	29.9	22.5	31.4	24.4	29.8	23	31	23.8	32	20	31	19.1	33.7	21
11	33.7	22.9	30.5	22.5	32.1	21.4	30.4	23.2	31.3	21	31.5	19.4	31.4	19.8	34.2	20.1
12	32.9	23.9	30	22.5	30.2	23.5	30.2	23.4	31.5	24	30.6	22	29.1	19	34.1	22.4
13	33.2	24.7	30.4	22.9	31.1	23.6	30	23.6	30.6	24	32.3	22.4	30.5	20.4	35	23.8
14	33	23.4	30	22.5	31.2	24.1	31.2	23.4	31.4	24	32.4	20.2	31.4	18.6	32.9	22.6
15	33.6	22.8	26.4	22.5	29.6	24	30.4	23	32	21.8	31.8	20.1	30	21.1	34.7	21.3
16	30	24.2	27.6	22.3	29.7	23.4	28.4	23.2	30	19.7?	32.3	21	31.5	21.3	33.5	20.8
17	32.7	23.9	29	22.6	31.6	25.8	29.4	23.2	31.6	22.2	31	22.8	33.5	19.9	35.4	22.3
18	33	24.5	29.9	22.8	31.1	24.8	29.4	23.4	32	22.2	32.7	21.6	33.2	19	32.7	23.6
19	32.9	22.8	29.3	22.8	30.9	24.7	26.8	22.6	31.6	21.5	33.1	21.3	32	18.2	34.7	21.8
20	33	24.2	29.4	24	30.9	23.1	30	22.8	31.6	23.4	33	23	32.7	20.9	34.5	24.5
21	32.8	23.2	30	23.5	31.1	25.2	30	23.4	32.1	21.5	32.8	22.4	31.8	18.9	33.3	23.5
22	33.1	23.8	30	23	30.6	24.4	30	23.2	32	21.1	32.5	21.1	31.3	18.6	36	22.3
23	34	23.8	30	23	31.1	25.7	30	23.8	32	23.9	34	21.4	31.3	22.1	35.6	23.1
24	33.3	24.4	27.8	22.1	30.6	24.4	29.4	23.4	32.1	20.5?	32	21.5	29.5	21.5	33.4	22.9
25	33.5	22.9	27.7	21.6	28.7	24.7	29	23.6	31	21.6	31.9	21.2	28.5	22	32.6	24.6
26	32.5	24	29	23.5	31.1	25.6	29.2	23.4	31.5	23.5	32.9	21	33.2	18.7	34.9	23.1
27	33.1	23.8	29.6	24.2	30.7	25.9	30.4	23	32.5	23.5?	31.8	22.6	32.6	19.6	35.5	23.8
28	33.7	23.5	30	24.2	31.1	24.9	30.2	23.6	32.8	24.6	32.8	22.1	32.5	18.9	34.2	23
29	33.6	21.8	30.4	24	31.7	24.5	29.2	24	32.5	23.5	33.2	21.7	32.2	19.4	35.5	22.8
30	34.1	24.7	29.2	24	31.9	25.4	29	24.6	32.6	24.5	34.5	22	31.6	18.4	36.6	22.6
31	34.2	23.9	30.1	23.5	32.5	24.3	30.4	24.4	32.8	25.5	32	20.3	32.3	19.9	36	23.9
Mean	33	23.5	29.1	22.8	30.4	23.9	29.7	23.4	31.4	22.6	31.8	21.4	31.2	20	33.6	22.3

Maximum and minimum temperatures at the stations of the Weather Bureau, March, 1916—Continued.

Day.	Lucena.		Atimonan.		Ambulong, Tanauan.		Canlubang, Calamba.		Paracale.		Santa Cruz, Laguna.		Manila.		Antipolo.	
	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.
	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.
1	27	23.6	27.8	25.2	29.4	23	28.4	22.4	28.8	24.5	27.2	23.4	32.1	22.6	31	21.2
2	28.6	23	29.4	23.8	27.3	22.4	27.5	22.1	27.6	23.7	26.9	22.2	30.7	21	30.7	20.5
3	29.5	21.2	30.8	23.6	31	21.6	29.5	21.5	28.8	22.1	29.5	22	31.4	20	30.2	19
4	31.2	21.3	29.4	21.4	33	22	31.5	19.6	30.2	23	31.8	21.6	31.9	20.6	33.2	19
5	29.5	23.5	26.5	24.3	31.6	23.8	30.5	22.6	26.8	24	28.6	22.2	31.8	21.8	33.1	20.8
6	30	23.6	27.1	23.3	30.8	23.8	30.5	22.5	27.4	23	29.4	23.9	32	23.3	31.9	22.3
7	31.7	23	29.4	23.2	34.3	23	31.6	22.2	28.8	23.5	31.4	22.5	32.5	21.2	31.7	20.6
8	31.2	21	30.2	22.2	33.8	21.9	33.8	20.9	30.3	22.5	33.3	21.1	32.1	22.1	33.7	20.8
9	31.7	23.3	28.8	24.5	33.7	22	32.3	21	30.2	23	31.3	23.5	33.4	21.7	33.5	21.5
10	32	23.2	30.1	23	34.1	22	32.4	22.2	30.2	22.9	32.1	22.7	33	20.8	33.6	19.7
11	31	20.2	28.6	21.3	32.3	21	31.6	20.6	29.8	22	31.6	22.3	32.9	22.7	33.6	21
12	30.5	23.1	28.7	24.8	32	24	30.8	22.1	29.4	25.5	30.6	21.6	33.7	20.2	33.2	20.6
13	30.5	23.5	28.4	25.1	34.5	24	32.6	22.1	28.8	23	32.2	23.3	33.8	22.1	35.1	21.2
14	30.2	23.1	30.7	25.4	32	23.4	31.9	23.2	29.6	24.3	30.1	23.5	32.4	21.3	34.4	21.3
15	32	22.6	31.4	25.2	33.1	22.7	31.8	22.6	30.4	24.3	31.3	21.3	34	21.2	34.3	20.8
16	31.2	22.7	30.4	25.9	33.8	24	31.5	21.2	29.5	23	31.1	22.7	32.5	20.4	33.7	19.9
17	32	22.9	31.8	25.3	33.8	22	32.4	21.1	30.6	23.8	31.6	21.3	32.6	20.9	34	20.7
18	31	22.7	30.2	23.8	29.9	22.8	28.8	22.8	30.2	23	29.6	22.5	30.2	22.2	32	20.6
19	31.8	21.7	30.2	21.6	33.7	21.8	31.8	21.4	30.2	21.9	31.1	22	33.5	22.3	32.7	21.7
20	31.4	22.8	31.7	22.2	33.2	23.5	31.6	23.4	30	24.3	32.2	24	33.5	21.9	34	21.5
21	31.6	22.5	31.6	23.2	34.3	21.8	33	21.5	30.5	23.7	32.6	22.4	33.3	21.9	34.2	22
22	32.2	23.5	30	25.8	34.4	22.3	33.2	20.2	31.4	22	32.2	20.8	34.2	20.3	35.3	20.2
23	32.5	22.7	30.3	25.8	33.9	24.6	31.9	22.4	31	24.2	32	22.2	33.9	21.1	34.8	19.9
24	29.4	22.6	27.6	24.2	29.9	23.3	32	22.5	28.6	24.1	27.9	22.7	30.6	22.7	30	21.5
25	29.5	23.8	29.7	25	31.3	23.7	30.4	23.2	29	24.2	28.7	23.9	30.8	21.9	31.6	22.4
26	30.9	22.6	30	24.7	32.9	23.6	31.6	22.3	30.2	23.5	31.7	22.8	32.4	20.7	33.4	20.5
27	32.1	22.5	30.8	25.4	33.2	23.8	32.4	23.4	30.6	26	31.8	23.3	32.3	22.6	33.2	22.5
28	32.4	22.7	30.7	25.6	34.4	23.6	32.6	22	31.4	25.2	32.2	22.4	33.1	20.7	34.2	21.3
29	32.2	23.5	29.5	25.7	34.4	23.6	32.6	21.8	30.8	23.5	32.2	22.5	34.9	21.6	35	21.1
30	32.6	22.1	30.7	25.8	33.8	24.1	32.6	20.2	31.5	25.4	31.6	21.2	34.3	20.3	34.3	20.2
31	33.1	23.7	30.2	24	35.8	22.8	33.4	20.6	31.2	23.8	33.2	22.6	34	22.1	34.6	21
Mean	31	22.7	29.8	24.2	32.8	23	31.6	21.9	29.8	23.6	30.9	22.5	32.7	21.5	33.2	20.9

Day.	Iba.		San Isidro.		Tarlac. <sup>a</sup>		Baler.		Dagupan.		Bolinao.		Baguio.		San Fernando, Union.	
	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.
	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.
1	31.5	18.3	32	21.7	33.9	22.2	29.5	21.5	31.7	22.9	29.8	24.6	22.8	13.6	31	21.2
2	32.4	18.9	30.9	19.1	34.8	22	31	21	33.3	21	31.3	20.6	22.2	11.7	29.7	20.5
3	34.3	19.9	29.4	20.1	34.8	21.1	25.9	20.5	31.7	21.2	32.7	21.1	23.3	12.3	32	19.5
4	32.9	19.8	32.9	19.4	34.8	20.7	28.9	21.1	30.7	21.1	29.7	21.7	23.5	13.4	31.1	22.9
5	32.3	20.2	33	21	34.8	21.5	30.5	20.8	30.7	21.6	30.5	23.6	22.9	13.7	30.8	21
6	32.1	22.6	33	22.1	36.2	21.4	30.8	21.1	33.4	22.3	32.9	22.6	23.3	13.5	31.3	22.2
7	31.4	20.3	34.5	21.4	36.8	22.2	32.7	22.8	32.7	22.8	33.9	21.6	22.9	14.8	31.7	21.5
8	32.1	21	34.4	21.5	36.8	22.5	31.6	22.5	31	22	31.9	22.4	24.6	14.5	31.9	21.1
9	31.7	19.7	34.3	21.2	37	20.6	28.1	23	33.7	21.5	33.2	22.9	24.6	14.6	33.2	20.2
10	31.1	19.8	35.1	20.2	36.9	21	30.7	19.6	33.2	21.4	31.5	21.3	23.4	14.3	32.5	21
11	31.4	19.1	33	22	36.4	21.1	30.6	20.8	31.2	23.7	31.5	22.4	23.8	15	31	21.1
12	31.8	18.4	34.1	20.2	37	20	32.5	22	32.7	23	32.5	19.9	24.7	14.5	31.6	20.6
13	32.2	20	33.5	21.2	37.2	21	31.8	21.7	31.7	21.7	32.3	21.3	25.1	15.4	32.5	21.5
14	32	21.4	34.8	21.9	37.2	22	33	22.4	34.4	22.4	33.5	23.1	23.7	15.7	32.2	22.4
15	31.5	22.2	34.5	22.5	37.4	22	31.6	22.4	34.4	23.7	32.5	23	23.7	15.3	31.9	24.5
16	32	21.3	33.5	21.6	36.5	21.1	31.6	22.9	34.2	23.4	34.2	22.7	22.6	15.2	32.5	23.3
17	32.2	19.7	33.4	21	37.2	21	30.6	21.3	33.4	22.9	32.9	22.1	23.3	14.5	32.2	22.5
18	32.5	21	34.2	22	37.5	21.4	31.4	22.1	35.2	22.4	33.9	24.8	24	14.8	32.3	23
19	32.2	23.9	33.1	23	36.5	22.4	29.9	20.9	36.4	23	35.2	24.4	25.2	14.6	32.6	24
20	31.9	20.6	35.4	20.9	36.8	21.5	31.3	22.6	32.2	21.9	32.6	22.7	23.7	14.5	32	23.8
21	32.6	21.7	35.4	22	37	21.8	30.5	22.2	35.1	22.6	34	24	24.3	15.3	32.3	22.8
22	33.1	21.7	36	21.4	38	23	30.1	20.2	32	23.5	31.8	26.8	24.4	15.5	31.8	23.3
23	32.2	20.4	34.1	21	38	22.9	34	21.7	35.1	22.5	33.1	23.8	24.2	14.9	32	23.6
24	32.5	21.1	33.5	23.5	34.8	23	32.9	22	33.6	23.5	32.6	23.4	22.8	13.9	32	23
25	32.7	23	32.2	20.6	34.6	20.5	31.7	21.6	35.1	22.5	33.1	23.9	22.2	13.5	32	24
26	32.1	22	33.1	21.4	35	20.4	27.2	21.4	35.8	22.8	32.5	23.7	23.2	13.6	32.5	20.9
27	33.3	20.3	32.1	21.1	35	21.2	31.2	22.3	32.6	22	32.9	23.4	24.2	14.2	32.1	23
28	32.3	20	35.9	20	37.6	21.1	30.1	20.8	32.2	22.4	32	23	23.2	14.5	32.5	22.7
29	34.5	21.7	34.3	23.4	37.8	23	31.7	22.1	36.9	23	33.4	24.1	24.4	15.2	34.4	22.6
30	33.4	20.5	34.5	20.2	36.7	22.8	30.1	20.2	37.2	22.5	33.9	24.5	23.8	15.4	34.6	24.4
31	33.7	20	36.9	21.5	37	22.8	30.4	20.6	35.3	22.2	34.2	21.9	23.4	14.6	33	23.3
Mean	32.4	20.7	33.8	21.3	36.4	21.7	30.8	21.6	33.5	22.4	32.6	22.9	23.7	14.4	32.1	22.3

<sup>a</sup> The maximum temperatures of this station are not very reliable: they seem to be too high.



Maximum and minimum temperatures at the stations of the Weather Bureau, March, 1916—Continued.

Day.	Echagüe.		Candon.		Vigan.		Tuguegarao.		Laoag.*		Aparri.	
	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.
1	19.4	30	21.7	29.2	19.1	28.6	19.8	32.2	21	23.9	21.2	
2	18.8	29.6	21	31	21.5	24.8	19.3	33.2	18.8	22.2	19.7	
3	19.4	29.5	21	30.7	20.8	29.8	19.5	32.8	18.4	26.8	19.3	
4	19.5	28.7	23.1	28	20.8	31	19.6	31.7	21.6	27.7	20.3	
5	21.3	29.6	22	28.2	19.8	28.5	21.3	32.5	19.4	25.6	22.3	
6	21	29.6	22	29	19.7	29.8	20.7	33.9	16.9	25.8	22.5	
7	21.5	30.5	22.4	30.8	21.2	34.4	21.5	33	20.5	28	21.7	
8	22.3	30.5	22	30.5	21.1	33.5	22.4	34.3	18.7	28.9	22.7	
9	22.3	30.5	20.7	30.2	19.6	33.1	21.8	33.6	19	28.3	22.8	
10	20.8	31	21.6	31.1	21.1	34	20	33.8	19.3	30.7	20.4	
11	23	30.6	22	31	20.5	32.3	22.2	34	21	27.8	24	
12	21.6	30.6	22.5	30	21.8	35	20.8	34.5	19.8	30	22.3	
13	21	31.3	22.6	31	22	36	20	33.2	21	30.8	22.5	
14	23.1	30.5	24	30.4	23	34.5	22	35.1	20.5	28.6	22.1	
15	23	30.5	23.6	30	22.6	30.1	22	34.7	23.3	27.4	24	
16	22	31	23.5	30.3	22.6	33	21.7	35.2	20.6	28.5	22.3	
17	22.6	31.5	23	30.2	23.2	30	22.4	35.1	20.5	27.1	22.5	
18	22.8	31.5	24.5	30.6	24.5	32.5	21.9	34.3	22.4	27.3	22	
19	22	31.9	25.5	30.9	24.8	33.8	21.8	33.7	23.9	30.8	22	
20	21.1	31.5	25	30.3	24.2	36.2	21.4	33.2	22.9	32.2	23.5	
21	21.7	31.5	24	31	23.5	36.7	23	33.8	22.1	32.7	23.2	
22	22.3	31.6	23.5	30.3	22.2	34.1	24	34.4	22.5	29.2	24.8	
23	23.5	31.5	23.6	30.7	22	26	21	34.6	23.9	25.6	22.1	
24	19.9	30.6	24	31.4	23.1	28.3	20.5	36.4	24	24	20.1	
25	19.9	30.8	24	30.5	22.8	28.5	20.5	34.2	22.4	25.7	21	
26	20.5	31.4	23.1	32.3	22.5	35.6	20.2	33.5	20.5	29.9	20.6	
27	21.5	31.5	23.6	31.7	23.1	36.6	21.3	33.9	21.1	29.7	21.3	
28	21.7	31.8	25	30.1	23.1	35.1	21.3	32.7	22.8	31	22	
29	22.3	31.5	23.5	31.7	22.9	35	22.6	34.7	21.4	29.1	23.6	
30	21.6	31.5	24	31.5	23	36.5	22.8	35.8	22.3	31.2	22.6	
31	21.1	32	25.5	32	24.1	37.5	21.3	35	23.6	31.5	22.3	
Mean	21.4	30.8	23.1	30.5	22.1	32.6	21.3	34	21.2	28.3	22.1	

\* The maximum temperatures of this station are not very reliable: they seem to be too high.



## SEISMOLOGICAL BULLETIN FOR MARCH, 1916.

By Rev. MIGUEL SADERRA MASÓ, S. J.,  
*Assistant Director of the Weather Bureau.*

### EARTHQUAKES FELT IN THE PHILIPPINES.<sup>1</sup>

5, 15<sup>h</sup> 05<sup>m</sup> 34<sup>s\*</sup> [5, 23<sup>h</sup> 05<sup>m</sup> 34<sup>s</sup>]. Iba (W Luzon). Oscillatory earthquake of intensity III.

8, 23<sup>h</sup> 27<sup>m</sup> 07<sup>s\*</sup> [9, 7<sup>h</sup> 27<sup>m</sup> 07<sup>s</sup>]. Eastern Mindanao. Earthquake felt throughout the whole part of Mindanao situated east of the 125°.4 meridian. The observer of Butuan reported that there the shocks reached intensity IV-V, while at Surigao, nearly 100 kilometers distant to the NNE, did not exceed grade II-III; in both localities they lasted more than 10 seconds. In the former station the low noise which accompanied the quake as well as the first impetus or propagation of the waves seemed to come from the south. The seismographic records of Manila place the epicenter at a distance of 850 kilometers, and those of the Wiechert seismograph of Butuan at less than 100 kilometers; these values may correspond to the center of the Agusan Valley in the vicinity of parallel 8° N, where many of the most important Agusan earthquakes originated.

10, 21<sup>h</sup> 45<sup>m</sup> 10<sup>s\*</sup> [11, 5<sup>h</sup> 45<sup>m</sup> 10<sup>s</sup>]. N Luzon. Earthquake shocks of intensity IV felt in the northernmost part of Luzon, comprised by the provinces of Ilocos Norte, Cagayan and northern Mountain Province. Its epicenter probably lay within the island in the Central Cordillera: to such conclusion lead the seismographic records of Manila, pointing to a center some 410 kilometers distant, and the movements noticed both in Cagayan and Ilocos Norte, which apparently had a E-W direction as if proceeding from the Cordillera, where certainly exists a very important epicenter. The relatively small extension of the quake and the fact that it was only slightly registered at Manila and did not affect the seismographs of Formosa, a trifle more distant than those of Manila, may be taken as indications of a shallow origin.

12, 7<sup>h</sup> 46<sup>m</sup> 53<sup>s\*</sup> [12, 15<sup>h</sup> 46<sup>m</sup> 53<sup>s</sup>]. Aparri (NE Luzon). Oscillatory earthquake, direction N-S, intensity III, duration 5 seconds.

12, 21<sup>h</sup> 48<sup>m</sup> [13, 5<sup>h</sup> 48<sup>m</sup>]. Naga (SE Luzon). Earthquake shocks of intensity II-III.

20, 11<sup>h</sup> 30<sup>m</sup> [20, 19<sup>h</sup> 30<sup>m</sup>]. Butuan (N Mindanao). Earthquake of intensity III, accompanied by subterranean noises, number VI of the Davison's scale.

25, 20<sup>h</sup> 07<sup>m</sup> [26, 4<sup>h</sup> 07<sup>m</sup>]. Ilocos Sur (NW Luzon). Earthquake shocks of intensity III.

27, 14<sup>h</sup> 09<sup>m</sup> [27, 22<sup>h</sup> 09<sup>m</sup>]. Legaspi (SE Luzon). Oscillatory earthquake, direction N-S, intensity III-IV, duration 4 seconds.

28, 9<sup>h</sup> 47<sup>m</sup> 08<sup>s</sup> [28, 19<sup>h</sup> 27<sup>m</sup> 08<sup>s</sup>]. Guam (Mariana Islands). Earthquake of intensity IV-V and several seconds of duration. It was felt throughout the island; the records of the Wiechert seismograph at Agaña show that the origin lay rather near to the island toward the S or SSE.

<sup>1</sup>The intensity of earthquakes is given in the notation known as the Rossi-Forel scale. The time is that indicated by the seismographs at the Central Observatory whenever the disturbance has been registered by them. This fact is denoted by an asterisk (\*). Otherwise the time is that noted by the observer who sent the report. All time indications are in Greenwich mean time (midnight=0<sup>h</sup>), insular time being added in brackets for the convenience of Philippine readers.

28, 16<sup>h</sup> 24<sup>m</sup> 44<sup>s\*</sup> [29, 0<sup>h</sup> 24<sup>m</sup> 44<sup>s</sup>]. Laoag (NW Luzon). Earthquake of intensity IV, approximate duration 5 seconds.

29, 1<sup>h</sup> 50<sup>m</sup> 26<sup>s\*</sup> [29, 9<sup>h</sup> 50<sup>m</sup> 26<sup>s</sup>]. Butuan (N Mindanao). Earthquake shocks of intensity II-III. This earthquake, feebly felt at Butuan and quite surely throughout the eastern coasts of Mindanao, originated in a place some 310 kilometers distant from the said station and 840 from Manila, presumably in the Pacific Deep. On the same date the seismograph of Butuan registered three similar but lighter disturbances with their origin at the same distance.

30, 21<sup>h</sup> 49<sup>m</sup> 26<sup>s\*</sup> [31, 5<sup>h</sup> 49<sup>m</sup> 26<sup>s</sup>]. S Samar and NE Mindanao. Earthquake felt with intensity III-IV on the southeastern end of Samar, and II-III in northeastern Mindanao. Its origin was at a distance of 750 kilometers from Manila and some 260 kilometers from Butuan, in the Pacific Deep about 127°.1 E and 10°.5 N.

## RECORDS OF THE MICROSEISMOGRAPH.

[Time: Greenwich mean. Midnight=0<sup>h</sup>. Instrument: Wiechert seismograph; 1,000 kilograms. A<sub>N</sub>: T<sub>0</sub>=6.1, ε=3.89,  $\frac{r}{T_0^2}$ =0.023; A<sub>E</sub>: T<sub>0</sub>=6.6, ε=2.32,  $\frac{r}{T_0^2}$ =0.050. Alluvium. 2.40 meters above sea level.]

No.	Date.	Character.	Phase.	Hour.	Period.	Amplitude.		Remarks.
						A <sub>N</sub> μ	A <sub>E</sub> μ	
84	1	IIv	eP	9 11 07	2	413		
			L	11 22				
			M <sub>E</sub>	11 31				
			F	17				
85	1	Iv	eP	18 05 38	7	11		
			S	09 05				
			L	11 24				
			M <sub>N</sub>	12 17				
			F	24				
86	4	Iv	e	1 00 08	5	16		
			L	03 19				
			M <sub>N</sub>	03 30				
			F	09				
87	4	Iv	eP	7 17 31	18	7		
			S	21 48				
			L	27 04				
			M <sub>N</sub>	31 45				
			M <sub>E</sub>	32 36				
			F	8 01				
88	5	Iv	eP	4 51 31				
			F	54				
89	5	Iv	eP	15 05 34	2	18		Iba (W Luzon).
			L	05 46				
			M <sub>E</sub>	05 54				
			F	10				
90	6	Iv	eP	8 24 08				
			F	30				
91	6	Iv	eP	9 16 11				
			F	23				
92	6	I	e	22 13				
			F	31				
93	7	Iv	eP	18 56 30				
			F	19 08				
94	8	Iv	eP	3 09 22	5	10		
			L	11 27				
			M <sub>E</sub>	12 28				
			F	22				
95	8	Iv	eP	23 27 07	7	8		Eastern Mindanao.
			L	28 39				
			M <sub>N</sub>	30 18				
			F	39				
96	10	Iv	eP	21 45 10	3	7		N Luzon.
			L	45 52				
			M <sub>N</sub>	45 56				
			F	51				

Records of the microseismograph—Continued.

No.	Date.	Character.	Phase.	Hour.	Period.	Amplitude.		Remarks.
						A <sub>N</sub> μ	A <sub>E</sub> μ	
97	11	Iv	eP F	h. m. s. 19 02 00 04				
98	12	Iv	eP F	2 00 45 04				
99	12	Iv	eP F	6 24 47 27				
100	12	Iv	eP L F	7 46 53 47 38 50				Aparri (NE Luzon).
101	12	I	e F	11 22 37				
102	17	Iv	eP F	19 33 22 35				
103	18	Ir	eP S L M <sub>N</sub> M <sub>E</sub> F	1 02 43 07 50 12 28 14 57 15 27 32	9 10	12	5	
104	19	Iv	eP L M <sub>N</sub> M <sub>E</sub> F	8 33 43 34 08 34 26 34 33 52	4 5	86	87	
105	19	I	e F	12 08 39				
106	19	Iv	eP F	17 29 18 31				
107	19	Iv	eP F	18 55 41 57				
108	19	Iv	eP L F	23 58 56 59 31 0 08				
109	21	Iv	eP L M <sub>E</sub> F	2 37 00 37 45 38 08 46	2		33	
110	21	Iv	eP F	7 44 04 46				
111	21	Iv	eP F	10 14 49 18				
112	22	Iv	eP F	9 58 00 10 00				
113	22	IIv	eP L M <sub>N</sub> M <sub>E</sub> F	19 45 14 45 39 47 33 47 34 20 12	7 7	243	283	
114	25	Ir	e S L	23 54 55 56 57 59 49				
	26		M <sub>E1</sub> M <sub>N1</sub> M <sub>N2</sub> M <sub>E2</sub> F	0 08 45 04 06 09 18 09 42 1 09	10 9 9 9	34 46	41 91	
115	26	Iv	eP L M <sub>E</sub> M <sub>N</sub>	18 41 32 41 52 41 54 41 55	2 2	86	100	End overtaken by following earthquake.
116	26	Iv	eP L M <sub>E</sub> F	18 47 31 47 45 47 48 56	2		17	
117	27	I	e F	12 33 44				

## Records of the microseismograph—Continued.

No.	Date.	Character.	Phase.	Hour.	Period.	Amplitude.		Remarks.
						A <sub>N</sub> μ	A <sub>E</sub> μ	
118	27	Iv	eP	<i>h. m. s.</i> 18 20 40	5	11		
			L	21 16				
			M <sub>N</sub> F	22 19 37				
119	27	Iv	e F	22 46 23 00				
120	28	Iv	eP	16 24 44				Laoag (NW Luzon).
			L	25 24				
			F	32				
121	28	Iv	eP F	22 42 24 44				
122	29	Iv	e (PS)	1 50 26				Butuan (N Mindanao).
			L	53 29				
			F	2 08				
123	30	Ir	e	1 48 00	11	8		
			S	51 18				
			L	55 00				
			M <sub>E</sub>	58 36				
			M <sub>N</sub> F	59 20 2 39				
124	30	Iv	eP	21 49 26	7	20		S Samar and NE Mindanao.
			S	50 48				
			L	52 00				
			M <sub>N</sub>	52 45				
			M <sub>E</sub> F	52 53 22 22				
			F	22 22				
125	30	Iv	eP	23 18 54				
			L	20 28				
			F	30				
126	31	Iv	eP	1 46 22				
			L	46 58				
			F	52				

TEMBLORES DE TIERRA SENTIDOS EN FILIPINAS.<sup>1</sup>

5, 15<sup>h</sup> 05<sup>m</sup> 34<sup>s\*</sup> [5, 23<sup>h</sup> 05<sup>m</sup> 34<sup>s</sup>]. Iba (W de Luzón). Temblor oscilatorio de intensidad III.

8, 23<sup>h</sup> 27<sup>m</sup> 07<sup>s\*</sup> [9, 7<sup>h</sup> 27<sup>m</sup> 07<sup>s</sup>]. E de Mindanao. Temblor de tierra sentido en toda la parte oriental de Mindanao al E del meridiano 125° 4 E. Según el report del observador de Butúan tuvo allí intensidad IV-V, mientras que en Surigao, cerca de 100 kilómetros al NNE no pasó de II-III; en ambos puntos duró más de 10 segundos. En Butúan tanto el débil ruido que lo acompañó, como los primeros ímpetus o propagación de las ondas parecían proceder del S. Los registros de los sismógrafos de Manila colocan su epicentro a 850 kilómetros de distancia, y el del Wiechert de Butúan a menos de 100, valores que van a coincidir hacia el centro del Valle del Agusan, en las cercanías del paralelo 8° N, donde suelen originarse muchos de los principales terremotos agusanos.

10, 21<sup>h</sup> 45<sup>m</sup> 10<sup>s\*</sup> [11, 5<sup>h</sup> 45<sup>m</sup> 10<sup>s</sup>]. N de Luzón. Temblor de tierra de intensidad IV, sentido en todas las provincias más septentrionales, Ilocos Norte, Cagayán y parte N de la Montañosa. El epicentro se hallaba probablemente dentro de la isla en la Cordillera Central: así se deduce tanto del registro de Manila, que lo coloca a unos 410 kilómetros de distancia, como de los reports recibidos de Ilocos Norte y de Cagayán, según los cuales los movimientos aparecían tener una dirección E-W, como procedentes de la Cordillera, donde en realidad existe un epicentro importante. La extensión relativamente pequeña de este temblor, así como la poca amplitud de los movimientos registrados en Manila y el hecho de no haber afectado los sismógrafos de Formosa, muy poco más distantes que los de Manila, son indicaciones de que el origen era muy poco profundo.

12, 7<sup>h</sup> 46<sup>m</sup> 53<sup>s\*</sup> [12, 15<sup>h</sup> 46<sup>m</sup> 53<sup>s</sup>]. Aparri (NE de Luzón). Temblor oscilatorio, dirección N-S, intensidad III, duración 5 segundos.

12, 21<sup>h</sup> 48<sup>m</sup> [13, 5<sup>h</sup> 48<sup>m</sup>]. Naga (SE de Luzón). Temblor de tierra de intensidad II-III.

20, 11<sup>h</sup> 30<sup>m</sup> [20, 19<sup>h</sup> 30<sup>m</sup>]. Butúan (N de Mindanao). Temblor de intensidad III, acompañado de ruido subterráneo VI de la escala de Davison.

25, 20<sup>h</sup> 07<sup>m</sup> [26, 4<sup>h</sup> 07<sup>m</sup>]. Ilocos Sur (NW de Luzón). Temblor de tierra de intensidad III.

27, 14<sup>h</sup> 09<sup>m</sup> [27, 22<sup>h</sup> 09<sup>m</sup>]. Legaspi (SE de Luzón). Temblor oscilatorio, dirección N-S, intensidad III-IV, duración 4 segundos.

28, 9<sup>h</sup> 47<sup>m</sup> 08<sup>s</sup> [28, 19<sup>h</sup> 27<sup>m</sup> 08<sup>s</sup>]. Guam (Islas Marianas). Temblor de tierra de intensidad IV-V y de varios segundos de duración. Fué sentido en toda la isla; su origen, según el registro del sismógrafo de Agaña se hallaba muy cerca de ella, al parecer hacia el S o SSE.

28, 16<sup>h</sup> 24<sup>m</sup> 44<sup>s\*</sup> [29, 0<sup>h</sup> 24<sup>m</sup> 44<sup>s</sup>]. Laoag (NW de Luzón). Temblor de tierra de intensidad IV, duración 4 segundos.

29, 1<sup>h</sup> 50<sup>m</sup> 26<sup>s\*</sup> [29, 9<sup>h</sup> 50<sup>m</sup> 26<sup>s</sup>]. Butúan (N de Mindanao). Temblor de tierra de intensidad II-III. El origen de este temblor, sentido débilmente en Butúan y sin duda también en las costas orientales de Mindanao, se hallaba a unos 310 kilómetros de distancia de la citada estación y a 480 kilómetros de Manila, seguramente en el Abismo del Pacífico. La misma fecha el sismógrafo de Butúan registró otros tres temblores imperceptibles originados a la misma distancia.

30, 21<sup>h</sup> 49<sup>m</sup> 26<sup>s\*</sup> [31, 5<sup>h</sup> 49<sup>m</sup> 26<sup>s</sup>]. S de Sámar y NE de Mindanao. Temblor de tierra sentido con intensidad III-IV en el extremo SE de Sámar y II-III al NE de Mindanao. Su origen se hallaba en el grande Abismo del Pacífico a 750 kilómetros de Manila y 260 de Butúan hacia los 127° 1 E y 10° 5 N.

<sup>1</sup> La intensidad de los terremotos se indica conforme a la conocida escala de Rossi-Forel. Cuanto a la hora de su ocurrencia, adoptamos la indicada por los sismógrafos de este Observatorio siempre que los hayan registrado, distinguiéndola por medio de un asterisco (\*). En caso contrario copiamos la apuntada por los observadores que nos envían las notas. Todas las indicaciones del tiempo se refieren al tiempo medio de Greenwich (medianoche=0<sup>h</sup>). Para conveniencia de los lectores de Filipinas se añade también el tiempo insular.





RECEIVED  
MAY 1 1916

THE GOVERNMENT OF THE PHILIPPINE ISLANDS

# WEATHER BUREAU

MANILA CENTRAL OBSERVATORY

---

BULLETIN FOR APRIL, 1916

---

PREPARED UNDER THE DIRECTION OF

REV. JOSÉ ALGUÉ, S. J.

DIRECTOR OF THE WEATHER BUREAU

MANILA  
BUREAU OF PRINTING  
1916



---

**BULLETIN FOR APRIL, 1916.**



# METEOROLOGICAL BULLETIN FOR APRIL, 1916.

By Rev. JOSÉ CORONAS, S. J.,  
Chief, Meteorological Division of the Weather Bureau.

## GENERAL WEATHER NOTES.

**Pressure and temperature.**—The mean atmospheric pressure of this month is moderately lower than that of the preceding year, and slightly lower than the April's normal. That of Manila is 0.54 mm. below the normal, and 1.43 mm. below the mean for April, 1915. The highest pressures were observed on the 7th, and the lowest on the 17th to 18th or on the 23rd to 24th.

The mean monthly temperature is slightly to moderately lower than that of April, 1915; and slightly lower than the normal of this month. The absolute maximum and minimum temperatures for Manila were 35.0° C. on the 24th and 28th, and 20.4° C. on the 16th. The extreme temperatures for Baguio were 26.3° C., 13.7° C. on the top of Mirador, and 26.9° C., 12.8° C. in the valley.

### PRESSURE AND TEMPERATURE AT THE FIRST AND SECOND CLASS STATIONS FOR APRIL, 1916.

Station.	Pressure.						Temperature.					
	Mean.	Departure from April, 1915.	Highest mean.	Day.	Lowest mean.	Day.	Mean.	Departure from April, 1915.	Highest.	Day.	Lowest.	Day.
	mm.	mm.	mm.		mm.		°C.	°C.	°C.		°C.	
Tagbilaran <sup>a</sup>	758.65		761.33	7	756.11	18	26.3				20.9	2
Surigao	58.29	-1.95	61.43	7	55	17	26.6	-0.1	34	25	21	2
Cebu	58.36	-1.80	61.51	7	55.74	17	27.5	-0.7	32.8	27	21.3	2
Iloilo	58.29	-1.24	61.26	7	56.03	18	27.5	-1.5	33.5	24	22.1	2
Ormoc	58.57	-1.73	61.66	7	55.17	17	26.4	-1.2	33.3	4	18.9	2
Tacloban	58.32	-2.10	61.84	7	53.28	17	27	-0.3	33.7	22	22.7	2
Capiz	58.36	-1.43	62.04	7	56.11	18	27.5	-0.9	34	27	21.8	2
Calbayog	58.55	-2	61.96	7	53.49	17	26.6	-2	35.3	12	19.9	2
Legaspi	58.71	-1.81	62.58	7	54.45	18	27.5	-0.9	33	3	21.7	1
Atimonan	59.03	-1.29	62.72	7	55.85	18	27.4	-0.9	33.4	24	22.1	23
Ambulong, Tanauan	58.42	-1.62	61.85	7	55.50	18	28.1	-2	38	25	21	1
Paracale	59.30	-1.62	63.25	7	55.60	18	27.1	-0.6	32	24, 26, 29	21.6	3
Manila	58.88	-1.43	62.50	7	55.94	18	27.3	-1.4	35	24, 28	20.4	16
San Isidro	59.08	-1.48	62.98	7	56.02	18	27.7	-1.9	37	1, 3	20.5	14
Dagupan	58.20	-1.22	61.78	7	55.36	23	23.3	-1.2	37.7	13, 29	22.5	14, 17, 25
Bolinao	58.59	-1.27	62.03	7	55.83	18	28.7	-0.7	35.7	13	22.1	20
Baguio <sup>b</sup>	636.92	-1.29	639.57	7	634.65	23	18.5	-1.4	26.3	16	13.7	8
Vigan	758.58	-1.30	762.16	7	755.64	18	27.7	-1.1	33.4	8	21.4	5
Tuguegarao	59.44	-1.21	64.20	7	56.25	24	27.3	-1.5	39?	15	20.5	14
Aparri	59.68	-1.04	64.52	7	56.55	24	26.2	-0.7	33.1	29	20.8	9

<sup>a</sup> 25 days of observation only.

<sup>b</sup> The barometric readings of this station are not reduced to sea level.

**Rainfall.**—The total rainfall for this month has been, with a few exceptions, greater than that of April, 1915, though, if compared with the normal of this month, it appears to be greater in a good number of stations and smaller in many others. The monthly rainfall for Manila is 45.7 mm. and 12.1 mm. above that of the preceding year and above the normal, respectively. In Baguio 132.1 mm. of rainfall were collected on the top of Mirador, this amount being 57.4 mm. above that of April, 1915, and 17.4 mm. above the normal of this month.

RAINFALL AT VARIOUS STATIONS OF THE WEATHER BUREAU DURING THE MONTH OF APRIL, 1916.

Station.	Total.	Departure from April, 1915.	Departure from normal.	Rainy days.	Departure from April, 1915.	Greatest rainfall in a single day.	Day.	Station.	Total.	Departure from April, 1915.	Departure from normal.	Rainy days.	Departure from April, 1915.	Greatest rainfall in a single day.	Day.
	mm.	mm.	mm.		mm.	mm.			mm.	mm.	mm.		mm.	mm.	
Jolo	63.5	-51.2	-40.6	5	-10	29.5	6	Virac	119	+62.1	-13.4	19	+5	26.3	17
Isabela, Basilan	31.8	-17.1	-48.4	3	-1	16	24	Naga	91.9	+81.6	-11.7	9	+7	33.5	29
Zamboanga	63.9	+42	+27.7	7	+5	19.6	7	Batangas	9.1	+9.1	-22.2	4	+4	4.3	30
Davao	136.5	+92.7	-28.8	9	+5	22.1	14, 25, 27	Lucena	121			10		63	5
Cagayan, Misamis	40.6	+2		5	-6	16.5	17	Atimonan	162	+128.1	+68.1	13	+6	60.2	5
Dapitan	82.1	+64.8	-20.3	10	+9	30	29	Ambulong, Tanauan	101.5	+62.4		8	+6	45.7	26
Butuan	128.9	+114.9	+7.9	13	-10	55.6	16	Canlubang, Calamba	17.8			9		7.1	12
Dumaguete	46.8	+42.5		7	+6	37.1	29	Paracale	106.8	+50.4		16	+3	16.5	8
Iwahig	10.3	+9.7		4	+2	6.9	7	Santa Cruz, Laguna	26.7	+5		10	+5	8.6	18
Surigao	247.3	+73.8	-11.5	19	+4	71.1	7	Manila	46.2	+45.7	+12.1	5	+4	33.8	18
Maasin	186.2	+154.5	+111.3	10	+7	46.3	7	Antipolo	63.5	+53.9		8	+6	34.8	24
Cebu	102.8	+101.4	+67.7	15	+14	31.7	17	Iba	9.4	-4.6	-38.7	5	+4	4.3	5
Iloilo	16.8	+10.9	+21.4	2	+0	15.5	17	San Isidro	118.5	+118.5	+79	10	+10	56.7	4
San Jose Buenavista	146.7	+146.7	+99.2	5	+5	81.5	29	Tarlac	48.8	+45	-19.9	7	+5	19.8	23
Cuyo	2	+2	+14.8	2	+2	2	29	Baler	170	-23.9	-127.2	17	-5	42.4	6
Ormoc	203.3	+188.6	+129.6	17	+12	62.5	17	Dagupan	23.9	-83.5	-50.6	5	+0	16.5	5
Guiuan	271.9	+188.7		18	-3	53.3	16	Bolinao	14.5	+14.5	-12.8	2	+2	9.7	6
Tacloban	128.4	+70.3	-7.2	16	+3	26.9	7	Baguio	132.1	+57.4	+17.4	11	+5	33.5	5
Capiz	27.3	+26.8	-19.7	11	+10	11.2	6	San Fernando, Union	0	-8.7	-15.1	0	-2	0	0
Borongan	238.8	+86.1	+3.8	20	+3	43.2	16	Echague	45	+5.9	-25	8	+4	10.7	19
Catbalogan	140.6			12		60.2	17	Candon	19.8	+15.2	+6.4	1	0	19.8	29
Calbayog	162.9	+27	+50.1	10	0	53.9	27	Vigan	34	+18.5	+14.7	2	0	33.1	20
Masbate	36.1	+26.5	-3.8	11	+6	16.3	18	Tuguegarao	110.3	+26	+40.2	4	-3	75.2	26
Romblon	117.1	+82.6	+57.1	13	+8	62.2	28	Laoag	0	0	-6.9	0	0	0	5
Batag	206.3	+151		15	+3	124.9	17	Aparri	.9	-51.2	-38.7	2	-4	.6	5
Legaspi	121.1	+63	-37.1	14	+6	47.9	17	Santo Domingo, Bata-	17.2	-43.6	-96.1	11	+4	5.8	5
Sumay, Guam	78.9	+54.8	+36.4	9	+3	26.7	13	nes							
Calapan	116.1	+90.5	+4	13	+4	51.6	29								

DEPRESSIONS AND TYPHOONS.

There were in all during this month one typhoon very close to the eastern coast of Samar, and one distant depression over the Pacific to the northeast of Luzon. Their tracks are published in Plate III together with the tracks of the depressions for last February (see the Bulletin of that month).

THE TYPHOON OF THE NORTHEASTERN COAST OF SAMAR, APRIL 13 TO 21.

This typhoon was probably formed on the 13th to 14th near or over the Western Carolines, in about 140° longitude E, and 7° or 8° latitude N. It moved WNW toward the Philippines, the first signs of a depression or typhoon being observed in our weather map of 6 a. m. of the 16th, when the pressure appeared to be "low over the Pacific to the E of northern Mindanao or of the southern Visayas."

The first definite typhoon warning was given out by the Manila Observatory at 4 p. m. of the same day:

There are signs of a depression or typhoon over the Pacific less than 300 miles east of the southern Visayas in about 10° latitude N. Its actual direction cannot yet be ascertained.

The direction of the typhoon to WNW was announced in the morning of the 17th with the following statement:

The typhoon was situated at 6 a. m. to-day in about 127° longitude E and 11° 30' latitude N moving WNW toward Samar.

Although there was no telegraphic communication with the eastern part of Samar since the afternoon of the 16th, yet it could be noticed in our weather map of 2 p. m. of the 17th that the track of the typhoon was inclining northward. Hence the following warning was issued at 4 p. m. of that day:

The typhoon seems to incline northward, its center being situated at 2 o'clock this afternoon near the eastern coast of Samar, in about 126° longitude E and 12° latitude N, moving slowly NW.

In fact the typhoon inclined more and more to the north in the afternoon of the 17th, when the vortex was very near to the northeastern coast of Samar, the barometer having

fallen to 745.36 mm. in Batag Island at 3.30 p. m. As shown in Plate III a complete recurving of the track to N and NE. took place during the night of the 17th and morning of the 18th.

In Plate IV we reproduce the isobars for 6 a. m. and 2 p. m. of the 17th and for 6 a. m. and 2 p. m. of the 18th.

The following typhoon warnings were given out by Manila Observatory on the 18th and 19th:

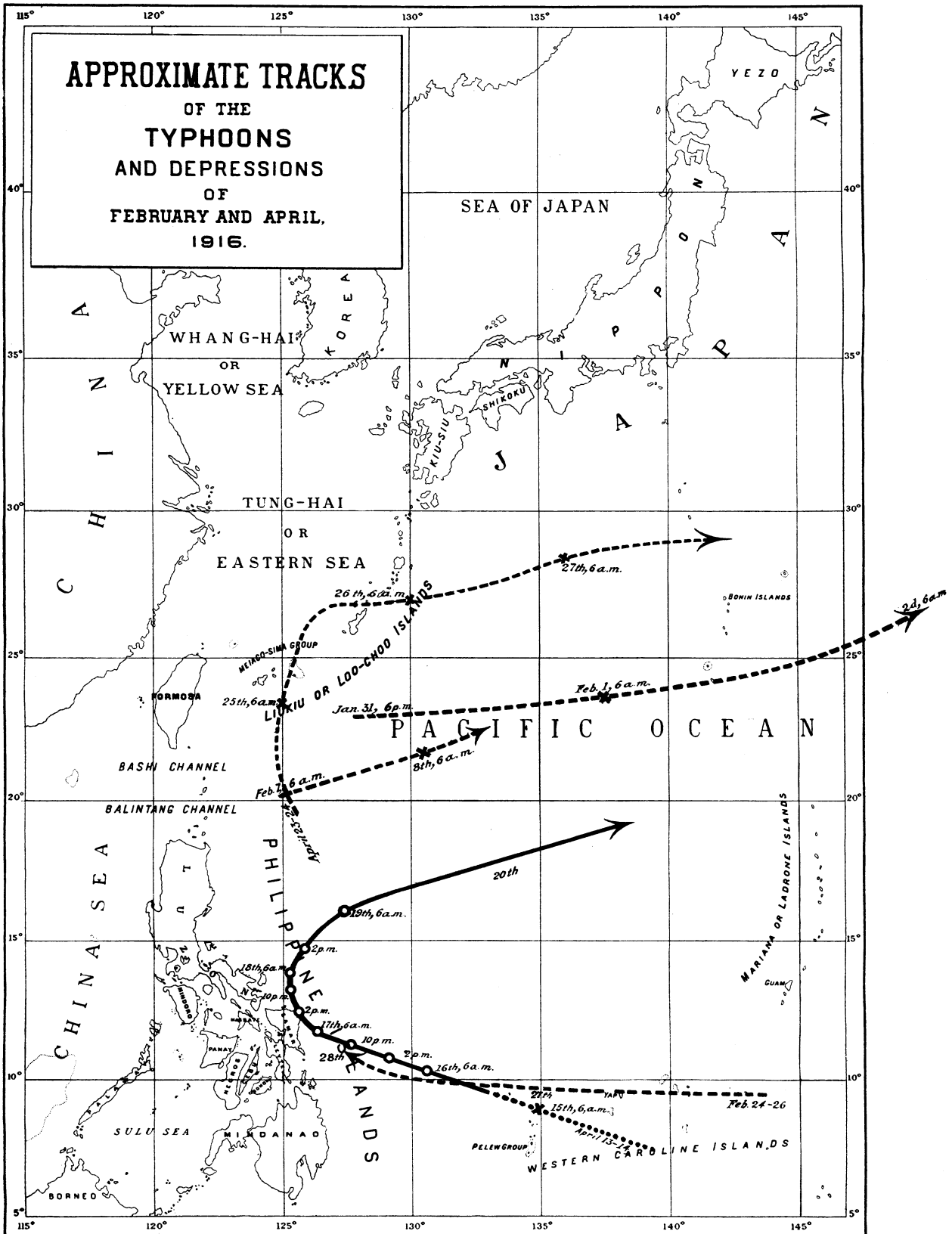
*April 18, 8.30 a. m.*—The typhoon has inclined more and more to the north since yesterday, its center being situated at 6 a. m. to-day to the east of southern Luzon between  $125^{\circ}$  and  $126^{\circ}$  longitude E and about  $13^{\circ} 30'$  latitude N, moving northward. All danger for Luzon has disappeared for the present.

*April 18, 6.30 p. m.*—The typhoon was situated at 2 o'clock this afternoon about 100 miles to the east of the southern part of Luzon moving slowly northward.

*April 19, 11.50 a. m.*—The typhoon has recurved northeastward, its center being situated at 6 o'clock this morning over 300 miles to the east of Luzon moving NE.

#### DEPRESSION OF THE LOOCHOOS, APRIL 23 TO 28, 1916.

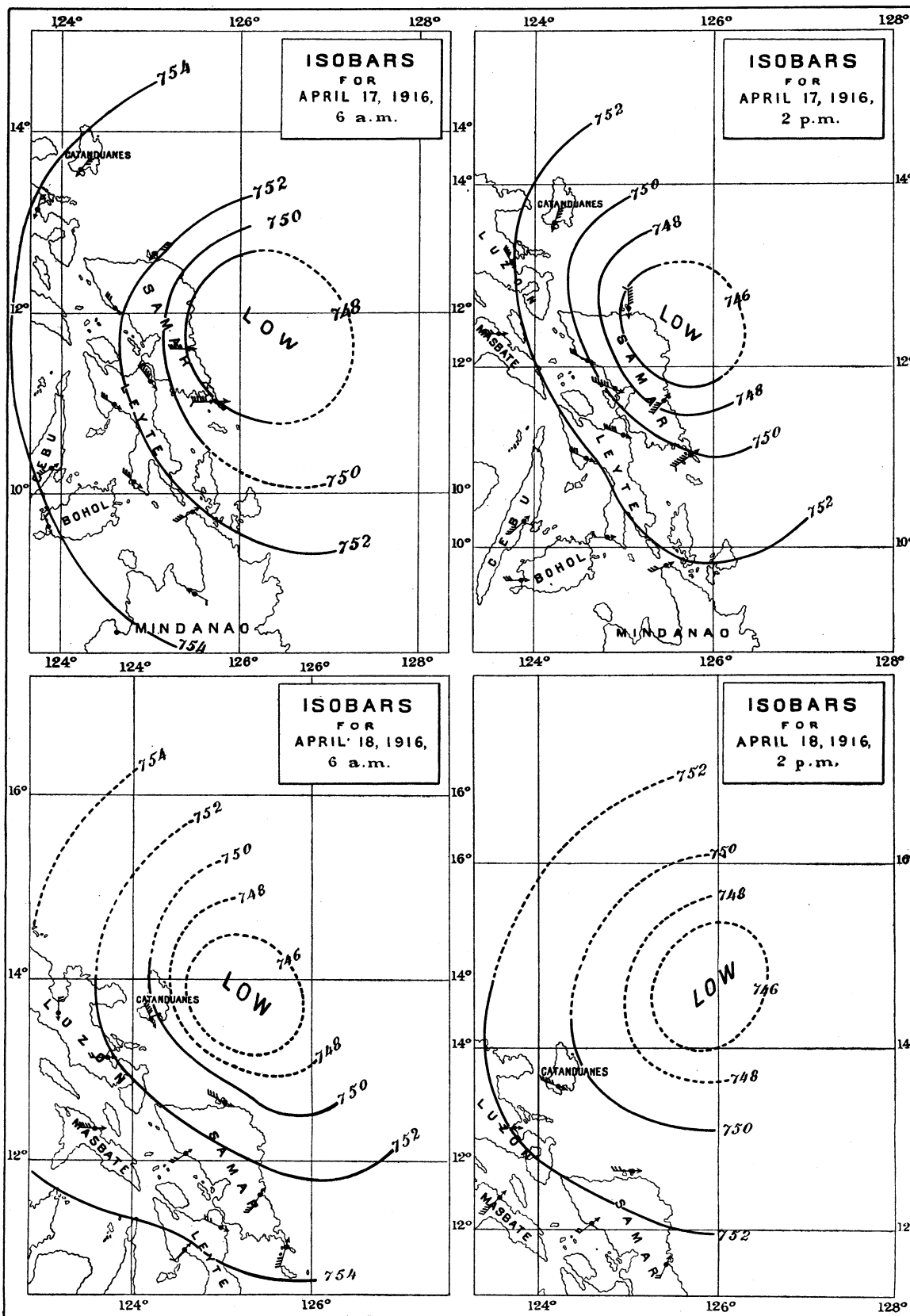
This depression was probably formed on the 23d over the Pacific to the east of Balintang Channel near  $20^{\circ}$  latitude N and  $125^{\circ}$  longitude E. It moved north and north-northeast until the afternoon of the 25th, when it began to move eastward across the northern part of the Loochoos. The depression passed to the north of the Bonins in the evening of the 27th.





ISOBARS FOR THE TYPHOON OF APRIL 17 TO 18, 1916.

Plate IV.



N.B - The barometric readings have been reduced to standard gravity.

## NOTAS GENERALES DEL TIEMPO.

Presión y temperatura.—La presión atmosférica media de este mes es bastante menor que la del año pasado, y ligeramente menor que la normal de abril. La de Manila es inferior a la normal en 0.54 mm., y a la media de abril, 1915, en 1.43 mm. Las presiones más altas se observaron el día 7, y las más bajas del 17 al 18 o del 23 al 24.

La temperatura media mensual es ligera o regularmente menor que la de abril, 1915, y ligeramente menor que la normal de este mes. La temperatura máxima absoluta de Manila 35.0° C. fué registrada los días 24 y 28; y la mínima absoluta 20.4° C., el 16. Las temperaturas extremas de Baguio fueron 26.3° C., 13.7° C. en la cumbre del Mirador, y 26.9° C., 12.8° C. en el valle.

Precipitación acuosa.—La lluvia total de este mes ha sido, con pocas excepciones, mayor que la de abril, 1915, aunque, comparada con la normal de este mes, resulta ser mayor en buen número de estaciones, y menor en otras muchas. La lluvia mensual de Manila es 45.7 mm. y 12.1 mm. mayor que la del año pasado y la normal de este mes, respectivamente. En Baguio se recogieron 132.1 mm. de lluvia en la cumbre del Mirador, siendo esta cantidad 57.4 mm. mayor que la de abril, 1915, y 17.4 mm. también mayor que la normal de este mes.

## DEPRESIONES Y TIFONES.

Durante este mes no hubo más que un tifón muy cerca de la costa oriental de Sámar, y una depresión lejana en el Pacífico al NE de Luzón. Sus trayectorias pueden verse en la Lámina III juntamente con las de las depresiones de febrero (véase el Boletín de dicho mes).

## EL TIFÓN DE LA COSTA NE DE SÁMAR, ABRIL 13 AL 21.

Este tifón se formó probablemente del 13 al 14 en, o cerca de, las Carolinas Occidentales, en los alrededores de 140° longitud E y 7° u 8° latitud N. Se movió al WNW en dirección a Filipinas, habiéndose observado los primeros indicios de una depresión o tifón en nuestro mapa del tiempo de 6 a. m. del 16, cuando la presión atmosférica se presentó "baja en el Pacífico al E del norte de Mindanao o del sur de Visayas."

El primer anuncio definido de tifón lo publicó el Observatorio de Manila a las 4 p. m. del mismo día en estos términos:

Hay indicios de una depresión o tifón en el Pacífico a menos de 300 millas al E del sur de Visayas en los alrededores de 10° latitud N. Su actual dirección no se puede aún precisar.

La dirección del tifón al WNW se anunció la mañana del 17 por medio de la siguiente nota:

El tifón se hallaba a las 6 a. m. de hoy en los alrededores de 127° longitud E y 11° 30' latitud N, moviéndose al WNW hacia Sámar.

Aunque no había comunicación telegráfica con la parte oriental de Sámar desde la tarde del 16, con todo se pudo observar en nuestro mapa del tiempo de 2 p. m. del 17 que la trayectoria del tifón se inclinaba al N. Así se dijo en el siguiente aviso de tifón dado a las 4 p. m. de dicho día:

El tifón parece inclinarse al N, hallándose su centro a las 2 de esta tarde cerca de la costa oriental de Sámar, en los alrededores de 126° longitud E y 12° latitud N, moviéndose lentamente al NW.

De hecho el tifón se inclinó más y más al N la tarde del 17, cuando el vórtice estaba muy cerca de la costa NE de Sámar, habiendo bajado el barómetro a 745.36 mm. en la Isla de Batag, a las 3.30 p. m. Como se echa de ver en la Lámina III, una recurva completa de la trayectoria al N y NE tuvo lugar durante la noche del 17 y la mañana del 18.

En la Lámina IV reproducimos las isobaras de 6 a. m. y 2 p. m. del 17, y 6 a. m. y 2 p. m. del 18.

El Observatorio de Manila publicó los siguientes avisos de tifón los días 18 y 19:

*Abril 18, 8.30 a. m.*—El tifón se ha inclinado más y más al N desde ayer, hallándose su centro a las 6 a. m. de hoy al E del sur de Luzón entre  $125^{\circ}$  y  $126^{\circ}$  longitud E y en los alrededores de  $13^{\circ} 30'$  latitud N, moviéndose al N. Todo peligro para Luzón ha desaparecido por ahora.

*Abril 18, 6.30 p. m.*—El tifón se hallaba a las 2 de esta tarde a unas 100 millas al E de la parte meridional de Luzón, moviéndose lentamente al N.

*Abril 19, 11.50 a. m.*—El tifón ha recurvado al NE, hallándose su centro a las 6 de esta mañana a más de 300 millas al E de Luzón, moviéndose al NE.

LA DEPRESIÓN DE LIUKIU, ABRIL 23 AL 28, 1916.

Esta depresión se formó probablemente el día 23 en el Pacífico al E del Canal de Balintang cerca de  $20^{\circ}$  latitud N y  $125^{\circ}$  longitud E. Se movió al N y NNE hasta la tarde del 25, cuando empezó a moverse hacia el E a través de la parte septentrional de Liukiu. La depresión pasó por el N de Bonins la noche del 27.

METEOROLOGICAL DATA FOR MANILA CENTRAL OBSERVATORY.<sup>a</sup>

[ $\phi=14^{\circ} 34' 41''$  N;  $\lambda=120^{\circ} 58' 33''$  E; barometer above sea, 14.2 meters; gravity correction not applied,  $-1.72$  mm.]

Day.	Air temperature. <sup>b</sup>				Underground temperature.				Relative humidity (mean)	Vapor pressure (mean)	Radiation.			Evaporation. <sup>b</sup>		
	Pressure (mean)	Mean.	Maximum.	Minimum.	0.25 meter.		0.50 meter.				1.50 meters.	2.50 meters.	Minimum on grass	Maximum in sun. Black bulb in vacuo.	Free exposure (total)	Shelter (total)
					8 a.m.	2 p.m.	8 a.m.	2 p.m.								
	mm.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	Per ct.	mm.	°C.	°C.	mm.	mm.
1	757.47	27.2	33.2	22	28.5	30.1	28.9	29	28.5	28	78.3	20.7	51.7	5	4.2	
2	58.44	28.3	34.4	23.2	29	31	29.1	29.3	28.8	27.9	69.9	19.5	21	53.9	6.9	4.8
3	59.80	27.8	33.5	21.6	29.3	31.5	29.2	29.8	28.6	27.9	73.8	20.2	18.7	55.2	5.9	4.2
4	60.15	27.8	33.4	23	29.5	30.9	29.4	29.8	28.6	27.9	76.6	21.1	20.7	54.4	4.7	4.1
5	61.28	25.9	30.5	23.2	28.8	29.8	29.3	29.7	28.7	27.9	82.2	20.3	22.5	46.9	3.3	2.5
6	61.84	26.5	31	23	28.6	29.6	29.3	29.6	28.7	27.9	74.2	18.9	20.6	49	4.9	4
7	62.50	26.3	32.5	22.3	28.2	29.6	29.1	29.3	28.6	27.9	73.9	18.5	19.9	52.5	5.2	4.1
8	61.78	27	34.1	21.4	27.7	29.9	28.8	29.1	28.6	27.9	68.1	17.6	18.7	47.8	6.5	4.1
9	61	26.3	32.5	22.4	28.2	29.8	29	29.3	28.8	28	78.4	19.8	20.2	56	3.8	2.8
10	60.66	26.5	32.2	21	27.9	29.5	28.8	29.1	28.8	27.9	77.4	19.7	18.9	50.5	5.3	3.9
11	60.56	27.1	34	21.5	28.2	29.6	28.8	29.2	28.8	28	71.9	18.8	18.9	56	6.4	4.9
12	60.84	26.6	32.9	22.5	28.2	29.1	28.8	29.1	28.8	27.9	74.9	19.2	19.8	49.2	3.9	3.4
13	60.63	27.5	34.8	22.5	28.2	30.3	28.8	29.2	28.8	28	73	19.4	20.7	56.1	6.9	4.9
14	60.27	26.5	33.3	21.7	28.3	29.7	28.9	29.2	28.9	28	76.1	19.4	19	53.6	4.4	3.1
15	59.04	26.8	34.1	21.4	28.4	30.1	28.9	29.4	28.9	28	74.5	19	18.9	54.6	6	4.4
16	58.87	26.2	32.5	20.4	28.1	29.7	28.9	29.1	28.7	27.9	70.8	17.4	18.2	52.6	5.7	4.1
17	57.24	27.9	34.4	22.7	28.3	30.6	28.9	29.5	28.8	27.9	73	20.2	20.1	59.5	5.4	3.9
18	55.94	27.4	33.8	22.9	29.1	30.6	29.1	29.5	28.8	28	78.8	21	20.6	54.3	3.8	2.8
19	56.49	27.2	32.4	23	28.7	30.3	29.2	29.5	28.8	28	82.4	21.9	21.5	52	3.6	2.8
20	56.39	27.5	32.8	22.5	29	30.1	29.4	29.5	28.9	28.1	74.2	20	20.6	53.2	5.4	4
21	56.37	27.7	32.7	23.7	29.5	31	29.6	29.8	29	28.1	73.6	20.1	21.8	51.9	5.7	4
22	56.66	27.8	32.8	24.2	29.5	30.7	29.8	29.9	28.9	28	74.8	20.6	22.8	52.2	5.2	3.6
23	56.03	28.3	33.9	24.7	29.8	31.4	29.8	30.1	28.9	28	76.5	21.6	22.6	56.3	5	3.5
24	56.31	28.6	35	25.2	30.3	31.8	29.1	30.5	29	28.1	76	21.8	24.1	55.8	5.6	3.8
25	57.23	28.6	33.7	24.5	30.6	31.5	30.4	30.7	29	28.1	73.4	21.2	22.7	54.9	5.5	4
26	58.65	27.8	34.2	24.3	30.3	31.5	30.5	30.8	29	28.1	75.2	20.6	22.8	55	4.6	3.6
27	58.43	27.7	34.2	22	29.9	31.5	30.3	30.8	29	28	72.9	19.8	19.8	53.1	6.3	4.6
28	58.40	27.8	35	23.2	29.8	31	30.4	30.8	29.1	28.1	73.1	19.9	20.7	55.2	5.7	4.1
29	58.21	28	34.2	23.2	30.1	31.5	30.5	30.7	29.1	28.1	74.6	20.6	21.3	53.3	5.8	4.2
30	58.86	27.6	33.7	23	30.2	31.9	30.5	30.8	29.4	28.1	78.5	21.3	21.2	53.5	4.1	3
Mean Total	758.88	27.3	33.4	22.7	29	30.5	29.4	29.7	28.8	28	75	20	20.7	53.3	5.2	3.8
Departure from normal	-0.54	-0.8	-0.5	-0.1							+5.3	+0.6			156.5	115.4

Day.	Wind.				Clouds.			Sunshine.	Rain, 24 hrs. beginning 6 a. m.		Miscellaneous.
	Prevailing direction.	Total movement.	Maximum hourly velocity.	Direction at the time of the maximum velocity.	Amount (mean).	Form and direction.			On the tower.	In the park.	
						Upper.	Lower.				
		Km.	Km.		0-10.			h. m.	mm.	mm.	
1	SW	205	18.5	SWbyW	4.6	Ci.	Cu.	E	8 25		
2	ESE, SE	187.5	14	SE, ESE	3.2	Ci.-S.	Cu.	E	10 35		
3	SW, SSW	142.5	14	SSW	1.4	Ci.	Cu.	E	10 30		
4	SE	185	18	WSW	3.7	Ci.	Cu.	E	7 35		
5	NE quad.	122	16	NE	9.9		Cu.-N.	E	0 10	5.5	5.2
6	E	177	20	ENE	8.8	A.-Cu.	E	E	1 00		d° p.
7	E	170.5	19	ENE	5.8	Ci.	Cu.	E	4 30		☉ p.
8	NE	166	17.5	E	6.1	Ci.	Cu.	E	7 10		
9	E quad.	138.5	13	E, ENE	7.7	A.-Cu.	N.-cf., Cu.	E	3 10		≡ a. p° d° p.
10	E, SE	196	18	ESE, SE	4.8	Ci.-S., Ci.	Cu.	E	5 40		d° p.
11	NE quad.	191	22	E	3.7	Ci.	Cu.	E	8 25		
12	N	136	19	NNE	7.6	A.-Cu.	Cu., N.-cf.	E	2 10	.5	.5
13	E	186	23	E	3.5	A.-Cu.	Cu.	E	9 10		d° p.
14	ESE, NE	154	17	WSW	7.8	Ci.	Cu.	E	3 50		☉ d° p.
15	ESE	220	21	SE	3.6	Ci.	Cu.	E	8 35		
16	E, SE	166	19	SE	8	Ci.-S.	Cu.	E	2 15		☉ a. p. ☉ p.
17	SW, SSW	118.5	16	SW	5.4	Ci.	Cu.	E	7 25		d° p.
18	SW	196.5	23	SW	4.9	Ci.	Cu.	NE, E	7 35	33.8	36.6
19	ENE, SW	209.5	22.5	SW	2.6	Ci., A.-Cu.	Cu.	E	10 15	6.1	5.1
20	SW, WSW	210	20.5	SW	2.3		Cu.	NEbyE	10 55		☉ p.
21	SW	284.5	26	SW	2.1	Ci.	Cu.	E	10 35		
22	SW quad.	270	22	SW	5.1	A.-Cu.	Cu.	E	7 10		☉ p.
23	WSW	247	24	SW	3.2	A.-Cu.	Cu.	E	9 15		
24	SW	242.5	23	SW	3.8	Ci.	Cu.	SE	9 40		
25	NNE	180	18	NNE	4.2	A.-Cu.	Cu.	E	10 20		☉ p.
26	WSW, NNE	146.5	15	WSW	3.6	Ci.	Cu.	SE	9 15	.3	.3
27	Variable	185	16	SE	2.6	Ci.	Cu.	E, ESE	10 20		☉ p.
28	W	214	19	W	3.7		Cu.-N. E quad	E	10 05		☉ p.
29	NE, WSW	201	15.5	W, SE	3.1	Ci.	Cu.	E	10 45		☉ p.
30	NW quad.	144	16	W	5.8	A.-Cu.	Cu.	E	7 35		☉ p.
Mean Total		186.4	18.8		4.8				7 29		
Departure from normal		5,592							224 20	46.2	47.7
		-1,308.4			+0.7				-37 34	+12.1	

<sup>a</sup> All the mean values given in this table are deduced from hourly observations.  
<sup>b</sup> These values are taken from instruments mounted in the Observatory Park, 1.5 meters above ground.

METEOROLOGICAL DATA FOR MIRADOR OBSERVATORY, BAGUIO.\*

[φ=16° 25' N; λ=120° 36' E; barometer above sea, 1,512.5 meters; gravity correction not applied, -1.65 mm.]

Day.	Pres- sure <sup>b</sup> (mean).	Air temperature at Mirador (on the top of the mountain).					Air temperature in the valley (near the city hall).					Rela- tive hu- midity (mean).	Vapor pres- sure (mean).	Radiation.			Evaporation.	
		Mean.	Maxi- mum.	Hour.	Mini- mum.	Hour.	Maxi- mum.	Hour.	Mini- mum.	Hour.	Mini- mum on grass.			Maxi- mum in sun. Black bulb in va- cuo. <sup>c</sup>	Free exposure (total)	Shel- ter (total)		
	mm.	°C.	°C.	Hour.	°C.	Hour.	°C.	Hour.	°C.	Hour.	Per ct.	mm.	°C.	°C.	mm.	mm.		
1	635.72	18.3	23.7	2.20p.	15.6	6.10a.	24.6	2.15p.	14.6	5.35a.	86.8	13.6	13.3	56	2	1.4		
2	36.47	18.6	24.6	2.00p.	15.5	5.50a.	25.2	1.40p.	14.5	5.00a.	87.7	13.8	12	58.7	2.1	1.3		
3	37.80	18.1	24.5	1.20p.	15.1	1.50a.	24.9	1.15p.	13.8	6.10a.	87.2	13.4	11.8	57.7	3	1.9		
4	37.88	18.4	24.3	1.00p.	15.1	5.10a.	24.2	1.15p.	14	6.05a.	84.5	13.4	10.8	56.2	2.9	1.8		
5	38.21	17.2	21.8	9.40a.	14.7	12m.n.	22.8	10.15a.	14.5	12m.n.	89.3	13	13.7	55	1.9	1.1		
6	38.55	17	23.9	0.15p.	14.2	2.25a.	23.2	Noon	13.8	5.55a.	85	12.2	12.6	62.7	2.7	1.8		
7	39.57	17.2	23.5	10.30a.	14.5	5.45a.	23.6	11.20a.	13.7	5.00a.	88.3	12.8	12.8	60	2.2	1.4		
8	39.13	17.9	24.2	11.10a.	13.7	6.05a.	24.7	0.30p.	13.7	3.50a.	83.3	12.5	11.1	56	5.2	3.2		
9	38.49	18.8	24.2	9.30a.	15.4	2.00a.	24.3	9.25a.	15.3	1.00a.	80.5	13	13.9	60	3.2	2		
10	38.49	18.7	23.3	0.05p.	15	3.15a.	23.4	11.00a.	13.8	5.00a.	84	13.5	10.6	58	2.2	1.4		
11	38.34	19.4	25.2	2.30p.	15.5	6.10a.	25.7	0.20p.	14.3	5.40a.	68.7	11.4	11.1	59.2	10.2	5.8		
12	38.58	19	24.8	11.35a.	14	4.20a.	25	11.05a.	14	0.50a.	67.2	10.9	10.7	58.2	6.3	3.9		
13	38.52	19.3	25.8	11.20a.	15	6.00a.	26.7	0.50p.	14.9	6.05a.	75.8	12.6	13	57	5	3.3		
14	38.20	19.1	24.9	0.35p.	15.8	4.00a.	25	1.05p.	14	5.10a.	73.3	12.1	11.1	58	4.6	3.2		
15	37.14	19.6	24.9	10.25a.	15	4.25a.	25.7	10.50a.	13.6	6.00a.	81.8	13.8	12.7	58.6	3.7	2.2		
16	36.94	19.5	26.3	11.15a.	15.2	5.55a.	26.9	0.15p.	14	6.00a.	72.7	11.9	11	57.5	5.7	3.5		
17	36.02	20	25.4	2.15p.	16.2	3.05a.	26.5	10.25a.	15.1	2.10a.	70.8	12.3	13.5	57.7	5	3.3		
18	34.84	18.8	24.6	11.00a.	16.7	5.20a.	24.5	11.15a.	15.6	3.40a.	86.3	13.9	13	60.7	2.9	1.8		
19	34.94	18.6	24.6	0.25p.	15.6	4.20a.	24.4	0.25p.	14	6.05a.	71.5	11.4	13.5	58.9	6	3.8		
20	34.86	18.5	24.8	0.30p.	14.7	5.05a.	24.6	1.40p.	12.8	5.10a.	68.3	10.9	9.6	57.2	3.8	2.3		
21	34.70	17.6	23.7	0.40p.	14.7	1.15a.	23.7	0.35p.	14	3.45a.	86	12.9	12.3	56.7	2	1.1		
22	35	19	25.1	1.05p.	15.7	5.00a.	24.2	11.55a.	14.9	4.55a.	87	14.1	12	60.7	2.2	1.3		
23	34.65	18.8	25.9	1.00p.	15.4	5.45a.	24.9	0.40p.	14.8	3.55a.	87	14	13.2	60.4	2.5	1.4		
24	34.97	18.2	24.7	1.55p.	15.6	7.40p.	24.6	2.20p.	15.1	1.55a.	90	14	12.4	61.2	1.7	1.2		
25	35.77	18.7	24.1	2.40p.	15.4	0.45a.	25.2	2.55p.	14	6.00a.	82.3	13.2	12.5	57.2	2	1.5		
26	36.92	17.4	22.8	0.05p.	16.1	5.00a.	22.5	11.50a.	14.9	1.05a.	92.8	13.7	12.5	57.7	1.2	1		
27	36.71	18.6	23.7	0.50p.	15.2	5.30a.	23	Noon	14	5.45a.	84.2	13.5	12.8	62.1	2.4	1.8		
28	36.77	18.2	24	11.45a.	16	4.30a.	23.5	1.30p.	15.2	6.00a.	86.5	13.4	12.6	62.6	2.7	1.8		
29	36.40	18.6	23.8	0.55p.	15.5	4.05a.	24.3	1.55p.	14	4.55a.	84.8	13.6	13.2	63.5	2.2	1.5		
30	37.07	18.2	23.3	0.55p.	15.6	9.55p.	23.5	11.40a.	14.2	5.10a.	86.7	13.6	11.5	56.7	1.3	1.1		
Mean	636.92	18.5	24.3		15.3		24.5		14.3		82	12.9	12.2	58.7	3.4	2.1		
Total															100.8	64.1		

Day.	Wind.				Amount (mean).	Clouds.		Sun- shine.	Rain, 24 hours begin- ning 6 a. m.	Miscellaneous.
	Prevailing direction. <sup>d</sup>	Total move- ment.	Maxi- mum hour- ly veloc- ity.	Direction at the time of the maximum velocity.		Form and direction.	Upper.			
1	W	302.5	29	W	4.3	Ci.	Cu. WSW	h. m.	mm.	☉ a. ☐ a. p.
2	W, E	310.2	26	W	4.7	Ci.	Cu.-N. SW	5 45		☉ a. ☐ a. ☐ p.
3	W, E	327.1	28.8	W	4.3	Ci.	N.-cf. SW	6 00		☉ a. ☐ a. p.
4	W	296.5	27.2	W	4.7	Ci.	Cu.	5 40		☉ a. ☐ a. ☐ d. p.
5	E	326.1	22.3	SW	7.3	Ci.	Cu.-N. SSE	0 55	33.5	☉ a. ☐ a. ☐ p.
6	E	390.4	29.6	E	7.6	A.-Cu. WhyS	Cu.-N. ENE	2 00	7.2	☉ a. ☐ a. ☐ p.
7	E	395.8	31.2	E	8.1	A.-Cu.	Cu. ESE, E	1 55	25.4	☉ a. ☐ a. ☐ p.
8	E	398.4	25.1	E	5.3	Ci.	Cu. WSW, W	5 15		☉ a. ☐ a. ☐ p.
9	E	443.1	34	E	4	Ci.	N.-cf. WSW	5 05		☉ a. ☐ a. ☐ p.
10	E, SW	227	22	W	4.4	Ci.	Cu. E	3 30		☉ a. ☐ a. ☐ p.
11	E	356.3	19.8	E	4	Ci.	Cu. ENE	7 35		☉ a. ☐ a. ☐ p.
12	E	393.7	23.5	SW	1.7	Ci.	Cu.	6 40		☉ a. ☐ a. ☐ p.
13	E	344.3	25.5	SW	2.3	Ci.	Cu. SE	6 30		☉ a. ☐ a. ☐ p.
14	E, SW	362.8	29.3	E	3.3	Ci.	Cu.	6 40		☉ a. ☐ a. ☐ p.
15	E quad.	306.8	27.2	W	4.4	Ci.	Cu.-N. SE	5 25		☉ a. ☐ a. ☐ p.
16	E	337.5	24.1	SW	6	Ci.	Cu.	6 15		☉ a. ☐ a. ☐ p.
17	Variable	323.4	23.1	SW	6.9	Ci.	Ch. ESE, SE	4 00		☉ a. ☐ a. ☐ p.
18	W	387.7	32.8	W	6.4	Ci.	Cu.-N. NW	3 05		☉ a. ☐ a. ☐ p.
19	W	427.6	34.6	W	3.6	Ci., A.-Cu.	Cu. WhyN	5 45		☉ a. ☐ a. ☐ p.
20	W	325.9	28.4	W	4.4	Ci.	Cu.	6 00	3.3	☉ a. ☐ a. ☐ p.
21	W	303.5	27.2	W	5.1	Ci.	Cu.	4 10		☉ a. ☐ a. ☐ p.
22	SW, W	246	26.9	SW	5.9	Ci.	Cu. S, SSW	4 05		☉ a. ☐ a. ☐ p.
23	W quad.	312.1	27.7	W	5.9	Ci.-S.	Cu. W	4 35		☉ a. ☐ a. ☐ p.
24	E, W	294	25.7	W	7.7	Ci.	Cu. EbyS, E	2 55	8.7	☉ a. ☐ a. ☐ p.
25	SW, E	271.4	26	E	6.7	Ci., A.-Cu.	Cu.-N. W	2 50	14.3	☉ a. ☐ a. ☐ p.
26	W	255.6	22.2	W	6.7	A.-Cu., Ci.-S.	Cu.-N. S, SW	0 45	6	☉ a. ☐ a. ☐ p.
27	Variable	271.4	20.7	E	4.6	A.-Cu., Ci.-S.	Cu.-N. SE, S	4 10	7.4	☉ a. ☐ a. ☐ p.
28	E, SE	372.9	25.2	W	5.6	Ci.	Cu.-N. WSW	4 45	1.8	☉ a. ☐ a. ☐ p.
29	E	309	20.3	W	6.1	A.-Cu.	Cu.-N. WSW	2 55	13	☉ a. ☐ a. ☐ p.
30	E	263.4	21.4	W	6.7	Ci.	Cu.-N. S	2 25	11.5	☉ a. ☐ a. ☐ p.
Mean		329.4	26.2		5.2			4 25		
Total		9,882.4						132 35	132.1	

<sup>a</sup> All the mean values given in this table are deduced from six daily observations taken at 2, 6, 10 a. m. and 2, 6, 10 p. m.  
<sup>b</sup> The barometric readings of this station are not reduced to sea level.  
<sup>c</sup> Maximum of hourly observations taken from 6 a. m. to 6 p. m.  
<sup>d</sup> This element is based on hourly observations taken from a quadruple register, which gives only eight possible directions of the wind.

DAILY RAINFALL AT THE STATIONS OF THE WEATHER BUREAU, APRIL, 1916.

Station.	Day of month.															
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.
	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.
Jolo						29.5	10.6		11.2							
Isabela, Basilan							15					0.8	1.3			
Zamboanga					7.6			9.7			13			0.3		
Davao								4.1		10.2		15		22.1		
Cagayan, Misamis							2.5								7.7	12.9
Dapitan				0.5			5	5.1	1.8						8.4	
Butuan						3.6	9.7	5.3			8.9	1.3	9.4	3.8	2.5	55.6
Dumaguete					3		.6									
Tagbilaran						4.8			1.8			1.5			1.3	
Iwahig							6.9									
Surigao						18.8	71.1	2	9.9	2.8	13.7	3.3	5.6	28	5.1	24.5
Maasin						21.3	46.3		5.8		11.7					12.2
Cebu							30.7	.8	4.6	.5	2.3					.8
Iloilo							1.3									
San Jose Buenavista																
Cuyo																
Ormoc					17		21.2	.5	13.7	.8	1.3	1.3				17.5
Guiuan							19	23.1	3.6	.8	19.3	.5	1	3	23.4	53.3
Tacloban			5.1	6.9	1.8	.9	26.9	6.4	8.3	2.7	5.4	8.4				20.5
Capiz					3	11.2	3	.3	.3	2.5		2.1				
Borongon					1	3.3	7.4	3.3	13.3	3	9.9	1.8	2.8	1.5	6.1	43.2
Catbalogan					5				7.4				.5			
Calbayog										.3	.3	8.1		4.3	5	18.3
Masbate					1	1.3		3	.8	.8	3.3	5.8				
Romblon					5		.3	5.3	7.1	5.8	1	1.3		1.3		
Batag		3.8			1.3		21.6	8.1	5.5	3	3.8	5.8	1.3		2.5	13
Legaspi					4.6	3.8		5.1	7.9	1.1	7.4	14.2	5.6			
Sumay, Guam		6.4								5.1			26.7	3.8	12.7	5.1
Calapan				3.3	16.1	1.3		1.8	11.7		5.5	1				.5
Virac					5.6	4.1	.8	8.1	5.8	1.5	3	4.6	2.3	1.5		1.1
Naga					4.1			1	2.8			1.5				5.7
Batangas					1				.2							
Lucena				24.4	63		1.8	2.5	.3		5.1	1.5				
Atimonan					60.2			7.6	.8	3.3	6.1			3.8		14
Ambulong, Tanauan											1	5.3				
Canlubang, Calamba				.5					3		.3	7.1	2.1			
Paracale				8.6	2.8			16.5	12.2		7.9	1.3	10.4	9.7		5.3
Santa Cruz, Laguna				.8	2.5				4.3	.3	4.1	4	.5	.8		
Manila					5.5							.5				
Antipolo				3.6	.8							.5		5		
Iba					4.3		1.8									1.5
San Isidro				56.7	.5							.5				
Tarlac		.5														
Baler				3.3	2.3	42.4	41.7		2.3	5.1	.2	21.1	4.6			
Dagupan					16.5											
Bolinao						9.7										
Baguio					33.5	7.2	25.4									
San Fernando, Union																
Echague			1.8		10.2	2.5	.8									
Candon																
Vigan							.9									
Tuguegarao		23.9														
Laocag																
Aparri					.6											
Santo Domingo, Batanes		.1	2.1		5.8	.5				1		.1				

Daily rainfall at the stations of the Weather Bureau, April, 1916—Continued.

Station.	Day of month.														Total.
	17.	18.	19.	20.	21.	22.	23.	24.	25.	26.	27.	28.	29.	30.	
	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.
Jolo								10.9							63.5
Isabela, Basilan								16							31.8
Zamboanga										2.7	11				63.9
Davao							13		22.1	10.9	22.1	17			136.5
Cagayan, Misamis	16.5										1				40.6
Dapitan										1	9.7	17.8	30	2.8	82.1
Butuan										12.5	1.8	11.4		1.1	126.9
Dumaguete			0.8	1.5						1.3		2.5	37.1		46.8
Tagbilaran				(*)	(*)	(*)	(*)			1.5	45.2	23.1		2	
Iwahig		0.8		2.1							.7				10.5
Surigao		5.6		8	9.1					1.3	5.9	29.7	.5	9.6	247.3
Maasin	10.2		24.9	12.7						19.5	21.6				186.2
Cebu	31.7	1.3	1	2.8	8.6					.5	.5	15.5	.8		102.4
Iloilo	15.5														16.8
San Jose Buenavista		24.9	32.6						7.4				81.5	.3	146.7
Cuyo		.8											1.3		2.1
Ormoc	62.5	.8	6.6	.8						11.4	24.4	4.3	13.4	5.8	203.3
Guiuan	22.1	1				5.3				16.3	42.9	24.6	3.8	8.9	271.9
Tacloban	19.8		1.5							.6	11.4	2.8			128.4
Capiz	2	1.8	3					.8					3		27.3
Borongan	42.1						17.8		10.9	9.9	15.2	20.6	3.6	22.1	238.8
Catbalogan	60.2	.3								22.3	18.1	3.6	2.5		140.6
Calbayog	48.2									21.6	53.9		7.4		162.9
Masbate	1.5	16.3			2						.3				36.1
Romblon	14.5		1.8									62.2	15.2	.8	117.1
Batag	124.9										6.1	1.8		3.8	206.3
Legaspi	47.9	1.3			14.3	1.8					2	4.1			121.1
Sumay, Guam					3.8						8.9	6.4			78.9
Calapan		12.4							1	45.7	1.5	6.6	1.5	38.9	101.5
Virac	26.3	4.1	1.3						.3		1	3.8	51.6	6.1	17.8
Naga	22.7	13.2								17.5	16.3	7.4	6.7	1	119
Batangas		3.6									7.4		33.5		91.9
Lucena	2.3		4.6											4.3	9.1
Atimonan	14.7	7.6	4.6	31.7	5.6									15.5	121
Ambulong, Tanauan									1					2	162
Canlubang, Calamba		3	.5							45.7	1.5	6.6	1.5	38.9	101.5
Paracale	2.6	9.1	3.6							.3		1			17.8
Santa Cruz, Laguna	.8	8.6									3	.5	13	.3	106.8
Manila		33.8	6.1												26.7
Antipolo		7.1	.5				11.2	34.8			3				46.2
Iba	.8													1	63.5
San Isidro			1.3	1.5		30.7	1.3	10.4		2.1		13.5			9.4
Tarlac	2					.5	19.8		9.7	2.8				13.5	118.5
Baler	2	3	7.9								2	10.2	.1	20.3	48.8
Dagupan					.3			1.5					2	1	170
Bolinao								4.1					4.8		23.9
Baguio				3.3				8.7	14.3	6	7.4	1.8	13	11.5	14.5
San Fernando, Union															132.1
Echague		9.1	10.7							5.1				4.8	0
Candon													19.8		45
Vigan				33.1											19.8
Tuguegarao						1			10.2	75.2					34
Laoag															110.3
Aparri		.3													0
Santo Domingo, Batanes	.1	4.3	.1							3	.1				.9
															17.2

\* No observation.

MAXIMUM AND MINIMUM TEMPERATURE AT THE STATIONS OF THE WEATHER BUREAU, APRIL, 1916.

Day.	Jolo.		Isabela, Basilan.		Zamboanga.		Davao.		Cagayan, Misamis.		Dapitan.		Butuan.		Dumaguete.	
	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.
	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.
1	29.3	22.3	32.2	23.4	30.5	22.8	33.4	22.4	32	21.3	33.5	21.4	31.5	22.2	30.4	23.5
2	30.1	21.7	32.6	23.1	29	22.4	33.7	22.6	31.4	20.5	32	20.8	32.2	20.7	30.2	20
3	29.8	21.7	33.1	22.7	31.8	22.2	33.2	23	31.6	21.1	34	18.6	33.2	21.9	31.6	22.7
4	29.5	21.3	32.6	22.1	30	21.8	34.2	23.5	31.9	21.8	32.8	22.2	33.1	23.4	31.9	23.7
5	29.4	22.2	32.1	22.5	29.4	22.4	33.7	22	32	23.1	32.5	21.8	33.6	22.8	30.7	23.5
6	28.8	20.9	32.8	22.2	31.5	23.9	33.7	22.5	33.4	22.4	32.1	23.4	33.5	23.5	30.2	24
7	29.9	21.3	33.1	22.6	29.8	23	32.7	22.7	29	23.6	30.7	25	29.2	33.5	30.3	24.7
8	31.9	21.8	33.6	22.3	31	21.5	31.7	22.5	31.6	23.2	30.5	23.3	32	22.7	29.8	23.6
9	29.1	21.8	34.1	22.6	30.9	21	32.5	21	32.2	21.2	31	24.8	32.6	22.8	30	25.3
10	29.4	21.7	33.2	22.1	31	22.4	31.7	21	31.6	21.1	32.5	23.3	33	22.6	30.9	23.2
11	29.7	21.4	33.4	22.7	30	22.4	31.7	21.2	31.7	21.1	31.7	24.6	32	22.6	31.3	23.9
12	30.9	21.3	33.6	22.1	30	22.6	32.2	21.4	31.8	22.2	31.6	25	31.4	22.9	31.9	25
13	30	22.8	33.8	22.4	30.8	23.7	32.8	23	32.7	22.4	31.6	25.2	31.1	23.2	30.9	25.7
14	31.3	22	34	22.6	30	23.9	32.7	21.4	32.1	21.8	32.5	25	32	23.4	31.1	24.1
15	29.5	22.9	30.9	23.1	31.5	22.1	32.9	21.3	30.7	22.1	31.4	23.5	31.4	22.5	30.4	22.9
16	31.6	21.7	31.6	23.1	29.4	23.5	31.7	23	27.8	23.7	31.6	22.9	27.4	23.9	32.3	24.5
17	32.4	22	32.6	24.1	29.6	24	32.9	23.2	31.6	23.4	32.1	23.4	31.5	23.4	32.6	24.4
18	31.9	22	32.8	23.1	30.6	23	32.5	22.7	31.5	23.6	33.2	22.6	32.4	23.8	32.6	23.4
19	31.7	21.3	33.1	21.6	30.4	22.9	32.5	22	31.8	23.6	33.1	22.5	33	23.8	32.3	23.5
20	30.7	21.3	31.1	22.1	30	22	32	22.2	31.3	24.2	32.6	22.4	32.3	23.8	31.4	22.5
21	29.4	21.7	32.1	22.1	30	22	32.8	21.6	31.9	23.8	33	21.6	33.3	24	32.2	22.4
22	29.6	21	32.6	22	30.4	21.8	32.3	22.1	31.8	21.4	33.2	21.8	33.5	23.2	31.8	24.2
23	29.4	20.7	33.1	20.6	30.2	21.9	32.8	23.1	31.5	21.1	33.5	21	35	23.3	31	23.2
24	29	20.5	33	21.6	29.7	23	32.6	22.5	31.8	24	34.4	22.4	32.5	24	31.4	23.7
25	30.6	21.4	30.6	22.6	30.7	23.8	33.7	21.9	32.5	23.4	34.6	23.4	35.1	23.4	31.2	24.1
26	31.9	22	31.1	24.6	31.8	23.8	32.7	23	32.1	23.5	34.5	22.4	33.5	23.7	31.5	24.2
27	30.9	22.7	33.1	23.1	32	23.5	31.7	22	31.7	22.9	34.6	23.5	30	23.3	31.4	23.7
28	32.2	22.6	31.1	22.6	29.5	24	31.9	21.9	31.4	22.9	33.8	24	31.7	23.2	30.9	24.4
29	30.3	22.9	31.6	22.4	31	22.8	30.8	22.5	29.7	23.2	29	22.5	29	23.2	27	22.2
30	30.6	22.8	31.2	23.6	30.5	23.9	26.7	22.8	30.4	23.4	33.5	22.4	27.6	22.8	31.3	22.7
Mean	30.4	21.8	32.5	22.6	30.4	22.8	32.4	22.3	31.5	22.6	32.6	22.9	32	23.1	31.1	23.6

Day.	Tagbilaran.		Iwahig.		Surigao.		Maasin.		Cebu.		Iloilo.		San Jose Buenavista.		Cuyo.	
	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.
	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.
1	31.3	22.4	32.4	22.3	30.4	21.7	33	22.9	31	22.8	31	23.4	33.2	21.6	32.8	25.9
2	32	20.9	32.3	22.2	31.3	21	32.2	21.8	31.1	21.3	31.5	22.1	33.8	21.3	33.6	24.2
3	31.6	22.3	32.3	21.6	31.6	23.3	34	21.8	32.5	23.4	32.4	22.9	33.9	20	33.3	24.9
4	32.4	22.7	34.3	20.9	31.3	22.8	34	22	31.5	23.5	32.1	23.4	33.6	22.5	32.5	24.8
5	31.5	22.6	32.8	22	31.1	22.7	33.5	22.2	31	23.8	31.5	22.9	34.5	21.8	33.2	25.9
6	31.7	22.8	32	22	31.9	22.9	33.5	22.2	31	24.7	31	24	33.7	21.8	32.2	25.9
7	30.4	22.5	31.6	23.7	26.9	23.9	29.5	22.9	30	22	31.9	24.2	35	23	32	26.3
8	30.9	22	32	23.8	31.7	22.8	32.5	22.4	30.5	22.9	31.5	24.4	34.3	25	31.5	26.5
9	31.5	22.6	32.4	23.9	31.5	23.2	33	23.3	29.8	23.4	31.9	24.4	34.2	22.1	32.2	26
10	31.4	21.4	32.5	22.7	31.3	22.8	32.5	23.5	31.1	23.8	32.5	24.3	34.7	22.6	32.8	26.1
11	31.4	21.9	32.5	22	31.6	23.2	32.4	23.2	30	24	32.4	24.2	36.7	22.5	31.8	25.9
12	31.5	22.5	32.6	23.4	31.9	25.7	32.4	23.5	31.8	23.9	31.3	24.3	33.7	23.1	31.7	26.1
13	31.4	21.6	32	24	31.6	24.3	33	23	31.6	24	32.4	24.5	35.2	22.1	32.5	25.9
14	31.5	22.2	33.1	22.5	32.5	23.3	34	23.8	31.8	24.5	33.2	24.5	34.6	21.6	32.3	25.9
15	30.5	21.5	33	22.3	30.3	24.1	32.4	22.4	31.9	24.3	31.8	24.3	34.1	22.6	31.4	26.3
16	32.4	23.5	33	21.7	28.5	24.6	31	22.8	31.2	25	31.8	24.2	34.7	22	32	26.3
17	33.3	24.4	35.2	22.8	29.6	25.8	30.5	22.8	32	23.8	32.8	24.8	32.7	25	32.2	26.5
18	33.5	25.5	35	22.2	33	25.1	30.8	24.5	30	25.3	31.5	23.4	34.2	23.5	34.5	25
19	32.5	24.3	34.4	22.4	32.5	24.4	30	24.2	30	24.8	30.1	24.9	29.2	24	34.1	26
20			34	22.4	32.4	24	31	22.8	30.7	24.4	31.8	23.6	31.7	23.1	34	25
21			33.5	21.1	32.7	23	32.5	23.8	31.2	23.2	31.5	23.3	32.2	22.6	34.2	24
22			33.7	21.6	31.9	22.8	34	24	31	24	31.9	23.5	32	22	34.3	23.7
23			33.7	20.9	31.9	23.3	34.5	23.5	32.5	23.6	33	24.4	32.7	23.1	34.1	24.1
24			32.5	21.2	32.8	23.8	35	23.8	32.2	24.7	33.5	24.2	33.3	23.6	33.5	23.6
25	32.8	23.1	34.5	21.2	34	23.1	34.8	24.4	31.8	24.8	33.1	24.2	33.8	23	33.5	23.6
26	32.4	23.4	34.9	21.9	32	23.6	33.4	23.5	31.6	25	33.1	23.4	32.7	23	33.3	27
27	31.9	23.5	34	22.4	27.1	23.3	30.5	23.2	32.3	23.9	32.9	24.1	33.8	23.1	33.3	26.3
28	31.3	22.5	34.9	23.6	31	23.5	33	23.2	31.5	24.2	32.5	24.3	33.8	23.5	34.9	25.6
29	28.5	22.6	34	22.9	29.5	23.3	31.9	23.4	30.6	21.4	31.3	24.4	33.8	23.4	34	27.4
30	30.5	23.5	34	21.5	29.5	23.4	32	23.6	32.1	24.2	32.3	23.5	32.3	21.6	32.8	24
Mean	31.6	22.7	33.3	22.3	31.2	23.5	32.6	23.7	31.3	23.8	32	23.9	33.6	22.7	33	25.5



Maximum and minimum temperatures at the stations of the Weather Bureau, April, 1916—Continued.

Day.	Ormoc.		Guiuan.		Tacloban.		Capiz.		Borongan.		Catbalogan.		Calbayog.		Masbate.	
	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.
	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.
1	30.4	20	32.3	24	30.5	23	31.9	22.8	32	21.3	30	19.2	32.6	20.7	31.2	22.6
2	30.4	18.7	32.3	23.6	32	22.7	32.2	21.8	33	21.9	30.2	19.5	34.3	19.9	33	22.5
3	32.1	22.9	32.4	24.1	33.1	24.9	32.7	23.1	32.6	22.4	30.3	22.7	33.7	23	33.8	23.8
4	33.3	21.8	31.7	24.5	33.3	24.9	32.4	24.2	31.9	21.7	31.5	20.9	34	22.3	33.4	24.8
5	32.2	21.2	32.2	23.9	32.9	23.8	32.3	23.4	31.5	22.2	31.5	20.9	35.1	21.4	33.4	24.2
6	32.3	24	32.5	25.9	31	24.3	32.5	25	31	23.2	31.1	22.5	34.1	22.7	32.6	23.6
7	31.9	23	28.9	25.1	30	23.5	31.8	23.7	30.5	24.2	31.3	22.2	34.3	22.5	32.5	24.6
8	33.2	23.5	30.8	23.6	32.6	23.6	31.6	24.9	30.5	23.9	32.8	22.4	34.1	23.6	31.8	25.2
9	29.4	22.6	30.7	23.5	28.5	23	32.8	24	29.2	22.8	30.2	21.6	33.1	22.5	32.6	24.5
10	31.5	21.1	31.5	24.3	31.6	22.9	32.7	23.7	31	21.9	32.7	21.3	34.3	22	32.2	21.27
11	31.2	23.4	31.2	22.8	30.4	23.5	32.3	25	30.5	22.9	31.8	21.8	35	23	33.4	21.8
12	32.3	24.3	31.9	25.3	31.9	23.7	32.3	25.2	30.8	24.7	32.2	23	35.3	23.2	33.4	23.8
13	33.1	23.1	32.1	25.5	32.5	23.3	32.8	24.9	31.4	26.2	33.1	23.2	34.9	22.9	33.6	24.5
14	32.3	23.1	31.9	24.4	31.7	23.7	32.6	25.4	31.4	24.5	33.5	21.9	33.9	23.1	33.4	26
15	33	23.1	31.6	24.9	33.1	24.4	32.1	25.1	31.2	24	32.9	21.5	35	23.3	32.2	24.4
16	31.7	24.7	31.4	24.7	29.3	24.9	32.3	24.2	30.5	24.6	30.9	22.1	33.2	23.8	30.6	25.2
17	29.8	23.3	28.5	23.4	27.9	23.6	32.5	25.3	27	22.3	27.1	24.1	26.2	24	29.5	25
18	31.1	25.3	29.9	25.2	30.8	24.6	32.4	25.9	31	24.3	30.3	24.5	30.9	25.1	27.2	24.2
19	31.1	24.4	31.9	26	31.4	24.4	33.8	25.1	34	22.9	30.3	23.9	33.2	24.1	31.4	23.8
20	31.5	23	31.7	23.7	31.9	23.6	33.2	24.4	31.6	22.4	30.8	22.1	34	22.4	31.5	25
21	31.4	22.8	34.1	23.4	32.1	23.2	33.4	23.2	31.5	22	30.9	22.2	33.1	22.4	32	24.5
22	31.1	22.3	33.2	23.2	33.7	23.5	33.1	23.1	31.9	22.4	31	22.5	32.6	22.7	32.2	23.8
23	31	21.7	34.2	23.7	31.5	23.3	33.7	23.7	31	22	31.1	22.8	32	22.6	31.2	21.57
24	31.8	22.2	33.3	23.1	31.9	24.9	32.6	23.7	31.4	23.4	32	24	33.9	22.7	33.6	21.27
25	32.3	22	32.8	22.7	32.6	23.5	33	23.9	31.5	22.4	31.7	22.2	34.4	22.5	33.6	23.2
26	32.7	22.8	32.7	22.7	32	24.3	33.4	24.5	31.2	23.4	31	22.9	30.2	22.8	33.4	23.4
27	29.2	22.6	27.8	23.5	27.9	23.5	34	25	29.2	23.9	30.3	22.5	31.5	23	32.6	24.5
28	32.3	22.4	31.7	23.7	31.7	23.3	32.8	24.8	31.1	22.7	30.4	22.6	31.2	22.4	32.8	24.6
29	31	23.6	32.4	21.6	31.7	22.8	33.7	24.8	31.1	22.9	31.1	22.9	30.8	23.2	32.6	25.4
30	32.4	22.4	31.3	24.5	32.2	23.9	32.9	24.4	31.2	22.7	30.7	21.5	33.9	22	32.4	24.6
Mean	31.6	22.7	31.7	24	31.5	23.8	32.7	24.3	31.1	23.1	31.2	22.2	33.2	22.7	32.3	23.9

Day.	Romblon.		Batag.		Legaspi.		Sumay, Guam.		Calapan.		Virac.		Naga.		Batangas.	
	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.
	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.
1	33.8	23	29.8	22	31.5	21.7	30.8	23.3	33.2	21.5	31.4	19.2	32.2	18	34.6	21.3
2	33.7	21.7	30	23.4	31.5	22.3	30.8	25.4	33	22.1	32	19.8	31.2	17.6	34.3	23.4
3	32.6	21.7	31	24	33	22	30.6	24.8	33.6	21.9	31.7	21.5	32	18	35.2	22.3
4	34.1	21.1	30.8	24.1	32.2	22.2	31.2	24.4	33	21.1	32.2	20.4	31.4	19.2	34.5	22.2
5	33.9	2.3	30.2	24	31.2	22.2	31.4	25	27.5	23.4	30.6	21.2	29.8	19.7	29.6	23.9
6	33.6	21.7	30.4	24	30.9	25.5	31.2	24.6	31.6	22.2	31	21.6	31.3	21.6	34.1	24.3
7	34.3	24.5	30.5	24.5	31.3	24.4	30.8	24.2	32.7	23.4	30.9	21.8	32.5	19.4	35.4	23.3
8	32.7	25.2	28.5	22	30.5	25.6	31.2	24.6	32	25	30.7	22.1	32.2	20.1	34.9	24.3
9	31.6	24.4	30	22.5	30.1	24.6	30.8	24.8	32	23.6	31.4	22.3	33.2	21.5	35.2	24.6
10	33.2	24.3	29.5	23.3	31.6	24.5	29.6	24.2	32.1	23.2	32.8	20.7	31.4	19.5	35.2	24.3
11	34	23.8	30	25.1	31.5	25.1	30.6	23.4	31.4	24.2	31.6	22.2	33	19.1	35.9	23.9
12	34.2	24.2	29.6	24.1	30.1	25	30	23.4	32	23.8	32.4	22.4	31.9	19.2	35	23.9
13	33.6	25.2	30	23.2	31.6	25	28.2	24.2	32.5	24.9	32.7	22.3	33.3	20.4	36.5	23.9
14	35	24.9	30.2	24.5	31.4	25	29.4	22.8	31.6	25.5	32.3	22	33.4	19.8	34.8	23.5
15	34.2	24.9	30.5	24	31.8	25.6	30	25	32	24.3	32.5	20.2	32.4	18.4	36.5	22.6
16	35.2	23	30.4	25	31.6	24.2	29.8	23.4	31.5	21.5	31.2	20.9	31.5	17.9	36.5	20.2
17	33.4	24.2		23	27.6	23.7	30.6	24.4	33.5	24.4	29.3	22.7?	29	21.4?	35.8	24.4
18	32.7	24.5			32.5	24.2	30.4	25	35	23.1	30.1	21.5	30	22.1	34.6	23.9
19	34.8	23.8	30	23	31.7	23.7	30.2	24.8	32.5	23.5	31.5	21.7	31.3	20.1	33.3	22.9
20	34.2	22.7	30	24.1	31.5	22.5	29.2	24.4	32.5	22	33.5	21	31.3	21.2	34.5	23.3
21	34.6	23.3	30.6	23.5	31.8	22.2	30.6	24.4	33.1	22	33.2	20.6	32.5	19.5	34	23.2
22	34.1	23	31.4	23.9	32.1	23.4	30.4	24.4	33	22	33.6	20.1	33	19.6	34.2	23.7
23	35.1	23.6	31.9	23.7	32.5	23.2	30.2	25	32.6	22.2	31.6	20	33.4	18.3	34.8	24.3
24	34.5	22.3	31.9	23.8	32.5	25.4	30	25.2	33.1	22	32	21.3	35.1	21.2	35.8	23.5
25	34.6	22.9	31.2	24.2	32.8	25.5	30.2	25	33.1	21.5	32.4	21.4	33.5	19.6	36.4	23.9
26	35.1	24	31	24.7	32.8	24	31.2	24.2	34.1	23.5	31.3	21.2	33.5	19.1	35.5	23.7
27	35.2	23.47	31.4	25	32.6	24.4	30.2	25.2	34.4	22.6	31.9	21.1	32.9	18	36.2	23.3
28	34.7	24.3	31.5	22.8	32.1	26.4	28.8	23.3	34.5	23	31.3	21.6	33.1	20.7	35.7	24.6
29	31.3	23.3	31.6	24	31.6	25.1	30.2	23.8	33.4	23.5	32.1	22	34.5	20.3	36.8	23.5
30	34.5	23.9	30.8	24.6	31.9	26.1	29.6	23.8	33.1	23.5	32.8	21.8	32.4	19.3	33.1	24.9
Mean	34	23.6	30.5	23.8	31.6	24.1	30.3	24.3	32.7	23	31.8	21.3	32.3	19.7	35	23.5

Maximum and minimum temperatures at the stations of the Weather Bureau, April, 1916—Continued.

Day.	Lucena.		Atimonan.		Ambulong, Tanauan.		Canlubang, Calamba.		Paracale.		Santa Cruz, Laguna.		Manila.		Antipolo.	
	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.
	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.
1	32.8	20.9	31.5	23.1	34.8	21	33.6	20.4	31	22.2	33.2	21.9	33.2	22	34.4	21.2
2	33.5	22.2	31.1	24.4	36	22.6	33.4	23	30.8	21.7	33.1	22.6	34.4	23.2	35.3	21
3	34	21.3	31.3	25.6	36.1	21.5	33.9	21.2	31.4	21.6	33.6	21	33.5	21.6	35	22
4	32.9	21.5	30.7	25.9	35	22.2	33.4	21.2	31.8	22.5	32.8	22.6	33.4	23	33.5	22.5
5	26.5	23.1	27.3	23.6	29	25	31.3	23.2	29.4	24.2	29.5	23.3	30.5	23.2	30.8	22
6	30.5	22.7	30.4	24.1	31.3	24	30.6	22.4	29.4	25	30.2	22.5	31	23	30.1	21.8
7	31.7	22.3	30.6	25.1	33.9	24.6	32.8	23.8	30.8	25.5	31.5	23.9	32.5	22.3	33.6	21.5
8	31	23	28.2	25.1	32.3	24.8	32.8	23.8	30	24.4	30.4	23.7	34.1	21.4	33.6	23
9	31.4	23.2	29.6	23.7	32	24.7	30.6	20.2	30.5	24.3	30.1	23.2	32.5	22.4	32.4	21.6
10	31	24.1	31.7	25.2	32	24	31.1	24.6	30	24.7	31	23.7	32.2	21	33.7	22.5
11	32.5	23.5	29.7	24.3	33.1	24.1	32.9	22.6	30.8	25.6	30.6	23.1	34	21.5	33.9	21.5
12	31.1	23.4	29.9	24.8	32.7	24.2	31.9	22.8	30	24	31.1	22.6	32.9	22.5	33.7	22.5
13	32.2	23.7	31.7	24.7	33.8	23.8	32.5	23.4	31	25	31.7	23.7	34.8	22.5	34.7	21.7
14	31.6	24	29.5	25.3	34	24.6	32.7	22.2	30.1	23.5	32.3	23	33.3	21.7	34.3	21.6
15	31.6	22.8	30.5	25.4	34.2	22.8	33.3	21.6	30.8	24	32.1	22	34.1	21.4	36	20.3
16	31	20.6	29.1	25.3	33.8	22.7	32.5	22.1	30.8	22.4	31.9	19.2	32.5	20.4	33.6	19.3
17	31.5	24.4	28.7	25	35.3	23.8	34.3	23.4	29.8	25.4	32.5	24	34.4	22.7	35.5	21.8
18	32.6	23.6	30.1	25.1	36.8	23	35.6	22.6	29.3	25.2	33.8	23.7	33.8	22.9	35.3	22.2
19	31.6	23.5	32.7	24.5	35.7	22.5	33.4	22.1	30.4	24.8	33.8	23.1	32.4	23	33.4	22
20	32	23.8	32.6	23.2	35.7	23	34.7	21.4	30.3	23.8	34.1	23.3	32.8	22.5	34.2	21.3
21	31.9	23.2	32.3	22.9	36.5	23.3	33.8	22.5	31	23	33.7	22.8	32.7	23.7	34.5	21.3
22	32.5	23.3	31	23.8	37	23.6	33.8	22.1	31.1	23.6	33.9	23.6	32.8	24.2	34.5	22.5
23	32.5	22.5	33.1	22.1	37.8	25.1	35.6	23.6	31.9	22.5	33.9	24.1	33.9	24.7	36	23.3
24	32.1	22.3	33.4	22.7	37.5	24.8	35.2	24.2	32	23.8	35	23.3	35	25.2	35.1	22.6
25	33	22.5	32.4	23.2	38	23.5	35.6	23	31.6	24	34.9	22.9	33.7	24.5	34	21.2
26	33.5	22.4	32.5	23.4	37.5	23.3	35.3	22.2	32	23.5	34.4	22.9	34.2	24.3	34.5	21.3
27	33.5	22.8	31.1	27	33	22	34.6	23.3	31.2	24.2	34.3	22.6	34.2	22	35.7	20.7
28	33	23.5	31.2	23.6	35.8	24	35.4	23.2	31.9	24.3	34.6	23.4	35	23.2	34.3	22.3
29	33.3	23.5	31.9	25.8	35.8	24	35.5	22.8	32	24.5	34.8	23.4	34.2	23.2	35.3	21.6
30	32.3	23.7	32.5	26.9	30.9	23.8	34.6	22.3	31.2	24.9	33.3	23.4	33.7	23	35.4	21.9
Mean	32	22.9	30.9	24.5	34.6	23.5	33.6	22.6	30.8	23.9	32.7	23	33.4	22.7	34.2	21.7

Day.	Iba.		San Isidro.		Tarlac. <sup>1</sup>		Baler.		Dagupan.		Bolinao.		Baguio.		San Fernando, Union.	
	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.
	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.
1	32.4	20.5	37	21.4	38	22.1	32	22	32.2	22.8	33.4	22.7	23.7	15.6	32.7	22
2	32.3	22	36.6	23	37	22.4	30.7	23.1	35.6	23.5	33	24.4	24.6	15.5	33.5	22.5
3	32.5	21	37	21.7	37.8	21.5	30	20.6	33.7	22.8	33.5	22.7	24.5	15.1	33.2	21.3
4	32.4	19	36	23.1	37.5	22.2	32.1	20.2	35.2	23	33	23.3	25.9	13.3	33.3	21.5
5	32.4	22.9	29.1	22.5	38.1	22.5	30.2	22.8	34.9	22.8	32.7	25.5	21.8	14.7	32.1	23.5
6	32.4	22.8	31.6	23	38	22.5	28	22.3	34.4	23.4	33.4	22.6	23.9	14.2	32	23.4
7	33.2	20.9	31.9	22.7		22.5	28	22.2	33.8	22.9	32.9	24.3	23.5	14.5	32.5	22.8
8	34.8	22.7	32.6	22			30.4	22.7	36.6	23.4	34.7	24.3	24.2	13.7	32.9	23
9	33.1	20.8	33.3	21.9	38.5	22.4	31.7	22.5	35.1	23	34.9	24.8	24.2	15.4	33.8	22.2
10	32.8	20.8	34.3	21	38.2	22.2	31.4	22.3	34.3	23	33.9	23.9	23.3	15	33	22.4
11	34.9	23.2	33.4	22	36	22.5	30.3	24.8	37	23	34.4	24.8	25.2	15.5	33.7	24.5
12	33.6	22.5	34.2	22.2	37.5	22.3	31.1	24.6	36.7	23.9	35.1	24.6	24.8	14	33.4	23.3
13	34.7	21.8	33.8	23.4	39	22.8	31.1	23.8	37.7	23.5	35.7	24	25.8	15	34	23.6
14	33.6	22.4	34.7	20.5	39.4	23	31.1	21.5	37.2	22.5	33.7	23.9	24.9	15.8	33.9	22.2
15	32.9	21.9	35	22	39.1	23	31.6	22.1	36.4	23.6	35.6	23.2	24.9	15	34	23.3
16	33	21.5	34.6	21.5	38.4	22	31.4	21.5	36.1	23.5	35.1	24.6	26.3	15.2	34.3	25.3
17	32.8	21.4	36.1	22	39.5	22.4	32.4	22.3	34.2	22.5	34	22.9	25.4	16.2	33.6	23.1
18	33.5	22.2	36	22.7	39	22.3	33.3	22	33.5	23.4	33.8	24.1	24.6	16.7	34.3	24.5
19	32.8	19.9	35.5	22.8	38.4	22.9	31.5	22	34.1	23.2	32.9	24.1	24.6	15.6	34.5	24.5
20	32.5	19.4	35.4	21.9	38.6	21	33.2	21.6	32.5	22.8	32.9	22.1	24.8	14.7	33.5	21.5
21	32.7	19.3	35.4	23.2	38.6	22.1	33.2	22.4	32.2	24.6	32.8	25.1	23.7	14.7	33.7	22
22	32.8	20	35.3	23.6	38.4	22.2	34	23.1	33.2	24.5	34	23.4	25.1	15.7	33.8	24.5
23	32.9	22.6	34.5	23.7	38.5	23.4	34.1	22.2	35.1	24.3	34.2	24.6	25.9	15.4	34.8	23.4
24	32.7	22	35	23.4	37.5	23.4	34.5	24.4	36.2	23.6	34.2	24.3	24.7	15.6	34.3	24.2
25	34	23.3	34.4	23.5	37.5	22.6	34.4	23.8	33.7	22.5	33.8	26	24.1	15.4	34	24.7
26	33.7	24.9	35.5	23.1	37.6	23	31.7	22.4	33.7	24.1	34.4	24.9	22.8	16.1	34.5	24.2
27	33.8	21.9	34.9	22.3	37.2	22.8	32.1	21.5	34	23	35.1	24.9	23.7	15.2	33.8	23.2
28	33.7	21.5	35.5	22.8	38.4	23	33	23.2	35.2	23.3	34.2	25	24	16	35.5	24
29	33.9	22	34.5	22.7	36.7	23.4	32.8	23.1	37.7	23.2	35.6	24.6	23.8	15.5	35	24.5
30	34	21.5	33.6	22.6	38.4	23	32.8	23.4	35.7	23	34.8	24.4	23.3	15.6	34.7	23.8
Mean	33.2	21.6	34.6	22.5	38.1	22.5	31.8	22.5	34.9	23.3	34.1	24.2	24.3	15.3	33.7	23.3

<sup>1</sup>The maximum temperatures of this station are not very reliable: they seem to be too high.

Maximum and minimum temperatures at the stations of the Weather Bureau, April, 1916—Continued.

Day.	Echagüe.		Candon.		Vigan.		Tuguegarao.		Laoag. <sup>1</sup>		Aparri.	
	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.
	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.
1	22.9	31.6	22.5	31.4	22	35	23	35.2	22.5	30.3	22.9	30.3
2	22.9	31.5	23.5	31.4	21.8	36	21.5	35.4	21.9	30.1	23.8	30.1
3	21.5	32.4	22.5	31.5	22	33.6	21	34.8	21.7	30	22.1	30
4	23.4	31.6	22.2	30.8	22	30.2	22.6	33.3	23.4	27.9	23.5	27.9
5	21.5	31.7	24.4	30.6	21.4	29.3	21.6	34.9	22.8	25.8	22.8	25.8
6	19.9	31.5	24	31.6	22.4	29.5	21	36.4	22	25.6	21.7	25.6
7	21.4	32.4	25.4	32	22.6	30.2	21.8	36.2	22.9	27.2	21.9	27.2
8	21.3	31.6	24.5	33.4	23.8	35.3	21.9	36.4	21.8	30.1	22	30.1
9	19.4	32	24.5	33.1	24.2	35.8	21	36	22.1	29.8	20.8	29.8
10	19.9	31.5	24.1	31.3	23	37.1	21.4	35.8	22.6	31.4	22.8	31.4
11	21.7	32	24	31.4	23.4	37	23	35.2	21.4	31.6	22.8	31.6
12	20.7	32.5	23.5	32.4	23.4	37.6	21.5	35.7	21.5	31.5	21.8	31.5
13	21.5	32	24.4	32.2	23.4	35	22	35.9	22.1	31	22.7	31
14	18.2	32.2	24.2	32.2	24.6	38.2	20.5	35.2	22	32.9	23	32.9
15	21.2	32	24	32	23.3	39	22.8	34.3	22.9	31.7	23.5	31.7
16	20	32.2	25.1	31.7	23.8	38.4	22	36.8	19.3	31.2	21.3	31.2
17	21.4	32.3	25.4	32.1	25.3	36.1	22.5	35.9	19	31.1	22.8	31.1
18	21.4	32.5	25.6	32.3	24.3	34	23.8	36.2	24.5	30.5	24.5	30.5
19	22	32.7	24.4	32.3	23.8	35.3	23.3	34.7	23.7	30.6	23.2	30.6
20	34.1	22.5	32	32.2	23.2	35.6	20.7	34.7	23.1	30	23	30
21	33.6	21.8	32.5	24.5	31	35.2	21.8	35	23	30.2	22.8	30.2
22	34.6	22.8	32.5	24.7	31	36.3	21.6	36.4	21.5	29.7	23	29.7
23	34	22.8	32	24.5	31.6	35.2	22.3	36.5	22.1	29.8	24.2	29.8
24	35	23.2	32.5	24.2	32.8	38	23.1	35.7	22.7	30.3	23.3	30.3
25	34.3	23.3	32.7	25.1	31.5	38	24	35.5	23	30.4	25.1	30.4
26	35.8	22	32.5	24.2	31.8	36	21.5	35.6	22.4	31.3	22.7	31.3
27	34	20.8	32.9	25.2	32.1	35	23.3	35.7	24	31.6	21.8	31.6
28	35.7	21.5	33.4	25.2	32	36.7	24	36.2	24.5	33.1	24	33.1
29	35.2	21.7	33.2	23	32.7	37.5	24	35.1	22.9	32	24	32
30	35.1	21	32.5	24.1	32.5	37.7	23.2	35.1	22.9	32	24	32
Mean		21.5	32.2	24.2	31.9	23.4	35.5	22.2	35.5	22.4	30.4	22.9

<sup>1</sup> The maximum temperatures of this station are not very reliable: they seem to be too high.



## SEISMOLOGICAL BULLETIN FOR APRIL, 1916.

By Rev. MIGUEL SADERRA MASÓ, S. J.,  
*Assistant Director of the Weather Bureau.*

### EARTHQUAKES FELT IN THE PHILIPPINES.<sup>1</sup>

1, 22<sup>h</sup> 53<sup>m</sup> [2, 6<sup>h</sup> 53<sup>m</sup>]. **Oromoc** (W Leyte). Oscillatory earthquake, direction SW-NE, intensity IV-V, duration 9 seconds.

8, 15<sup>h</sup> 15<sup>m</sup> [8, 23<sup>h</sup> 15<sup>m</sup>]. **Tagbilaran** (SW Bohol). Earthquake of intensity III; the rumbling sound which accompanied the earthquake as well as the direction of the shocks apparently came from the SE.

14, 12<sup>h</sup> 16<sup>m</sup> 53<sup>s\*</sup> [14, 20<sup>h</sup> 16<sup>m</sup> 53<sup>s</sup>]. **Central Luzon**. Earthquake of intensity IV felt throughout the provinces of Pangasinan, Benguet, southern Isabela, Nueva Vizcaya, northern Nueva Ecija, and northern Tayabas, or the Baler region. It originated SSW of Nueva Vizcaya in an epicenter frequently mentioned in this bulletin, which seems to correspond to a fault crossing the island from the Gulf of Bolinao, in China Sea, to the Baler Bay, in the Pacific coast. The shaken area was certainly prolonged E-W, extending itself in this direction 200 kilometers, that is, the width of the island at the 16° parallel, and less than 100 kilometers N-S.

23, 13<sup>h</sup> 35<sup>m</sup> [23, 21<sup>h</sup> 35<sup>m</sup>]. **Butuan** (N Mindanao). Oscillatory earthquake, direction SE-NW, intensity III, duration 3 seconds.

25, 23<sup>h</sup> 33<sup>m</sup> 39<sup>s\*</sup> [26, 7<sup>h</sup> 33<sup>m</sup> 39<sup>s</sup>]. **N Luzon**. Earthquake felt with intensity IV-V in the northernmost provinces, Ilocos Norte, Apayao, and Cagayan. Its epicenter lay at some 400 kilometers of distance from Manila, probably near to the end of the Central Cordillera.

28, 10<sup>h</sup> 13<sup>m</sup> 32<sup>s\*</sup> [28, 18<sup>h</sup> 13<sup>m</sup> 32<sup>s</sup>]. **Camarines** (SE Luzon). Earthquake of intensity III.

28, 20<sup>h</sup> 21<sup>m</sup> 07<sup>s\*</sup> [29, 4<sup>h</sup> 21<sup>m</sup> 07<sup>s</sup>]. **NW Luzon**. Earthquake felt along the NW coasts, in the provinces of Ilocos Norte and Ilocos Sur. It had intensity IV and probably originated in the China Sea not far from the mentioned coasts. About an hour later, at 21<sup>h</sup> 45<sup>m</sup> 44<sup>s\*</sup> [29, 5<sup>h</sup> 45<sup>m</sup> 44<sup>s</sup>] occurred a less strong repetition or aftershock proceeding from the same epicenter, some 340 kilometers distant from Manila.

<sup>1</sup>The intensity of earthquakes is given in the notation known as the Rossi-Forel scale. The time is that indicated by the seismographs at the Central Observatory whenever the disturbance has been registered by them. This fact is denoted by an asterisk (\*). Otherwise the time is that noted by the observer who sent the report. All time indications are in Greenwich mean time (midnight=0<sup>h</sup>), insular time being added in brackets for the convenience of Philippine readers.

## RECORDS OF THE MICROSEISMOGRAPH.

[Time: Greenwich mean. Midnight=0h. Instrument: Wiechert seismograph; 1,000 kilograms. AN:  $T_0=6.1$ ,  $\epsilon=3.89$ ,  $\frac{r}{T_0^2}=0.023$   
 AE:  $T_0=6.6$ ,  $\epsilon=2.32$ ,  $\frac{r}{T_0^2}=0.050$ . Alluvium. 2.40 meters above sea level].

No.	Date.	Character.	Phase.	Hour.	Period.	Amplitude.		Remarks.
						$A_N$ $\mu$	$A_E$ $\mu$	
127	1	Iv	eP	h. m. s.				
			L	5 15 35				
			M <sub>E</sub>	18 15	4	17		
			F	31				
128	3	Iv	e	10 36 46				
			M <sub>E</sub>	40 09	6	11		
129	3	Iv	e	10 44				
			F	11 03				
130	6	Iv	eP	1 38 11				
			F	41				
131	7	Iu	eP	9 38 12				
			S	48 07				
			L	59 24				
			M <sub>N1</sub>	10 08 51	16	13		
			M <sub>E1</sub>	09 00	19	21		
			M <sub>E2</sub>	14 18	15	20		
			F	18 32	16	12		
			F	11 04				
132	9	Iv	eP	18 32 55				
			F	36				
133	10	Iv	eP	1 06 42				
			F	09				
134	10	Iv	eP	20 40 42				
			L	41 00				
			M <sub>E</sub>	41 10	1	28		
			F	45				
135	11	Iv	eP	16 00 21				
			F	02				
136	11	Iv	eP	17 14 03				
			L	14 26				
			M <sub>N</sub>	14 28	1	33		
			F	18				
137	12	Ir	e	9 23 17				
			F	53				
138	12	Iv	eP	17 00 29				
			F	15				
139	14	I	e	2 17 33				
			F					
140	14	I	e	2 38 06				
			F	54				
141	14	IIv	eP	12 16 53				
			L	17 13				
			M <sub>N</sub>	17 30	1	145		
			M <sub>E</sub>	17 32	1	174		
			F	35				
142	14	IIv	eP	16 40 42				
			L	40 58				
			M <sub>N</sub>	41 12	1	329		
			M <sub>E</sub>	41 12	1	435		
			F	55				
143	15	Iv	eP	2 12 23				
			L	12 41				
			M <sub>N</sub>	12 42	2	92		
			M <sub>E</sub>	12 43	1	84		
			F	20				
144	15	Ir	e	9 25				
			M <sub>E</sub>	36 36	16	4		
			F	56				
145	15	IIr	eP	12 37 16				
			S	41 47				
			L	47 06				
			M <sub>N</sub>	55 08	17	34		

End overtaken by following earthquake.

Central Luzon.

Records of the microseismograph—Continued.

No.	Date.	Character.	Phase.	Hour.	Period.	Amplitude.		Remarks.
						A <sub>N</sub> μ	A <sub>E</sub> μ	
146	15	I <sub>r</sub>	M <sub>E</sub>	h. m. s.	17	-----	28	
			F	13 55 43				
			eP	15 02 00				
			S	04 22				
147	16	I <sub>v</sub>	L	07 00	6	77	63	
			M <sub>E</sub>	08 32				
			M <sub>N</sub>	08 43				
			F	16 08				
148	16	I <sub>v</sub>	eP	16 54 54	3	-----	24	
			L	59 04				
			M <sub>E</sub>	1 00 16				
149	17	I <sub>v</sub>	F	06	2	-----	34	
			eP	16 52 28				
150	18	II <sub>r</sub>	L	52 44	6-7	-----		
			M <sub>E</sub>	52 48				
			F	55				
151	21	II <sub>r</sub>	e	4 12 19	8	113	134	
			S	17 32				
			F?	5 22				
152	21	I	eP	11 36 57	8	-----		
			S	41 32				
			L	46 07				
			M <sub>N</sub>	47 05				
153	22	I	M <sub>E</sub>	12 12	8	-----		
			L	14 05 24				
			F	24				
154	24	I <sub>v</sub>	e	9 54	-----	-----		
			L	10 08				
			F	08				
155	24	I <sub>u</sub>	e	4 46 14	-----	-----		
			S?	5 49 03				
			L?	5 22				
			M <sub>N1</sub>	8 21 43				
			M <sub>N2</sub>	35 16				
			M <sub>N3</sub>	52 24				
156	24	I <sub>v</sub>	F	9 00 19	18	6		
			eP	35 50				
			L	42 45				
157	24	I <sub>v</sub>	F	10 17	18	12		
			eP	20 50 56				
158	25	I <sub>v</sub>	F	53	-----	-----		
			eP	21 46 32				
159	25	I <sub>v</sub>	F	49	-----	-----		
			eP	23 33 39				
160	26	I <sub>r</sub>	L	34 23	-----	-----		N Luzon. End overtaken by following earthquake.
			eP	23 48 08				
161	27	I <sub>v</sub>	F	52	-----	-----		
			eP	2 41 13				
162	28	I <sub>v</sub>	F	3 15	-----	-----		
			eP	19 19 29				
163	28	I <sub>v</sub>	F	22	-----	-----		Camarines (SE Luzon).
			eP	10 13 32				
164	28	I <sub>v</sub>	L	20	3	-----	21	NW Luzon.
			M <sub>E</sub>	20 21 07				
			F	21 44				
164	28	I <sub>v</sub>	M <sub>E</sub>	22 29	-----	-----		NW Luzon.
			L	29				
164	28	I <sub>v</sub>	F	21 45 44	-----	-----		
			eP	49				

TEMBLORES DE TIERRA SENTIDOS EN FILIPINAS.<sup>1</sup>

1, 22<sup>h</sup> 53<sup>m</sup> [2, 6<sup>h</sup> 53<sup>m</sup>]. Ormoc (W de Leyte). Temblor oscilatorio, dirección SW-NE, intensidad IV-V, duración 9 segundos.

8, 15<sup>h</sup> 15<sup>m</sup> [8, 23<sup>h</sup> 15<sup>m</sup>]. Tagbilaran (SW de Bohol). Temblor de tierra de intensidad III; el ruido sordo, grado I de la escala de Davison, que lo acompañaba y la dirección de los movimientos parecían proceder del SE.

14, 12<sup>h</sup> 16<sup>m</sup> 53<sup>s\*</sup> [14, 20<sup>h</sup> 16<sup>m</sup> 53<sup>s</sup>]. Centro de Luzón. Temblor de tierra de intensidad IV, sentido en las Provincias de Pangasinán, Benguet, parte S de Isabela, Nueva Vizcaya, parte N de Nueva Écija y N de Tayabas, en la región de Baler. Su origen debe colocarse al SSW de Nueva Vizcaya, en el epicentro muchas veces indicado en este boletín, el cual parece coincidir con una falla que cruza la Isla de Luzón desde el Golfo de Bolinao en el Mar de la China al de Baler en el Pacífico. El área de este temblor ciertamente tenía una forma prolongada de E-W, midiendo en esta dirección por lo menos 200 kilómetros, lo ancho de la isla en el paralelo 16° N, y menos de 100 de N-S.

23, 13<sup>h</sup> 35<sup>m</sup> [23, 21<sup>h</sup> 35<sup>m</sup>]. Butúan (N de Mindanao). Temblor oscilatorio, dirección SE-NW, intensidad III, duración 3 segundos.

25, 23<sup>h</sup> 33<sup>m</sup> 39<sup>s\*</sup> [26, 7<sup>h</sup> 33<sup>m</sup> 39<sup>s</sup>]. N de Luzón. Temblor de tierra sentido con intensidad IV-V en las provincias más septentrionales, Ilocos Norte, Apayao y Cagayán. El epicentro estaba a unos 400 kilómetros de Manila, probablemente hacia el extremo de la Cordillera Central.

28, 10<sup>h</sup> 13<sup>m</sup> 32<sup>s\*</sup> [28, 18<sup>h</sup> 13<sup>m</sup> 32<sup>s</sup>]. Camarines (SE de Luzón). Temblor oscilatorio de intensidad III.

28, 20<sup>h</sup> 21<sup>m</sup> 07<sup>s\*</sup> [29, 4<sup>h</sup> 21<sup>m</sup> 07<sup>s</sup>]. NW de Luzón. Temblor de tierra sentido a lo largo de las costas NW de Luzón, en las Provincias de Ilocos Norte e Ilocos Sur. Tuvo intensidad IV y su origen probablemente debe buscarse en el Mar de la China cerca de las mencionadas costas. Una hora más tarde a 21<sup>h</sup> 45<sup>m</sup> 44<sup>s\*</sup> [29, 5<sup>h</sup> 45<sup>m</sup> 44<sup>s</sup>] ocurrió una repetición de menor intensidad, procedente del mismo epicentro, el cual distaba de Manila unos 340 kilómetros.

<sup>1</sup> La intensidad de los terremotos se indica conforme a la conocida escala de Rossi-Forel. Cuanto a la hora de su ocurrencia, adoptamos la indicada por los sismógrafos de este Observatorio siempre que los hayan registrado, distinguiéndola por medio de un asterisco (\*). En caso contrario copiamos la apuntada por los observadores que nos envían las notas. Todas las indicaciones del tiempo se refieren al tiempo medio de Greenwich (medianoche=0<sup>h</sup>). Para conveniencia de los lectores de Filipinas se añade también el tiempo insular.







THE GOVERNMENT OF THE PHILIPPINE ISLANDS

# WEATHER BUREAU

MANILA CENTRAL OBSERVATORY

---

BULLETIN FOR MAY, 1916

---

PREPARED UNDER THE DIRECTION OF

REV. JOSÉ ALGUÉ, S. J.

DIRECTOR OF THE WEATHER BUREAU

MANILA  
BUREAU OF PRINTING  
1916



---

---

**BULLETIN FOR MAY, 1916.**



# METEOROLOGICAL BULLETIN FOR MAY, 1916.

By Rev. JOSÉ CORONAS, S. J.,  
Chief, Meteorological Division of the Weather Bureau.

## GENERAL WEATHER NOTES.

Pressure and temperature.—With the exception of a few stations of Luzon, the mean atmospheric pressure of this month has been lower than that of the preceding year and than the May's normal, especially in the Visayas and Mindanao. The highest pressures were recorded on the 9th and 17th; and the lowest on the 3d in the Visayas and Mindanao, and on the 28th in Luzon.

The mean monthly temperature has been also lower than the normal and than the mean for May, 1915, except in northern Luzon, where it has been somewhat higher than the preceding year. The monthly absolute maximum and minimum temperatures for Manila were 35.5° C. on the 21st, and 22.0° C. on the 23d. The extreme temperatures for Baguio were 25.6° C., 14.6° C. on the top of Mirador, and 26.4° C., 13.7° C. in the valley.

PRESSURE AND TEMPERATURE AT THE FIRST AND SECOND CLASS STATIONS FOR MAY, 1916.

Station.	Pressure.						Temperature.					
	Mean.	Departure from May, 1915.	Highest mean.	Day.	Lowest mean.	Day.	Mean.	Departure from May, 1915.	Highest.	Day.	Lowest.	Day.
	mm.	mm.	mm.		mm.		°C.	°C.	°C.		°C.	
Tagbilaran <sup>a</sup> .....	757.57	- 0.79	759.16	9	755.78	3	26.2	- 1.6	32.2	24	21.2	2
Surigao.....	57.55	- .99	59.37	17	55.53	3	26.4	- 1.1	34.1	29	21.5	2
Cebu.....	57.57	- .89	59.40	9	55.48	3	27.5	- 1.4	34	25	22.3	30
Iloilo.....	57.49	- .65	58.98	17	56.08	3	26.9	- 1.8	33.5	11	21.7	6
Ormoc.....	57.80	- .85	59.60	9	55.30	3	26.3	- 1.4	32.2	17, 18, 22	21.1	22
Tacloban.....	57.57	- .93	59.44	9	54.82	3	26.8	- 1.3	33.1	12, 30	22.3	5
Capiz.....	57.83	- .55	59.36	17	56.33	26	27	- 1.4	33.4	15, 25	21.8	6
Calbayog.....	57.78	- .82	59.60	17	55.30	3	26.2	- 1.6	34.2	25	21.6	17
Legaspi.....	57.85	- .36	59.66	17	56.43	3	27.8	- 1.1	32.6	16	22.8	30
Atimonan.....	57.98	+ .16	59.80	17	56.56	28	27	- 1.7	33.1	30	22.3	23
Ambulong, Tanauan.....	57.33	- .51	59.01	17	55.96	28	27.6	- 1.3	34.7	19, 23	22.7	15
Paracale.....	58.21	- .02	59.97	17	56.81	28	27.4	- .7	32.5	21, 31	22.2	6, 23
Manila.....	57.88	- .28	59.74	17	56.34	27, 28	27.4	- 1.8	35.5	21	22	23
San Isidro.....	58.09	- .25	60.07	17	56.57	28	28.1	- .6	36.5	20	21.8	5, 23
Dagupan.....	57.20	- .12	59.14	17	55.52	28	28.7	0	38.7	10	22.4	22
Bolinao.....	57.51	- .16	59.42	17	55.87	28	29	+ .3	37.9	10	21.9	6
Baguio <sup>b</sup> .....	636.26	- .35	637.66	17	635.06	28	18.8	- .4	25.6	19, 27	14.6	22
Vigan.....	757.48	- .16	759.29	17	755.81	28	28.8	+ .2	35.8	5	22.5	13
Tuguegarao.....	58.16	+ .30	59.87	9	56.15	29	28.8	+ .6	40.5	28	21.3	3, 5
Aparri.....	58.22	+ .41	60.23	9	56.06	28	27.6	+ .3	34.2	19	20.6	20

<sup>a</sup> 29 days of observation.

<sup>b</sup> The barometric readings of this station are not reduced to sea level.

Rainfall.—The total rainfall of this month has been greater than the normal and than that of the preceding year in practically all the stations of southeastern Luzon, the Visayas and Mindanao, whilst it has been decidedly lower in central and northern Luzon. The total amount of rainfall for Manila is 10.6 mm. and 66.5 mm. below that of the preceding year and the normal for this month, respectively.

RAINFALL AT VARIOUS STATIONS OF THE WEATHER BUREAU DURING THE MONTH OF MAY, 1916.

Station.	Total.	Departure from May, 1915.	Departure from normal.	Rainy days.	Departure from May, 1915.	Greatest rainfall in a single day.	Day.	Station.	Total.	Departure from May, 1915.	Departure from normal.	Rainy days.	Departure from May, 1915.	Greatest rainfall in a single day.	Day.
	mm.	mm.	mm.		mm.	mm.			mm.	mm.	mm.		mm.	mm.	
Jolo	426.1	+ 184	+ 224	15	- 5	232.4	6	Calapan	184.4	+ 95.4	+ 22	23	+ 10	78	3
Isabela, Basilan	131	- 178.3	+ 4.8	13	- 5	32	6	Virac	277.1	+ 203.7	+ 131.9	22	+ 11	27.9	7
Zamboanga	162.6	+ 116.9	+ 85.7	13	+ 6	44.9	6	Naga	324.5	+ 250	+ 209.4	19	+ 9	58	3
Davao	157.4	- 17.1	- 75.1	6	- 7	38.3	1	Batangas	92.4	+ 71.1	- 16.3	13	+ 7	34.8	4
Cotabato	182.3	- 61.6	- 43.5	22	+ 4	31.3	7	Lucena	218.2	- 16.3	- 16.3	16	- 7	62.7	3
Cagayan, Misamis	106.4	+ 62.1	- 14	+ 1	26.7	7	Atimonan	505.7	+ 472.5	+ 336.9	24	+ 14	71.9	3	
Dapitan	285	+ 159.6	+ 179.3	20	+ 8	53.3	23	Ambulong, Tanauan	67.3	- 31.1	- 31.1	13	+ 6	14.2	4
Butuan	302.5	+ 153.6	+ 153.6	23	- 1	69.3	27	Canlubang, Calamba	127.1	- 16.1	- 16.1	16	- 1	24.8	10
Dumaguete	118.8	+ 39.7	- 15	+ 7	24.4	5	Paracale	357.6	+ 204.8	- 20	+ 3	58.2	20		
Tagbilaran <sup>a</sup>	195.4	+ 136.17	+ 91.2	- 15	- 7	24.4	5	Santa Cruz, Laguna	195.1	+ 96.3	- 22	+ 9	44	7	
Iwahig	225.7	+ 98	- 20	+ 4	37.9	9	Manila	39.8	- 10.6	- 66.5	15	+ 6	9.3	7	
Surigao	374.7	+ 329.7	+ 233.4	16	+ 7	119.4	1	Antipolo	61.8	- 91.3	- 15	+ 3	36.1	29	
Maasin	300.2	+ 157.3	+ 170.8	11	+ 4	115.5	2	Iba	132.4	- 52.8	- 120.4	12	- 1	53.4	13
Cebu	187.7	+ 151.1	+ 95.1	12	+ 5	64.8	30	San Isidro	86.1	- 112.9	- 103.8	9	- 6	51.8	21
Iloilo	245.8	+ 114.8	+ 80	15	+ 5	120.4	4	Tarlac	156	+ 56.4	- 27	10	+ 4	53.3	19
San Jose Buenavista	206.3	+ 39.8	+ 38.2	13	- 1	81.3	3	Baler	243.7	- 18.7	- 43.5	20	+ 3	42.9	27
Cuyo	288.2	+ 133.9	+ 116.1	14	+ 1	93	26	Dagupan	241.6	+ 64.1	- 24.9	12	- 3	64.8	18
Ormoc	260	+ 186	+ 172.5	16	+ 6	128.1	2	Bolinao	148.3	+ 26.4	- 27.8	13	0	64	29
Guiuan	546.6	+ 471.2	- 22	+ 11	114	2	Baguio	312	+ 7.9	- 115.8	17	- 1	36.5	21	
Taloban	340.1	+ 212.9	+ 183.1	20	+ 4	131	2	San Fernando, Union	216.9	- 129	+ 20.8	8	- 1	152.9	29
Capiz	327.2	+ 250.6	+ 146.3	19	+ 8	105.6	2	Echagüe	84.2	- 200.7	- 74.6	6	- 11	31.7	21
Borongan	417.4	+ 335.2	+ 180.9	20	+ 5	55.6	7	Candon	131	- 62.6	- 81.1	8	- 5	55.6	13
Calbayog	166.4	- 175.4	- 53.5	19	+ 12	77.1	5	Vigan	89.2	- 265.6	- 46.6	9	- 6	36.8	21
Catbalogan	214.9	+ 175.4	+ 53.5	19	+ 12	77.1	5	Tuguegarao	76.4	- 166.5	- 47.8	5	- 10	37.6	29
Masbate	98.7	- 75.1	+ 15.8	9	- 2	42.2	3	Laosg	154.6	- 698.1	- 70.5	6	- 14	45.2	13
Romblon	217.5	+ 154.6	+ 94	20	+ 7	66.8	9	Aparri	64.5	- 66.1	- 43.9	4	- 11	57.1	20
Batag <sup>b</sup>	169.7	+ 158?	- 36.1	5	- 12	117.2	3	Santo Domingo, Batanes	42.4	- 550.6	- 208.3	6	- 17	15.7	31
Legaspi	477.9	+ 415.6	+ 331.2	21	+ 12	117.2	3								
Sumay, Guam	478.9	+ 429.3	+ 363.8	22	+ 14	114.3	9, 10								

<sup>a</sup> 29 days of observation.

<sup>b</sup> 28 days of observation.

DEPRESSIONS AND TYPHOONS.

Three depressions or typhoons were observed during this month in the Far East, one of them having formed near Jolo Island, and another having crossed the Visayan Islands in the form of a shallow depression.

THE DEPRESSION OF APRIL 29 TO MAY 5, 1916.

Judging from the observations of Guam and from those taken on board the U. S. A. T. *Sheridan* on her trip from Guam to the Philippines, it would seem that this depression was probably formed on April 29 over the Western Carolines to the SSW of Guam, and then it moved almost due W toward the southern part of Samar and the northern part of Leyte. The center of the depression was shown by our weather map for May 2, 6 a. m., as situated between 10° and 11° latitude N and between 127° and 128° longitude E. On the 3d it was clear that the depression was of little importance, and on the 4th it began to fill up within the Visayas between Samar and Panay.

The following typhoon warnings were issued by Manila Observatory regarding this depression:

May 2, 9.15 a. m.—There is a depression or typhoon over the Pacific less than 300 miles east of the southern part of the Visayas, moving probably west.

May 2, 4 p. m.—The typhoon was situated at 2 o'clock this afternoon to the east of the southern part of Samar between 126° and 129° longitude E. and about 11° latitude N, moving W or WNW.

May 3, 9.30 a. m.—The depression is situated this morning near the southern part of Samar, moving west: it seems to be of no great intensity at present.

May 4, 11 a. m.—The depression is still over the Visayas filling up gradually between Panay and Samar.

THE TYPHOON OF MAY 5 TO 14, 1916.

Although it has been impossible for us to obtain any observations made near the center of this atmospheric disturbance, yet it seems almost certain that it was a regular



well developed typhoon. It seems to have formed and developed on the 5th to 7th over the Western Carolines S of Guam near 9° latitude N and 144° longitude E. It began to move WNW on the 7th, keeping that direction until the 9th when it inclined northward. A complete recurving of the track of this typhoon to the N and NE took place on the 10th and 11th, the center of the storm being at the time near 15° latitude N and 135° longitude E. From the 11th to the 14th the typhoon moved ENE, passing about half way between Guam and the Bonin Islands on the 13th.

THE TYPHOON OF MAY 6 TO 22, 1916.

This typhoon formed and developed on May 6 to 7 within 60 miles to the NW of Jolo Island. It was indeed a case of a very small typhoon: and hence, the telegraphic communication with Jolo being interrupted, it was absolutely impossible for Manila Observatory to announce it. The meteorological observations made at Jolo on May 6, 7, and 8 are given in the following table:

METEOROLOGICAL OBSERVATIONS MADE AT JOLO, MAY 6 TO 8, 1916.

Date and hour.	Pres- sure. <sup>a</sup>	Wind.		Rainfall.	State of the sea and its direction.
		Direction.	Force.		
May 6:	mm.			0-12.	mm.
6 a. m.	755.82	S		1	<sup>b</sup> 5.3
2 p. m.	54.52	S		1	5.1
May 7:					
1 a. m.	53.95	SSW		3	Smooth.
2 a. m.	53.25	SSW		4	Do.
3 a. m.	52.81	SbyW		5	Slight.
4 a. m.	53.15	SbyW		5	Do.
5 a. m.	53.84	S		6	Moderate from NW.
6 a. m.	53.24	SbyE		7	Do.
7 a. m.	52.42	SbyE		11	227.3
8 a. m.	53.55	SbyE		10	32.5
9 a. m.	53.84	S		8	Do.
10 a. m.	54.29	S		7	Do.
11 a. m.	53.94	S		8	Do.
Noon	53.82	S		9	Do.
1 p. m.	53.64	S		7	Moderate from NW.
2 p. m.	53.48	S		6	Do.
3 p. m.	52.87	S		6	Do.
4 p. m.	53.01	S		6	4.6
5 p. m.	53.37	S		6	Do.
6 p. m.	53.83	S		6	8.4
7 p. m.	53.92	S		6	Do.
8 p. m.	54.14	S		7	Do.
9 p. m.	53.69	SbyE		8	Do.
10 p. m.	53.94	SbyE		9	Do.
11 p. m.	54.29	S		7	Do.
May 8:					
1 a. m.	53.84	S		7	Do.
2 a. m.	53.05	S		7	Do.
3 a. m.	53.56	S		8	Do.
4 a. m.	53.43	S		7	Do.
5 a. m.	54.51	S		7	Do.
6 a. m.	54.81	SbyW		7	43.7
8 a. m.	56.40	SW		7	.5
10 a. m.	57.15	SW		5	Do.
2 p. m.	56.88	SSW		3	2

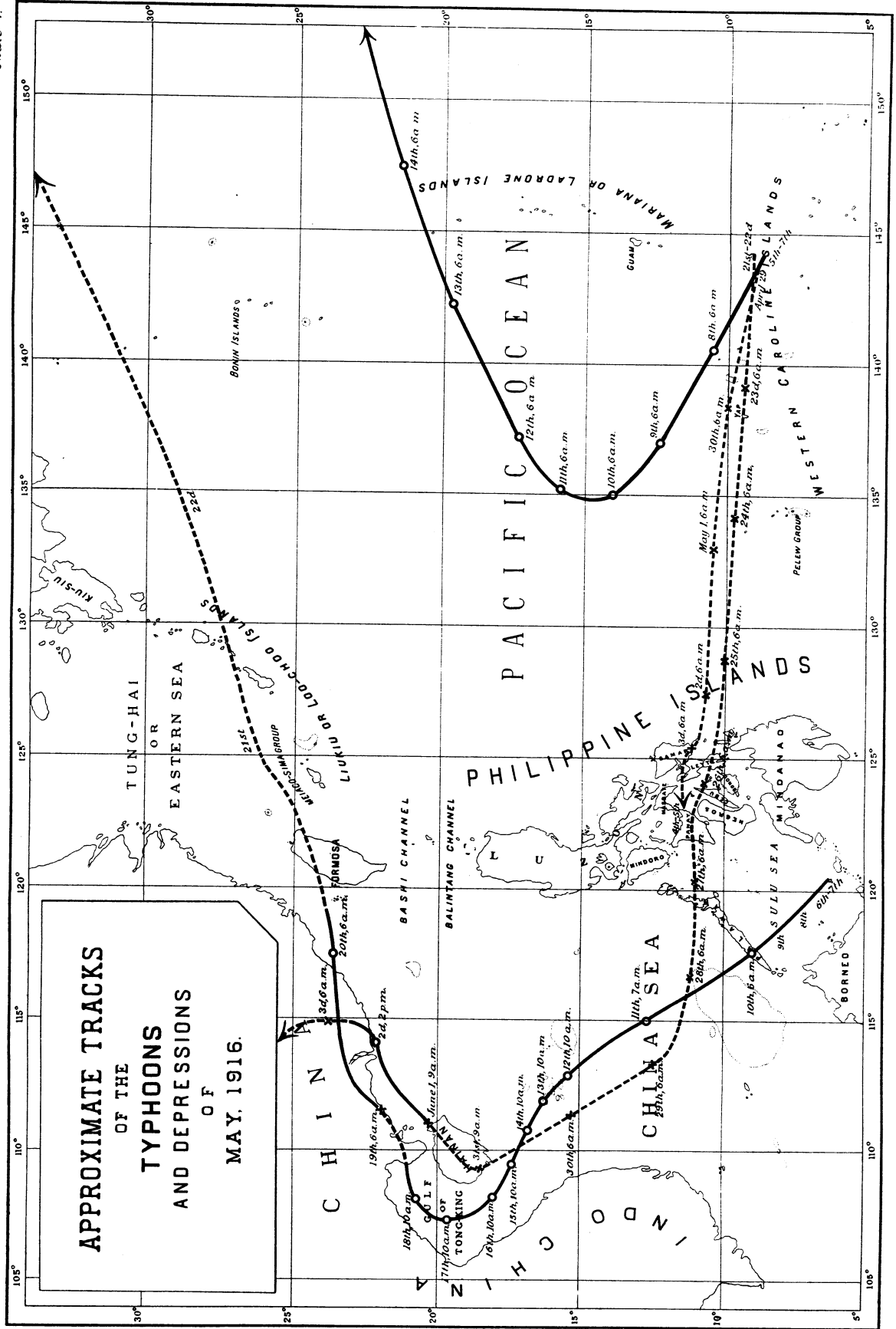
<sup>a</sup> These barometric readings seem to be about 1 mm. too low.

<sup>b</sup> Rainfall since 2 p. m. of the preceding day.

Our observer of Jolo gave a few details on the effects of this typhoon in two letters dated May 10 and 15. The damage done by the hurricane winds was estimated at ₱60,000. About 30 or 40 per cent of all kinds of plants were destroyed throughout the Island of Jolo; many trees were uprooted, and many nipa houses thrown down during the height of the storm. Several houses of strong materials were damaged and partially unroofed. There were four persons killed and two wounded in a house smashed by a falling tree.

It is very probable that the typhoon moved NW as it met the S. S. *Albay* on the 11th in 115° 02' longitude E and 12° 39' latitude N. The observations taken on board this steamer are altogether too interesting not to publish them here in their entirety.

Plate V.



METEOROLOGICAL OBSERVATIONS MADE ON BOARD THE STEAMER "ALBAY" MAY 8 TO 12, 1916.

(Capt. E. YREZABAL.)

Date and hour.	Position.		Pres- sure.	Wind.		Date and hour.	Position.		Pres- sure.	Wind.	
	Latitude north.	Longi- tude east.		Direc- tion.	Force.		Latitude north.	Longi- tude east.		Direc- tion.	Force.
May 8: a Noon	°	°	mm.		0-12.	May 11: 4 a. m.			753.5	NE	
May 9: Noon	10 39	109 41	760.1	NE	2	5 a. m.			52.8	N	
4 p. m.			59			6 a. m.			49	NNW	12
May 10: 4 a. m.			58.9			7 a. m.	12 39	115 02	38	Calm	
8 a. m.			59.9	NE	3	8 a. m.			48	SW	12
Noon	11 58	113 02	58.6			10 a. m.			55	SW	
2 p. m.			57			Noon	12 46	115 11	55	S	
4 p. m.			57.9			1 p. m.			55.6	SW	5
6 p. m.			58.3			2 p. m.			55.9		
8 p. m.			58			4 p. m.			56.5		
10 p. m.			56	NE	7	6 p. m.			56.4	SSE	4
Midnight						8 p. m.			57.3		
May 11: 2 a. m.			54.6			10 p. m.			58		
						Midnight					
						May 12: 6 a. m.			58.2		

<sup>a</sup> Departure from Saigon to Manila.

As shown in these observations, the steamer *Albay* was in the vortex of the typhoon at 7 a. m. of the 11th with a barometric minimum of 738 mm., an extraordinary falling of 11 mm. having taken place in one hour. The passing of the vortex on the steamer is thus described in a report which accompanies the observations:

It was at 5 a. m. when the wind began to blow with hurricane force from the N with very heavy mountainous sea. At 6 a. m. the wind backed to NNW blowing with fierce violence while the fury of the sea was simply appalling. From 6 a. m. to 7 a. m. the barometer fell no less than 11 mm., and at 7<sup>h</sup> 05<sup>m</sup> we entered the vortical calm; the sky cleared up, the calm was absolute, and a great number of birds were seen on the deck. Our position at this moment was: 12° 39' latitude N, 115° 02' longitude E. At 7.40 a. m. the wind blew again with hurricane force from SW, its violence decreasing gradually after 8 a. m. The storm was practically over at 10 a. m.

This report and the preceding observations show clearly that this was a typhoon of very small dimensions, as stated above. Taking the isobar 755 mm. as the outer limit of the real body of the storm, it can be safely stated that the latter had a small diameter of hardly a hundred miles or a radius of 50 miles.

After a careful study of a great number of observations from Indo-China, Hainan, the China coast, and Formosa, we came to the conclusion that this typhoon continued moving NW until the afternoon of the 12th when it inclined WNW toward the Gulf of Tongking, at the same time decreasing in its rate of progress; it crossed the Gulf of Tongking on the 16th, 17th, and 18th while recurving N, NE, and ENE; it moved eastward to the N of Hongkong on the 19th; and traversed Formosa and the Loochoos on the 20th and 21st, respectively. It was only a depression when crossing Formosa and the Loochoos.

THE DEPRESSION OF MAY 21 TO JUNE 3, 1916.

This depression was probably formed on May 21 to 22 to the south of Guam near 9° latitude N and 144° longitude E. It moved almost due west and entered the Philippines in the evening of the 25th about half way between Surigao and the southern coast of Samar; it crossed the northernmost part of Palawan Island in the morning of the 27th; and met the S. S. *Albay* in the China Sea at about midnight of the 28th to 29th, in about 12° latitude N and between 113° and 114° longitude E. It is to be remarked, however, that this depression was of very little importance, at least while

crossing the Philippines and passing near the *Albay* in the China Sea. From midnight of the 28th the depression moved NNW toward Hainan, where it recurved northeastward on the 31st. Very probably the depression increased in intensity after leaving Hainan on June 1 while it was moving toward Hongkong where the barometer fell to 748.91 mm. at 6 p. m. of the 2d. The winds in Hongkong, after having backed from S to SSE, ENE, N and NNW, veered again to the E at 7 p. m. of the 2d keeping practically this direction until after 1 a. m. of the 3d; it was probably due to a secondary center formed in the evening of June 2 to the south of Hongkong.

## NOTAS GENERALES DEL TIEMPO.

**Presión y temperatura.**—A excepción de unas cuantas estaciones de Luzón, la presión atmosférica media de este mes ha sido inferior a la del año pasado y a la normal de mayo, especialmente en Visayas y Mindanao. Las presiones más altas se observaron los días 9 y 17; y las más bajas el 3 en Visayas y Mindanao, y el 28 en Luzón.

La temperatura media mensual ha sido también menor que la normal y que la media de mayo, 1915, menos en el N de Luzón, donde ha sido algo mayor que la del año pasado. Las temperaturas máxima y mínima absolutas del mes en Manila fueron 35.5° C. y 22.0° C. registradas el 21 y 23, respectivamente. Las temperaturas extremas de Baguio fueron 25.6° C., 14.6° C. en la cumbre del Mirador, y 26.4° C., 13.7° C. en el valle.

**Precipitación acuosa.**—La lluvia total de este mes ha sido mayor que la del año pasado y que la normal de mayo prácticamente en todas las estaciones del SE de Luzón, de Visayas y Mindanao, al paso que ha sido decididamente menor en el centro y N de Luzón. La cantidad total de lluvia caída en Manila en todo este mes es menor que la del año pasado en 10.6 mm. y menor también que la normal de mayo en 66.5 mm.

## DEPRESIONES Y TIFONES.

Tres depresiones o tifones se observaron durante este mes en el Extremo Oriente, habiéndose formado uno de ellos cerca de la Isla de Joló, y habiendo cruzado otro las Islas Visayas en forma de una depresión dilatada.

## LA DEPRESIÓN DEL 29 DE ABRIL AL 5 DE MAYO, 1916.

A juzgar por las observaciones de Guam y por las que se hicieron a bordo del Transporte Americano *Sheridan* en su viaje de Guam a Filipinas, parece ser que esta depresión se formó el 29 de abril en las Carolinas Occidentales al SSW de Guam, moviéndose luego casi exactamente al W en dirección a la parte meridional de Sámar y septentrional de Leyte. Nuestro mapa del tiempo de 6 a. m. del 2 de mayo indicaba el centro de la depresión entre 10° y 11° latitud N y entre 127° y 128° longitud E. El día 3 no había duda de que la depresión era de poca importancia, y el 4 empezó a deshacerse dentro de las Visayas entre Sámar y Panay.

El Observatorio de Manila dió los siguientes avisos referentes a esta depresión:

Mayo 2, 9.15 a. m.—Hay una depresión o tifón en el Pacífico a menos de 300 millas al E de la parte sur de Visayas, moviéndose probablemente al W.

Mayo 2, 4 p. m.—El tifón se hallaba a las 2 de esta tarde al E de la parte sur de Sámar entre 126° y 127° longitud E y cerca de 11° latitud N, moviéndose al W o WNW.

Mayo 3, 9.30 a. m.—La depresión se halla esta mañana cerca de la parte S de Sámar, moviéndose al W: parece no ser por ahora de mucha intensidad.

Mayo 4, 11 a. m.—La depresión se halla aún en las Visayas, rellenándose gradualmente entre Panay y Sámar.

## TIFÓN DE 5 A 14 DE MAYO, 1916.

Aunque no nos ha sido posible obtener observación alguna hecha cerca del centro de esta perturbación atmosférica, con todo parece casi cierto que era un tifón bien desarrollado. Parece haberse formado y desarrollado del 5 al 7 en las Carolinas Occidentales al S de Guam, cerca de 9° latitud N y 144° longitud E. Comenzó a moverse al WNW el día 7, conservando esta dirección hasta la tarde del 9 en que se inclinó al N. Una completa recurva de la trayectoria de este tifón al N y NE tuvo lugar los días 10 y 11, hallándose entonces el centro del baguio cerca de 15° latitud N y 135° longitud E. Del 11 al 14 el tifón se movió al ENE, pasando a la mitad de distancia entre Guam y las Islas Bonin el día 13.

## TIFÓN DE 6 A 22 DE MAYO, 1916.

Este tifón se formó y desarrolló del 6 al 7 de mayo a menos de 60 millas al NW de la Isla de Joló. Era en verdad un tifón de muy pequeñas dimensiones: de ahí que, hallándose interrumpida la comunicación telegráfica con Joló, fuera absolutamente imposible para el Observatorio de Manila el anunciarlo. Las observaciones meteorológicas hechas en Joló los días 6, 7 y 8 de mayo las publicamos en el texto inglés.

Nuestro observador de Joló nos dió algunos detalles sobre los efectos de este tifón en dos cartas fechadas el 10 y el 15 de mayo. Los daños causados por los vientos huracanados se calculan en ₱60,000. Cerca de 30 ó 40 por ciento de las plantas de toda clase quedaron destruídas en toda la Isla de Joló; muchos árboles fueron arrancados de cuajo, y no pocas casas de nipa derribadas al suelo durante la mayor intensidad del baguio. Varias casas de materiales fuertes sufrieron desperfectos y fueron parcialmente destechadas. Hubo cuatro personas muertas y dos heridas en una casa que fué aplastada por la caída de un árbol.

Es muy probable que el tifón se movió al NW, pues encontró al vapor *Albay* el día 11 en los 115° 02' longitud E y 12° 39' latitud N. Las observaciones hechas a bordo de este vapor son demasiado interesantes para que dejemos de publicarlas; las damos, pues, casi en su totalidad en el texto inglés.

Como se echa de ver en dichas observaciones, el vapor *Albay* estuvo en el vórtice de este tifón a las 7 a. m. del día 11 con una mínima barométrica de 738 mm., habiendo tenido lugar un extraordinario descenso barométrico de 11 mm. en el espacio de una sola hora. El paso del vórtice sobre el barco se describe en los siguientes términos en unas notas que acompañan dichas observaciones:

Eran las 5 a. m. cuando el viento empezó a soplar del N con fuerza huracanada, hallándose la mar sumamente alborotada. A las 6 a. m. el viento roló al NNW soplando con terrible violencia en tanto que el estado del mar era por demás imponente. De 6 a. m. a 7 a. m. el barómetro bajó no menos de 11 mm., y a las 7<sup>h</sup> 05<sup>m</sup> entramos en la calma vortical; el cielo quedó despejado, la calma fué absoluta, y se vieron gran número de pájaros sobre la cubierta. En aquel momento nos hallábamos a los 12° 39' latitud N y 115° 02' longitud E. A las 7.40 a. m. el viento volvió a soplar con fuerza huracanada del SW, disminuyendo gradualmente su violencia después de las 8 a. m. El temporal había prácticamente terminado a las 10 a. m.

Estas notas y las observaciones arriba citadas indican claramente que este tifón fué de muy reducidas dimensiones, como queda dicho. Tomando la isobara 755 como el límite exterior del verdadero cuerpo del baguio, puede decirse con seguridad que el diámetro de éste era apenas de 100 millas.

Después de un detenido estudio de un gran número de observaciones de Indochina, Hainán, costa de China y Formosa, creemos poder asegurar que este tifón continuó moviéndose al NW hasta la tarde del día 12 en que se inclinó al WNW en dirección al Golfo de Tongking, disminuyendo al mismo tiempo su velocidad de traslación; que atravesó el golfo de Tongking los días 16, 17 y 18 en tanto que recurvaba al N, NE y ENE; que se movió al E hacia el N de Hongkong el día 19, y cruzó Formosa y las Islas Liukiu el 20 y 21, respectivamente. Al pasar sobre Formosa y Liukiu no era más que una depresión de poca importancia.

## LA DEPRESIÓN DEL 21 DE MAYO AL 3 DE JUNIO, 1916.

Esta depresión se formó probablemente del 21 al 22 de mayo al S de Guam cerca de 9° latitud N y 144° longitud E. Se movió casi directamente al W y penetró en Filipinas la tarde del 25, próximamente a la mitad de distancia entre Surigao y la costa meridional de Sámar; cruzó el extremo septentrional de la Isla de Palawan la mañana del 27; y encontró al vapor *Albay* en el Mar de China hacia la media noche del 28 al 29,

cerca de  $12^{\circ}$  latitud N y entre  $113^{\circ}$  y  $114^{\circ}$  longitud E. Es de notar, sin embargo, que esta depresión era de muy poca importancia, al menos mientras cruzaba las Filipinas y pasaba cerca del vapor *Albay* en el Mar de China. Desde la media noche del 28 la depresión se movió al NNW hacia Hainán, donde recurvó al NE el día 31. Muy probablemente aumentó en intensidad el 1.º de junio, mientras se movía hacia Hongkong donde el barómetro bajó a 748.91 mm. a las 6 p. m. del día 2. Los vientos en Hongkong, después de haber rolado del S al SSE, ENE, N y NNW, viraron de nuevo al E a las 7 p. m. del 2, conservando prácticamente esta dirección hasta después de la 1 a. m. del día 3: esto se debió probablemente a un centro secundario formado la noche del 2 de junio al S de Hongkong.

METEOROLOGICAL DATA FOR MANILA CENTRAL OBSERVATORY.\*

[ $\phi=14^{\circ} 34' 41''$  N;  $\lambda=120^{\circ} 58' 33''$  E; barometer above sea, 14.2 meters; gravity correction not applied, -1.72 mm.]

Day.	Pres- sure (mean).	Air temperature. <sup>b</sup>				Underground temperature.				Relative humid- ity (mean).	Vapor pres- sure (mean).	Radiation.		Evaporation. <sup>b</sup>			
		Mean.	Maxi- mum.	Mini- mum.	Mini- mum.	0.25 meter.		0.50 meter.				1.50	2.50	Mini- mum on grass.	Maxi- mum in sun. Black bulb in vacuo.	Free ex- posure (to- tal).	Shelter (total).
						8 a.m.	2 p.m.	8 a.m.	2 p.m.			8 a.m.	8 a.m.				
	mm.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	Per ct.	mm.	°C.	°C.	mm.	mm.	
1.	758.87	27.1	33.3	22.4	30.2	31.1	30.5	30.7	29.3	28.1	76.8	20.2	20.5	57.3	3.9	3.5	
2.	58.01	27.8	34.8	22.2	29.6	31.5	30.4	30.6	29.4	28.2	70.1	18.9	19.8	59.5	6.4	4.7	
3.	57.75	27.8	33.3	23.9	29.9	31.2	30.4	30.5	29.5	28.1	68.3	18.7	21.6	47.7	6.5	4.7	
4.	58.07	26.7	33.3	23.5	29.5	31.1	29.1	30.4	29.4	28.1	76.7	19.7	22.3	47.6	4.4	3.4	
5.	57.86	27.6	34	22.2	29.3	31	30	30.3	29.5	28.2	70	18.7	19.9	53.6	6.3	4.6	
6.	57.65	27.8	34	23.3	29.5	30.7	30	30.3	29.5	28.2	72.3	19.8	20.6	52	5.4	4.3	
7.	57.79	26.8	32.7	22.8	29.5	30.7	30	30.2	29.6	28.3	82.9	21.5	20.7	59.8	2.1	2	
8.	58.69	27	32.5	23.4	29.2	30.3	29.8	30.2	29.5	28.2	78.7	20.6	21.5	56.5	4	3.4	
9.	59.95	27	33.4	22.5	29	30.1	29.8	30	29.6	28.2	77.7	20.4	20	52.8	3.8	3.2	
10.	58.86	26.2	30.7	22.8	29.2	30.3	29.8	30.2	29.5	28.2	84.6	21.3	20.5	53	1.2	1.7	
11.	57.86	27.8	33.2	22.8	29.2	30.8	29.8	30	29.5	28.3	77.1	21	21	57.5	5.2	3.6	
12.	58.12	28.2	33.3	24.8	29.5	31.5	29.8	30.4	29.4	28.3	76.6	21.6	23	56	4.7	3.3	
13.	57.94	27.4	31.9	24.2	30.1	31.1	30	30.6	29.4	28.4	80.5	21.7	22.4	51.5	3.4	2.4	
14.	56.99	27.3	31.3	24.7	29.7	30.9	30.2	30.4	29.6	28.3	77.8	20.8	23.4	48.5	3.6	2.5	
15.	56.85	27.2	34.5	23.3	30	31.5	30.1	30.4	29.7	28.3	79.4	21	21.3	53.2	3.6	2.9	
16.	59.12	25.6	31.3	23.5	29.8	30.3	30.2	30.2	29.6	28.3	89.3	21.7	21.8	41.4	1.2	1.4	
17.	59.74	26.8	32.9	22.5	29.1	30.2	29.9	30.1	29.6	28.3	81.8	21.2	21.1	51	4.5	3.1	
18.	58.42	27.9	34.9	22.8	29.5	31.2	29.9	30.3	29.6	28.3	72.2	19.7	20.6	55.4	5.5	3.9	
19.	57.71	28.2	34.7	22.2	29.6	31.5	30	30.4	29.6	28.4	72.9	20.3	19.9	54	5.9	4.1	
20.	58.02	27.9	33.8	24	30.4	31.6	30.3	30.6	29.7	28.4	78.2	21.6	21.8	54.5	4.3	3	
21.	57.80	27.4	35.5	23.8	30.2	32.4	30.3	30.9	29.6	28.4	81.8	21.7	22.1	57.2	4.3	3	
22.	57.80	26.5	31.9	23.1	30.3	31.2	30.5	30.6	29.6	28.4	82	21	21.6	52.5	3.2	2.7	
23.	57.56	27.6	34.5	22.2	29.5	31.5	30.3	30.8	29.6	28.4	72.8	19.6	19.2	56.6	6.1	4.4	
24.	57.64	28.4	34.5	23.2	30.2	31.5	30.3	30.8	29.6	28.4	70.7	20	20.3	55.5	6.4	4.5	
25.	57.99	27.4	33.5	23.2	30.4	30.9	30.6	30.6	29.7	28.5	79.1	21.4	20.5	52.5	3	2.7	
26.	57.29	27.5	34	23.2	29.6	31.1	30.1	30.6	29.7	28.5	78.5	21.2	20.6	51	3.2	2.5	
27.	56.34	27.6	34.2	24	29.5	31.3	30.1	30.6	29.7	28.5	80.4	21.7	22.2	48.8	3.6	2.9	
28.	56.34	28.6	34.3	23.6	29.6	31.5	30.1	30.6	29.8	28.5	74.8	21.4	21.6	55.3	6.1	4.1	
29.	56.44	27.7	35.1	23.9	30.2	32.2	30.3	30.8	29.7	28.5	81.1	22	21.7	56.5	4.3	3.2	
30.	57.62	27.3	31.9	24.3	30	31.5	30.4	30.8	29.8	28.5	82	21.9	23.1	51.9	3.7	2.6	
31.	57.86	27.1	33	24	29.8	30.9	30.2	30.7	29.8	28.5	83.7	22.2	21.6	56	2.9	2.2	
Mean	757.88	27.4	33.4	23.3	29.7	31.1	30.1	30.5	29.6	28.3	77.8	20.8	21.2	53.4	4.3	3.2	
Total															132.7	100.5	
Departure from normal	-0.47	-1	-0.2	-0.6							-1.8	-0.8					

Day.	Wind.				Clouds.			Sun- shine.	Rain, 24 hours beginning 6 a. m.		Miscellaneous.
	Prevailing direction.	Total move- ment.	Maxi- mum hour- ly veloc- ity.	Direction at the time of the maximum velocity.	Amount (mean).	Form and direction.			On the tower.	In the park.	
						Upper.	Lower.				
1.	NE quad.	Km. 163.5	Km. 15.5	NW	0-10. 5.2	A.-Cu. ENE	Cu. E	h. m. 9 05	mm. 5.6	mm. 6.1	⊥ a. ● p.
2.	NE	153.5	14.5	NE	3.9	Ci.	Cu. NE, ENE	9 50			d a. ⊥ p.
3.	NE	312	31	NNE	8.1	Ci.-S.	Cu. E	4 00	1	1.3	d <sup>2</sup> p.
4.	NNE	194	24.5	NE	9.7	A.-Cu., Ci.-s.	Cu. E	2 40	.1	.1	d <sup>2</sup> a. p <sup>o</sup> p.
5.	E quad.	170.5	17.5	E	3.2	A.-Cu.	Cu. E	10 15			
6.	E quad.	190.5	18.5	E	5.6	A.-Cu., Ci.	Cu. E	7 10			p <sup>o</sup> p.
7.	E quad.	150	12	WNW	7.9	Ci.-Cu. NE	Cu., Cu.-N. E	4 15	9.3	8.6	d a. ⊥ p. ● p.
8.	E quad.	172	19	NE	7	Ci., A.-Cu.	Cu., Cu.-N. E	4 40	1.8	2	● a. ⊥ p.
9.	E, ESE	189.5	19.5	NE	6.6	A.-Cu., Ci.	Cu. E	4 30	2.3	2	● ⊥ p.
10.	E quad.	122.5	12	ESE	9.2	Ci.-S.	Cu.-N. E	3 00	6.3	5.6	● a. p. ⊥ p.
11.	SE	227.5	22.5	ESE	7.7	A.-Cu. SE	Cu. SE	9 00			
12.	SE	191.5	17.5	SW	7.2	Ci.-S. wsw	Cu. SW	6 35			⊥ ⊥ p.
13.	SW	214	28.5	SW	9.3	Ci.-S.	Cu.	1 15			⊙ a.
14.	W quad.	138	12	W	9.9	Ci.-S.	S.-Cu. WSW	0 15			d <sup>o</sup> a.
15.	E quad.	166	19	NNE	7.6	A.-Cu. W	Cu. E	4 40	1	1.3	⊥ d <sup>2</sup> p.
16.	N quad.	157	19	ENE	8	A.-Cu.	Cu., Cu.-N. E	2 45	3.3	3.3	⊥ a. ⊥ p. ● p.
17.	E, W	185	15	W	7.4	Ci.	Cu. E	4 10			
18.	SE, ESE	211	22	SE	4.4	Ci. ESE	Cu. E	7 45			⊥ p.
19.	S, W	172	15.5	W	2.2	A.-Cu.	Cu. E	10 35			
20.	SW, NW	164	18	SW	6.1	A.-Cu.	Cu., Cu.-N. ENE	5 25			⊥ a. ⊥ p.
21.	N, SE	162	15	N	7.1	A.-Cu. N	Cu. E	7 15	.3	.3	⊥ d p.
22.	NE quad.	164	17	W	7.1	A.-Cu. N	Cu. E	3 55	.3	.3	● d <sup>o</sup> ⊥ p.
23.	E quad.	212	20	WNW	3.3	Ci.	Cu. E	7 50			⊥ p.
24.	E quad.	205	16	W	5.1	Ci. E	Cu. E	8 25			
25.	SE	148	17	W	6.5	Ci. E	Cu. E	3 20	5.1	5.1	p <sup>o</sup> ● ⊥ p.
26.	E quad.	141	15	SW	7	Ci.	Cu. E	4 35	1	1	p p.
27.	NE	180	17.5	ESE	7.8	Ci. ENE	Cu. E	4 10	.9	.8	p <sup>o</sup> d <sup>o</sup> p.
28.	SE	204	19	SE	7.2	Ci. ENE	Cu. ESE	7 05			p <sup>o</sup> p.
29.	NE	198	19	S	8.6	Ci.-S.	Cu. E	4 50	1.5	1.5	⊥ p. ● p.
30.	WSW, NNW	209	17	SW	8.1	Ci.-S.	Cu. WNW	3 40			
31.	SE	134	13.5	W, SW	8	A.-Cu.	Cu. E	4 25			⊥ p.
Mean		180.7	18		6.8			5 32			
Total		5,601						171 20	39.8	39.3	
Departure from normal		-1,237.5			+1.1			-59 01	-66.5		

\* All the mean values given in this table are deduced from hourly observations.  
 \* These values are taken from instruments mounted in the Observatory Park, 1.5 meters above ground.





## DAILY RAINFALL AT THE STATIONS OF THE WEATHER BUREAU, MAY, 1916.

Station.	Day of month.															
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.
	<i>mm.</i>	<i>mm.</i>	<i>mm.</i>	<i>mm.</i>	<i>mm.</i>	<i>mm.</i>	<i>mm.</i>	<i>mm.</i>	<i>mm.</i>	<i>mm.</i>	<i>mm.</i>	<i>mm.</i>	<i>mm.</i>	<i>mm.</i>	<i>mm.</i>	<i>mm.</i>
Jolo	2.8		1.8		6.3	232.4	97	12.9	11.4			15.5		6.1		
Isabela, Basilan					12.7	32	1	27.9							0.8	3.6
Zamboanga			4.1		4.5	44.9	11.4	35.3	5						7.7	8.5
Davao	38.3										21.8			16.8		
Cotabato	14.5	4.1	3.8	9.4	2	11.2	31.3	13	2.8	5.6	1		9.9			
Cagayan, Misamis	1.3	4.6	2.3	17.5	18.8	2	26.7			1.5			7.6			
Dapitan	2.5	2.3	6.9	1.5	1.3			10.6	1.5		.8		25.4		4.1	1.8
Dutuan	48.7	22.4		6.6	28.7		6.1		2	.5			17.5		.3	
Dumaguete	.5	20.8	4.1	8	24.4			1.8	3.3		2.5			3.6		
Tagbilaran		10.8		56.9	6.1		8.1							(*)	(*)	1
Iwahig		8		1	4.8		13.8	26.9	37.9	8.5	21.7	.5	17.8			
Surigao	119.4	76.1		1	1.5		29						17.5	3	4.6	3.6
Maasin	11.4	115.5	7.9		8.9			18.8					17.8			
Cebu	1.8	26.5	9.4	17.2	3.3					3.8		19.6	1.5			
Hoilo		14	11.7	120.4	4.1		1.8	3.6	2	1				4.6		
San Jose Buenavista		6.4	31.3	27.7	10.1		43.7	8.1	1.5							1.5
Cuyo		1.5	22.4	71.4	6.4		6.6	3.8	3.1	1.3						48.5
Ormoc	3.1	128.1	25.1	8.9	2.5		12	56.6	6.1				.5	2.5		
Guiuan	40.4	114	37.3	10.6	59.5	18	14.2	29.5	1			13.7	2.8	4.3	.5	4.8
Tacloban	9.5	131	36.1	21.1	29	11.8	29.5	4.3			2.5		1.5			
Capiz	2.3	105.6	23.3	37.6	6.3	5.6	37.9	17.3	10.9	12.7					.5	42.4
Borongon	26.2	51.1	20.6	2.1	40.2	21.5	55.6	17.3				2.5		3.8	8.1	
Catbalogan	21.8	22.3	1.6	6.3	36.6		5	23.4	11.4	12.7				1.3	11.2	
Calbayog	5	29.2	11.7	3	77.1		40.8	5.5	3.3							8
Masbate		16.3	42.2	3.3	13.5	3.3	3.6						7.1			
Romblon	5.1	.5	26.2	9.6	40.6	8.6	3.8	9.6	66.8	.8	7.1		.5	3.8		4.1
Batag	2.8	7.9	10.7	5	36.1		25.9	10.7	9.4	2				12.2		
Legaspi	1.5	4.9	117.2	23.1	63.6	96.2	14.8	11.9	2.3	10.4		.8	23.6	.8		25.9
Sumay, Guam	25.4	16.5		2.5		10.1	7.6	3.8	114.3	114.3	1.3		6.4			
Calapan		8		6.1	33.8	2.3	5	24.1	1.8	9.4	.8	.5		4.3	.5	1
Virac	1.8	18	24.4	18.5	27.2	20.9	27.9	14.4	8.6	.3			24.6	1.8		1.5
Naga		31	58	19.5	39.9	1		14.4	1.3		5		49.3	.8	22.4	
Batangas			6.4	34.8			4.3	5.8	2	8.9				.5	2.5	
Lucena	2.3		62.7	13.5	46.7	6.4	1.3	1.3	25.4				18.6			20.6
A timonan	.5	4.3	71.9	50.4	40.5	20.8	24.7	1.3	24.1	21.1	15	27.9	3.8	1		8.1
Ambulong, Tanauan			3.8	14.2		1.3	3.6		3.3	3.3	2.3			9.1	5.9	
Canlubang, Calamba			4.9	10.1	1.5	1.3	9.9		8.6	24.8	2		21.6	5.6	2.6	
Paracale		5.1	44.4	48.8	1.8	48.2	9.9	26.2	34.3	9.4	5.6	6.4		2.8		2.5
Santa Cruz, Laguna		.3	19.1	21.6	.8	4.8	44	10.4	13.7	4.3		19.3	.3		9.9	.3
Manila	5.6		1			.5	2	8	1.8						1	3.3
Antipolo			4.8	4.3			2.1		3.5						1.3	1.8
Iba						2.5	6				9.9		53.4	1		5.8
San Isidro							1.5							10.9		7.9
Tarlac						.5										34.3
Baler	6.4						22.9	2.3		7.1	25.4	7.4	27.7	1.8		24.4
Dagupan											21.6					35.3
Bolinao		.3										8.2	2.8		6.1	5.8
Baguio	30.2						5.1				31.2	2.3	25.9	19.8	29	24.6
San Fernando, Union				9.3							13.3	13.6				
Echagüe													2.8			
Candon	17												55.6	5.8		33.5
Vigan										.3			32.7	3.3		.8
Tuguegarao															7.1	
Laoag											40.1			45.2	28.4	
Aparri	.3															
Santo Domingo, Batanes						5.5	7	.6								

\* Rain for 8 hours: 6 a. m. to 2 p. m.

\* No observation.

Daily rainfall at the stations of the Weather Bureau, May, 1916—Continued.

Station.	Day of month.															Total.
	17.	18.	19.	20.	21.	22.	23.	24.	25.	26.	27.	28.	29.	30.	31.	
Jolo	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.
Isabela, Basilan	0.5	5.6	9.9			21.6				0.5	1.8					426.1
Zamboanga		1	1	2.5						5.1	9.1	3.3	31			131
Davao				3.3						31.2	4.3				1.4	162.6
Cotabato	16.3		14	4.8	4.3	6.9	9.9	3.3	8.9	3.8				24.1		157.4
Cagayan, Misamis		1.7				.8			2.5	18.6	.5			1.5		182.3
Dapitan	*	62.3			44.4	16.5	53.3	29.2	5.1	13	2.5					106.4
Butuan	13.4	7.1	.6	1	19.3	.8	2.5	1.3	1.5	46.5	69.3	3	3.6	2.5		302.5
Dumaguete		8.3				4.8		1.5	3	20.7	14.2					118.8
Tagbilaran		18		7.1				4	31.6	6.4	11.2					195.4
Iwahig		6.6				5.1		.3	3.8	7.6	16	7.9		26.2	4.6	225.7
Surigao	24.4			5.1		12.7	35.6	16.1	14	10						374.7
Maasin	14.2						5.6	6.6	34.8	58.7						300.2
Cebu										36.9	.8		2.1	64.8		187.7
Hiloilo	.8	30	1.5							46.5	1.5		2.3			245.8
San Jose Buenavista	1.5	2.3	1.3						10.2	10.7						206.3
Cuyo				15.7						93	12.2	1.3			1	288.2
Ormoc		.3				42.2	3.3	3	4.1	21.6						260
Guiuan	21.6	10.7	3.8			8.4	36.5	20.8	14.5	49.8	.5					546.6
Tacloban		15.2	1.1		1.2	3	12.1	7.7	1.1	20.5				4.3		340.1
Capiz	4.8	1.5	2.1			.5			2.1	3.6	23.2					327.2
Borongan	18	17.3	.8	2.8		11.4	22.1	27	16.7	52.3						417.4
Catbalogan		.3		.8	.5		.3	1.3		5.6	2.3	1	4.6		.6	166.4
Calbayog	11.7	2.3				4	1.3	1	10.4	2.3			2.5			214.9
Masbate									3.3	6.1						98.7
Romblon				.5					1	6.8	4.1	17.5		.5		217.5
Batag	1.3	13		*	*		1.8	2	18.3	8.1		2.5				169.7
Legaspi	6.9					2.1		13.7	15.5	25.9	16	8				477.9
Sumay, Guam			1.3	2.5	2.5	12.8	6.4	3.8	31.8	16.6	3.8	12.7		26.6	55.9	478.9
Calapan	.3	1.8	.8			1.8	1.5	7.6		3	5.6					184.4
Virac	3	9.4	15.7			18.8	.5	13.2	5.8	16.2	4.6					277.1
Naga	9.4		14.7	28		5.5		12.6		13		2.4				324.5
Batangas			1.8							.3	16.3	8.3			.5	92.4
Lucena							.8	1.3	5	15	2.6	18.3	1.5			218.2
Atimonan	3.8		4.6			25.4		2.5		33.3	15.5	53.8	33	5.9		505.7
Ambulong, Tanauan									3			8.4				67.3
Canlubang, Calamba									3.6	5.6		10.2	14	.8		127.1
Paracale				58.2		14.9	17	10	4	7.6		5				357.6
Santa Cruz, Laguna	1.8		3.3	8.4		1.8			4.8	14	8.1		1.3		2.8	195.1
Manila					3	.3			5.1	1	.9		1.5			39.8
Antipolo						.5			1.3		1.6	5	36.1			61.8
Iba	.3		8.9			19.3						13.5	11.4	.3		132.4
San Isidro				5.3	51.8						.3		.3		5.3	86.1
Tarlac			53.3	3.8	3.6	5.1						36.8	9.7	5.1		156
Baler	16.5			17.3			.2	9.9		22.6	42.9	.8	4.6	2.8	.2	243.7
Dagupan	1.8	64.8	4.3	1.5	19.6	.5	16.5		2.3				59.4			241.6
Bolinao	13.5				11.9	20.6				3.6		10.2	64			148.3
Baguio	26.9	3		9.1	36.5	21			4			1	7.6		34.8	312
San Fernando, Union		20.3	1.3		1.1							5.1	152.9			216.9
Echagüe	2			1	31.7	18.5								28.2		84.2
Candon			3.3		4.6							1.3	9.9			131
Vigan		1.8	1.8		36.8							.6	11.1			89.2
Tuguegarao					5.8	1.3						24.6	37.6			76.4
Laog					1.3							4.5	35.1			154.6
Aparri			3.8	57.1										3.3		64.5
Santo Domingo, Batanes	.1					13.5									15.7	42.4

\* No observation.

<sup>b</sup> 29 days of observation.

<sup>a</sup> Rain for 64 hours; 2 p. m. of the 16th to 6 a. m. of the 19th.

<sup>c</sup> 28 days of observation.

MAXIMUM AND MINIMUM TEMPERATURES AT THE STATIONS OF THE WEATHER BUREAU, MAY, 1916.

Day.	Jolo.		Isabela, Basilan.		Zamboanga.		Davao.		Cotabato.		Cagayan, Misamis.		Dapitan.		Butuan.	
	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.
	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.
1	30.7	22.8	31.1	22.1	30	22.8	29.5	21.5	30.1	23.7	29.7	23.1	32	22.9	26.3	23
2	32.3	21.6	30.5	23.6	30.5	22.2	31.7	22.8	29.1	22.9	27.3	22.6	29	22.8	26.5	21.4
3	30.9	22.5	31.6	24.1	29.8	22.9	32	21.5	29.9	23	30.2	22.1	31.5	22.4	31.5	22.1
4	32	23.8	31.2	23.1	30.2	24.9	32.5	22	29.5	23.3	32.2	24.4	31.6	22.8	32	23.8
5	29.8	22.8	30.6	23.6	29.5	24.9	32.7	22.8	29.2	22.8	28.1	24.3	28.5	22.5	28	23.8
6	27.6	23	29.6	23.1	29	23.5	31.9	22.3	30.9	22.9	31	23.3	31.7	22.6	30.6	23.1
7	26.6	21.3	28.6	22.6	29	21.5	32.8	23	25.9	23.5	30.8	22.7	31.1	21.6	33.3	22
8	26	20.9	28.8	22.6	27.3	23.5	29	21.5	30	22.1	31.4	21.4	29.5	21.7	32.3	21.6
9	29.9	20.8	29.4	22.1	27.8	21.8	32.2	21.4	29.2	23.1	31.4	23.2	31.1	21.8	33.1	22
10	32.1	22.3	30.6	22.7	30.3	21.5	31.7	21.2	30.9	22.2	31	22.4	32.6	22.5	33.3	23.2
11	31.8	22.7	30	23.3	30	22.9	31.7	22.4	30.6	23	32.1	22.6	32.9	22.5	33.1	23.3
12	32.6	22.4	31.6	23.6	30.7	22	30.7	22.4	29.9	23.8	32.2	23.1	31.7	22.9	31.8	23.8
13	30.4	22.1	30.8	23.1	29.5	23	31.9	22.5	30.7	23.3	32	22.6	32.6	22.3	33.2	23.4
14	29.5	21.4	31.1	22.6	29.4	22.3	31.5	23	31.8	23.5	30.4	23.1	32.9	22	31.6	22
15	30.8	22.1	31.4	23.6	31	22.2	32.2	23	32	23.2	31.8	23	32.5	22.5	32.6	23.2
16	30.1	21.8	29.1	23.1	29	22	32.7	22	30.6	23.9	32	23.2			33.1	22.5
17	28.6	21.4	30.3	22.5	29.7	23	32.5	22.5	28.8	23.1	31.3	22.5			29.6	23.7
18	28.4	22	29.4	23.1	29.5	23.4	32.9	22.2	31	22.9	32.2	23.5	30	22	31.8	23.6
19	29.2	22	30.6	24.1	31.4	23	31.5	23	32.2	23	32	22.9	32.5	22.3	32.9	22.4
20	28.5	21.8	30.5	23.6	30.5	23.2	32	23.3	32.6	22.7	31.7	22.2	32.5	22.5	33.1	23
21	30.4	21	30.6	22.9	29.6	22.1	32.7	22	30.8	23.4	32.6	23.3	32	23.1	33.6	22.3
22	27.9	21.2	29.4	22.6	29.8	22.9	32.2	22.5	32.5	23.5	31.7	23	32.1	23	32.6	23
23	29.9	20.9	31.6	22.5	29.8	22.4	33.2	22	31.4	22.1	31.8	23.3	31.9	22.2	31.8	23.4
24	30.4	21.1	30.6	22.5	30.2	23	32.2	23	31.8	23.1	32.1	23.2	31.7	22.9	33	23.4
25	30.9	21.8	28.6	23.1	28	23.4	32.2	23.2	31.7	22.8	32.4	23.6	33	24.1	32	23.7
26	29.6	22.4	30.1	22.6	29.5	24.6	31.2	23	29.5	23.1	30.1	23.8	29.5	24	30.5	22.9
27	29.3	22.8	30.6	21.6	29.4	22.6	32.7	22.5	32.7	22.7	30.8	23.1	31.6	22.6	32.8	22.9
28	30.8	22.3	29.6	22.1	30.3	22.8	30.8	22.1	32.5	23.3	31.3	23.8	32.3	22.8	33	22.4
29	31.4	21.6	30.8	21.8	29.7	23.8	32.5	22	32	23.1	31.9	22.6	33.1	22.6	32.5	22.7
30	30.3	22.5	29.6	22.6	30.5	22.8	30.7	23.8	30.1	23	30.9	23.6	31.9	22.8	31.7	24.7
31	28.8	22.4	30.1	22.3	30	22.5	29.7	22.9	31.5	22.6	31.8	23.2	32.6	22.8	32	23.1
Mean	29.9	22	30.3	22.9	29.7	22.9	31.8	22.4	30.7	23.1	31.2	23.1	31.7	22.6	31.8	22.9

Day.	Dumaguete.		Tagbilaran.		Iwahig.		Surigao.		Maasin.		Cebu.		Iloilo.		San Jose Buenavista.	
	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.
	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.
1	31.4	23.5	31.2	23.4	34.3	22.2	28.3	23.2	28.57	22.8	31	24.3	32.2	23.5	32.3	21.1
2	28	23.4	25.6	21.2	34.2	21.4	24.8	21.5	21.2	26.6	22.4	30.1	24.3	31.7	23	23
3	30.6	22.5	30.5	22.1	34.6	21.9	29.6	23.5	27	22.4	30.5	22.4	27.9	23.7	31.6	23.1
4	30.8	23.4	29.5	25.4	33	24.5	32.8	24.2	32.5	23.5	28.6	24.2	25.9	23.6	27.2	23
5	29.8	23.2	28.9	21.9	32.3	23.4	31.3	23.9	32.8	24.4	27.4	23.2	27.6	22.7	29.2	23.4
6	29.5	23	30.6	22.5	32.8	23.5	31	23.1	33.5	23.2	31	22.9	30.5	21.7	30.8	21.5
7	30.8	23.8	31.6	23.1	32.1	22.9	31.3	22.9	34	23	31	24	32.1	24.4	31.2	22.6
8	29.5	23.8	29.8	23.3	30.8	23.9	31.5	23.1	33.4	23.6	30.5	23.9	31.2	23.7	30.7	23.3
9	29.3	23.4	30.5	23.6	29.4	23.3	30.8	23.8	33	24	29	24.1	31.6	23	29.7	22.6
10	29.3	23.9	31.5	22.6	29	23.6	31.5	23.8	34	24.2	31.2	23.7	30.9	24.3	31.2	23.3
11	30.4	23.3	30.4	23	27.3	22.9	31.6	23.2	34.4	23.6	31.5	23.7	33.5	23.7	33.7	23
12	31.7	23.8	30.3	23.5	31.5	22.5	33	23.8	33.8	23.5	30	24.1	30.5	24.4	32.2	23.4
13	31.6	22.8	31.6	22.6	31	22.8	32.7	23.3	32.5	23.8	31	23.6	30.5	24.4	32.7	23.5
14	30.4	22.7			32.1	21.5	31.1	23	32.8	23.4	30.6	24	31.8	23.8	33.1	23.5
15	30.4	24			32.1	22.5	32.4	23.4	33	23.4	31	24.3	31.5	24.2	32.6	24
16	31	25	31.9	23.6	32.3	22.1	32.3	23.4	32.4	23.4	32.3	25.4	30	24.8	33.3	24.6
17	30	25.1	31.6	22.7	31.3	23.4	30.2	23.1	33	23.8	31.6	25	32.6	24.8	31.8	23.7
18	30.6	25.7	31.9	23.4	32.4	22	32.4	22.9	32	22.6	32.7	25	32.5	23.8	33.2	22.7
19	29.5	23	30.5	23.3	32	23.5	33.6	23	33	23.5	31.8	24.5	31.8	23.8	31.8	24.6
20	30.2	23.7	30.7	22.9	32.9	23.1	33.1	23.2	34	23.8	32.1	24.5	32.5	23	33.3	22.6
21	30.2	24.1	31.8	22.9	32.8	22.8	33.4	23.7	34.1	23.4	33	24.9	31.8	24.2	33.7	23
22	30.2	24.4	31.7	23.3	33	22.3	32.1	23.7	33	22.8	32.5	24.8	32	24.2	33.2	23.5
23	30.8	23.9	30.3	23.3	32.9	23.9	31.4	23.5	32	24.2	32	24.5	32.5	24.7	33.8	23.2
24	30.4	26	32.2	23.2	33.4	23.7	30.2	23.5	34	23.5	33.1	25.5	33	25.2	33.2	24
25	32.2	25.2	30.3	23.8	32.9	24.9	31.4	24.3	31	24.1	34	24.7	33	25.5	34.8	23.5
26	29	24.8	27.4	23.7	33	22.7	30.4	24.1	31.5	24.6	28.1	24.17	28.3	23	29.6	24.1
27	30.5	23.4	30.5	22.7	30.5	23.7	32.5	23.7	33	23.5	32	24.2	31.2	24	30.7	24.1
28	29.3	23.8	29.4	22.5	31.3	22.8	31.7	24.7	33.5	24.6	31	24.3	31	24	31.3	23.6
29	30.6	23	30.5	23	33	22.3	34.1	23.8	32.5	23.6	32.6	24.5	32.7	24.2	33	23.5
30	31.7	23.7	30.7	23.4	31.6	22.9	33.4	24.1	32.6	24.5	30.5	22.3	31	23.4	33	23.2
31	31	22.8	30.9	22.5	32.5	21.8	32.9	23.2	35	23.8	31.5	23.5	33.3	23	33.7	23.3
Mean	30.3	23.8	30.5	23	32.1	22.9	31.6	23.5	32.7	23.5	31	24.1	31.2	23.9	32	23.3

Maximum and minimum temperatures at the stations of the Weather Bureau, May, 1916—Continued.

Day.	Cuyo.		Ormoc.		Guiuan.		Tacloban.		Capiz.		Borongan.		Catbalogan.		Calbayog.	
	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.
	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.
1	33.7	25.6	30.8	21.9	31.4	23.5	30	23.2	33	23.2	32	22.3	29.8	21.4	29.6	22
2	32.2	27.3	25.4	23.3	29.4	23.8	26	22.9	31.2	24.8	28	23.4	26.5	22.5	27.3	23.1
3	26.9	25.3	23	23.4	27.8	25	29.1	24.5	28.1	24	29	25.2	30	24.2	31.1	24.8
4	27.4	23.6	29.3	24.4	32	23.6	31.3	23.5	27.3	24.2	31	23.9	31.5	24.7	30.9	24.4
5	27.9	23.6	28.6	22.1	29.6	23.1	28.6	22.3	29.9	22	29.3	23	28	23.5	28.1	23.7
6	29.3	23.9	31	21.9	31.7	22.5	31.4	22.9	30.3	21.8	31.9	22.9	30.4	23.5	30.9	23.7
7	32	25.8	30.8	22.8	31.9	23.1	30.3	22.7	32.2	24.2	31.2	23.6	29.8	22.9	29.2	23.4
8	30.7	23.6	31	23.4	31.6	23.1	29.6	23	31.7	23.3	30.5	22.8	28.8	23.2	29.8	23.6
9	28.5	24	29.8	22.6	33.3	22.6	31.2	23.1	32.1	23.4	31.2	23.3	30.1	23.5	30.3	23.2
10	28.5	24.3	30.4	22	32.8	23	31.7	23.1	31.7	23.6	31.7	22.3	31.3	22.9	30.8	21.9
11	31.2	25	31.4	21.6	32.3	22.6	31.8	23.1	32.2	24.2	31.7	22.1	31.3	21.8	32	22.2
12	32.2	24.4	30.8	22.9	33.3	23	33.1	24	32.1	24.7	31.5	22.8	31.4	22.7	33.2	22.9
13	32.4	24.3	31.5	22.4	33.4	22.9	32.6	23.2	32.5	23.9	31.5	22.4	31.5	22.9	30.5	23.1
14	31.9	24.8	25.3	23.6	31.9	24.1	30.5	23.1	33	24.2	33	22.9	30.6	23.9	29.7	23.7
15	31.6	24.7	32.1	23.3	33.1	24.2	31.2	23.5	33.4	24.8	31.5	23.3	31	23	30.7	23.9
16	31.3	25	32	22.7	32.9	23.7	31.6	24	31.8	22	31.5	23.3	31.8	23.6	31.4	23.3
17	31.3	25.9	32.2	23	32.6	23.5	32.3	23.6	32	25.2	32	22.4	32.8	21.8	33	21.6
18	32.9	26.4	32.2	22.5	30.2	22.8	32.1	22.9	31.6	23.2	29.5	22.9	30.5	23.8	31	22.4
19	32.4	25.8	31.3	22.8	33.3	23.4	31.8	22.9	32.7	23.9	31.4	22.6	31.7	23.5	30.8	22.6
20	31.7	24.5	31.6	21.9	33.1	23.1	31.7	24.4	32.8	23.5	31.4	22.6	31.4	21.9	30.7	22.5
21	33	24.8	31.5	21.7	32.7	23	31.5	23.7	32.8	24.4	31.6	22.4	32.2	21.5	32.7	22.2
22	32.4	25.4	32.2	21.1	33.5	23.6	32.2	23.4	32.4	23.6	32	22.3	32.4	22.8	33.2	23.2
23	32.2	24.9	31.7	22.8	32.5	24.1	33	23.7	32.4	24.2	31.7	22.5	33.5	22	34	22.2
24	32.4	26.1	31.6	23.6	31.1	24.5	30.9	24.5	32.9	25.3	29	23.7	31	23.1	32.1	23.3
25	33.2	27.1	31.6	23.3	32.2	25.7	33	24.5	33.4	25.9	31.7	24.4	33	22.7	34.2	23.1
26	32.2	27.8	27.9	24.6	30.7	25.5	28.4	24.3	31.9	24.4	30	24.7	30.8	24.5	30.7	24.6
27	27.6	23.2	30.9	23.4	31.7	24.3	31	23.5	31.3	24.2	31	22.9	32.3	24	31.6	23.8
28	30.3	24.3	31.4	22.7	30	23.5	32.5	23.5	30.8	23.9	31.2	22.9	31.8	22.3	32.7	23
29	31	24.4	32	23.3	32.5	23.5	32.7	23.8	32.8	23.3	31.9	22.7	32	22.3	31.1	22.5
30	32	24.2	30.8	23.4	32.7	22.5	33.1	23.9	31.5	23.7	31.7	22.1	32.5	22.7	32.5	23.5
31	31.8	24.3	31	21.8	32.5	22.5	32.1	23.5	33.3	23.4	31.8	22.1	32.4	22.7	34.1	22.5
Mean	31.1	24.9	30.7	22.8	31.9	23.5	31.2	23.5	31.8	23.9	31.1	23	31.1	22.9	31.3	23.1

Day.	Masbate.		Romblon.		Batag.		Legaspi.		Sumay, Guam.		Calapan.		Virac.		Naga.	
	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.
	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.
1	30.8	24.5	34.1	23.4	31.4	24	32.5	25.4	29.8	25.6	33.1	23.5	31.8	21.9	32	20.1
2	29.4	26.5	35.2	23.8	29.5	24.3	31.5	25.7	26.2	22.2	33	23.1	33.6	22	31.8	21.4
3	28.5	24.8	31.2?	24.4	29.9	24.5	27.9	24.8	30.2	25	30	23	29.2	22.7	26.6	22.1
4	29.6	25.6	30.7	24.3	28.6	24.7	30.6	25.1	30.4	25	32.8	23.3	29	22.5	31.5	22.1
5	29.8	23.2	30.7?	24.3	28.6	24	27.2	24.2	29.8	25	32.8	23.5	31.8	22.6	28.5	22.3
6	30.5	23.4	31.5	22.8	30.2	24.2	30.2	23.2	28.2	25	32.9	23.5	32	23	29	22
7	30.6	25.4	33.9	25	30.5	25	31.3	25.2	28.8	23.8	32	24	32.1	22.8	33.5	21.1
8	30	25.2	33	24.9	29.5	23	30.8	25	27.4	23.8	32	25	31.7	22.4	32.2	21.3
9	31	25.2	34.2	24.8	29.9	23.8	31.1	25	26	23.8	32.5	22.2	31.9	22.3	32	21.8
10	31.8	24.5	34.4	23.4	30	24	31	25.8	26.8	22.2	32	24.6	31.4	22.5	32.3	21.2
11	31.6	25.2	32.2	23.9	30.4	23.8	32	25.9	28.8	23.4	31.4	24	32.3	21.6	33.5	20.7
12	32	25	32.9	23	31.5	24	32.1	23.5	30.6	23.4	32	22.9	31.5	21.2	32	22.8
13	32.6	24	33.1	23.2	31.4	23.9	31.5	23.9	30	24	32	23	30	21.7	31.7	21.3
14	31.4	24.5	32.6	23.4	30.7	23.9	31.4	23	30	23.4	32.1	23	29.8	21.4	31.5	20.9
15	31.2	25.4	34.6	23	29.9	24.3	30.2	24.6	30.4	23.4	32.5	22	29.9	22.2	32.4	21.8
16	31.8	25.6	34.7	25.4	30.8	25.4	32.6	25.6	30.6	24.2	32.3	23	31.6	22.1	33	21.9
17	31.6	25.5	34.1	23.8	30.8	25.3	31.5	24.6	30	25	32.1	23.5	32.4	22.8	31	20.2
18	31.6	24.8	34.2	24.5	28.7	23.3	31.4	24.3	30.2	24.4	32.8	22.8	31.4	22	32.8	20.8
19	32.2	25	35.2	24.3	-----	23.5	32.1	25.2	30.4	24.6	32.9	23.6	32.3	22.3	33.5	21.1
20	32.6	25.4	35.8	23.3	-----	-----	32.2	24.4	31	24.4	32.8	23	32.2	23	34.5	21
21	32	25.4	36.3	24	-----	-----	32.5	26.6	29.8	25	32.9	22.5	32.4	22.1	34.2	20.7
22	31.6	25.2	37.3	24.2	-----	-----	30.6	25.1	28.2	25	33	23	29.5	23.2	31.5	21.6
23	32.8	25	33.8	24.9	30.7	24	32.2	25.9	29.8	24.4	32.6	23.9	32.7	21.3	33.8	20.2
24	31.4	25.5	35	25.9	31.3	25.6	31.1	26	29.4	24.4	33.1	24	33.8	22.2	31	21
25	32	25.6	36	26.3	31.2	25.7	32.1	26.2	29.2	24.4	33.1	24.5	32.3	23.4	32.6	21.5
26	31.8	26	34.2	24.7	29.6	24.9	31	26.2	26.4	23.4	33.6	24	30.6	23.7	32.6	23.8
27	32	25.2	34.1	25.6	30.1	23.6	31.3	25.9	29.4	23.4	32	25	31.8	22.5	33	22.5
28	33.8	25.8	33.5	24	31	24.6	31.8	25.4	30	26.5	32.4	24.2	32.1	22	33.2	21.4
29	32.4	25	34.5	23.2	30.6	24.5	31.8	24.1	30	23.4	33.5	23.5	32.5	21.6	33	20.6
30	31.8	24.6	33.3	23.4	30.8	24.3	32.4	22.8	29.8	25.3	31.6	23	32	21.1	33.5	20.6
31	33.4	24.6	34.6	23.4	31.2	23.9	32.5	24.1	28.4	23.4	33.4	22.5	31.5	21.4	33.2	20.6?
Mean	31.5	25.1	33.9	24.1	30.3	24.3	31.3	24.9	29.2	24.2	32.5	23.4	31.6	22.2	32.2	21.4

Maximum and minimum temperatures at the stations of the Weather Bureau, May, 1916—Continued.

Day.	Batangas.		Lucena.		Atimonan.		Ambulong, Tanauan.		Canlubang, Calamba.		Paracale.		Santa Cruz, Laguna.		Manila.	
	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.
	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.
1	35.3	22.5	32.2	23.1	31.7	26.6	33.7	23.1	34.4	21.6	31.8	26.2	33.9	22.4	33.3	22.4
2	36	22.3	32.4	23.1	30.3	26.6	33.9	24	34.3	23.4	31.2	27	33.4	22.7	34.8	22.2
3	30.6	23.9	27.2	24.3	28.1	24.5	30	23.7	30.8	22.4	29.4	25	28.3	23.3	33.3	23.9
4	29.6	23.9	29.9	23.6	29.2	24.5	30.2	23.9	31.9	22.8	28.8	24.7	30.4	23.3	33.3	23.5
5	33.4	22.3	31.5	23.8	29.4	25.1	32	24.1	33.4	22.6	30	26.3	31.6	23.7	34	22.2
6	34.8	23.5	32	24.2	29.6	24.1	33.2	24.9	33.9	23.8	30.8	23.2	32.1	24.4	34	23.3
7	34.6	24.2	32	23.5	31.3	25.1	31.2	24.4	34	23.2	31.2	25.2	32.1	24.2	32.7	22.8
8	35.2	24.4	31.7	23.4	32	26	32	23	32	24.2	31.4	24.9	30.9	22.7	32.5	23.4
9	34.5	24.2	32.8	23.7	32.1	23.9	32.8	24.9	33.6	23.8	30.9	24.3	31.7	23.6	33.4	22.5
10	32.8	23.3	31.4	23.4	30.6	24	29.5	24.2	30.3	23.2	31.3	24.5	31.2	23.6	30.7	22.8
11	33.5	23.5	33.1	23.3	31.4	23.1	32.3	23.7	32.2	23.2	31.4	24.4	31.8	23.7	33.2	22.8
12	32.8	24.2	32	24.4	29.9	24	34	24	32.8	23.4	31.1	23.8	32.4	24	33.3	24.8
13	31.6	23.9	31	23	30.3	24	33.3	24	31.2	23	30.6	24.5	31.3	23.8	31.3	24.7
14	33.4	23.8	31.5	23.1	30.5	23.3	31.3	23.3	—	24.4	30.6	24	30.7	23.4	31.3	24.7
15	33	23.4	32.6	22.7	31.4	24	33.1	22.7	31.6	22.8	30.6	24	32.1	23.6	34.5	23.3
16	34.8	24.4	32.4	24	29.6	23.7	31.5	23.4	31.6	23.2	32.2	24.4	31.7	23.5	31.3	23.5
17	35.9	23.5	32.7	22.6	32	23.3	33	23.5	32.8	22	31.6	23.4	32.5	22.7	32.3	22.8
18	34.6	25.2	32.5	24.2	31.9	23.5	34.2	24.3	33.2	21.8 <sup>a</sup>	32.2	24.8	32.9	23.4	34.7	22.8
19	36	24.6	33	24.2	32.9	24.1	34.7	23.4	33.6	23.2	32	24.8	33	23.2	34.7	22.2
20	33.7	24.4	32.8	24.1	32.9	24	34	24.5	32.8	24.2	32.2	24.3	32.9	24.1	33.8	24
21	36.3	23.7	33.2	23.6	33	23.8	34	23.6	33.9	23.4	32.5	23.9	33.8	23.3	35.5	23.8
22	36.3	24.5	32.8	24	32.5	22.6	33.1	24.4	32.8	23.6	31.8	24.5	31.2	24.3	31.9	23.1
23	36.5	23.6	32.5	23.6	31.9	22.3	34.7	23.8	33.4	23.4	32	23.2	32.4	22.6	34.5	23.2
24	37	24.6	32.5	24.6	30.7	26.6	34.1	25.7	32.5	22.8	31.2	24.8	31.5	23.4	34.5	23.2
25	34.4	24.5	33	24.7	32.4	24.9	33	25	32.6	23.8	32.2	25.8	32.7	24.2	33.5	23.2
26	34.2	23.7	30.7	25.5	28.9	25.9	33.8	25	32.6	22.4	31.1	26.8	32	23.5	34	23.2
27	35.6	25.3	32.3	24.1	32	23.6	32.1	24.8	33.2	24.6	31.6	25.3	32.2	24.1	34.2	24
28	32.2	24.7	32	23.6	31.7	22.9	32.3	23.9	31.2	24.7	32.2	24.4	32.1	23.7	34.3	23.6
29	32.9	24.5	32.4	23.7	32.5	23.1	33	23.4	32.6	24.2	32.4	23.7	32.2	23.8	35.1	23.9
30	31.4	23.7	32.8	22.6	33.1	23.3	34.3	23.6	33.1	23.2	32.4	24.5	32.7	23.4	31.9	24.3
31	32.4	23.2	32.3	22.6	31.1	23.9	34	23.7	31.4	22.4	32.5	24.3	32.8	23.7	33	24
Mean	34	23.9	32	23.7	31.2	24.2	32.8	24	32.7	23.2	31.4	24.6	32	23.5	33.4	23.3

Day.	Antipolo.		Iba.		San Isidro.		Tarlac. <sup>a</sup>		Baler.		Dagupan.		Bolinao.		Baguio.	
	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.
	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.
1	34.3	20.6	34	21.7	33.9	22	36	22.6	31.3	21.8	35.6	22.9	35.1	25.1	32.7	15.1
2	34.7	21.3	34.3	21.6	34.7	22.9	36.3	23.4	31.9	22.4	37.8	23.6	35.5	24.4	24.2	15
3	31.7	20.9	34.7	22.5	34.8	22.4	37.8	22.8	33.7	22.1	34.3	23.6	34.6	24.6	25.2	14.8
4	31.7	21.8	33.9	24	34.4	24.4	36.2	23	33.7	24.3	35.2	25.4	35.7	23.7	24.6	15.7
5	33.8	22	34.2	23.1	34.5	21.8	36.3	23.3	32.6	21.8	37.7	24.4	35.9	25.4	24.7	15.3
6	34.7	22	34.1	20.7	35.2	22	37.7	23.1	33.4	21.9	33.7	23.2	35	21.9	24.7	15.2
7	33	22.2	33.4	21.7	33.4	22.8	37.4	22.8	34.2	23.2	36.2	23.5	35.8	24.9	24.8	15.5
8	32.9	21.8	37.2	22.5	34.9	23.5	37.1	23.5	33	23.4	38.2	24.4	36	25.4	25.5	16.2
9	32.6	21.7	34.5	24.2	35.4	23	37.3	22.8	34.4	24.8	37.7	25.1	36.4	25.1	25.3	15.8
10	31.6	22.3	36.2	21.7	34.4	22.2	35.6	22.4	35	22.5	38.7	24	37.9	25.7	25.7	15.8
11	33.1	22.5	35	24.2	33.6	22.3	35	22.8	30.6	23.2	37.8	24.6	37.2	25.8	25.2	15.8
12	34.4	22.8	33.2	25.5	35.5	25	34.5	23.1	31	23.6	37	24.5	34.8	26.1	23.7	16.5
13	31.5	22.7	28.3	23.1	32.1	24.4	33	23	31.2	23.8	33.7	23.8	31.3	24.1	20.2	15
14	31.2	22.3	30.5	22.2	34.5	23.5	35.5	22.8	30.7	22.4	33.6	23.1	31.6	23.6	20.9	14.7
15	33.5	22.5	32.2	22.9	34.6	22.6	36.7	23	31.2	22.3	36.3	23.7	33.8	23.4	23.2	15.3
16	34.3	22.5	32.8	24	34.3	23.2	36.2	23.3	30.5	23.1	35.2	23	33.9	24.9	23.5	15.6
17	35.6	21.6	32	22.9	32.4	22.9	35	23.4	29.5	22.8	34.1	23	33.6	24.4	22.8	15.5
18	35.7	22	33.1	23.1	34.7	22.4	36.1	23.2	31.4	21.6	36.7	23	33	24.6	24.3	15.6
19	36.1	21.5	32.9	24	35.6	23.1	36.7	24.5	32.7	21.9	36.2	23.9	33.7	26	25.6	15.9
20	35.3	22.8	31.5	23.6	36.5	23.5	35.2	23.4	32.5	22.7	35	23.1	33.6	25.8	24.3	16.2
21	35.3	22.5	32	24.5	35.2	23	35	23.6	32.4	22.8	35.5	22.6	33.5	23.9	23.1	14.8
22	34.8	23	32.6	22.5	33.5	22	35.4	22.5	32.5	22.5	35.2	22	33.5	23.5	23.3	14.6
23	36.1	21.8	33	21.7	33.7	21.8	36	22.4	33	21.5	36	22.5	33.6	23.8	23.8	16.5
24	35.4	22	33.1	22.4	34.2	23.2	36.7	23.8	32.7	22.4	36.7	22.9	33.9	25.4	24.4	16.2
25	34.1	22.5	32.9	22.9	34.1	23.6	36	24.2	32.4	23.2	35.4	24.9	34.5	27	23.5	16.8
26	36.1	21.9	33.5	23	35.2	23.3	37.2	24	33.4	22.8	35.4	24.5	34	25.6	25.4	16.8
27	34.7	23.5	34.5	24.4	33.9	24.4	36.7	24.1	33.2	24.2	35.7	25	35.4	25.4	25.4	16.1
28	35.4	23.2	33.8	25.7	34.7	24.4	36.2	24.6	32.1	23.6	37.1	24.6	35.8	24.3	24.8	17
29	35.6	22.8	31.8	23.5	35.1	24	36	24.7	32.4	22.3	37.3	22.5	32.7	23.8	24.8	16.3
30	32.3	22.5	31.2	23.1	33.6	23.3	34	23.5	32.7	22.9	32.3	22.5	31.8	23.2	23.7	16
31	32	22.4	32.3	22.3	34.6	25	35.5	24.4	31.8	23.4	34.1	24.5	32.8	23.6	23.9	16.2
Mean	34	22.2	33.3	23.1	34.4	23.2	36	23.4	32.4	22.8	35.9	23.7	34.4	24.6	24.1	15.7

<sup>a</sup> The maximum temperatures of this station are not very reliable; they seem to be too high.

Maximum and minimum temperatures at the stations of the Weather Bureau, May, 1916—Continued.

Day.	San Fernando, Union.		Echague.		Candon.		Vigan.		Tuguegarao.		Laoag. <sup>a</sup>		Aparri.	
	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.
	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.
1	35	23.8	34.6	21	33	25	33.5	24.8	36.4	22.4			31.4	23.3
2	36	24	34.3	21.4	32	23	34.6	23.5	37.4	22			31.1	23.3
3	33.9	24.5	32.8	20.6	32.5	24.5	34.7	24.8	34.8	21.3			31	22.9
4	35	24.5	33.9	22.6	32.5	24	33.9	26.1	36	22.3			31.5	23.3
5	35	24.1	33.3	20.6	32.5	25	35.8	25.4	36.8	21.3			30.9	23
6	34.4	23.5	33.7	20.3	33.5	25	33.6	25	37	21.5			31.3	23.3
7	35	24.8	34.5	21.7	32.5	25	34.1	24.3	38	22.5			32.1	22.8
8	35.5	24.5	35.9	21.6	32.6	26	33.7	25	37.4	24			31.2	25.1
9	35.3	23.8	35.5	21.6	32.1	26.2	33.8	25.3	38.4	23.5			31.3	24.6
10	36	24	36	20.3	31.8	25.2	34.2	25.8	39.1	22.6			32.2	22.8
11	36.5	24	36.7	21.1	32	25.6	34	24.7	39.2	22.8	36.3	24.6	32.5	23.5
12	34.5	24.8	33.7	22	32.5	25.6	33.3	25	36.5	23.3	33.1	24.7	32.4	24
13	31.5	23.5	35	23.3	33.4	26.5	33.5	22.5	36.6	23.6	33.1	23.5	30.9	22.8
14	32.3	23.6	34	21.6	34.3	23.9	33.1	22.8	37.6	22.7	33.1	22.5	31.6	23.5
15	33.4	25	35	23.2	33.8	23.8	34.5	23.3	37.7	24.4	33.5	23.8	31.7	22.8
16	33.7	24.1	35.3	23	33	25.5	33.8	24.3	36.6	23.9	34	24.5	32	23.8
17	33.7	24.5	35.7	21.5	33.3	24.5	34.2	24	38.5	24.1	34.6	24.5	32.8	24.8
18	35.2	24.3	36	21.5	36.2	25	33.6	25.1	39.2	23	35.1	24.7	34	24.5
19	34.5	24.8	37.6	21.5	32.1	25.1	33.8	24.8	39.5	24.5	35.1	24.4	34.2	25.2
20	33.9	25	37.5	22.2	32.2	26	34.3	25	39	23.5	35.2	25	33.4	20.6
21	34.3	25	36	22.4	34	26	33.8	22.9	39.1	23	36	24.3	32.5	23.2
22	33	23	35.6	22.3	34.6	24.6	33.4	23.6	35	23.2	35.8	24.4	31.5	23.3
23	34.5	24	34	19.8	34	25	33.2	24.2	37	21.6	36	25.2	32	22.7
24	34.5	25	35.9	21.5	34.4	25	34	24.4	39.5	23.3	35.9	24	33	24.2
25	34	24.8	36.5	22.3	35.4	25.6	34.3	25	39.1	25	36.3	24.6	32.5	24.5
26	34.5	24.2	36.2	22	35.8	26.5	34.9	25.9	39.3	23.7	36.8	25.2	32.7	25.2
27	34.6	26	36.2	23.1	36.6	27	34.9	25.9	38.6	24.1	37.5	25.6	33.1	25.8
28	36.6	25	36	22.2	37	27.2	34.2	26.5	40.5	23.7	36.7	25.7	33.2	25.1
29	35	24.7	36.6	23	34.6	26	34.3	24	39	24.5	34.5	23.5	32.8	25.7
30	31.7	23	36	23.5	31	25.1	33	23	37.1	22.7	32.9	23.6	32.1	24.8
31	33.5	25	35.5	22.6	34.6	26	33.8	24.6	38.5	24.3	34.2	24.2	32.2	24
Mean	34.4	24.3	35.3	21.8	33.5	25.3	34	24.6	37.9	23.2	35	24.4	32.2	23.8

<sup>a</sup> The maximum temperatures of this station are not very reliable; they seem to be too high.





## SEISMOLOGICAL BULLETIN FOR MAY, 1916.

By Rev. MIGUEL SADERRA MASÓ, S. J.,  
*Assistant Director of the Weather Bureau.*

### EARTHQUAKES FELT IN THE PHILIPPINES.<sup>1</sup>

6, 11<sup>h</sup> 19<sup>m</sup> [6, 19<sup>h</sup> 19<sup>m</sup>]. **Surigao** (NE Mindanao). Earthquake shocks of intensity II-III. It was registered by the Wiechert seismograph of Butuan and the record shows that the epicenter lay at a distance of some 90 kilometers toward the northern part of the Butuan Bay.

7, 11<sup>h</sup> 15<sup>m</sup> 10<sup>s\*</sup> [7, 19<sup>h</sup> 15<sup>m</sup> 10<sup>s</sup>]. **Aparri** (NE Luzon). Oscillatory earthquake, direction N-S, intensity III-IV, duration 8 seconds. Probably its origin must be placed E of the Bashi Channel: it was registered at Zikawei and Taihoku; in the last place some seconds earlier than at Manila.

8, 12<sup>h</sup> 56<sup>m</sup> 13<sup>s\*</sup> [8, 20<sup>h</sup> 56<sup>m</sup> 13<sup>s</sup>]. **S Luzon and N Mindoro**. Earthquake shocks of intensity III-IV. The origin seems to have been in the eastern part of the strait separating Luzon from Mindoro.

16, 5<sup>h</sup> 00<sup>m</sup> [16, 13<sup>h</sup> 00<sup>m</sup>]. **Surigao** (NE Mindanao). Earthquake of intensity II-III.

21, 13<sup>h</sup> 47<sup>m</sup> [21, 21<sup>h</sup> 47<sup>m</sup>]. **Sorsogon** (SE Luzon). Earthquake of intensity III; it was felt principally in the neighborhood of Bulusan Volcano.

23, 22<sup>h</sup> 09<sup>m</sup> 42<sup>s\*</sup> [24, 6<sup>h</sup> 09<sup>m</sup> 42<sup>s</sup>]. **Butuan** (N Mindanao). Earthquake of intensity II-III.

26, 20<sup>h</sup> 23<sup>m</sup> 23<sup>s\*</sup> [27, 4<sup>h</sup> 23<sup>m</sup> 23<sup>s</sup>]. **Cuyo Island**. Oscillatory earthquake of intensity IV, duration 12 seconds. Its origin was in the Sulu Sea, S of Cuyo.

29, 12<sup>h</sup> 52<sup>m</sup> [29, 20<sup>h</sup> 52<sup>m</sup>]. **Agusan Valley** (E Mindanao). Oscillatory earthquake of intensity III-IV, long duration. The origin was situated 190 kilometers distant from Butuan and 1,000 kilometers from Manila, probably in the *Deep* of the Pacific Ocean.

31, 15<sup>h</sup> 10<sup>m</sup> 25<sup>s</sup> [May 1, 0<sup>h</sup> 49<sup>m</sup> 25<sup>s</sup>]. **Guam** (Mariana Islands). Earthquake of intensity II-III. Its origin seems to be placed some 210 kilometers distant W of Guam.

<sup>1</sup> The intensity of earthquakes is given in the notation known as the Rossi-Forel scale. The time is that indicated by the seismographs at the Central Observatory whenever the disturbance has been registered by them. This fact is denoted by an asterisk (\*). Otherwise the time is that noted by the observer who sent the report. All time indications are in Greenwich mean time (midnight=0<sup>h</sup>), insular time being added in brackets for the convenience of the Philippine readers.

RECORDS OF THE MICROSEISMOGRAPH.

[Time: Greenwich mean. Midnight=0<sup>h</sup>. Instrument: Wiechert seismograph; 1,000 kilograms.  $A_N: T_0=6.1, \epsilon=3.89, \frac{r}{T_0^2} = 0.023;$   
 $A_E: T_0=6.6, \epsilon=2.32, \frac{r}{T_0^2} = 0.050.$  Alluvium. 2.40 meters above sea level].

No.	Date.	Character.	Phase.	Hour.	Period.	Amplitude.		Remarks.
						$A_N$ $\mu$	$A_E$ $\mu$	
165	2	Iv	eP F	<i>h. m. s.</i> 8 59 52 9 02				
166	2	I	e M <sub>N</sub> M <sub>E</sub> F	22 53 32 59 00 23 00 48 12	7 10	11	8	
167	3	Iv	e F	2 29 42				
168	3	Ir	eP S L M <sub>N</sub> M <sub>E</sub> F	4 38 16 41 07 44 06 45 54 46 42 5 08	10 9	11	10	
169	3	Iv	eP F	6 14 03 16				
170	5	Iv	eP M <sub>N</sub> F	18 55 40 19 00 44 08	9	7		
171	6	Iv	eP M <sub>E</sub> F	7 30 22 31 46 44	5		10	
172	6	Iv	eP F	14 58 18 15 04				
173	7	IIv	eP L M <sub>N</sub> M <sub>E</sub> F	11 15 10 16 10 17 46 18 26 51	4 4	191	266	Aparri (NE Luzon).
174	8	Iv	eP F	11 58 03 12 01				
175	8	IIv	eP L M <sub>N</sub> M <sub>E</sub> F	12 56 13 56 28 56 30 56 38 13 06	2 2	125	299	S Luzon and N Mindoro.
176	8	Iv	eP F	14 54 18 56				
177	8	Iv	eP F	15 23 30 29				
178	8	Iv	eP F	17 25 58 29				
179	8	Iv	eP F	17 29 51 33				
180	9	Iv	e F	0 47 1 01				
181	9	Iv	eP F	1 54 23 57				
182	9	Ir	eP S L M <sub>E</sub> M <sub>N</sub> F	14 40 42 46 40 53 54 58 11 58 14 15 22	13 14		4	
183	10	Iv	eP F	14 48 53 51				
184	10	Iv	e F	21 56 22 05				
185	11	Iv	eP F	18 39 17 43				

Records of the microseismograph—Continued.

No.	Date.	Character.	Phase.	Hour.			Period.	Amplitude.		Remarks.
								A <sub>N</sub> μ	A <sub>E</sub> μ	
186	13	Iv	eP F	h. m. s.						
				0 49 11						
				52						
187	15	Iv	e F	0 02 18						
188	18	Ir	eP S L M <sub>N</sub> F	7 36 20 38 29 40 28 42 06 53	7	5				
189	20	Ir	eP S L M <sub>N</sub> F	7 17 10 19 37 22 28 23 38 46	9	6				
190	21	Iv	e L M <sub>N</sub> M <sub>E</sub> F	11 55 29 58 00 58 53 59 00 12 17	4 5	39		49		
191	23	Iv	eP F	3 56 24 4 10						
192	23	Iv	eP F	22 09 42 18					Butuan (N Mindanao).	
193	25	I	e F	22 49 23 28						
194	26	Iv	eP L M <sub>E</sub> F	20 23 23 24 16 24 42 30	3	11			Cuyo Island.	
195	26	I	e F	21 01 26						
196	27	Iv	eP L M <sub>E</sub> F	16 17 03 17 20 17 23 22	2	49				
197	28	Iv	eP L M <sub>E</sub> F	12 12 00 12 34 12 44 18	2	9				
198	30	Iv	e F	13 47 56						
199	30	Iv	e F	21 06 08 11						
200	31	Iv	e F	8 32 43						
201	31	Iv	eP L F	15 21 37 21 56 24						

TEMBLORES DE TIERRA SENTIDOS EN FILIPINAS.<sup>1</sup>

6, 11<sup>h</sup> 19<sup>m</sup> [6, 19<sup>h</sup> 19<sup>m</sup>]. Surigao (NE de Mindanao). Temblor de tierra de intensidad II-III. Registrado por el sismógrafo de Butúan; de su registro se deduce que el epicentro distaba unos 90 kilómetros, hallándose probablemente entre Surigao y Butúan hacia la parte N de la bahía de este nombre.

7, 11<sup>h</sup> 15<sup>m</sup> 10<sup>s\*</sup> [7, 19<sup>h</sup> 15<sup>m</sup> 10<sup>s</sup>]. Aparri (NE de Luzón). Temblor oscilatorio, dirección S-N, intensidad III-IV, duración 8 segundos. El origen se hallaba sin duda hacia el E del canal de Bashi: fué registrado por los sismógrafos de Taihoku algunos segundos antes que en Manila. Registróse también en Zikawei.

8, 12<sup>h</sup> 56<sup>m</sup> 13<sup>s\*</sup> [8, 20<sup>h</sup> 56<sup>m</sup> 13<sup>s</sup>]. S de Luzón y N de Mindoro. Temblor de tierra de intensidad III-IV. Su origen se hallaba al E del estrecho que separa Luzón de Mindoro.

16, 5<sup>h</sup> 00<sup>m</sup> [16, 13<sup>h</sup> 00<sup>m</sup>]. Surigao (NE de Mindanao). Temblor de tierra de intensidad II-III.

21, 13<sup>h</sup> 47<sup>m</sup> [21, 21<sup>h</sup> 47<sup>m</sup>]. Sorsogón (SE de Luzón). Temblor de tierra de intensidad III; sentido principalmente en la región del volcán Bulusan.

23, 22<sup>h</sup> 09<sup>m</sup> 42<sup>s\*</sup> [24, 6<sup>h</sup> 09<sup>m</sup> 42<sup>s</sup>]. Butúan (N de Mindanao). Temblor de tierra de intensidad II-III.

26, 20<sup>h</sup> 23<sup>m</sup> 23<sup>s\*</sup> [27, 4<sup>h</sup> 23<sup>m</sup> 23<sup>s</sup>]. Isla de Cuyo. Temblor oscilatorio, intensidad IV, duración 12 segundos. Su origen se hallaba en el Mar de Joló hacia el S de las Islas Cuyo.

29, 12<sup>h</sup> 52<sup>m</sup> [29, 20<sup>h</sup> 52<sup>m</sup>]. Valle del Agusan (E de Mindanao). Temblor oscilatorio, intensidad III-IV, duración larga. Su origen se hallaba a unos 190 kilómetros de distancia de Butúan y a 1,000 de Manila, sin duda en el *Abismo* del Pacífico.

31, 15<sup>h</sup> 10<sup>m</sup> 25<sup>s</sup> [mayo 1.º, 0<sup>h</sup> 49<sup>m</sup> 25<sup>s</sup>]. Guam (Islas Marianas). Temblor de tierra de intensidad II-III. Su origen parece debe colocarse unos 210 kilómetros distante de Guam hacia el W.

<sup>1</sup> La intensidad de los terremotos se indica conforme a la conocida escala de Rossi-Forel. Cuanto a la hora de su ocurrencia, adoptamos la indicada por los sismógrafos de este Observatorio siempre que los hayan registrado, distinguiéndola por medio de un asterisco (\*). En caso contrario copiamos la apuntada por los observadores que nos envían las notas. Todas las indicaciones del tiempo se refieren al tiempo medio de Greenwich (medianoche=0<sup>h</sup>). Para conveniencia de los lectores de Filipinas se añade también el tiempo insular.

## SEISMOGRAPHIC RECORDS OF BUTUAN, MINDANAO.

During the last days of May, 1915, the meteorological station of Butuan, situated near the entrance of the Agusan Valley,  $8^{\circ} 56' N$ ,  $125^{\circ} 32' E$ , was provided with a Wiechert horizontal seismometer of 200 kilograms; the object being to have a seismic station in the southern part of the Archipelago, where could be recorded many earthquake shocks which on account of their small intensity do not affect the seismographs of Manila at a distance of more than 500 kilometers. Many reasons persuaded the selection of Butuan in preference to other southern stations: First, the fact of being placed within the Agusan Valley, at present the most seismic region of the Archipelago; second, its relative vicinity to the great Deep of the Pacific, which follows the eastern coasts of Mindanao and Samar. It was also intended to know in what proportion the seismic disturbances felt and recorded in the Agusan Valley had their origin within its limits. Possibly in this respect and considering the position of Butuan, practically at the exit of the Valley, some one would have preferred a more interned station, but any other situated further south would greatly increase the distance from the most important part of the Philippine Deep where soundings of 9,788 meters were secured, about  $9^{\circ} 56' N$ ,  $126^{\circ} 50' E$ ; moreover the main seismic center of the Agusan Valley seems to lie above the  $8^{\circ}$  parallel, not distant from Butuan.<sup>1</sup>

The seismographic records covering the first complete year show clearly both the extraordinary seismicity of the Agusan Valley and the great part played by the vicinity of the Pacific Deep. As may be seen in the following table the total number of seismic disturbances recorded by the seismograph from the first of June 1915 up to the 31st of May 1916 reaches the high figure of 903; last March showing the maximum number of 98 disturbances. The perceptible shocks at Butuan during the same twelve months did not exceed 30 in number nor degree V in intensity.

SEISMIC DISTURBANCES, JUNE 1, 1915-MAY 31, 1916.

1915		1916	
June .....	82	January .....	70
July .....	81	February .....	81
August .....	73	March .....	98
September .....	82	April .....	80
October .....	44	May .....	91
November .....	57		
December .....	64	Year .....	903

After calculating the distance of the origin of 628 disturbances originated within a radius of 500 kilometers, which comprises Mindanao island, the Visayas group and great part of the Pacific Deep, it was found that nearly 70 per cent or 437 of that number started at a distance of 230 kilometers or less, remaining only about 30 per cent for the further region from 230 to 500 kilometers; these last are almost evenly distributed among the intervening distances.

The said 437 disturbances merit special attention. For its great number it is undoubtedly responsible the fact that within the mentioned distance of 230 kilometers are located not only many of the principal active centers of Mindanao and Visayas but also the part of the Pacific Deep where most of the small seismic disturbances affecting only the nearest regions seem to take place. Their distribution is far from being uniform, it shows evidently that at certain distances seismic disturbances occur with greater facility and frequency than at others, those privileged really corresponding to known or supposed centers of activity.

<sup>1</sup> See "The Earthquake of the Agusan Valley and the Eastern coasts of Mindanao, July 12, 1911," Monthly Bulletin, 1911, pp. 225-237. "The relation of seismic disturbances in the Philippines to the geologic structure." Phil. Journal of Science, Sec. A, August, 1914.

To investigate the distribution, a column of numbers was prepared from 0 to 500, distributed in tens of kilometers. After each record had been measured and the distance calculated, it was noted or charged to the nearest ten of kilometers, so that the greatest discrepancy never exceeded 5 kilometers. The result is shown in the following table:

DISTRIBUTION OF 437 RECORDS IN ACCORDANCE WITH THE DISTANCE OF THE ORIGIN.

	Kms.		Kms.
43 .....	0-10	36 .....	120
3 .....	20	2 .....	130
38 .....	30	67 .....	140
17 .....	40	27 .....	160
37 .....	50	43 .....	190
25 .....	70	15 .....	210
57 .....	90	27 .....	230

The first figure 43 represents local disturbances; the second high one 38, under 30 kilometers, seems to depend on the seismic centers existing in the southern part of the Butuan Bay; these centers have been considered many times in this bulletin as volcanic or superficial. Under 50 kilometers comes another high number 37 due without doubt to the important Agusan center situated above the 8° parallel; to the same must be attributed the relatively great figure under 70 kilometers; it is indeed peculiar the almost complete absence of records belonging to distances of 60 and 80 kilometers. The 90 kilometers radius includes part of the Pacific coast, or the border of the Great Deep, consequently the very big number of disturbances corresponding to this distance needs no any explanation. The principal maximum falling under 140 kilometers may be entirely attributed to the influence of the Pacific Deep, because at such a distance the bathymetric zone of 8,000 meters is already reached. Within the average distance of 190 kilometers are to be found not only the greatest soundings of the submarine abyss, but also the part of it comprised between the 10° and 11° parallel where seem to originate frequent shocks affecting simultaneously southern Samar and northeastern Mindanao, therefore a fairly high figure naturally is expected.

These brief preliminary notes lead evidently to a foreseen conclusion, namely, that a good percentage of the frequent seismic disturbances registered and experienced at Butuan have their origin outside of the Agusan Valley, chiefly in the great abyss of the Pacific. With records covering a period of many years it will be possible to point out accurately not only the different unstable zones of the Agusan Valley but also the portions of the great trough where disturbances are more likely to start.

## REGISTROS SISMOGRÁFICOS DE BUTÚAN, MINDANAO.

En mayo de 1915 se montó en Butúan, población situada en la parte oriental de Mindanao cerca del extremo norte del valle del río Agusan, a los  $8^{\circ} 56' N$ ,  $125^{\circ} 32' E$ , un sismógrafo horizontal estático de Wiechert, de 200 kilogramos de peso, con el fin de tener una estación sísmica hacia el sur del Archipiélago donde se registrasen los temblores de tierra de aquellas regiones, muchos de los cuales por su poca intensidad no llegan a ser registrables en Manila, a más de 500 kilómetros de distancia. Se escogió Butúan por muchas razones: Primera por hallarse en el valle del Agusan, el cual en la época presente parece ser en Filipinas la región de más frecuentes temblores; segunda por distar relativamente poco del grande Abismo del Mar Pacífico, que bordea las costas orientales de Sámar y de Mindanao. Se pretendía también conocer en que proporción los temblores registrados en el Agusan tenían su origen dentro del mismo valle. Tal vez quien se fije en la posesión de Butúan tan cerca del límite norte del expresado valle juzgará que hubiera sido preferible alguna otra población situada más al sur, sin embargo esto la hubiera alejado mucho del núcleo del Grande Abismo, o sea del sitio de su máxima profundidad de 9,788 metros, a los  $9^{\circ} 56' N$ ,  $126^{\circ} 50' E$ ; además el principal centro sísmico del valle agusano parece se halla cerca del paralelo  $8^{\circ}$  y así no distante de Butúan.<sup>1</sup>

Un año completo de observación revela ya tanto la extraordinaria sismicidad agusana como la grande influencia que ejerce en ella la vecindad del Abismo del Pacífico. Como puede verse en el siguiente cuadro el número total de temblores registrados desde el 1.º de junio de 1915 a igual fecha de junio de 1916 asciende a la respetable cifra de 903; siendo el mes de marzo de este año el que presenta un máximo de perturbaciones sísmicas. Los temblores perceptibles en Butúan no pasaron de 30 en número, ni su intensidad del grado V durante el mismo período.

## PERTURBACIONES SÍSMICAS REGISTRADAS DESDE EL 1.º DE JUNIO, 1915 AL 31 DE MAYO, 1916.

1915		1916	
Junio .....	82	Enero .....	70
Julio .....	81	Febrero .....	81
Agosto .....	73	Marzo .....	98
Septiembre .....	82	Abril .....	80
Octubre .....	44	Mayo .....	91
Noviembre .....	57		
Diciembre .....	64	Año .....	903

Habiendo calculado la distancia del origen de 628 registros de movimientos originados en un radio de 500 kilómetros, el cual abarca toda la región de Mindanao, Visayas y gran parte del Abismo del Pacífico, resulta que 70 por ciento de este número, o sea 437 tenían su epicentro dentro de 230 kilómetros de distancia, quedando sólo un 30 por ciento para los 270 kilómetros restantes y distribuyéndose con bastante uniformidad hasta la distancia de 430 kilómetros.

Digno de especial atención es el estudio de estos 437 choques originados en la expresada región. Su gran número es sin duda debido a que dentro de este radio se hallan no sólo varios de los principales centros activos de Mindanao y Visayas sino también buena parte del Abismo del Pacífico donde parecen ser más frecuentes los pequeños temblores que afectan a las regiones vecinas. Su distribución no es uniforme ni parece ser arbitraria, los choques se acumulan con preferencia a ciertas distancias, las cuales realmente, como se verá, corresponden a los diversos centros de actividad.

Para investigar su distribución se preparó una serie de números de 10 en 10 para representar los kilómetros de distancia desde 0 a 500; a medida que se deducía de cada

<sup>1</sup>“El terremoto del valle de río Agusan y de la costa oriental de Mindanao, 12 julio de 1911,” Monthly Bulletin, 1911, págs. 232-237.

sismograma la distancia de su origen se señalaba en la decena de kilómetros más próxima, siendo así la máxima discrepancia de solos 5 kilómetros; el resultado se presenta en el cuadro siguiente:

DISTRIBUCIÓN DE 437 REGISTROS SEGÓN LAS DISTANCIAS DE SU ORIGEN.

	Kms.		Kms.
43 .....	0-10	36	120
3 .....	20	2	130
38 .....	30	67	140
17 .....	40	27	160
37 .....	50	43	190
25 .....	70	15	210
57 .....	90	27	230

El primer número 43 representa los sísmos propiamente locales; la siguiente alta cifra 38, que corresponde a los 30 kilómetros de distancia, parece depender de uno o varios centros existentes en la parte sur de la bahía de Butúan, los cuales en repetidas ocasiones y en este Boletín se calificaron de volcánicos o superficiales. A los 50 kilómetros se presenta un segundo aumento debido ya al importante epicentro propiamente agusano, situado hacia al sur cerca del paralelo 8°. El número correspondiente a 70 kilómetros debe atribuirse al mismo centro; lo raro es que apenas se originen sísmos a los 60 y 80 kilómetros. La distancia de 90 kilómetros abarca ya parte de la costa del Pacífico o sea del borde del Abismo y así se explica que a esta distancia le corresponda un máximo de 57 perturbaciones sísmicas. El máximo principal de 67 sísmos a los 140 kilómetros debe ser del todo atribuido al Abismo del Pacífico, puesto que este radio se extiende ya a la zona de 8,000 metros de profundidad; el radio de 190 kilómetros alcanza no sólo al sitio de máxima profundidad del Abismo, sino también a una región del mismo, situada entre los 10° y 11° de latitud, donde se originan frecuentes temblores que afectan la parte S de Sámar y NE de Mindanao, no es pues extraño le corresponda una cifra alta.

De este breve resumen se desprende claramente lo que ya era dable suponer; que una buena parte de los numerosos movimientos sísmicos perceptibles e instrumentales registrados en Butúan tienen su origen fuera del valle, los más en el Pacífico y precisamente en el Grande Abismo. Cuando se tengan reunidos algunos años de observación será posible definir mejor tanto los diferentes centros inestables del Agusan como las regiones del Abismo donde con preferencia se producen movimientos sísmicos.



MAY 22 1917  
OFFICE OF THE DIRECTOR  
OF THE WEATHER BUREAU

THE GOVERNMENT OF THE PHILIPPINE ISLANDS

# WEATHER BUREAU

MANILA CENTRAL OBSERVATORY

---

BULLETIN FOR JUNE, 1916

---

PREPARED UNDER THE DIRECTION OF

REV. JOSÉ ALGUÉ, S. J.

DIRECTOR OF THE WEATHER BUREAU

MANILA  
BUREAU OF PRINTING  
1916



---

---

**BULLETIN FOR JUNE, 1916.**

---

---



# METEOROLOGICAL BULLETIN FOR JUNE, 1916.

By Rev. JOSÉ CORONAS, S. J.,  
Chief, Meteorological Division of the Weather Bureau.

## GENERAL WEATHER NOTES.

Pressure and temperature.—Although there was no atmospheric disturbance of any importance near the Philippines, yet the mean atmospheric pressure for this month is below that of the preceding year and the June's normal, especially in Luzon. The highest pressures were observed on the 25th, and the lowest on the 12th and 13th.

The monthly mean temperature is also below the normal and below that of June, 1915, the greatest differences having been observed likewise in Luzon. The extreme monthly temperatures for Manila were 35.1° C. on the 5th and 22.3° C. on the 23d and 24th. For Baguio we have the following absolute maximum and minimum temperatures of the month: 25.4° C., 15.2° C. on the top of Mirador, and 25.5° C., 14.1° C. in the valley.

PRESSURE AND TEMPERATURE AT THE FIRST AND SECOND CLASS STATIONS FOR JUNE, 1916.

Station.	Pressure.						Temperature.					
	Mean.	Departure from June, 1915.	Highest mean.	Day.	Lowest mean.	Day.	Mean.	Departure from June, 1915.	Highest.	Day.	Lowest.	Day.
	mm.	mm.	mm.		mm.		°C.	°C.	°C.		°C.	
Tagbilaran	757.25		759.76	25	754.99	13	26.6		32.6	17	21.8	29
Surigao	57.19	-0.79	59.70	25	55	13	26.9	-0.1	35.5	16	22.7	18
Cebu	57.14	-.82	59.56	25	54.71	13	27.5	-1.3	33.5	17	22	18
Iloilo	57.17	-.49	59.76	25	55.04	12	26.9	-1.5	33.3	25	21.9	30
Ormoc	57.46	-.70	59.97	25	55.34	13	26.5	-1.1	32.3	7	21.7	23
Tacloban	57.09	-.94	59.76	25	54.70	13	27.1	-.5	33.5	5	22.2	30
Capiz	57.18	-.79	59.95	25	54.76	12	26.8	-1.5	34.2	16	22.4	30
Calbayog	57.24	-1.01	59.90	25	54.83	12	26.8		35	5	21.8	2
Legaspi	56.98	-1.04	59.89	25	54.34	12	27.5	-1.2	33.3	27	22	2
Atimonan	56.69	-1.24	59.66	25	53.65	12	27.1	-1.3	33.5	18	22.5	2
Ambulong, Tanauan	56.23	-1.07	59.35	25	53.27	12	27	-1.3	35.6	1	22	3
Paracale	56.87	-1.44	59.93	25	53.73	13	27.2	-1.1	34	16	23	Various
Manila	56.77	-1.14	59.79	25	53.84	12	27.1	-1.7	35.1	5	22.3	23, 24
San Isidro	56.91	-1.35	59.98	25	53.99	13	27.1	-1.9	35.6	3	22.2	23
Dagupan	55.95	-1.23	59.22	25	52.80	13	27.8	-1.1	37.2	7	21.8	24
Bolinao	56.15	-1.31	59.66	25	52.55	13	27.1	-1.9	33.5	7	22.4	22
Baguio <sup>a</sup>	635.07	-1.48	637.85	25	631.91	13	18.4	-1.1	25.4	7	15.2	13, 21, 22
Vigan	756.08	-1.40	759.58	25	752.07	13	27.7	-1.4	34.6	5, 9	22.8	2, 12, 14
Tuguegarao	56.41	-1.63	59.75	25	52.64	13	28	-1.4	39.4	3	21.7	27
Laoag <sup>b</sup>	56		59.72	25	51.82	13	27.7		35.4	30	22.9	26
Aparri	56.25	-1.66	59.76	25	52.12	13	27.7	-.8	36.6	7	23.3	22

<sup>a</sup> The barometric readings of this station are not reduced to sea level.  
<sup>b</sup> 29 days of observation only.

Rainfall.—The total rainfall of this month is generally greater than last year in Luzon, but rather smaller in Mindanao. As for the Visayas, our stations are almost equally divided, some of them reporting an amount greater, and others an amount smaller, than that of June, 1915. If the same total amount of rain for this month is compared with the normal of June, we find that it was below the normal in nineteen stations while it was above it in twenty-four. The monthly rainfall for Manila is 97.9 mm. above that of the preceding year, but 9 mm. below the normal: that of Baguio is only 0.2 mm. below that of June, 1915, but 105.3 mm. below the normal.

## RAINFALL AT VARIOUS STATIONS OF THE WEATHER BUREAU DURING THE MONTH OF JUNE, 1916.

Station.	Total.	Departure from June, 1915.	Departure from normal.	Rainy days.	Departure from June, 1915.	Greatest rainfall in a single day.	Day.	Station.	Total.	Departure from June, 1915.	Departure from normal.	Rainy days.	Departure from June, 1915.	Greatest rainfall in a single day.	Day.
	mm.	mm.	mm.		mm.	mm.			mm.	mm.	mm.		mm.	mm.	
Jolo	97.6	-336.4	-97.9	15	-9	40.6	26	Calapan	163.2	-115.1	-59.3	19	-4	34.3	12
Isabela, Basilan	173.8	-34	-28.6	17	0	32.8	27	Virac	137.6	-215.9	-82.8	19	-7	22.6	29
Zamboanga	77.3	-33.6	-22.4	13	-7	27.5	17	Naga	193.2	+116.7	+11.1	19	+4	85.9	12
Davao	401.4	+7.6	+149.6	14	-4	99.1	21	Batangas	145.7	+91.4	+25.3	23	+12	30	12
Cotabato	149.6	-214	-98.3	22	-4	18.5	26	Lucena	118.3	-	-	17	-	26.7	9
Cagayan, Misamis	244.5	-44	-	16	0	40.1	18	Atimonan	294.3	+93.6	+119.2	14	-1	96	11
Dapitan	249.7	-122.5	+73.3	14	-6	64.7	7	Ambulong, Tanauan	243.7	+109.5	-	21	+10	47.3	19
Butuan	198.4	+10.4	+34.1	23	0	33.6	18	Canlubang, Calamba	244.8	-	-	16	-	59.9	8
Dumaguete	140.9	+42.9	-	15	+3	23.1	18	Paracale	203.7	+49.1	-	17	-5	70.9	8
Tagbilaran	200.2	-	+52.6	15	-	49.8	7	Santa Cruz, Laguna	197.3	+76.3	-	18	+3	30.8	29
Iwahig	297.1	-56.5	-	19	-4	63.4	30	Manila	224.6	+97.9	-9	17	+7	72.9	14
Surigao	85.3	-120.4	-40.4	12	-6	21.1	21	Antipolo	478.9	+438.2	-	21	+13	73.2	12
Maasin	217.9	+80.1	+62.7	11	+2	53.8	18	Iba	707.3	+317.4	+261.2	18	-2	116.9	13
Cebu	194.6	+102.4	+22.4	14	-1	42.9	21	San Isidro	193.9	+171.2	-1.8	19	+9	50.4	13
Iloilo	371	-28.9	+141.8	20	+7	61.7	13	Tarlac	294.4	+117.6	+67.9	20	+7	50.8	13
San Jose Buenavista	331	+101.5	-16.8	22	-1	118.7	18	Baler	447.8	-176.1	+152.5	20	-9	159.6	10
Cuyo	248.5	-1.3	-31.1	23	+2	100.8	18	Dagupan	165.1	-17.3	-140.5	18	+2	33.9	13
Ormoc	325.5	+197.9	+133.7	16	-2	78	29	Bolinao	389.6	+103.7	-5.1	23	+4	93.5	17
Guiuan	163.9	-234.6	-	16	-9	26.2	30	Baguio	286.1	-2	-105.3	22	-2	71.7	17
Tacloban	172.7	-2.5	-27.1	12	-8	33.8	18	San Fernando, Union	166.6	+54.2	-117.6	23	+13	25.1	5
Capiz	357	+183.1	+70.4	20	+4	54.6	27	Echague	124.4	+4	+19	14	+6	43.4	27
Borongan	199	-228.5	-49.3	17	-11	47	30	Candon	155.5	+119.2	-143.5	18	+12	37.3	11
Catbalogan	199.1	-	-	18	-	65.8	29	Vigan	290.5	-204.6	+4.2	22	+14	67.1	11
Calbayog	286	-78.7	+99.7	17	-7	64	21	Tuguegarao	199	+157.4	+73.3	12	+3	52.6	27
Masbate	204.7	+184.4	+86.7	12	+5	66.1	29	Laosag	227.5	-137	-9	20	+8	32.3	6
Romblon	448.2	+298.3	+245.2	23	+10	77	8	Aparri	186.2	+137.6	+66.9	11	+6	58.2	14
Batag	191.8	-175.7	-	14	-9	53.3	6	Cape Bojeador	127.7	-	-	16	-	28.2	8
Legaspi	216.3	-67.5	+25.4	14	-9	61.8	22	Santo Domingo, Bata-							
Sumay, Guam	266.8	+202.1	+137.9	17	0	47	14	nes	211.3	+132.5	+57.2	19	+10	71.9	17

## DEPRESSIONS AND TYPHOONS.

No depression or typhoon was observed over the Philippines during this month. Several depressions were noticed, however, in our weather map of the Far East; one over the Pacific near the Western Carolines on the 12th to 14th, and several others over the northwestern part of the China Sea near Hainan and the Gulf of Tongking. Yet, the data we possess are not enough to enable us to trace with sufficient accuracy but two of the tracks of these depressions. They will be published in the Bulletin of next month together with the tracks of the depressions and typhoons of July. The first of these depressions seems to have appeared on June 8 to 9 to the northeast of the Paracels, and to have moved very slowly to WNW, and then to W across the Island of Hainan. It probably filled up on the 14th in the Gulf of Tongking. While this depression was over Hainan, there appeared another one about two hundred miles to the east of the same Island; it remained almost stationary on the 12th to 14th, moved slowly west on the 14th and 15th, crossed Hainan on the 16th, and probably filled up on the 17th in the Gulf of Tongking.

## NOTAS GENERALES DEL TIEMPO.

**Presión y temperatura.**—Aunque no hubo perturbación atmosférica de importancia cerca de Filipinas, con todo la presión atmosférica media de este mes es menor que la del año pasado y que la normal de junio, especialmente en Luzón. Las presiones más altas se observaron el día 25, y las más bajas el 12 y el 13.

La temperatura media mensual es también menor que la normal y que la de junio, 1915, habiendo sido observadas asimismo las mayores diferencias en Luzón. Las temperaturas extremas del mes en Manila fueron 35.1° C. el día 5, y 22.3° C. el 23 y el 24. En Baguio se registraron las siguientes temperaturas máxima y mínima absolutas del mes: 25.4° C., 15.2° C. en la cumbre del Mirador, y 25.5° C., 14.1° C. en el valle.

**Precipitación acuosa.**—La lluvia total de este mes es generalmente mayor que la del año pasado en Luzón, pero algo menor en Mindanao. Respecto a las Visayas, nuestras estaciones están casi por igual divididas, acusando algunas de ellas una cantidad mayor, y otras menor que la de junio, 1915. Comparada la cantidad total de lluvia de este mes con la normal de junio, la encontramos menor que dicha normal en diez y nueve estaciones, al paso que fué mayor que ella en veinticuatro estaciones. La lluvia de Manila durante este mes es mayor que la del año pasado en 97.9 mm., pero menor que la normal en 9 mm.; la de Baguio es sólo 0.2 mm. menor que la de junio, 1915, pero 105.3 mm. menor que la normal.

## DEPRESIONES Y TIFONES.

Ninguna depresión o tifón se observó en Filipinas durante este mes. Se notaron, sin embargo, varias depresiones en nuestro mapa del tiempo del Extremo Oriente: una en el Pacífico cerca de las Carolinas Occidentales del 12 al 14, y varias otras en la parte NW del Mar de China cerca de Hainán y del Golfo de Tongking. Con todo, los datos que poseemos no son suficientes para que podamos trazar con bastante exactitud más que dos de las trayectorias de estas depresiones. Tales trayectorias se publicarán en el Boletín del próximo mes juntamente con las de las depresiones y tifones del mes de julio. La primera de estas dos depresiones parece haber aparecido del 8 al 9 de junio al NE de Paracels y haberse movido luego muy lentamente al WNW y después al W a través de la Isla de Hainán. Probablemente se deshizo el día 14 en el Golfo de Tongking. Mientras esta depresión estaba en Hainán, aparecía otra a unas 200 millas al E de la misma isla; permaneció casi estacionaria del 12 al 14, se movió lentamente al W los días 14 y 15, atravesó Hainán el 16, y probablemente se deshizo el 17 en el Golfo de Tongking.

METEOROLOGICAL DATA FOR MANILA CENTRAL OBSERVATORY.<sup>a</sup>

[φ=14° 34' 41" N; λ=120° 58' 33" E; barometer above sea, 14.2 meters; gravity correction not applied, -1.72 mm.]

Day.	Pressure (mean).	Air temperature. <sup>b</sup>			Underground temperature.				Relative humidity (mean)	Vapor pressure (mean)	Radiation.		Evaporation. <sup>b</sup>					
		Mean.	Maximum.	Minimum.	0.25 meter.		0.50 meter.				1.50 meters.	2.50 meters.	Minimum on grass	Maximum in sun. Black bulb in vacuo.	Free exposure (total)	Shelter (total).		
					°C.	°C.	°C.	°C.									°C.	°C.
1	757.70	27.3	34	24.3	29.8	31.7	30.4	30.8	29.9	28.5	84.1	22.5	22.3	54.2	3.5	2.5		
2	56.68	28.6	34.9	23.3	30.1	31.8	30.5	30.8	29.7	28.5	76.4	21.8	21.7	54.9	6.1	4		
3	56.74	29.1	35	23.7	30.5	32.5	30.7	31.3	29.8	28.6	70.9	20.6	21.2	56.5	7.1	4.7		
4	56.97	28.2	32.4	24.3	31.3	32.5	30.9	31.2	30	28.5	76.8	21.6	22	48.7	4.2	2.9		
5	56.63	28.4	35.1	24	30.9	32.5	30.9	31.3	29.9	28.5	77.1	21.9	22.4	56	4.8	3.6		
6	55.99	28.5	34.9	24.1	31	32.7	30.9	31.4	30	28.6	75.3	21.4	21.7	58.3	5.3	3.6		
7	55.71	27.1	33.4	24	30.8	31.9	31	31.2	30	28.6	81.7	21.6	22.1	48.8	2.2	1.9		
8	55.47	27.2	33.7	23.3	30.2	32	30.8	31.2	30	28.6	82.2	21.6	21.2	54.8	3.4	2.5		
9	55.29	28.6	34.9	24.1	30.3	32.5	30.7	31.2	30.1	28.5	74.4	21.2	22.6	53.9	6.8	4.6		
10	55.47	28.4	33.8	24.7	30.9	31.7	31	31.3	30.1	28.6	74.6	21.2	22.4	55	5.8	4		
11	54.96	27.5	34	24.2	30.8	31.7	31	31.6	30.1	28.7	80.8	21.7	22.1	55.2	3.1	2.7		
12	53.84	26.1	31.5	23.9	30.4	31.1	30.9	31	30.2	28.6	89.9	22.4	22.8	54.5	1.4	1.6		
13	54.08	25.7	29.7	23.8	29.3	29.9	30.4	30.6	30	28.6	90	21.9	23.1	52.5	1.1	1.3		
14	55.23	24.9	27.5	23.4	29.1	29	30	30	30	28.6	94	22	21.8	31.5	0	.4		
15	55.17	26.2	31.3	23.2	28	28.8	29.5	29.5	30.1	28.6	89.8	22.6	22.5	52.7	1.9	1.4		
16	54.82	27.7	31.2	24.9	29	29.4	29.5	29.6	30.1	28.7	85.7	23.6	23.2	49.7	2.2	1.9		
17	55.32	27.7	31.7	24.8	29.2	29.9	29.8	29.8	30.1	28.7	85.2	23.4	23.3	49.2	2.5	2.2		
18	56.73	27.1	31.9	24.2	29.3	30.2	29.8	29.8	30	28.7	85.3	22.6	22.4	54.4	2.4	1.8		
19	56.86	27.2	33.3	24	29.6	30.7	30	30.2	30	28.8	85.2	22.6	22.3	55.5	2.5	2.2		
20	56.83	26.6	30.8	24.2	29.6	30.5	30.1	30.2	30.1	28.6	84.8	21.8	23.3	53.6	3.2	2.8		
21	56.85	26.2	31.2	23.2	29.8	30.8	30.3	30.4	29.9	28.6	84.9	21.4	22.6	51.7	3	2.1		
22	57.78	24.8	28.8	22.9	29.4	29.5	30.2	30.1	29.8	28.7	91.2	21.2	22.3	41.2	6	1		
23	58.70	26	32.2	22.3	29	30	30	30.1	29.9	28.7	86	21.3	20.7	55.3	2.4	2.1		
24	59.33	26.6	32.7	22.3	29	30.1	30	30	29.9	28.7	85.4	22	20.3	51.7	2.6	1.9		
25	59.79	26.6	32	23.3	29.4	30.3	30.1	30.1	30	28.7	86.6	22.3	21.6	52.5	2.1	1.6		
26	59.23	27.3	33.3	23.6	29.5	30.8	30	30.2	30	28.7	84.2	22.5	22.3	54.4	2.8	2		
27	58.56	27.7	32.8	23.7	30.1	30.9	30.3	30.5	30	28.7	83.7	22.8	21.9	55.7	3.4	2.2		
28	58.61	27.5	32.1	24.5	30.3	31	30.5	30.6	30	28.7	85	23	22.9	50.6	3.2	2.2		
29	59.26	26.5	30.6	24.1	30.2	30.5	30.5	30.6	30	28.7	87.4	22.4	22.4	48.5	1.2	1.3		
30	58.48	26.9	32	24	29.8	30.4	30.6	30.5	30	28.8	85.5	22.4	22.7	52.2	2.8	2		
Mean Total	756.77	27.1	32.4	23.8	29.9	30.9	30.4	30.6	30	28.6	83.5	22	22.2	52.1	3.1	2.4		
Departure from normal	-1.15	-0.8	-0.1	-0.1							+2.7	-0.3						

<sup>a</sup> All the mean values given in this table are deduced from hourly observations.  
<sup>b</sup> These values are taken from instruments mounted in the Observatory Park, 1.5 meters above ground.



METEOROLOGICAL DATA FOR MIRADOR OBSERVATORY, BAGUIO.\*

[ $\phi=16^{\circ} 25' N$ ;  $\lambda=120^{\circ} 36' E$ ; barometer above sea, 1,512.5 meters; gravity correction not applied,  $-1.65$  mm.]

Day.	Pres- sure <sup>b</sup> (mean)	Air temperature at Mirador (on the top of the mountain).				Air temperature in the valley (near the city hall).				Rela- tive hu- midity (mean).	Vapor pres- sure (mean).	Radiation.		Evaporation.		
		Mean.	Maxi- mum.	Hour.	Mini- mum.	Hour.	Maxi- mum.	Hour.	Mini- mum.			Hour.	Mini- mum on grass.	Maxi- mum in sun. Black bulb in va- cuo. <sup>c</sup>	Free exposure (total)	Shel- ter (total)
		mm.	°C.	°C.	°C.	°C.	°C.	°C.	°C.			°C.	Per ct.	mm.	°C.	°C.
1	36.07	18.2	24.2	0.25p.	15.7	5.25a.	23.8	0.50p.	15.2	4.05a.	91.3	14.2	14.6	62	1.9	1.4
2	35.40	18.4	23.9	0.40p.	15.7	1.40a.	25	11.55a.	14.7	5.20a.	86.3	13.6	14.1	58	2.2	1.7
3	35.39	18.8	24	1.15p.	16.1	0.05a.	24.5	Noon	15.2	5.50a.	88.2	14.3	14.1	59.8	2	1.3
4	35.61	18.8	23.9	10.05a.	16	5.15a.	24.5	10.20a.	16.2	2.40a.	86.7	13.9	15	59.2	1.3	1.1
5	35.44	18.6	24.8	1.00p.	16.5	3.55a.	25.4	0.50p.	16	5.45a.	89	14.2	15.1	59	2	1.4
6	34.98	19.6	24.8	10.40a.	16.7	5.15a.	25.1	11.45a.	16.6	5.45a.	87	14.6	15.3	57.8	2.2	1.6
7	34.56	19.8	25.4	10.05a.	16.3	5.55a.	25.5	1.40p.	15.1	5.25a.	86.2	14.6	14.8	56.9	2.6	1.7
8	34.15	19.3	24	1.35p.	16.8	6.00a.	24	0.50p.	16.3	5.20a.	84.8	14	15	54.2	2.8	1.9
9	34.14	19	25.1	1.20p.	16.2	5.15a.	24.8	1.45p.	16.2	5.15a.	83	13.4	15.2	58	4.8	2.9
10	34.10	19	24.8	2.05p.	16.5	6.00a.	25.2	1.10p.	16	5.05a.	84.3	13.8	15.2	55.5	2.8	1.9
11	33.24	18.4	23.3	Noon	16	11.20p.	24.7	1.25p.	15.4	10.25p.	86.3	13.4	15.3	55.7	2	1.6
12	32.10	17	19.9	11.05a.	15.5	4.20a.	20.3	9.05a.	15.7	4.20a.	96.2	13.9	14.9	53.2	.3	.7
13	31.91	17.1	19.2	11.45a.	15.2	8.20p.	20.5	0.15p.	16	1.00a.	91	13.2	15.1	39.6	.6	1.1
14	33.08	17.2	19.7	0.05p.	15.5	5.20p.	20.3	11.45a.	15.8	4.30p.	94	13.7	14.7	40.1	.3	.5
15	33.48	18.6	24	0.50p.	16.3	0.05a.	23.7	2.40p.	15.9	5.25a.	90.5	14.3	15.1	55	2.4	1.3
16	33.50	18.1	21.3	10.25a.	16.5	12m. n.	21.1	10.15a.	16.6	12m. n.	88.5	15.2	16.8	51.4	0	.2
17	33.97	19	24.2	1.40p.	16.2	4.00a.	24.4	1.15p.	15.7	5.25a.	88.2	14.3	14.4	57.4	1.5	1
18	35.01	18	21.8	10.35a.	15.5	5.20a.	23.3	10.45a.	15.7	6.00a.	89.8	13.7	14.6	52	1.1	1.2
19	35.15	18.3	23.5	11.40a.	16.4	5.20a.	23.6	10.40a.	15.5	5.45a.	91.2	14.2	14.9	58.1	1.7	1.3
20	34.32	17.8	22.8	1.00p.	15.6	12m. n.	23.2	1.05p.	15.8	12m. n.	94.5	14.4	15.8	52	.3	.7
21	34.44	16.9	21.6	0.05p.	15.2	9.00p.	21.7	Noon	15.7	8.20p.	96.2	13.8	14.6	56	.4	.4
22	35.14	16.2	17.3	11.00a.	15.2	10.00p.	18.8	0.10p.	15.4	10.25p.	93.5	12.9	14.3	20.8	.9	1
23	36.65	18.3	22.8	2.00p.	15.6	6.00a.	23.4	Noon	14.7	3.30a.	76.7	11.9	14.1	58.3	4.5	2.9
24	37.34	18.5	24.8	10.15a.	15.9	2.30a.	25	10.25a.	14.1	4.00a.	78.5	11.6	13.4	56.7	4.8	2.8
25	37.85	18.8	23.3	11.35a.	16.3	4.40a.	23.3	10.10a.	14.9	5.00a.	85	13.8	13.3	58.7	1.5	1.1
26	37.39	18.7	23.5	1.30p.	16.3	6.00a.	23.3	1.25p.	15.4	5.55a.	92.5	14.8	13.4	56.2	1.4	1
27	36.66	18.6	23.6	1.50p.	16.5	4.45a.	23.5	1.20p.	16.5	12m. n.	92.2	14.7	15.6	59.8	1	.8
28	36.83	19	23.5	0.35p.	15.7	5.10a.	24.1	1.10p.	15.2	6.00a.	90.3	14.7	13.9	57.4	1.2	1
29	37.45	18.1	22.8	0.50p.	16.2	6.00a.	24.4	0.55p.	14.7	6.00a.	94.2	14.5	14.9	55	.3	1
30	36.64	19.1	24	2.00p.	16.2	5.50a.	24.4	2.05p.	15.7	1.35a.	76.7	12.5	14.2	56.2	8.3	4.9
Mean	635.07	18.4	23.1		16		23.5		15.6		88.6	13.9	14.7	54.3	2	1.4
Total															59.6	43.4

Day.	Wind.				Amount (mean).	Clouds.		Sun- shine.	Rain, 24 hours begin- ning 6 a. m.	Miscellaneous.
	Prevailing direction. <sup>d</sup>	Total move- ment.	Maxi- mum hour- ly veloc- ity.	Direction at the time of the maximum velocity.		Form and direction.				
						Upper.	Lower.			
1	E, SW	284.7	20.7	W	0-10.	Ci.-S.	Cu. NW	h. m.	mm.	● 2 40
2	Variable	261.6	18.8	W	7.1	A.-Cu.	ESE	2 40	37.6	● 1 11
3	E quad.	345.2	27.1	E	5.1	Ci. NbyN	Cu.	2 35		● 2 35
4	E quad.	301.9	17.5	SW	8	Ci.	Cu.-N.	1 20	5.1	○ 2 20
5	E	315.2	22.7	E	6.6	Ci. NNW	Cu. SE	1 40	1.6	○ 1 40
6	E	234.1	20.1	SW	5.3	Ci.	Cu., Cu.-N.	3 20		○ 3 20
7	E, SW	212.2	18.8	E	5.7	Ci. ENE	Cu.	2 55		○ 2 55
8	E	322.2	19.3	E	9.1	Ci.	Cu.-N. SSE	0 35	.8	○ 0 35
9	E	441.9	35.7	E	7.9	Ci.-S.	Cu. ESE	2 15		○ 2 15
10	E	390.7	30.1	E	9	Ci.-S.	Cu. SbyE	1 05	2.5	○ 1 05
11	E, SE	405.1	23.4	SE	9.1	Ci.-S. NbyW	Cu.-N. swbys, SSE	0 55	24.1	○ 0 55
12	S quad.	364.5	31.7	SW	9.9		Cu.-N. s, sbyw	0 10	17.5	○ 0 10
13	SW	606.8	55.2	SW	10	Ci.	N. SSW	0 00	18.6	○ 0 00
14	SW	570.5	41.5	SW	9.9	Ci.	N. WSW	0 00	8.6	○ 0 00
15	SW, W	488	35.6	W	9.4	Ci.-S.	Cu.-N. WSW	1 55	15.5	○ 1 55
16	SW, W	490.5	31.4	SW	10		Cu.-N.	0 10	7.7	○ 0 10
17	W, SW	311.5	23.4	W	9.1	Ci.-S.	Cu.-N. SSW	1 25	71.7	○ 1 25
18	E	239.5	17.1	SW	10	Ci.-S.	Cu.-N.	0 20	5.3	○ 0 20
19	E	270.2	18.3	E	8.6	Ci.-S.	Cu. SE	1 05	2.8	○ 1 05
20	E, SE	348.2	27.2	E	8.6	A.-Cu., Ci.-S.	Cu.-N. SSE	0 40	12.5	○ 0 40
21	S quad.	375.3	33.8	SW	9.3	Ci.-S.	Cu.-N. s, swbyw	0 40	16.1	○ 0 40
22	E	283.2	21.4	E	9.9		Fr.-N. WSW	0 00	7.7	○ 0 00
23	E, S	252	21.9	E	8	Ci.-S.	Cu. S	2 30		○ 2 30
24	E	292.4	20.3	SW	6	Ci.-S. NNE	Cu.	3 25		○ 3 25
25	Variable	236.9	19.3	NE	6.4	Ci.	Cu. ESE	2 00		○ 2 00
26	E quad.	252.6	23.3	W	8.4	Ci.	Cu.-N. ESE	1 25	.3	○ 1 25
27	W quad.	262.9	22.7	SW	8.9	Ci., Ci.-S.	Cu.-N. WbyS	1 05	1	○ 1 05
28	Variable	243	19.1	W	5.7	Ci.	Cu. E	0 55	6.9	○ 0 55
29	Variable	258.7	20.1	W	7.4	Ci.	Cu.-N. WSW	0 35	11.2	○ 0 35
30	E	524.4	31.2	E	6.7	Ci.-S.	Cu. SE	1 30		○ 1 30
Mean		339.5	26		8.1			1 24		
Total		10,185.9						41 50	286.1	

\* All the mean values given in this table are deduced from six daily observations taken at 2, 6, 10 a. m. and 2, 6, 10 p. m.  
 b The barometric readings of this station are not reduced to sea level.  
 c Maximum of hourly observations taken from 6 a. m. to 6 p. m.  
 d This element is based on hourly observations taken from a quadruple register, which gives only eight possible directions of the wind.

DAILY RAINFALL AT THE STATIONS OF THE WEATHER BUREAU, JUNE, 1916.

Station.	Day of month.															
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.
	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.
Jolo	1			2				8.9	0.3	0.3	6.6			0.5		
Isabela, Basilan		17	11					8.1	27.4	2.5		14.2	4.1			
Zamboanga			1.9					1	.5				2.2			
Davao		22.6	54.6	3.3	3.8	19	26.7			24.1	25.1					
Cotabato		1.8	5.6	1.8	8.4	10.2	4.3	7.9		11.2	2	5.1		6.4		
Cagayan, Misamis			8.1	32.5			38.1	9.1		1	2.5	3.6	32			
Dapitan			.8	6.9			64.7	17.8		2	3.6	19.3	.5			
Butuan		.5	2.8	1.6	.3	11.2	5.4	1	18.8	.3	3	16.3	18.5			
Dumaguete	4.1			10.7			4.4	9.9								
Tagbilaran			1	9.1	1	3	49.8	14		1.6						
Iwahig	43.4	18.5					23	26.9	1.3	35.8	15.8	23.9	.5			
Surigao					7.1	.3		9								
Maasin					11.4			41.9		26.7			8			
Cebu				9.4	8.1			9.1	4.3	4.3						
Iloilo				17.3	3.8			12.2	20.3	10.4	57.3	2.3	61.7	19		
San Jose Buenavista				4.1	2			11.7	10.7	10.2	1.8	33.8	25.2	30.7	9.2	
Cuyo				4.6	7.9	6.3	3.3	11.4	1.6	4.8	.5	11.2	2	13.7	5.1	8
Ormoc	3.8			22.6				.6		3.6	16.3	26.9	19.3			
Guiuan				13.7	1.3	6.9	8.1	8.9	18.3				25.4			
Tacloban							2	6.2	26.6	15.5	17.7		9.5			
Capiz					40.4	.3	31	14	1.5	1.8	3.5	40.2	4.3		1	1.5
Borongan						4.3		5	4.6	1.8	36.1	25.4				
Catbalogan			13	3.3	6.6	3		.5	3		8.6	31.2	21.8			8
Calbayog				1		2.8			1	6.9		49.8	37.2	5.5		5
Masbate										.3		18.5	24.9	11.5		3
Romblon	14.7	17.3		9.9		6.6	2.3	77	15.5	41.1	24.8	32.3	27.7	32.5		
Batag		15.7		5.6	15	53.3			20.8		9.9	32.8	2			
Legaspi						1.8			1.8	.5	1.8	44.9	12.7	3.3		
Sumay, Guam	15.2	5.1	10.2	11.4		1.3			16.5		6.4	5	47	11.5	1.3	
Calapan				1	27.4	3			2	34.3	12.7	6.9				
Virac			6.1	.8			10.9	14.3	8.1	17	1.5	16	3			
Naga				19.5	.3	.5			17	5.1	85.9	13.9	3.3			
Batangas	1.3			6.6	5.1			2.3	15	18.8	3.3	3.6	30	15	19.8	.3
Lucena									14.2	1	26.7	4.3	3	15.7	1.6	4.1
Atimonan					3				22.4	53.8	1.3	25.3	96	4.3	3.8	
Ambulong, Tanauan	11			10.9		3.6	15		1.8			11.9	29.3	11.4	27.9	3
Canlubang, Calamba	1.8				.5				59.9			5.6	29.2	8.4	22.6	
Paracale				4.3	.5	13.5	2.3	70.9			8	35.3	26.9	.5	2.5	
Santa Cruz, Laguna				3.6				25.7	4.8			23.6	20.3	9.6	17	.5
Manila		1.3						6	1.4			40.6	39.6	14.3	72.9	.7
Antipolo	59.9			2.3		.5						69.8	73.2	7.4	68.3	8.4
Iba	1				4.3		4.6			16.5	9.1	26.9	79.5	116.9	67.8	54.9
San Isidro			1	3.3					.6			7.9	3.6	27.7	50.4	6.6
Tarlac	3	41.7		15							20.6	15.5	30.3	50.8	18.3	2.3
Baler			1.5	23.1	5.3		14.7	31.7	5.3	159.6	19.3	7.4	1.3	1.8		2.8
Dagupan	2.8										3.1	19.7	16.3	33.9	11.4	1.3
Bolinao		28.7	4.1		2.8	7.1	70.1	11.9	5.6	.3	5.3	31	43.4	4.1	15.8	2.3
Baguio	37.6	11		5.1	1.6			.8		2.5	24.1	17.5	18.6	8.6	15.5	7.7
San Fernando, Union	1.5	19.8		.5	25.1	5.1			6.2	11.4	7.6	4.6	10.6	11.7	5.8	4.3
Echague	34.5									1	3	3.6	3	3	2.5	1.8
Candon	3.8	10.2		10.4				1.3	35.1			37.3	1.3	1.5	7.1	10.2
Vigan	11.7	13.5		5.1	6.5	3.4		1.8	16.4	15.9	67.1	5.2	8.6	20.9	15.6	15.1
Tuguegarao			3.6		10.7					4.8	34.5	10.4	4.1	1.3	13.5	
Laosg	7.4	7.8			13	32.3		8.6	17.3	26.4	29	3.5	5.8	8	2.5	26.8
Apurri										.5	6.9		42.9	58.2	13.7	
Cape Bojeador		6.4				6.2	1.3	28.2			26.3	10.4	5.8	1	2	15
Santo Domingo, Batanes				.1				.1	.5	18.6	.1	24.3	9.6	.8	5.3	14.7

METEOROLOGICAL BULLETIN.

Daily rainfall at the stations of the Weather Bureau, June, 1916—Continued.

Station.	Day of month.														Total.	
	17.	18.	19.	20.	21.	22.	23.	24.	25.	26.	27.	28.	29.	30.		
	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	
Jolo	10.4	0.8	1		17.6				1.5	40.6	2.8	3.3			97.6	
Isabela, Basilan	2	12.7	1		1.5		0.8		14.5	5.6	32.8	.8	17.8		173.8	
Zamboanga	27.5	8.6			4.4		.5	5	5.6	18.8		.3	1		77.3	
Davao	59.7	11.9	17		99.1					9.9			24.6		401.4	
Cotabato	3.3	8.7	9.4		2.8	5.3		11.9	4.6	18.5	2.1	7.4	10.9		149.6	
Cagayan, Misamis	3.3	40.1	3.8		16.5	6.5					10.6		35.8	1	244.5	
Dapitan	21.1	9.6						27.2			4.6	17.5	54.1		249.7	
Butuan	9.1	33.6	.5		3	16.5		24.7	16.5	1.3	6.4	5.4	7.1		198.4	
Dumaguete	9.4	23.1	3		10.8	21.1		5.3			2.4	18.5	12.4	4.8	140.9	
Tagbilaran	8.7	13.9			.8	10.7		13.4	1.5		48.6		21.5	5.3	200.2	
Iwahig		9.5	1.2	3.8		5	1	10.9				10.4	4.3	63.4	297.1	
Surigao	17	11.2	1		21.1	3		.8		9.9		3.8	1.1		85.3	
Maasin	7.6	53.8			13						23.6	21.6	5.6	9.7	217.9	
Cebu	22.8	28.4		2	42.9	9.7				38.5	1.8	2	11.2		194.6	
Iloilo	18.8	28.7	2		11.4	3.8		12.4	38.1	.5	5.6	5.3	40.1		371	
San Jose Buenavista		118.7	14	1.5	4.1	1.5	.8	.3	.3	2.8	11.2	3.6	32.8		331	
Cuyo		100.8	11.7	3.6	2.8	2	1.3				24.1	7.9	18.8	2.3	248.5	
Ormoc	13.2	69	5.8		5.1	19.3					27	78	14.5		325.5	
Guiuan	4.8	23.4			8.6	.8		2			5.3	6.9	3.3	26.2	163.9	
Tacloban		33.8			25.6	3.7		.3				7.7	24.1		172.7	
Capiz	2	51.1	24.1		12	3				18.8	54.6	1.5	51.6	.3	357	
Borongan	15.7	30		.8	25.2	.8					1	2	.8	47	199	
Catbalogan		8.1		.3	18.3	8.4		.3				5.1	65.8	1	199.1	
Calbayog		30.9		1	64		2.3	19	.8			1.5	61	.8	286	
Masbate		8.9	9.6		46.7	8.7		5.1				4.1	66.1		204.7	
Romblon	.3	30.2	40.9	.5	44.2	2.3		3		2.5			4.8	17.5	.3	448.2
Batag		10.2	10.7	1.3				1.3					7.1	6.1		191.8
Legaspi		6.9	3.3		37.6	61.8							3	37.8	1.8	216.3
Sumay, Guam	45.7			5.1					38.1		5.1	8.9	33		266.8	
Calapan		5.6	6.1	2.3	1.3		.5		.5		.8	12.4	32.8	8.1	168.2	
Virac	7.4	9.1			5.8	.5	13	4.6		1		11.9	22.6		137.6	
Naga		3.8	2.5	1	15.7	3.5	9.7	4.1		1		6	5.5	.3	193.2	
Batangas		1.3	3		2.5		.5	3.8	.8	.5	.3	2	4.3	5.6	145.7	
Lucena		6.9	1.5	.3	4.3	5.6		.3				2.3	12.7	16.5	118.3	
Atimonan		20.3			34.3	20.3		2.3		.8			6.4		294.3	
Ambulong, Tanauan		2	47.3	4.8	20.3	10.2			5.8	12.7	.8	6.4	2.3	5.3	243.7	
Canlubang, Calamba			36.8		24.2	1.8				12.9		1	7.6	2.3	244.8	
Paracale		10.4	3.3		2.1	3.3		2.3				3.8	21		208.7	
Santa Cruz, Laguna		2.5	13.7	1	28.4	3.3			4.1	4.8	.3		30.8	3.3	197.3	
Manila		1	7.1	1.4	18.8	2.4	16						2.9	1.5	224.6	
Antipolo	2.5	7.6	63	11.9	11.2	21.3	29.7		10.9	2		4.6	14.7	4.1	478.9	
Iba	61.5	1.8	85.9	41.1	70.6	27.3							13		707.3	
San Isidro	1.8	21.6	14.5	6.9	7.7	12.2			18.3		1.8	2.3	4.9	.8	193.9	
Tarlac	4.8	17.3	30.5	.5	2	2.6				30		3	3.1	.3	294.4	
Baler	2.8	14.2	53.6	8.4	9.7	5.6						16	17.2	49.3	447.8	
Dagupan	6.4	8.9	9.7	17.8	2.5	6.6	3				1	4.1	13.5		165.1	
Bolinao	93.5	11.7	4.6	6.1	3.5	16.5			.3		10		10.9		389.6	
Baguio	71.7	5.3	2.8	12.5	16.1	7.7				.3	1	6.9	11.2		286.1	
San Fernando, Union	11.4		6.9	2	3.8	2.8					14.7	.3	5.1	.3	166.6	
Echague	24.9		1.3		4.3						43.4		.5	.3	124.4	
Candon	4.3		12.7	3.8	1.3	1	5.1				5.3		3.8		155.5	
Vigan	10.4		32.5	9.8	7	4.8					1.3		.3	17.6	290.5	
Tuguegarao	21.1	1.5			40.9						52.6				199	
Laog	2.8		11.5	18.8	11.4	1.5	.5				.3				227.5	
Aparri	15	2.5		29.2	13		3.8						.5		186.2	
Cape Bojeador	4.3		2.5	9	9.5						.1		.6		127.7	
Santo Domingo, Batanes	71.9	58.4	.1	3		.1	1.1	1	.5					1.1	211.3	

MAXIMUM AND MINIMUM TEMPERATURES AT THE STATIONS OF THE WEATHER BUREAU, JUNE, 1916.

Day.	Jolo.		Isabela, Basilan.		Zamboanga.		Davao.		Cotabato.		Cagayan, Misamis.		Dapitan.		Butuan.	
	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.
	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.
1	30.9	22.1	30.6	23.6	30.5	22.4	31.7	22.5	32.8	23	32.4	23.1	32.6	22.7	32.8	23.3
2	29.8	21.8	29.6	22.6	28.8	23.5	31.9	23	33	23.7	32.3	23.1	33.1	23	33.5	23.2
3	30.2	22.1	29.6	23.6	29.3	23.5	31.7	21.5	30.9	23.2	31.5	25.1	32.5	22.8	33.3	23.9
4	28.9	22.9	29.1	23.1	29.3	23.2	30.7	23	30.5	23.2	31.4	23.3	32.3	32.6	33.2	23.5
5	31	20.9	30.6	23.1	30.2	23.8	31	22	31	22.7	31.3	22.8	32	23.3	31.8	23.1
6	30	20.9	30.1	22.4	29.6	23.5	31.5	22.7	30.6	22.8	31.6	23.7	31.6	22.8	32	23.5
7	30.3	21.8	29.1	23.1	30	23.3	31.9	22.2	31	23.7	31.4	24	30.9	23.1	32.5	23.6
8	29.2	21.3	29.1	22.1	29	23.9	31.5	22	30.5	23.2	30.7	23.9?	32	21.6	32.5	23.2
9	29.3	21.8	31.1	22.6	29	22.8	30.9	22.5	30.8	22.3	30.8	22.5	31.4	22.3	32	22.9
10	31.1	22.2	31.6	22.3	29.6	23.8	30.5	22.4	30.4	22.3	31.8	22.8	32	22.9	32	23
11	31.4	23.1	30.1	22.6	29.5	22.9	31.6	22.6	30.5	22.2	31.7	23.1	32.2	23.6	32.5	22.9
12	31.5	21.8	31	23.6?	30	23.9	31.9	23.6	31	22.7	32.2	22.4	31.1	23.3	31.7	22.8
13	31.2	23.8	31.6	22.3	30.5	24.3	32	22.5	31	23.1	32.4	23.1	32.6	23.1	33	22.9
14	31	22.3	32.1	22.6	29.8	22.6	31.7	22	31.6	22.7	32.3	22	33.1	22.4	32.8	22.9
15	31.9	21.6	32.6	22.1	30.8	23.1	31.5	20.9	30.3	23.2	33.3	22.1	32.5	22.5	33.6	22.5
16	32	22.9	33.8	22.6	30.2	22.7	31.7	22	30.6	23.7	33	22.1	32.5	22	34.5	22.7
17	30.6	22.6	30.9	22.3	29.5	24.1	31.6	22.1	31	21.8	31.9	23.2	32.1	23.4	32.5	23.8
18	26.4	21.1	30.6	22.1	26	22.3	32.7	22.9	27.4	23	28.9	23.2	28.3	22.6	30	22.9
19	27.7	20.5	32.1	22.7	28.9	22.3	29.7	22	30.6	22.6	30.3	22	30.5	22.1	28.7	22.7
20	31.2	21.5	32.6	22.6	29.7	22.2	31.2	22.5	30.6	22.8	31.3	22.1	31.3	22.5	30.5	23.6
21	30.9	22.8	33.8	22.6	30.5	22.8	31.8	22	31.5	23.5	32.3	22.9	32.5	22.9	32.3	23.1
22	29.8	21.4	33.1	23.3	29.5	23.6	31.9	22.1	31.6	22.5	31.4	22.1	32	23	32.3	22.5
23	31.9	22.7	33.6	22.6	30.4	24.8	31.5	22.3	31.9	23	30.7	22.2	32.5	22.5	31.5	22.4
24	30.5	21.8	34.1	23.1	30	22.9	31.5	23.2	33.2	23	31.4	22.8	33.5	22.5	32.6	22.7
25	29.5	21.5	32.1	22.6	29.6	22.5	31	21.6	31.8	22	31.3	22.2	32.2	21.8	32.1	22.2
26	30.3	21.4	32.6	22.1	29	22.7	31.9	22	31.8	23.1	31.4	22.2	32.1	22.4	32.5	22.6
27	30.4	21.8	30.6	22.6	29.4	22.4	30.5	22.5	29	22.3	31.5	22.8	32.1	22.5	31.5	23.2
28	30.3	21.7	29.4	21.6	28.4	22.8	27.5	22.2	29.8	22.2	29.3	21.9	30.4	22.3	29.2	22.2
29	27.4	21.4	31.5	22.1	28.2	21.9	30.2	21.5	30.3	22.3	30.7	22	31	22	30.8	22.4
30	29.4	21	33.1	21.6	30.4	21.6	30.7	21	31.7	21.6	30.3	21.9	31.5	21.6	32.1	21.7
Mean	30.2	21.9	31.4	22.6	29.5	23.1	31.2	22.2	31	22.8	31.4	22.7	31.9	22.6	32.1	22.9

Day.	Dumaguete.		Tagbilaran.		Iwahig.		Surigao.		Maasin.		Cebu.		Iloilo.		San Jose Buenavista.	
	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.
	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.
1	31.4	23	31.3	22.6	32.7	22.1	32.3	22.7	34.4	24.1	31.5	23.7	31.2	23.1	32.7	23
2	31.3	24.3?	30.6	22.9	32.5	22.4	33	23.4	33.8	23.5	31.5	23.5	32.9	23.3	33.4	22.9
3	30.3	22.8	30.5	23.4	32.4	22.5	32.1	23.8	35	23.5	31.3	24	32.6	24.8	33.7	24.3
4	31.3	24.1	30.5	23.4	32.9	22.2	32.8	24.4	34.5	24	31.7	24.7	31.6	23.5	33.2	24.4
5	29.3	23.5	30.2	23.1	30.6	22.4	32.2	24.1	34	24.2	31.6	24	31.5	24.7	32.2	23.6
6	30.5	23.3	30.6	23.4	32.7	23	30.8	23.8	33	23.2	31	24.1	31	25.1	32.2	24
7	30	23.6	31.1	22.5	31.6	23	33.4	23.8	34.4	23.5	32.8	24.4	31.5	24	31	23.4
8	31.4	23.5	31.4	23.6	31.6	23.1	32.1	23.8	32	23	31.8	24.7	30	24.5	30.3	23.8
9	30.4	23.6	30.7	22.5	31	23.4	29.5	24	32	22.8	31	23.3	31.5	23.5	29.7	23.1
10	31.6	22.7	31.2	23.8	31.3	22.5	32.9	23.3	34	23.6	31.8	24.5	31.2	23.5	31.7	23.1
11	32.9	23.8	31.4	25	31.8	22.4	32.5	23.3	34.2	23.9	30.5	24.4	29.1	24	30.2	24.6
12	32.3	23.8	30.9	24.1	32.9	21.7	33.3	23.7	31.5	25	30.2	25.5	30.5	24.2	31	23.2
13	33.3	25.2	31.5	25.6	28.4	22.9	33.1	24.3	34.4	25.2	30.3	26.2	30.5	23	29.4	24.3
14	32.7	23	30.8	24.6	31.5	22.5	33.5	24.4	33.2	24.4	30.2	25	31	23	30.2	23.1
15	32.1	22.4	31.9	23.4	33.8	22.5	34.8	23.2	32.8	24.2	31.5	25.4	31.1	25.9	31.7	23
16	34	24.3	31.5	24.5	34.2	22.1	35.5	22.9	32.5	23.8	30.9	25.6	31.4	27.1	31.8	24.6
17	29.3	25?	32.6	24.7	33.8	22.8	33.1	23.8	31	24.6	33.5	24	31.1	24	32.2	24.3
18	30.3	22.7	29.8	23.4	27.5	22.5	30.3	22.6	30.6	22.8	30	22.5	29.5	23.8	28.3	24.5
19	30.8	22.8	30.3	24.6	31.8	23.2	31.8	24.2	32.5	24.5	29.5	25	30.6	24.2	31.7	23.1
20	31.2	23.4	31.5	22.7	33	21.9	32.5	22.5	34	24.5	31.2	22.6	31.4	24.5	30.2	23.7
21	31.5	23.5	31.3	22.8	32.3	23.3	32.5	22.3	34.2	23	30.6	22.5	30.5	23.6	30.7	23.5
22	30.5	23.5	29.5	22.6	31.7	24.3	32	23.1	34.5	22.8	31.1	22.4	31.5	23.9	32.7	22.8
23	31	23	30.6	22.5	32.3	22	33.4	22.8	35	22.6	32.5	23.7	32	22	32	22.4
24	30.4	24.3	31.2	23.4	34.3	21.6	34.7	23	35.1	23	32.3	24.6	33.3	23	32.2	22.7
25	31.4	24.2	30.9	23.8	32	22.3	32.8	23.1	34	24	31.2	24.8	31	23.6	32.7	23
26	32	23.7	29.5	22.5	29.6	22.1	32.2	23.6	32.2	23.5	29.4	23	30.1	24.5	28.7	23.5
27	30.7	22.6	30.1	22.4	32	21.6	30.5	23.5	30.8	22.4	30.8	24	30.4	24.1	31.7	23.1
28	30.3	22.5	30.2	21.8	30.3	22.4	31.1	22.8	31.4	23.2	29.5	23.3	28.5	23.1	29.2	23.5
29	29.6	22.1	29.5	22.5	29.4	22.6	31.6	23.3	33	22.8	29.7	23.5	28.5	21.9	30.2	22.7
Mean	31.2	23.4	30.8	23.4	31.7	22.6	32.4	23.4	33.1	23.7	31	24	30.9	23.9	31.3	23.5

Maximum and minimum temperatures at the stations of the Weather Bureau, June, 1916—Continued.

Day.	Cuyo.		Ormoc.		Guiuan.		Tacloban.		Capiz.		Borongan.		Catbalogan.		Calbayog.	
	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.
	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.
1	32.8	25	31.2	22.6	32.8	22.9	33.1	24	32.9	23.9	31.5	22	32	22.1	33.5	22.3
2	31.8	24.1	31.9	21.8	33.6	22	32.5	23	33.2	23.5	32.3	21.2	32	22	34	21.8
3	32.8	23.4	31.5	23.5	34.7	22	32.9	24	33.4	23.4	32.8	22.5	32.5	23.3	32.7	23.6
4	30	25.1	31.5	22.8	32.9	22.7	32.7	24.2	33.2	23.8	32	22.5	32.5	23.3	34.1	23.7
5	29.8	24.8	31	22.8	32.4	23.4	33.5	24	33.6	24.6	32	23	31.7	22.7	35	22.9
6	31.1	24.4	30.9	22.7	30.6	23.1	30.6	24.4	32.3	24.1	29.6	22.9	29.3	21.8	28.3	22.5
7	30.6	24.9	32.3	22.4	32.3	22.6	32.7	24.4	31.5	24.4	32.1	22.3	32.1	21.8	33.5	22.2
8	32	24.3	31.5	22.8	32.2	23.9	31.7	24.5	31	23.8	32	23.2	30.9	23	32.3	22.9
9	31.5	24.8	29.6	23.3	32.7	23.1	31.1	24.3	31.5	23.4	31.5	22.7	31.5	23	31.3	23.8
10	30.9	25.6	31.9	22.7	31.5	24.5	32.1	24.5	31.8	24.2	32.1	23.4	31.5	23.1	31.3	23.5
11	31	24.4	31.6	23.2	31.6	25.1	31.3	23.6	31.9	24.2	29.5	22.9	32	23	32.1	23
12	31.1	24.1	30.5	23.7	31.4	27.3	31.4	23.9	33.7	23.3	32	23.7	32	23.4	31.6	23
13	28	24.4	30.5	23.2	32.3	27.5	33.2	23.5	32.4	24.3	32.9	24.1	31.5	23	33.5	23.7
14	30.8	25.7	30.7	23.4	31.7	24.2	31.5	23.5	32.8	23.3	33	23	32	23.5	32.5	26.2
15	31.4	23.2	31.1	24.5	31.7	27.5	33	24	33.7	24	34.2	23.6	32.4	24.6	33.6	26.7
16	32.5	26	31.5	24.8	33	27.5	32.9	24.5	34.2	24.9	33	23.6	32.5	24.6	34.6	25.4
17	32.6	26.3	31.8	23	32.9	27.5	33	24.6	33.3	24.5	32.9	24.9	31.1	24.6	32	24.2
18	27.9	25	29.8	23.1	32	23.4	32.5	23.4	31.3	23.3	32	23.4	31.2	23.8	33.8	23.6
19	27.9	22.9	29	23.4	29.1	23.8	29.2	22.9	31.2	23.4	30.8	23.6	30	24	30.7	24.2
20	30.5	23.7	29.8	23.9	30.1	26.7	30.3	23.7	31.9	23.5	31.6	23.8	31.2	24.5	30.8	24.5
21	31.3	24.6	30.8	23.2	32.3	27.2	32.5	23	32.8	23.6	28	23.9	31.1	24.8	34	22.7
22	28.8	25.5	30.7	22.7	30.6	24.3	31.3	23	30.8	23.6	31	22.9	31	24	32.8	23.4
23	29.4	25.1	31.2	21.7	32.7	23.3	31.4	22.9	31.9	23.2	31.2	22.6	30.9	23	30.3	23.2
24	32.4	24.1	31.8	22	32.4	22.6	32.6	23.6	32.8	22.8	31.7	22	31.3	21.7	33.8	22.4
25	32.3	25.9	32.1	22	33.9	22.6	32.2	24.5	32.7	24	31.9	22.4	32.4	22	32.9	22.9
26	32.5	26	31.7	21.8	33.7	23.8	32.4	24.7	33	24.4	32	22.7	31.7	22.7	32.1	22.6
27	30.5	24.8	29.8	22.5	31.6	23.1	31.6	23	31.9	23.2	32.2	22.8	31.4	22.5	31	22.8
28	31.8	23.2	29.8	22.9	28.3	24.4	29.1	23	31.9	23.2	29.5	22.7	30.9	23.2	31.3	23
29	30.3	23.9	28.9	23	30.7	23.8	30.3	23	29.2	22.6	31.9	22.7	29.6	22.7	30.3	22.5
30	29.7	22.8	30.8	22.6	32.6	23.7	32.2	22.2	29.8	22.4	31.2	22.3	31.4	22.8	31.5	22.6
Mean	30.9	24.6	30.9	22.9	32	24.3	31.9	23.7	32.3	23.7	31.7	23	31.5	23.2	32.4	23.4

Day.	Masbate.		Romblon.		Batag.		Legaspi.		Sumay, Guam.		Calapan.		Virac.		Naga.	
	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.
	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.
1	32.4	24.6	33.6	23.4	31.2	23.1	32.4	23.1	30.4	22.8	32.2	23	32.6	20.8	33	20.8
2	33.8	23.4	34.3	23.3	31.8	23.3	33.2	22	28.4	23.7	33	23	32.4	21	34.2	20
3	34.2	24.8	34.6	22.2	31.7	23.1	33	24.2	29.8	25.8	33.2	23.1	32.7	22.3	34.3	19.9
4	32.8	25.8	34.7	23.4	31.2	24.5	33.1	24.7	30	24.4	33	23	33	22.5	35	21.8
5	33.4	25.6	34	23.4	29.8	24.5	32.2	25.4	30	24.8	33	23.4	33.2	22.4	31.5	21.1
6	31.8	25.8	34.2	24.5	26.8	22	30.4	23.7	30	25.8	33.5	23	31.6	20.8	32.9	21
7	33.4	23.8	33.7	23.9	30.7	23.3	32.4	23.3	30	24.8	33.4	23.1	32	21.1	33.5	21.5
8	33	25.2	34.4	23.5	30.8	24.8	32.1	24.9	30.4	23.6	32.1	23	32.5	23.5	34.2	21.8
9	32.4	25	32.6	22.1	30.6	23.8	32	23.9	30.4	25.6	32.8	23.5	32.1	22.2	31.2	21.1
10	31	25.5	32.9	23.7	30	23.8	33	24.6	31	25.4	31.5	24.3	32.6	22.7	32.5	21
11	32.2	25.2	33.5	23	31.3	24	33	24.9	28.4	25.4	33	23	31	23	33	21
12	31.8	24.2	31.8	23.6	31.7	22.2	31.2	22.2	30	25.4	30.5	24	31.5	22.3	31	21.5
13	31	24.6	32	23.4	29.2	22.5	29	23.4	24.4	24	28	23.4	29.8	22.6	29.8	22.1
14	31	24.6	32.4	22.9	29.9	23.6	30.1	24	27.6	25	30	23	31.2	22.5	31	23
15	32	26.2	32.6	23.3	32.8	24.8	32.4	24.9	29.6	23	32.6	23.1	32.8	22.4	31.8	22.5
16	32.4	26	33.7	25.6	31.4	24.8	32.6	26	30	25.4	32.8	23.1	33	22.7	32.9	23.2
17	31.8	24.8	33.4	25.7	31.8	24.8	33	25.5	30	25.8	32.1	24	32.3	22.6	33.4	23.3
18	31.4	25.6	33.3	23.9	31.2	23.9	32.6	24.5	30.2	22.4	33.8	24	32.1	22.2	33.5	22.2
19	30.5	24	31.9	22.7	31.4	24.2	31	25	30	23	31.4	23	31	22	31.5	22.1
20	30.4	24.8	32.5	24.3	29.4	24	31	24.4	29.4	25	31	23	31.8	23.1	31.4	21.9
21	31	24.6	32.5	23.2	32.5	24.2	32	24	30.6	23.2	32.8	23.5	32.4	23	32.8	23
22	31	23.6	32.8	22.3	30	23.4	30.5	22.6	30	23.4	31.8	23.3	31.5	21.8	31.1	20.3
23	31.6	24.8	34.4	24.1	31.2	24	32.7	23.5	29	23.4	32.2	23	30	21.3	33.6	21.4
24	31.6	24.6	34.8	23	31.7	23.5	32.6	23.2	29.8	23.4	33	21.1	31.3	21.5	32.3	20.8
25	31.6	24.5	32.9	23	30.7	24	32.4	24	29.2	23.8	33	23.3	32.4	21.9	32.5	22
26	32	25	33.6	23.4	31.7	23.4	33	24.6	30.8	23.2	32.5	23.6	32.5	22.3	34.2	21.6
27	30.8	25	33.4	23.4	31.8	23.4	33.3	23.7	31	23.4	32.6	22.4	32.3	22.1	34.2	21.1
28	31	25.2	33.9	23.9	31.8	23.6	32.3	24	29.4	23.4	32.5	22	32.8	22	33	21
29	30	24.4	30.9	23.3	31.3	22.8	31	24.1	26.6	23.8	29	22.5	31.4	22.7	30.9	20.9
30	31.4	22.8	30.6	22.9	31.3	22.5	31.1	23.5	30.4	23.8	30	22	31	23.3	33.5	21.1
Mean	31.8	24.8	33.2	23.5	31	23.6	32	24.1	29.7	24.2	32.1	23.1	32	22.2	32.7	21.5

Maximum and minimum temperatures at the stations of the Weather Bureau, June, 1916—Continued.

Day.	Batangas.		Lucena.		Atimonan.		Ambulong, Tanauan.		Canlubang, Calamba.		Paracale.		Santa Cruz, Laguna.		Manila.	
	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.
	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.
1	33.8	23.1	33	23	32.2	22.9	35.6	23.4	33.9	22.8	32.2	23	33.6	23	34	24.3
2	33.8	22.7	33	22.4	32.5	22.5	35	22.8	33.7	22.3	32.3	23	33.6	23	34.9	23.3
3	34.2	22.7	32.6	22.4	32.5	22.7	35.2	22	34	22.5	32.5	23	33.3	22.7	35	23.7
4	33.2	23.7	33	23.6	32.4	24.9	34.7	23	33.6	22.6	33.2	24.7	33.3	23.3	32.4	24.8
5	32.8	24.4	32.7	23.8	32.1	24.2	33.9	23.7	32.8	24	32.5	24.3	33.3	24.1	35.1	24.1
6	35.4	23.9	33	23.9	33.2	25	33.2	23.1	33.6	23.2	33	24.5	33.5	22.8	34.9	24.1
7	32.3	24.8	31.1	23.6	31.6	23.2	32.9	23.8	33.2	23.4	31.4	24.1	31.2	23.6	34.4	24
8	32.2	23.7	32.2	22.7	32.5	23.7	31.4	22.5	32.2	22.4	32.8	24	31.1	22.6	33.7	23.3
9	34.6	23.9	32	23.9	32	23.5	32.7	23.5	33	23.6	30.4	23.5	32.4	23.9	34.9	24.1
10	31.2	23.9	30.3	23.3	30.6	24.2	31	23.7	31.5	23.6	30.5	23.8	31.2	23.3	34.9	24.1
11	31.9	24.3	31.2	23.2	32	23.3	32.4	23.6	32.4	22.4	32	23.8	31	23.6	34	24.2
12	31.2	24.3	30.5	24.3	29.5	23.9	29.7	23.5	30.8	23.2	31.5	24.4	34	23.6	34	24.2
13	27.1?	23.7	28	23.5	28.5	24.1	26.7	24	28.2	23.1	30.3	24.4	28.9	23.4	27.5	23.9
14	30.5	24	29.1	23.6	28.4	24	27.8	23.4	29.1	23.5	30.8	24.5	29.5	23.2	27.5	23.4
15	31.8	23.3	31.5	23.2	31.3	23.9	30.8	23	31.8	22.6	32.3	24.7	30.9	23.2	31.3	23.2
16	31.7	24	32	23.8	33	25.6	31.1	24	31.6	24.1	34	25	32.1	23.7	31.2	24.9
17	31.8	24.4	31.6	23.4	32.2	24.1	31.1	24.5	31.6	23	32.2	25.2	32.7	23.8	31.7	24.8
18	31.8	24.7	32	24.1	33.5	24.2	30.4	24.7	32.2	24.1	32.2	24.1	32.5	24.4	31.9	24.2
19	30.9	23.9	31.5	22.6	31	23.1	33	23	32.3	22.4	31.1	24.4	32.1	23.4	30.8	24.2
20	30.2?	23.5	31.3	23.6	30.3	24.4	30.5	23.2	28.9	23	32.3	24	31.4	23.4	31.2	23.2
21	31.8	24.4	31.3	24	32.4	23.5	30.6	23	31.9	22.6	33.6	24	31.9	23.9	28.8	22.9
22	29.5	23.5	29.1	23.4	29.9	23.2	28.3	23.2	29	22.4	30	23.3	29.4	23.1	23.2	22.3
23	32.2	23.6	31.9	22.6	32.4	22.9	32.4	22.3	31.6	22.3	31.6	23	(a)	21.5	32.7	22.3
24	32.5	22.2	32	22	32.4	23.1	33.5	23	32.6	21.5	32.3	24.5	32.4	23.7	32.7	22.3
25	32.6	23.7	32.6	23.2	31.5	24.6	32.3	23	32.6	22.5	32.3	24.5	32.4	23.7	33.3	23.6
26	32.7	24.6	32.6	23.6	31.9	24.5	34	23.4	32.4	22.4	32.2	24.3	32.4	23.8	32.9	22.4
27	32.5	23	32	22.5	32.5	23.7	33.2	22.8	32.9	22.6	33.3	24.6	32.2	23.3	32.1	24.5
28	32.6	23.9	32.7	22.3	33.2	23.9	33.8	23.5	31.2	22.6	33.3	24.6	32.2	23	30.6	24.1
29	29.6	24.3	29.9	23	30.9	23.8	30	23.5	29.9	22.8	31.1	24.4	31.2	23.3	32	24
30	31.2	23.5	31.3	22.7	32.9	24.4	32.7	23	31.6	22.9	31.6	24	31.9	23.2	32	24
Mean	32	23.8	31.6	23.2	31.7	23.8	32	23.3	31.9	22.9	32	24.1	31.9	23.2	32.4	23.8

Day.	Antipolo.		Iba.		San Isidro.		Tarlac.		Baler.		Dagupan.		Bolinao.		Baguio.	
	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.
	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.
1	34.5	22.4	31.5	24.5	35.4	23.1	35.5	23.2	32.8	22.6	35.3	24	32.9	25	24.2	15.7
2	33.5	21.8	31.8	22.5	35	23.4	35.6	23.4	32.6	22.5	35.7	23.8	32.4	24.9	23.9	15.7
3	34.7	22.2	32.2	23	35.6	24.1	35.5	24.2	32.8	22.7	36.1	24.8	32.8	24.4	24	16.1
4	33	22.8	32.2	23.3	35.2	24.6	36.5	24.5	31	23.2	34.2	25.1	33.1	25.2	23.9	16
5	33.7	22.4	32.1	24.2	33.9	24.5	34	24.8	31.1	23.3	36.7	25	32	25.8	24.8	16.5
6	34.4	21.6	32.2	24	35.4	24	36.5	25.4	32	22.6	36.9	25.5	32.6	25.4	24.8	16.7
7	34.4	22.6	32.6	23.2	33.4	24.4	35	25.8	30.3	22.3	37.2	25.5	33.5	24.2	25.4	16.3
8	33.5	22.1	31.2	24	34.3	23.5	33.2	24	31.7	24	36.2	25	31.4	24.7	24	16.8
9	33.5	22.7	34.5	24	35.2	24.5	34.6	24.6	31.6	23.5	36	25.1	32.9	24.7	25.1	16.2
10	34.4	23	32.2	23.3	34.9	23.8	35.2	24.2	31	22.6	36.1	25	32.2	24.9	24.8	16.5
11	34.7	23.2	31.6	23.5	33.1	24	33.2	24	31	23.4	34.3	23.4	31.9	24.4	23.3	16
12	30.4	22.5	27.3	22.7	29.4	23.5	29	23.1	31.5	23.7	28.7	23.5	27.3	23.8	19.9	15.5
13	28.8	22.5	26.3	22.8	25.9	23.5	26.2	22.6	29.4	23.4	26.7	23.2	25.9	23.9	19.2	15.2
14	27	22	26.5	22.5	27.5	23.4	27.5	23.5	30.6	24.2	29.6	23	28.9	24.1	19.7	15.5
15	30	22	30.1	22.9	29.6	23.8	30.4	23.1	30.8	24.2	33.2	24	30.1	24.6	24	16.3
16	29.7	24	31.2	24.2	32.8	25	33.5	24.4	33.2	24.7	34.2	25.1	31.3	25.3	21.3	16.6
17	29.5	23.7	31.1	24	31.6	24.9	33.4	24	32.8	24.9	30.3	25.1	31.3	23.4	24.2	16.2
18	31.1	23	30.2	22.5	32.4	23.7	33.4	23.5	33	23.2	33	23.3	30.3	23	21.8	15.5
19	32.9	22.5	30.3	22	31	23.5	33	23.2	31.7	23.8	35.3	23.2	32.1	24	23.5	16.4
20	30.3	22	29.9	22.6	30.5	23.8	33	23.2	31.2	23.2	32.7	24	30.8	23.4	22.8	15.6
21	30.5	22.9	28.5	22.1	31.4	24	32.2	23.4	32.9	22.9	32.7	24	30.4	23.5	21.6	15.2
22	29.6	21.3	25.9	21.3	26.9	23	27.2	23	30.5	22.5	26.6	23.2	25.1	22.4	17.3	15.2
23	32.3	21.2	30.1	22.6	31.5	22.2	32.5	22.5	32.6	21.4	32.7	22.8	29	23.6	22.8	15.6
24	31.3	21.5	31.2	21.3	32.4	22.4	33.2	23	32	22	34.1	21.8	31.6	22.9	24.8	15.9
25	30.8	22.5	31.2	22.5	33.6	23.4	34.6	23.5	32.5	22.3	32.5	24.2	31.7	23.6	23.3	16.3
26	33	22.4	31.9	23.1	33.4	23.6	37	23.5	33.1	23	35.2	24.6	31.3	24.4	23.5	16.3
27	33.1	22.5	31.2	23.2	33.4	24	34.5	24	34.5	23	34.7	24.6	30.2	25.1	23.6	16.5
28	32	23.3	32.1	22.9	33.9	23.6	34.5	24	34.4	23.2	35.2	24.5	31.7	24.9	23.5	15.7
29	29.5	22.5	32.6	23.5	30.2	23	34.6	24.1	30.6	22.8	33.7	23.9	32.6	23.8	22.8	16.2
30	31.6	22.3	32.2	22.6	30.1	23.5	33.5	24	29.3	23.1	34.9	23.7	33.1	24	24	16.2
Mean	31.9	22.4	30.8	23	32.3	23.7	33.3	23.8	31.8	23.1	33.6	24.1	31.1	24.2	23.1	16

\* The maximum thermometer was accidentally broken.

Maximum and minimum temperatures at the stations of the Weather Bureau, June, 1916—Continued.

Day.	San Fernan- do, Union.		Echague.		Candon.		Vigan.		Tuguegarao.		Laoag.		Aparri.	
	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.
	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.
1	33.9	25	35.5	23.8	35.1	25.5	34	23	37.8	24.5	34	24.5	32.2	24.6
2	34.3	23.9	35	22.8	33.4	25	33.8	22.8	37.4	23.6	34.2	24.1	32.2	24.5
3	33.3	23.6	35.2	23.9	34.4	25.2	33.9	25.2	39.4	24.2	33.8	23.8	33.6	24.5
4	33.9	25.4	34	23.3	35.7	25.5	33.9	23.6	36.8	24.4	33.6	24.5	32.6	24.8
5	34.5	25	35.2	24	35.4	25	34.6	24.2	38.4	23.6	34.7	24.1	34.8	24.5
6	34	24	36	21	34.5	25.7	34	24	38.5	22.8	34.5	24.4	32.9	24.5
7	34.2	24	36.2	22.2	34.5	24.8	34	23.5	37.7	24.2	34.4	24.2	36.6	24.6
8	34.2	25.8	34	22.4	31.3	24.8	34.4	24.6	37.2	23.6	34.4	24.4	34.3	25.6
9	33.5	24.5	34.7	23	36.4	26.1	34.6	24.6	39.1	23.4	34.2	24.5	33.7	25
10	32.5	25.5	31.5	22.9	33.2	25.5	32.6	24.5	34.4	23.5	32.6	25	32	24.2
11	32.3	25.6	34	23.2	32.4	26.2	32.3	23.1	36.8	22.4	32.1	23.9	32.2	24
12	30	24	34	23.3	31.5	25	31.1	22.8	31.7	23	29.7	23.6	30.6	23.4
13	30.1	24.3	33.3	23.5	31.5	25.4	33.3	24	34.2	23.3	32.8	24.2	31.9	24.2
14	31.3	24.5	33.6	23.9	32.6	26	33	22.8	35.8	23.3	33.2	23.8	32.9	23.8
15	33.4	24.5	35.5	24	35.1	25.5	33.4	24.1	35.5	22.9	33.2	24	33.5	23.6
16	31.4	25.3	35.7	23.3	32.3	27	31.4	24.4	35.5	23.2	31.8	25	32.9	24.2
17	32.8	25	35.4	23.6	32	25.5	31.7	23	36.6	24.4	33.3	23.9	32.9	24.5
18	33	23.3	33.1	22.6	31.2	25.5	31.4	23.3	30	23.7	33	24.9	30.8	24.2
19	32.5	24.3	32.5	22.4	31.6	26	32.4	23.3	33.2	24.1	32.8	24.5	30.5	24.3
20	32.5	24.3	32.5	22.9	31	25	31.6	23.6	36.2	23.6	32.4	23	30.5	24.3
21	32.6	24.5	36.5	22.8	34.6	25	31.8	23.2	36.2	23.4	32.6	23	33.3	24.6
22	27.2	24	29.8	23.4	31.6	24.7	28.4	23.2	36.3	23.3	32.5	24.1	32.2	24
23	31.3	22.8	34.7	22.3	31.6	24	28.4	23.3	28.4	23.1	27.5	23	27.7	23.3
24	32.6	22.4	35	22.7	30.1	24.2	31.4	23.2	33.8	23.8	30.3	23.2	32	24.5
25	32.7	23.7	35.5	22.5	31.4	24.9	32.3	23.3	35	23	33.5	23	31.6	23.4
26	33	24.7	35.6	24.5	31.4	25.2	32.1	23.6	36	24	32.9	23	32.3	24.8
27	33.7	25	36.5	23.8	32.6	25.2	32.7	23.6	35.5	24.6	33.7	23.9	32.6	24.8
28	33.3	23	34.5	21.4	35.1	25	33.3	24.1	36.5	21.7	34.4	23.9	31.8	24.8
29	32.7	24.8	33.8	23.9	33.1	26.9	33.3	25.5	34.4	24.2	34.3	24.5	31.9	24.3
30	32.7	24	34	24	32.2	24.9	33.6	24.2	35	24.5	35.4	23.3	33.1	25
Mean	32.7	24.3	34.5	23.1	32.9	25.3	32.8	23.7	35.4	23.6	33.1	24	32.5	24.4





## SEISMOLOGICAL BULLETIN FOR JUNE, 1916.

By Rev. MIGUEL SADERRA MASÓ, S. J.,  
*Assistant Director of the Weather Bureau.*

### EARTHQUAKES FELT IN THE PHILIPPINES.<sup>1</sup>

5, 3<sup>h</sup> 06<sup>m</sup> 28<sup>s\*</sup> [5, 11<sup>h</sup> 06<sup>m</sup> 28<sup>s</sup>]. Catbalogan (W Samar). Oscillatory earthquake, intensity III.

9, 21<sup>h</sup> 26<sup>m</sup> 58<sup>s\*</sup> [10, 5<sup>h</sup> 26<sup>m</sup> 58<sup>s</sup>]. SE Mindanao. Earthquake of intensity IV-V, felt throughout the Davao Gulf, Agusan Valley and eastern coasts, an extension of about 400 kilometers in the N-S direction. The intensity of the shocks, III at Butuan and IV at Davao, in connection with the records of Butuan, Manila, Zikawei, and Osaka show that the origin lay off the SE coasts of the island, in the Pacific, near to the southern end of the Deep at about 6° N and 128° E.

10, 21<sup>h</sup> 21<sup>m</sup> 33<sup>s\*</sup> [11, 5<sup>h</sup> 21<sup>m</sup> 33<sup>s</sup>]. SE Mindanao. Earthquake of intensity III-IV, felt in the same region as the preceding one and seemingly originated near the same center. Its record is not found in any of the Bulletins at hand from the eastern observatories. On the 11th at 0<sup>h</sup> 25<sup>m</sup> 36<sup>s</sup> [8<sup>h</sup> 25<sup>m</sup> 36<sup>s</sup>] a light aftershock was recorded at Butuan from the same origin.

10, 22<sup>h</sup> 31<sup>m</sup> 17<sup>s</sup> [11, 8<sup>h</sup> 10<sup>m</sup> 17<sup>s</sup>]. Guam (Mariana Islands). Earthquake of intensity III-IV, felt chiefly on the southern part of the island.

15, 23<sup>h</sup> 47<sup>m</sup> 41<sup>s\*</sup> [16, 7<sup>h</sup> 47<sup>m</sup> 41<sup>s</sup>]. Butuan (N Mindanao). Earthquake shocks of intensity II-III, short duration. The origin also was distant, probably toward the SE in the Pacific Ocean.

16, 2<sup>h</sup> 51<sup>m</sup> [16, 10<sup>h</sup> 51<sup>s</sup>]. Laoag (NW Luzon). Oscillatory earthquake, intensity III, duration 5 seconds.

27, 1<sup>h</sup> 38<sup>m</sup> [27, 9<sup>h</sup> 38<sup>m</sup>]. Aparri (NE Luzon). Oscillatory earthquake, direction NE-SW, intensity III-IV, duration 4 seconds.

29, 10<sup>h</sup> 49<sup>m</sup> 42<sup>s\*</sup> [29, 18<sup>h</sup> 49<sup>m</sup> 42<sup>s</sup>]. SE Mindanao. Earthquake shocks felt over the oriental part of the island like those occurred on the 9th and 10th; the origin very probably had also identical location. It was registered throughout the Far East. Their intensity did not exceed degree IV-V, but the observer at Butuan calls the attention about the great amplitude and extraordinary slowness of the waves, a fact distinctly noticed by the people of Butuan which was surprised at the special feeling of drowsiness and sea-sickness experienced during the long 20 seconds which the gentle rocking lasted. At the place a special name is given to the seismic disturbances of such a character, and every one is well accustomed to distinguish them from local sudden and rapid shocks. The former are taken as indications of approaching rainy weather while the last are believed to predict fair and dry weather. On the same date at 13<sup>h</sup> 15<sup>m</sup> 00<sup>s</sup> [29, 21<sup>h</sup> 15<sup>m</sup> 00<sup>s</sup>], a light aftershock was only registered by the seismograph at Butuan. A similar small shock originated near the same center had also been recorded on the 25th at 22<sup>h</sup> 05<sup>m</sup> 29<sup>s</sup> [26, 6<sup>h</sup> 05<sup>m</sup> 29<sup>s</sup>].

<sup>1</sup> The intensity of earthquakes is given in the notation known as the Rossi-Forel scale. The time is that indicated by the seismographs at the Central Observatory whenever the disturbance has been registered by them. This fact is denoted by an asterisk (\*). Otherwise the time is that noted by the observer who sent the report. All time indications are in Greenwich mean time (midnight=0<sup>h</sup>), insular time being added in brackets for the convenience of the Philippine readers.

RECORDS OF THE MICROSEISMOGRAPH.

[Time: Greenwich mean. Midnight=0<sup>h</sup>. Instrument: Wiechert seismograph; 1,000 kilograms.  $A_N$ :  $T_0=6.1$ ,  $\epsilon=3.89$ ,  $\frac{r}{T_0^2}=0.023$ ;  
 $A_E$ :  $T_0=6.6$ ,  $\epsilon=2.32$ ,  $\frac{r}{T_0^2}=0.050$ . Alluvium. 2.40 meters above sea level].

No.	Date.	Character.	Phase.	Hour.	Period.	Amplitude.		Remarks.
						$A_N$ $\mu$	$A_E$ $\mu$	
202	1	I	e F	<i>h. m. s.</i> 2 43 52				
203	1	Iv	eP L M <sub>N</sub> M <sub>E</sub> F	14 12 22 12 41 12 47 12 48 21	2 2	79	125	
204	1	Iv	eP F	20 25 15 27				
205	2	Iv	e F	14 18 31 37				
206	3	I	e F	5 18 37				
207	5	Iv	eP S L M <sub>N</sub> F	3 06 28 07 30 08 22 09 53 28	7	21		Catbalogan (W Samar).
208	8	Ir	eP S L M <sub>N</sub> M <sub>E</sub> F	6 27 12 30 00 32 08 33 43 34 19 52	7 6	15	11	
209	9	Iv	eP F	3 01 38 04				
210	9	IIr	eP S L M <sub>N</sub> M <sub>E</sub> F	21 26 58 29 09 31 16 32 09 32 35 22 54	7 7	92	92	SE Mindanao.
211	10	Ir	eP M <sub>E</sub> F	21 21 33 25 38 34	5		7	SE Mindanao.
212	11	Iv	eP L M <sub>E</sub> F	0 14 23 15 14 16 03 26	5		22	
213	12	Iv	eP L M <sub>N</sub> F	22 40 39 40 53 40 57 45	2	26		
214	14	Iv	eP L M <sub>E</sub> F	12 44 55 46 42 46 54 13 01	3		28	
215	15	Ir	e F	11 24 44 12 08				
216	15	Iv	e F	23 47 41 59				Butuan (N Mindanao).
217	16	I	e F	4 30 22 49				
218	16	Iv	eP L M <sub>E</sub> F	16 51 42 52 11 52 15 59	2		32	
219	19	Iv	eP L M <sub>E</sub> M <sub>N</sub> F	2 25 12 25 34 25 38 25 47 30	2 3		18 39	

Records of the microseismograph—Continued.

No.	Date.	Character.	Phase.	Hour.	Period.	Amplitude.		Remarks.
						A <sub>N</sub> μ	A <sub>E</sub> μ	
220	21	I <sub>r</sub>	eP	1 02 54				
			S	06 05				
			L	09 08				
			M <sub>E</sub>	10 09	9		25	
			M <sub>N</sub> F	10 15 44	10	16		
221	21	I	e F	7 16 32				
222	21	I <sub>u</sub>	e	21 51 53				
			S	22 03 03				
			L	16 23				
			M <sub>E</sub> F	19 07 23 11	15		10	
223	22	I <sub>v</sub>	eP	6 15 24				
			L	16 26				
			M <sub>N</sub>	17 42	2	12		
			F	23				
224	26	I <sub>r</sub>	eP	6 49 23				
			S	51 16				
			L	53 04				
			M <sub>E</sub>	53 08	8		7	
			F	7 06				
225	27	I <sub>v</sub>	eP	11 43 48				
			L	44 06				
			F	47				
226	29	II <sub>r</sub>	eP	10 49 42				
			S	51 43				
			L	53 41				
			M <sub>E</sub>	54 18	6		92	
			M <sub>N</sub>	54 57	6	79		
			F	11 43				
227	29	I <sub>r</sub>	eP	13 17 36				
			S	20 07				
			L	22 55				
			M <sub>E</sub>	23 55	7		14	
			F	42				
228	29	I <sub>v</sub>	eP	19 43 00				
			L	43 17				
			F	45				
229	30	I <sub>u</sub>	e	3 20				
			L	58 42				
			F	5 13				

SE Mindanao.

TEMBLORES DE TIERRA SENTIDOS EN FILIPINAS.<sup>1</sup>

5, 3<sup>h</sup> 06<sup>m</sup> 28<sup>s\*</sup> [5, 1<sup>h</sup> 06<sup>m</sup> 28<sup>s</sup>]. Catbalogan (W de Sámar). Temblor oscilatorio de intensidad III.

9, 21<sup>h</sup> 26<sup>m</sup> 58<sup>s\*</sup> [10, 5<sup>h</sup> 26<sup>m</sup> 58<sup>s</sup>]. SE de Mindanao. Temblor de tierra de intensidad IV-V sentido en toda la región del Golfo de Dávao, del Agusan y parte de la Provincia de Surigao en una extensión de 400 kilómetros en la dirección N-S. Las relativas intensidades de III y IV que tuvo en las estaciones de Butúan y de Dávao, junto con las registros de Butúan, Manila, Zikawei y Osaka, indican que el origen estaba al SE fuera de la isla hacia el extremo S del Abismo del Mar Pacífico cerca del paralelo 6° N y del meridiano 128° E.

10, 21<sup>h</sup> 21<sup>m</sup> 33<sup>s\*</sup> [11, 5<sup>h</sup> 21<sup>m</sup> 33<sup>s</sup>]. SE de Mindanao. Temblor de intensidad III-IV sentido en la misma región que el precedente y originado probablemente en el mismo sitio. No fué registrado que sepamos fuera del Archipiélago. A 0<sup>h</sup> 25<sup>m</sup> 36<sup>s</sup> del 11 [11, 8<sup>h</sup> 25<sup>m</sup> 36<sup>s</sup>] se registró en Butúan una repetición o *aftershock* originado en el mismo centro.

10, 22<sup>h</sup> 31<sup>m</sup> 17<sup>s</sup> [11, 8<sup>h</sup> 10<sup>m</sup> 17<sup>s</sup>]. Guam (Islas Marianas). Temblor de tierra de intensidad III-IV, sentido principalmente en la parte S de la isla.

15, 23<sup>h</sup> 47<sup>m</sup> 41<sup>s\*</sup> [16, 7<sup>h</sup> 47<sup>m</sup> 41<sup>s</sup>]. Butúan (N de Mindanao). Temblor de tierra de intensidad II-III, duración corta. Probablemente el origen se hallaba en el Mar Pacífico al SE de la isla.

16, 2<sup>h</sup> 51<sup>m</sup> [16, 10<sup>h</sup> 51<sup>m</sup>]. Laoag (NW de Luzón). Temblor oscilatorio, intensidad III, duración 5 segundos.

27, 1<sup>h</sup> 38<sup>m</sup> [27, 9<sup>h</sup> 38<sup>m</sup>]. Aparri (NE de Luzón). Temblor oscilatorio, dirección NE-SW, intensidad III-IV, duración 4 segundos.

29, 10<sup>h</sup> 49<sup>m</sup> 42<sup>s\*</sup> [29, 18<sup>h</sup> 49<sup>m</sup> 42<sup>s</sup>]. SE de Mindanao. Temblor sentido en la misma región del E de Mindanao que los de los días 9 y 10, originado seguramente cerca de la misma región del Pacífico que aquéllos. Registráronlo todos los sismógrafos del Extremo Oriente. Su intensidad en la isla no pasó de IV-V, pero el observador de Butúan hace notar la mucha amplitud y lentitud de los vaivenes, produciendo modorra y ligero mareo, sin percibirse apenas el movimiento, que llamó mucho la atención a la gente del pueblo, la cual tuvo tiempo de darse cuenta del fenómeno durante su larga duración de 20 segundos. En la localidad los temblores de este carácter tienen un nombre especial y los distinguen muy bien de los locales generalmente de movimientos rápidos y bruscos; es creencia común que tales temblores de tierra son señal precursora de lluvia. A 13<sup>h</sup> 15<sup>m</sup> 00<sup>s</sup> [29, 21<sup>h</sup> 15<sup>m</sup> 00<sup>s</sup>] de la misma fecha el sismógrafo de Butúan registró una repetición. También el día 25 a 22<sup>h</sup> 05<sup>m</sup> 29<sup>s</sup> [26, 6<sup>h</sup> 05<sup>m</sup> 29<sup>s</sup>] había registrado una perturbación sísmica originada en el mismo centro.

<sup>1</sup> La intensidad de los terremotos se indica conforme a la conocida escala de Rossi-Forel. Cuanto a la hora de su ocurrencia, adoptamos la indicada por los sismógrafos de este Observatorio siempre que los hayan registrado, distinguiéndola por medio de un asterisco (\*). En caso contrario copiamos la apuntada por los observadores que nos envían las notas. Todas las indicaciones del tiempo se refieren al tiempo medio de Greenwich (medianoche=0<sup>h</sup>). Para conveniencia de los lectores de Filipinas se añade también el tiempo insular.





1.5914  
P. 56

MAR 22 1917  
UNIV. OF MICH.  
LIBRARY

THE GOVERNMENT OF THE PHILIPPINE ISLANDS

# WEATHER BUREAU

MANILA CENTRAL OBSERVATORY

---

BULLETIN FOR JULY, 1916

---

PREPARED UNDER THE DIRECTION OF

REV. JOSÉ ALGUÉ, S. J.

DIRECTOR OF THE WEATHER BUREAU

MANILA  
BUREAU OF PRINTING  
1916





---

---

**BULLETIN FOR JULY, 1916.**



# METEOROLOGICAL BULLETIN FOR JULY, 1916.

By Rev. JOSÉ CORONAS, S. J.,  
*Chief, Meteorological Division of the Weather Bureau.*

## GENERAL WEATHER NOTES.

**Pressure and temperature.**—The mean atmospheric pressure for this month is higher than that of the preceding year, especially in Luzon. The highest pressures were generally observed in the Philippines on the 6th and 7th, and the lowest on the 23d.

The mean monthly temperature is generally lower than that of July, 1915. The extreme monthly temperatures for Manila were 34.1° C. on the 9th, and 22.4° C. on the 2d. The absolute maximum and minimum temperatures for Baguio were 25.4° C., 15.0° C. on the top of Mirador, and 25.9° C., 14.1° C. in the valley.

### PRESSURE AND TEMPERATURE AT THE FIRST AND SECOND CLASS STATIONS FOR JULY, 1916.

Station.	Pressure.						Temperature.					
	Mean.	Departure from July, 1915.	Highest mean.	Day.	Lowest mean.	Day.	Mean.	Departure from July, 1915.	Highest.	Day.	Lowest.	Day.
	mm.	mm.	mm.		mm.		°C.	°C.	°C.		°C.	
Tagbilaran .....	757.68	+0.07	759.24	6	756.24	23	26.5	-0.9	33.2	24	21.7	1, 7
Surigao .....	57.67	+ .20	59.41	6	56.13	23	27	- .7	36.2	31	21.9	4
Cebu .....	57.65	+ .12	59.34	6	56.24	23	27.7	- .8	33.1	19	22.2	5
Iloilo .....	57.61	+ .30	59.29	6	55.93	23	27.1	- .6	33	9, 10	23	3, 28
Ormoc .....	57.92	+ .22	59.62	6	56.32	23	26.4	-1.1	32.2	8, 11	21.3	1
Tacloban .....	57.68	+ .38	59.42	6	55.98	23	27.1	- .4	33.7	27	22.5	1, 2
Capiz .....	57.78	+ .41	59.42	6	56.05	23	26.8	- .7	34.4	25	22.1	1
Calbayog .....	57.80	+ .36	59.42	6	56	23	26.7	- .6	35	29	22	7
Legaspi .....	57.60	+ .68	59.50	6	55.48	23	27.9	- .5	34	28, 29	22.7	7
Atimonan .....	57.43	+ .69	59.13	11	54.99	23	27.3	- .7	34.6	31	22.8	1
Ambulong, Tanauan .....	57.18	+ .86	59.10	6	54.94	23	26.7	- .9	34.2	30, 31	21.8	22
Paracale .....	57.63	+ .68	59.41	7	55.01	23	27.6	- .6	35.3	28	22.9	7
Manila .....	57.63	+ .62	59.26	6	55.54	23	26.9	- .7	34.1	9	22.4	2
San Isidro .....	57.83	+ .64	59.36	6	55.42	23	26.8	- .8	34.4	9, 31	22.2	19
Dagupan .....	56.90	+ .72	58.56	6	54.33	23	28	0	37.3	9	23	11, 26
Bolinao .....	57.16	+ .77	58.87	6	54.53	23	27.8	+ .1	34.5	13	23.1	8, 27
Baguio* .....	635.87	+ .39	637.32	7	634.03	23	18.4	- .5	25.4	16	15	26
Vigan .....	757.09	+ .79	758.88	13	754.57	23	27.6	- .7	34.8	18	22	12
Tuguegarao .....	57.54	+ .95	59.30	6	55.15	23	27.8	-1.1	38.5	22	22.3	13
Laoag .....	57.14	-----	58.89	6	54.90	23	27.6	-----	37	17	22.3	19
Aparri .....	57.50	+1.06	59.28	7	54.73	23	27.8	- .5	34.1	14	23.3	6, 7

\* The barometric readings of this station are not reduced to sea level.

**Rainfall.**—Owing to lack of typhoons near the Philippines during this month, the monthly amount of rainfall is for a great number of our stations lower than the normal and than the total rainfall for July, 1915, the differences being particularly great in the western part of Luzon. Some of the stations, however, reported a monthly rainfall above that of the preceding year and above the normal of this month. The rainfall collected during the month in the gauges of Manila Observatory is 96.4 and 215.4 mm. below that of July, 1915, and the normal of this month, respectively. The total monthly rainfall of Baguio is 669.9 mm. below the July's normal.

## RAINFALL AT VARIOUS STATIONS OF THE WEATHER BUREAU DURING THE MONTH OF JULY, 1916.

Station.	Total.	Departure from July, 1915.	Departure from normal.	Rainy days.	Departure from July, 1915.	Greatest rainfall in a single day.	Day.	Station.	Total.	Departure from July, 1915.	Departure from normal.	Rainy days.	Departure from July, 1915.	Greatest rainfall in a single day.	Day.
	mm.	mm.	mm.		mm.	mm.			mm.	mm.	mm.		mm.	mm.	
Jolo	288.6	+ 27.3	+117.4	22	-1	49	5	Virac	217.8	- 97.8	- 60.1	23	-2	52	16
Isabela, Basilan	104.8	-222.7	-101.6	20	-1	17.8	13	Naga	239.4	+ 65	- 7.7	21	+5	40.6	21
Zamboanga	161.6	+ 5.6	+ 53.6	18	-2	40.2	14	Batangas	123.1	-122.5	-137.9	18	-3	31	2
Davao	198.5	+ 19.9	- 2.5	10	+2	55.4	31	Lucena	88.7			18		26.4	4
Cagayan, Misamis	192.8	+ 61.6		18	-1	45.5	14	Atimonan	411.6	+285.7	+182.8	16	+1	96.8	18
Butuan	204.7	+ 61.8	+ 76.4	24	+3	50	4	Ambulong, Tanauan	221	- 3.8		16	+3	45.2	21
Dumaguete	88.4	- 52.4		9	-6	25.5	13	Canlubang, Calamba	259.8			19		91.4	31
Tagbilaran	72.1	- 61	-193.4	12	-1	25.1	10	Paracale	148.8	- 50.7		21	+4	30.3	18
Iwahig	195.8	- 9.1		21	-3	47.5	22	Santa Cruz, Laguna	192.6	+ 28.6		22	+3	47.5	13
Surigao	143.3	+ 99.4	- 4.1	16	+2	31.6	16	Manila	179.9	- 96.4	-215.4	25	+5	46	14
Maasin	139.1	- 30.4	-116.4	7	0	44.4	22	Antipolo	168	-165.5		24	+6	48.3	24
Cebu	226.9	+106.5	+ 45.8	14	-2	41.7	1	Iba	239.8	-649.4	-727.4	24	+1	43.2	19
Iloilo	221.4	-182	-216.1	13	-4	74.4	13	San Isidro	154.1	-154.9	-190.7	21	-1	44.2	4
San Jose Buenavista	258.8	+223.6	-304.2	21	-4	45	7	Tarlac	209.6	+ 18.1	-193	21	+3	50.8	21
Cuyo	400.1	+ 39.9	+ 11.8	25	0	125.7	17	Baler	300.6	+ 72.6		17	-2	58.4	6
Ormoc	180.5	+ 11.3	-113	16	-1	43.9	31	Dagupan	100.1	-139.7	-424.9	14	-8	20.6	25
Guiuan	216.2	+ 72.9		21	0	33.5	16	Bolinao	290.1	-124.2	-361.3	18	-7	51.1	19
Tacloban	122.9	- 4.5	- 66.5	18	-1	38.3	13	Baguio	276.9	-144.7	-669.9	29	+3	34	12
Capiz	291.1	+ 14.1	- 56.3	25	+6	51.5	13	San Fernando, Union	178.9	-211.4	-382.8	19	-3	43.4	30
Borongan	257.1	- .7	+ 55.9	21	+4	52.4	3	Echague	223	+ 16.7	+ 23.3	16	-1	50.8	28
Catbalogan	132.3			22		41.1	26	Candon	144.3	- 98.2	-494.2	21	-1	33.5	26
Calbayog	101.1	-170.9	-105.2	18	0	26.2	18	Vigan	348.9	+ 89.1	-290	22	+2	83.1	5
Maabate	208.5	+ 83.1	+ 7.5	15	-5	55.4	18	Tuguegarao	75.9	- 58.8	-145	10	-1	17.3	3
Romblon	191.3	-218.3	-107.1	21	-1	32.5	16	Laoag	285.1	- 58.3	-331.2	24	+6	64.3	24
Batag	108.3	-139.9		12	+1	25.4	16	Aparri	58.1	- 24.9	-108.4	13	+2	10.7	27
Sorsogon	244.5			6		101.6	16	Cape Bojeador	154.4			13		39.8	27
Legaspi	173.4	+ 12.8	- 72.2	15	-1	45.5	17	Santo Domingo, Batanes	88.3	-105.5	- 177.5	16	-3	17.6	27
Sumay, Guam	197	-168.7	-131.2	24	+3	29.2	18								
Calapan	271	+ 23.2	+ 13.7	20	+1	48.3	3								

## DEPRESSIONS AND TYPHOONS.

Only one distant typhoon and three depressions of little intensity were observed during the month in our weather map of the Far East. The first of these depressions appeared on the 4th between Luzon and the Paracels: it moved W, and then NW toward the eastern coast of Hainan, probably filling up in the evening or during the night of the 6th near or over the Hainan Strait. The second depression moved westward across the northern part of Mindanao and the southern part of the Sulu Sea on the 15th to 18th; it probably filled up on the 19th or 20th near 8° latitude N and 115° longitude E. The third depression was probably formed on the 17th to 18th west of the northern part of Luzon, and moved westward through the Paracels toward the southern coast of Hainan. The last two disturbances seem to have been rather two low-pressure areas than real depressions of any importance.

The only typhoon of the month followed a very peculiar track; it moved first ENE to the south of the Bonins on the 25th, and then it recurved north and northwest toward Japan. The barometers at the Bonins were as low as 746.9 mm. at 2 p. m. of the 25th. The typhoon crossed Japan on the 29th and the 30th, and probably filled up on the 31st in the Sea of Japan.



## NOTAS GENERALES DEL TIEMPO.

**Presión y temperatura.**—La presión atmosférica media de este mes es mayor que la del año pasado, especialmente en Luzón. Las presiones más altas se observaron generalmente en Filipinas los días 6 y 7, y las más bajas el 23.

La temperatura media mensual es generalmente menor que la de julio, 1915. Las temperaturas extremas del mes en Manila fueron 34.1° C. el día 9, y 22.4° C. el 2. Las temperaturas máxima y mínima absolutas de Baguio fueron 25.4° C., 15.0° C. en la cumbre del Mirador, y 25.9° C., 14.1° C. en el valle.

**Precipitación acuosa.**—Debido a la ausencia de tifones cerca de Filipinas durante este mes, la cantidad de lluvia mensual es en buen número de nuestras estaciones menor que la normal y que la lluvia total de julio, 1915, siendo particularmente notables las diferencias en la parte occidental de Luzón. Algunas de nuestras estaciones, sin embargo, registraron una cantidad mensual de lluvia mayor que la del año pasado, y mayor también que la normal de este mes. La cantidad de lluvia-recogida durante el mes en los pluviómetros del Observatorio de Manila es menor que la de julio, 1915, en 96.4 mm., y menor también que la normal de este mes en 215.4 mm. La lluvia total del mes en Baguio es menor que la normal de julio en 669.9 mm.

## DEPRESIONES Y TIFONES.

Durante este mes sólo se observaron en nuestro mapa del tiempo del Extremo Oriente un tifón lejano y tres depresiones de poca intensidad. La primera de estas depresiones apareció el día 4 entre Luzón y Paracels: se movió al W, y luego al NW en dirección a la costa oriental de Hainán, deshaciéndose probablemente la tarde o durante la noche del 6 en el, o cerca del, Estrecho de Hainán. La segunda depresión se movió hacia el W a través de la parte septentrional de Mindanao y la meridional del Mar de Joló del 15 al 18: probablemente se deshizo el 19 ó 20 cerca de 8° latitud N y 115° longitud E. La tercera depresión se formó probablemente del 17 al 18 al W de la parte septentrional de Luzón y se movió al W a través de Paracels hacia la costa meridional de Hainán. Las dos últimas perturbaciones parecen haber sido más bien dos áreas de baja presión que verdaderas depresiones de alguna importancia.

El único tifón del mes siguió una trayectoria muy peculiar; movióse primero al ENE hacia el S de Bonins el día 25, y luego recurvó al N y NW hacia Japón. Los barómetros de Bonins llegaron a bajar a 746.9 mm. a las 2 p. m. del 25. El temporal cruzó Japón el 29 y el 30, y se deshizo probablemente el 31 en el Mar del Japón.

METEOROLOGICAL DATA FOR MANILA CENTRAL OBSERVATORY.<sup>a</sup>

[ $\phi=14^{\circ} 84' 41''$  N;  $\lambda=120^{\circ} 58' 33''$  E; barometer above sea, 14.2 meters; gravity correction not applied, -1.72 mm.]

Day.	Air temperature. <sup>b</sup>			Underground temperature.				Relative humidity (mean).	Vapor pressure (mean).	Radiation.		Evaporation. <sup>b</sup>				
	Pressure (mean).	Mean.	Maximum.	0.25 meter.		0.50 meter.				1.50 meters.	2.50 meters.	Minimum on grass.	Maximum in sun. Black bulb in vacuo.	Free exposure (total).	Shelter (total).	
				8 a.m.	2 p.m.	8 a.m.	2 p.m.									8 a.m.
	mm.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	Perct.	mm.	°C.	°C.	mm.	mm.	
1	757.88	26.8	32.3	23.5	29.9	30.7	30.4	30.7	30.1	28.8	84	21.8	21.7	53.4	2.7	2.1
2	58.29	25.3	30.7	22.4	29.7	30.1	30.4	30.3	29.9	28.7	89.7	21.4	20.7	52.7	.6	.9
3	57.96	26.1	30.6	23	29.2	29.7	30.1	30.2	30	28.7	87.8	22	21.4	48	1.4	1.2
4	57.68	26.6	30.8	23.5	29.3	30.2	30.1	30.2	30	28.8	84.9	21.8	21.8	53.5	2.6	2.4
5	58.50	27.2	32.5	23.1	29.4	30.6	30.1	30.2	30.1	28.7	82.4	21.9	21.3	53.2	3.3	2.4
6	59.26	26.7	31.7	24.6	29.8	30.7	30.2	30.3	30	28.8	86.4	22.4	23.5	46.2	1.9	1.5
7	59.11	26.6	32.8	23.7	29.6	30.8	30.1	30.3	30	28.7	85.4	21.9	22.4	53	2.2	1.9
8	58.29	27.3	33.7	22.8	29.5	30.8	30.2	30.4	30	28.8	81.8	21.7	21.5	53.5	3.3	2.5
9	58.16	28	34.1	24	30.1	31.4	30.3	30.6	30	28.8	82.2	22.8	22.6	56.4	3.8	2.6
10	58.90	26.8	32.9	23.2	30.2	31.1	30.5	30.7	30.1	28.8	85.3	22.1	21.3	59	1.7	1.6
11	58.93	27.2	32.9	23.7	29.9	30.7	30.5	30.8	30.1	28.8	84	22.3	22.5	53.8	2.7	2.2
12	58.76	27.1	33.3	23.8	29.8	31	30.5	30.6	30	28.8	83.1	22	22.2	53.4	2.7	2.2
13	58.97	26.7	32.4	22.5	29.7	30.9	30.5	30.6	30	28.8	83.5	21.5	22.2	52.3	2.7	2.1
14	58.70	26.2	32.3	23.3	29.5	30.6	30.4	30.5	30	28.8	87.4	21.9	22.2	53.2	2.7	2.1
15	58.61	27.1	33.6	22.8	29.2	30.2	30.1	30.3	30.1	28.8	84.3	22.2	21.4	55.5	2.5	1.9
16	57.89	26.9	32.7	23.3	29.5	30.3	30.2	30.2	30.1	28.8	84.8	22	21.8	56	.7	1.9
17	57.41	26.2	30	23.5	29.5	29.8	30.1	30.2	30.1	28.8	88.4	22.3	22.2	45.6	2	1.2
18	57.55	25.7	28.2	23.8	29.1	29.3	30	30	30	28.8	89.8	21.9	22.3	35	2.8	.9
19	57.48	27.1	32.2	23.5	29.1	30	29.8	30	30	28.8	84.3	22.2	22.5	57.3	2.7	1.9
20	57.37	26.9	33	23.5	29.4	30.3	29.9	30.1	30	28.9	84.3	22	21.9	49.8	2.8	2.1
21	57.22	26	31.5	23.2	29.3	30.5	30.1	30.1	30	28.9	88.6	22	21.8	47.9	2	1.5
22	56.20	27.2	32.2	22.8	29.5	30.7	30.1	30.2	30	28.9	83.8	22.2	21.5	52.5	3.1	2.2
23	55.54	27.9	32	24.5	29.8	30.8	30.2	30.2	30	28.8	81.6	22.7	23.2	53.7	3.6	2.7
24	56.17	27.6	31.8	23.8	30	31	30.4	30.6	29.9	28.9	82.5	22.4	22.6	53.2	3.4	2.5
25	56.89	26.8	31.3	24.4	30.3	31.1	30.6	30.7	30.1	29	88.2	22.9	23.5	56	1.5	1.5
26	56.62	26.9	31.8	23.8	30	31	30.6	30.8	30.1	28.9	85.6	22.4	22.9	54	2.7	2.1
27	56.15	27.4	31.9	24.3	30.3	31.1	30.7	30.8	30.1	28.9	85	22.9	23.6	51	2.7	2.1
28	56.16	27.4	32.4	24.2	30	31.1	30.6	30.7	30	28.9	85.1	23	22.7	52.3	3	2.2
29	56.50	27.5	32	24.7	30.1	31.1	30.7	30.8	30.1	28.9	85.9	23.2	23.6	53.6	3	2.3
30	56.64	28.1	32.5	24.5	30.5	31.5	30.8	30.8	30.2	28.9	82	23	23.6	53.9	3.7	2.6
31	56.73	27.9	33	24.8	31	31.8	30.9	31.2	30.2	28.9	83.4	23	23.5	55.5	3.7	2.6
Mean Total	757.63	26.9	32.1	23.6	29.7	30.7	30.3	30.5	30	28.8	85	22.3	22.3	52.4	2.5	2
Departure from normal	+0.39	-0.1	+1.1	-0.1							+0.2	-0.1			78.1	61.5

Day.	Wind.				Clouds.			Sun-shine.	Rain, 24 hours beginning 6 a. m.		Miscellaneous.
	Prevailing direction.	Total movement.	Maximum hourly velocity.	Direction at the time of the maximum velocity.	Amount (mean).	Form and direction.			On the tower.	In the park.	
						Upper.	Lower.				
		Km.	Km.		0-10.			h. m.	mm.	mm.	
1	E quad.	117.5	15	NE	7.2	Ci.	E	6 35	0.8	0.9	d a. p. $\square$ $\circ$ p.
2	NW quad.	52	7.5	NW	8.8	Ci.-S.		0 50	2.3	2.4	$\circ$ a. p.
3	N quad.	80	9	NNW	8.2	Ci.		0 55	.3	.4	$\circ$ a.
4	SE	164.5	20	SE by S	9.2	Ci.-S.	NE	2 15	.3	.3	$\oplus$ a. d. a. p.
5	SW quad.	140	11	SE	8.6	Ci., Ci.-S.		3 45			
6	E, SE	114.5	11	W	10	Ci.-S.		0 10	.3	.3	d p.
7	NE, E	132	15	WSW	6.2	Ci.		5 10	.5	.5	$\square$ $\circ$ d $\square$ p.
8	SE	143	10.5	SE	7	Ci.		7 10	.8	1.3	$\square$ $\square$ d $\square$ p.
9	SE	160	16	SE	5.6	Ci.		7 30			$\square$ $\square$ p.
10	N	108	12	WNW	6	Ci., Ci.-S.		5 10	4.6	3.9	p $\square$ p.
11	NE, W	132	16	W	7.3	A.-Cu. SE		5 25	1	1	d a. $\bullet$ $\square$ p.
12	NE quad.	104	13	W	8.2	Ci.-S. SE		2 50			p $\square$ $\square$ p.
13	N quad.	178	24	NNW	8.8	Ci.-S.		4 50	31.3	32.3	d $\circ$ a. $\square$ $\square$ $\circ$ p.
14	NW quad.	177.5	17.5	WNW	8.7	A.-Cu. SE		4 40	46	48.3	$\circ$ a. $\square$ $\square$ $\circ$ p.
15	N quad.	128.5	13.5	SE	8.8	Ci.-S.		6 40			$\oplus$ a. $\square$ $\square$ $\square$ p.
16	N quad.	132	16	SSE	8	Ci.		5 10	19.8	20.8	$\oplus$ a. $\square$ $\square$ a. p. $\oplus$
17	N quad.	29	8	N	9.2	Ci.-S., A.-Cu. E		1 25	1.1	.9	$\oplus$ a.
18	NE quad.	48.5	9.5	E	10	Ci.-S.		0 00	3.8	3.3	d a. p.
19	W quad.	92	12.5	W	8.5	A.-Cu. S		4 45	2	1.3	d a. $\square$ $\square$ p.
20	NW quad.	175	23.5	NW	6.6	Ci. SSW		6 20	.4	.3	$\circ$ a. d. p.
21	E	135	16.5	SW	8	A.-Cu. E		5 45	.3	.3	$\oplus$ a. $\square$ $\square$ d p.
22	SW	169	16.5	SW	4.8	Ci.		7 05	3.3	3.3	$\square$ $\square$ p.
23	SW	340	26	SW	7	Ci.-S. NE		4 25	.5	.5	$\oplus$ a. d. p.
24	SW	335.5	26.5	WSW	8.5	A.-Cu. WNW		6 10			$\oplus$ a.
25	SW	279.5	28.5	SW	8.2	A.-Cu. W		5 45	11.6	11.5	$\oplus$ a. $\oplus$ a. $\bullet$ a. p.
26	E	165	23	SW WSW	7.1	A.-Cu. WNW		7 00	6.1	5.4	$\circ$ a. $\bullet$ a. p.
27	SW quad.	302	23	WSW	8.1	A.-Cu. SSE		4 40	.6	.8	$\circ$ a. $\square$ d p.
28	SW quad.	256.5	28	WSW	6.2	Ci.-S.		5 10	40.5	40	$\circ$ a. $\bullet$ a. p. $\square$ p.
29	SW	252.5	32.5	SW	6.6	A.-Cu. WSW		7 40	1.6	1.6	$\circ$ a. $\circ$ p.
30	SW	269.5	22.5	SW	6.2	A.-Cu. W		9 10	.1	.2	$\bullet$ a. $\square$ $\square$ p.
31	SE, WSW	204.5	21.5	WSW	4	A.-Cu., Ci.-s.		9 30			d a. $\square$ $\square$ p.
Mean Total		169.3	18		7.6			4 53			
Departure from normal		5,248						153 55	179.9	181.8	
		-3,202.4						+8 13	-215.4		

<sup>a</sup> All the mean values given in this table are deduced from hourly observations.  
<sup>b</sup> These values are taken from instruments mounted in the Observatory Park, 1.5 meters above ground.

METEOROLOGICAL DATA FOR MIRADOR OBSERVATORY, BAGUIO.<sup>a</sup>

[ $\phi=16^{\circ} 25' N$ ;  $\lambda=120^{\circ} 36' E$ ; barometer above sea, 1,512.5 meters; gravity correction not applied, -1.65 mm.]

Day.	Pressure (mean) <sup>b</sup>	Air temperature at Mirador (on the top of the mountain).					Air temperature in the valley (near the city hall).				Relative humidity (mean)	Vapor pressure (mean)	Radiation.		Evaporation.	
		Mean.	Maximum.	Hour.	Minimum.	Hour.	Maximum.	Hour.	Minimum.	Hour.			Minimum on grass.	Maximum in sun. Black bulb in vacuo. <sup>c</sup>	Free exposure (total)	Shelter (total)
	mm.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	Per ct.	mm.	°C.	°C.	mm.	mm.	
1	636.18	18.7	24.4	0.10p.	15.6	12 m. n.	25.1	0.20p.	15.4	10.50p.	81.5	12.9	15.4	55.2	3	2.2
2	36.28	18.6	21.9	9.55a.	15.6	0.05a.	22.3	10.20a.	15	5.00a.	87.7	14	14.1	55.2	2.7	1.9
3	36.28	19.1	24.6	1.00p.	16.7	6.00a.	24.8	1.15p.	16.3	12 m. n.	79.3	13	14.7	58.7	6.2	3.9
4	35.58	18.6	21.8	10.00a.	16.7	6.00a.	24.1	9.20a.	16.6	2.55a.	78.7	12.5	15.4	55.8	5.2	3.2
5	36.43	19.3	24.3	10.25a.	15.7	6.00a.	24.6	3.05p.	15.5	5.50a.	79.2	12.9	14.6	56	3.6	2.2
6	37.13	18.5	22.8	3.05p.	16.8	12 m. n.	22.6	2.25p.	15.4	5.20a.	86.3	13.6	14.5	51.4	1.6	1.5
7	37.32	18.6	23.1	0.25p.	16.4	5.25a.	23.5	Noon	16.2	6.05a.	89.3	14.3	14.9	58.7	1.2	.9
8	36.52	18.5	23.3	1.25p.	15.7	5.45a.	24.7	10.25a.	15.3	5.00a.	92	14.5	14.4	56.1	1.4	1
9	36.60	18.5	23.8	10.50a.	16	5.00p.	25.5	11.10a.	15.9	5.30a.	83.8	13.3	14.4	57.4	2.1	1.7
10	37.18	17.8	22	8.35a.	16	12 m. n.	22.5	9.50a.	15.3	12 m. n.	93.3	14.1	14.1	53.3	.9	.8
11	37.18	18.7	25.2	11.45a.	15.7	6.00a.	25.7	11.50a.	15	2.05a.	86.5	13.7	14.3	58.3	2.4	1.8
12	37.11	18	24.8	11.00a.	15.8	2.00p.	24.7	11.20a.	15	5.20a.	84.2	12.7	14.3	58.5	2.8	2
13	37.28	18.2	22.8	1.55p.	15.7	6.00a.	24	1.45p.	15	2.20a.	88	13.7	14.1	62.4	1.6	1.2
14	36.96	19.1	24.2	0.50p.	16.1	12 m. n.	25.9	1.00p.	15.6	3.25a.	82.5	13.6	15.1	57.6	4.7	2.8
15	36.80	19.1	24.7	0.40p.	15.5	1.45a.	25.4	2.00p.	15	7.25p.	72.7	12	14.1	57.7	4.3	3
16	36.41	19.4	25.4	1.00p.	15.4	5.50a.	25.5	2.00p.	14.3	5.20a.	78	13.1	13.1	59.5	3.4	2.3
17	35.80	19.4	25.3	1.50p.	16.1	3.20a.?	25	Noon	15	4.50a.	72.7	12.1	14.1	60.8	5.1	3.3
18	35.74	18.5	22.8	9.30a.	15.6	5.00a.	23.7	11.35a.	15.9	4.05a.	88	13.9	14.5	54.7	1.5	1.6
19	35.89	18.2	23.5	11.30a.	15.7	3.00a.	24.8	11.55a.	15.2	4.35a.	89.3	13.8	14.4	57.7	1.4	1
20	35.66	17.7	22.5	0.10p.	15.5	5.45a.	23	10.10a.	15	6.00a.	94	14.2	14.1	54.8	.9	1
21	35.55	18	22.6	0.50p.	15.9	0.20a.	21.8	8.50a.	15	1.00a.	94.5	14.6	14.8	56.4	.6	.8
22	34.72	18.7	24.1	1.10p.	16.7	1.55a.	23.4	1.00p.	16.7	1.00a.	94	15.1	16.1	59	.7	.6
23	34.03	18.6	23.4	10.30a.	16.7	4.00a.	24.2	10.20a.	16.7	4.50a.	92.7	14.8	14.6	58.1	.5	.6
24	34.47	18	21.8	9.00a.	16	9.40p.	23.3	8.50a.	16	5.00a.	94.7	14.6	15.5	53.4	.5	.7
25	34.96	16.8	21.3	0.35p.	15.7	6.30a.	21.8	10.50a.	14.8	6.25a.	95.2	13.6	14.1	54.7	.6	.5
26	34.42	17.1	21.9	9.50a.	15	6.00a.	22.1	10.25a.	14.1	6.10a.	96.8	14.1	13.4	58.1	.6	.4
27	34.04	17.1	20.4	11.55a.	15.5	3.30a.	20.3	1.05p.	15.6	2.50a.	96.8	14.1	14.9	53	.1	.1
28	34.46	18.5	24.2	2.00p.	15.7	1.50a.	24.2	2.05p.	16	4.20a.	91.8	14.5	15.3	57	1.5	.9
29	34.72	18.3	23.4	1.10p.	16.4	3.50a.	23.8	0.25p.	15.2	5.25a.	94.7	14.8	14.6	61.7	1	.7
30	35.02	18.4	24	1.20p.	16.4	6.30a.	23.7	0.05p.	15.7	5.30a.	96.2	15.2	15.4	60.3	.8	.5
31	35.38	19.5	24.7	1.00p.	16.7	6.00a.	25	1.45p.	16.4	4.40a.	92.3	15.5	15.5	60.4	1.4	.7
Mean	635.87	18.4	23.4		16		23.9		15.5		88	13.8	14.7	57.2	2.1	1.5
Total															64.3	45.9

Day.	Wind.				Clouds.		Sunshine.	Rain, 24 hours beginning 6 a. m.	Miscellaneous.	
	Prevailing direction. <sup>d</sup>	Total movement.	Maximum hourly velocity.	Direction at the time of the maximum velocity.	Amount (mean).	Form and direction.				
		Km.	Km.		0-10.	Upper.	Lower.	h. m.	mm.	
1	E quad.	453.8	40.2	E	7.4	Ci.-S. NEbyE	Cu.	1 05	29.2	☉ a. ☉ ☉ ☉ ☉ ☉ p.
2	SE, W	280.3	30.1	E	8.6	Ci.-S.	Cu. NE	0 30	.3	d a. ☉ ☉ ☉ p.
3	E	470.3	27.4	E	4.4	Ci. ESE	Cu.	2 00	.5	☉ ☉ p.
4	E	758.2	45.9	E	8.9	Ci.-S. Cu.-N. E, SE	Cu. E, SE	0 40	.5	☉ a. d ☉ p.
5	E quad.	374.9	30.8	E	3	Ci.-S.	Cu.	1 25	8.1	☉ ☉ a. p.
6	E	271.5	18.7	E	9.1	A.-Cu. WSW	Cu.-N. S	0 25	8.1	☉ d a. ☉ ☉ ☉ ☉ ☉ p.
7	E, W	252.4	20.7	NW	8.7	A.-Cu.	Cu.-N. N, S	1 15	3.9	☉ a. d ☉ ☉ ☉ p.
8	Variable	279.2	23.1	W	5.9	Ci. NW	Cu.	2 15	6.4	☉ ☉ a. ☉ ☉ ☉ ☉ p.
9	Variable	276.4	26.4	NE	5.9	Ci.	Cu. E	0 50	5	d ☉ ☉ ☉ ☉ p.
10	E, W	256.7	22.8	W	6	A.-Cu. NE	Cu.	0 55	11.2	☉ ☉ ☉ ☉ ☉ p.
11	E	368.7	24.4	E	5.1	Ci.	Cu.	1 35	1.5	☉ a. ☉ ☉ ☉ ☉ p.
12	E	371.2	24.7	W	5.6	Ci. S	Cu.	2 05	34	☉ a. ☉ ☉ ☉ ☉ ☉ p.
13	W, NE	367	21.7	E	5.9	Ci. S	Cu. WSW	0 25	6.1	☉ ☉ ☉ ☉ p.
14	E	482.8	36	E	5.9	A.-Cu. E	Cu. SE	0 55	.3	☉ ☉ ☉ d ☉ ☉ p.
15	E	464	32.7	E	8.3	Ci. NW	Cu.	3 20	10.7	☉ a. ☉ ☉ ☉ ☉ p.
16	E quad.	248.6	18.2	NE	4.9	Ci. SW	Cu.	3 05	...	☉ ☉ ☉ ☉ ☉ p.
17	E	377.1	44.8	E	6.3	Ci. ESE	Cu.-N.	3 20	.5	☉ ☉ ☉ p.
18	E, SE	324.2	26.4	SE	7.6	Ci.	Cu.-N. EbyS, SSE	0 25	8.3	☉ a. p. ☉ ☉ ☉ ☉ p.
19	E, W	256.2	22.3	W	8.6	A.-Cu. EbyS	Cu.-N. NE	0 55	23.4	d ☉ a. ☉ ☉ ☉ ☉ p.
20	N, SW	243.5	20.7	W	7	Ci. NW	Cu. ENE	2 00	8.4	☉ ☉ ☉ ☉ p.
21	W quad.	242.4	20.4	SW	6.9	A.-Cu., Ci.	Cu. SE	1 15	2.1	☉ d a. ☉ ☉ ☉ ☉ p.
22	W, E	263.7	30.1	W	8	A.-Cu.	Cu.-N. nwbyN	1 15	9.7	☉ ☉ ☉ ☉ ☉ p.
23	W	237.2	22	W	6.6	Ci.	Cu.-N.	1 30	2.3	☉ a. ☉ ☉ ☉ d a. p.
24	W	272	26.8	W	8.9	Ci.-S.	Cu.-N.	0 55	23.6	☉ a. ☉ ☉ ☉ ☉ a. p. p.
25	W	206.9	23.9	W	7.4	A.-Cu.	Cu. WSW	0 35	14.5	☉ ☉ p.
26	W, SW	237.5	21.1	W	7.3	Ci.	Cu.-N.	1 45	20.6	d a. ☉ ☉ a. p. p.
27	W	410.5	34.4	W	9.3	A.-Cu.	Cu.-N. WSW	0 50	21.4	☉ ☉ ☉ a. ☉ ☉ ☉ ☉ ☉ p.
28	W	331.3	28.2	W	7	Ci. E	Cu. WNW, W	4 30	15.7	☉ ☉ ☉ ☉ p.
29	W, SW	243.1	33.3	W	5.3	Ci.	Cu.	4 10	7.4	☉ ☉ p.
30	SW quad.	249.7	20.4	W	7.6	Ci.	Cu. SE	2 10	1	☉ a. p. ☉ ☉ p.
31	Variable	234.5	21.9	SW	6.1	Ci.	Cu. SSE	2 55	.3	☉ a. p. d ☉ ☉ ☉ p.
Mean		326	27.1		6.9			1 39		
Total		10,105.8						51 15	276.9	

<sup>a</sup> All the mean values given in this table are deduced from six daily observations taken at 2, 6, 10 a. m. and 2, 6, 10 p. m.  
<sup>b</sup> The barometric readings of this station are not reduced to sea level.  
<sup>c</sup> Maximum of hourly observations taken from 6 a. m. to 6 p. m.  
<sup>d</sup> This element is based on hourly observations taken from a quadruple register, which gives only eight possible directions of the wind.



DAILY RAINFALL AT THE STATIONS OF THE WEATHER BUREAU, JULY, 1916.

Station.	Day of month.															
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.
	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.
Jolo			18.3	49		0.3	6.7	6	2.8	4.4		47	16.5	11.4	3	
Isabela, Basilan			6.9	12.7			3.6		2.8	.5	1.5	17.8	1.8	3.3	5.6	
Zamboanga		0.5	.9				6.6	24.4	3.8	35.5	.6	1.3	21.6	40.2	4.8	
Davao	17.8	16.5	17							24.4		14.5	31.3			
Cagayan, Misamis	6.4	7.1	6.8	10.9						3.6	17		2.5	45.5	3.3	
Butuan		1.8	23.9	50	3	3.1	6.9	6.9	3	42.4	17.5	4.6	9.2	7.6	5.8	
Dumaguete		12.4	7.1	7.1			12.4					4.1	25.5		2.7	
Tagbilaran	1.9	7.6	1.3	4.7		.8				25.1		1		2.9	21.1	
Iwahig	4.8	33.9	10.8	14	4.6					2.3			8.4	.5	5.8	
Surigao	22.6	11.2	21.6	3.3	3		5.3			22.1	.5	8.2	4.6		8.9	
Maasin			26.9										17.5			
Cebu	41.7	39.4	18.1	40.1		6.9		10.2			11.9	4.8	15.2			
Iloilo		18.1	6.4	23.6							6.6	8	74.4		5.6	
San Jose Buenavista		18.3	45	16.2	1.3	1.3				2.8	27.7	3.8	27.2	1.3	14	
Cuyo		19.3	47.8	25.6	1.3	19.6			8	22.9	1	2.8	.8	.8	48	
Ormoc	11.9	2.6	7.1	35.6	.5	1.8					1.8	7.9		6.1		
Guiuan	7.6	16.8	23.4	5.3	3	5.8	27.9	2.8	1.5	9.7	5.3	2	27.9	1.3	9.9	
Tacloban	3.7	1.6	18.4	3.8		.3				11.3	3.2	3.2	38.3		1.7	
Capiz	.8	29	11.2	.8	12.2	9.7	8.9		2.8	21.8	8.7	43.5	51.5	2.8	18.8	
Borongan	5.3	5	52.4	3.3			9.7	1		2.5	3.6		26.7	.3	37.6	
Catbalogan	6.6	3.5	5.8			.5	1.3		8.7	5.8	1.3		20.3	.3	3.8	
Calbayog	2	4.8	9.6	1.8	4.9	2.8						9.9	7.9	1.3	6.4	
Masbate	.3	1.6	.5		45.7	.5			12.4						10.4	
Romblon	.5	2.8	12.5	6.1	3	1.6			20.3	3	2.3	1.5	6.9	17.1	22	
Batag	3.8	5	10.7							13.9	2	2	14	14	25.4	
Sorsogon		34.1	34.8		18.2								6.3		101.6	
Legaspi	1.3	5.1	6.1	13.5	5.6					20.1	.8	1.5	13.5		2.8	
Sumay, Guam	5.1	6.4		8.9	8.9	7.6	2.5		5.1		7.6		5.1		5.1	
Calapan	37.8	17.3	48.3	6.4		19.8	1	1.5	5.1	6.6	9.2	34	8.7		32.3	
Virac	3	10.2	10.9	1.8	24.1	.8	3.3		.8	14.5	.8	3.6	2.8	3.5	17.7	
Naga	3.5	11	3.3	35.5	1	20.1		26.9	15.3			23.9	.2		5	
Batangas		31	6.1	29.7	.6	1	3	3					3.8	3	2.5	
Lucena	.8	.8	5.8	26.4	1	1.3			9.4	1		.8	2.8	11.1	11.9	
Atimonan		13.2	1.3	16.6				11.4			9.9	25.4	49.7	28.4	33	
Ambulong, Tanauan	26.1		17.3	16	.8	8.7	8.9				6.6		.5	8.9	13.8	
Canlubang, Calamba		4.3	3.5	17.3	5.6	.8		6.6	1.8				3.6	18.8	2	
Paracale	.5	8.7	4.3	3.8			2.8		4.6	3.5	2.1	7.1	20.1		.5	
Santa Cruz, Laguna		13.2	27.4	1.5		5.1		.8		.5		2.3	47.5	6.1	7.8	
Manila	.8	2.3	.3	3		.3	.5	.8		4.6	1		31.3	46	19.8	
Antipolo	1	3.8	4.8	11.2	.5	1.8	12.7			2.3			4	16.3	.8	
Iba	6.9				3	21.7	11.2		2.5	22.1	.5		7.6	39.4	10.3	
San Isidro	.8	7.2	7.1	44.2		1.3				2.8			.5	11.1	.5	
Tarlac		5.6		10.5		.3	.8		30.2	11.9	4.8	5.3	2.3	14.7		
Baler	1.5	12	28.7	28.7	1.3	58.4	6.9			7.4	5.1	7.9	35.3	42.4	9.1	
Dagupan		2.3						.8		1.5	18			15.2	1	
Bolinao	31.7	2			3.6	41.9				13.7	5.6					
Baguio	29.2	.3	.5	.5		8.1	3.9	6.4	5	11.2	1.5	34	6.1	.3	10.7	
San Fernando, Union	.5	11.7				.3			4.1	.3			1		4.4	
Echague	1.5	2		1.8				1.3	19		2.8				5.1	
Candon	7.1			4.6	5.1	2.8				11.2		1.3	5.6	4.6	1.3	
Vigan	34.6		35.1		83.1	2.6	.9			9		12.4	.7	23.6	1.8	
Tuguegarao			17.3	2.8						5.3	5.3					
Laog			2		2.5	.3			3.8	.5	4.1	.5	2.3	3.6	.5	
Aparri	.5		.3											3.6	.5	
Cape Bojeador					2	6.1		.8						35.7		
Santo Domingo, Batanes	.3	.5		.8			8.9					1	.4		2	

## Daily rainfall at the stations of the Weather Bureau, July, 1916—Continued.

Station.	Day of month.															Total.
	17.	18.	19.	20.	21.	22.	23.	24.	25.	26.	27.	28.	29.	30.	31.	
Jolo	14.5	4.1		10.7	21.8	26.9	28.7	5.9	2.5	3.3						288.6
Isabela, Basilan	3	2.5	10.4								0.8	5.1				104.8
Zamboanga	5							4	3.3		.1	.5				161.6
Davao							11.4					6.1		4.1	55.4	198.5
Cagayan, Misamis	11.4	15.4		1.3					8.6	26.7	6.6	8.1			5.8	192.8
Butuan	.3	2.3		.3					11.4	.5	.3		.3	.6	4.3	204.7
Dumaguete		10.2														88.4
Tagbilaran	2.7		2.5													72.1
Iwahig	20.5	.5		7.4	10	47.5	3.6		.3	1.3	3.3	2.3		13.4	.6	195.8
Surigao										1.8		.5		.5	.3	143.3
Maasin	9.7			21.1		44.4							4.8		14.7	139.1
Cebu	3.4									.3		1.8	2		.5	226.9
Hiloilo	13.7		38.9	1.8							.5	24.9			6.1	221.4
San Jose Buenavista	18.8	.3	1.3					4.8	.3	38.9	1.3	7.6	2		24.6	258.8
Cuyo	125.7	2		1.3		2.5		2	20.3	20.6	2.3	23.9	1.5	3.5	2.8	400.1
Ormoc	1.3	.3					21.6			1		33.8		3.3	43.9	180.5
Guiuan	13.9	16	2.5					1.5		1.3						216.2
Tacloban	7.1	2			5.7	7.3	4.7	.5					4.7		5.8	122.9
Capiz	1.3	2.9	.3	12.7	.3				6.1		1.3	19.3	1	22.9		291.1
Borongan	24.2	.3		14.5	1.5	15	3.6	7.6			.3	10.4				257.1
Catbalogan	1.8	.3		3.6					.5	41.1	2	.8	.3	7.1	1.5	132.3
Calbayog	8.2	26.2	1.5									.5	1.5	.8	7.9	101.1
Masbate		55.4		6.9	7.6	22.8		2.5	21.6					6.1	14.2	208.5
Romblon	19.4	3.1	1.7	.1						10.2		8.1			19.3	191.3
Batag	14	1								2.5						108.3
Sorsogon	49.5															244.5
Legaspi	45.5	9.4			21.8		6.1									173.4
Sumay, Guam	17.8	29.2		1.3	12.7	16.5	3.8	3.8	16.5	2.5	1.3		5.1	17.8	1.3	197
Calapan	5.4	20.6	.3	2				.5		.8					10.7	271
Virac	24.9	4.1	.3	1.8				26.9		1.3		7.4			2.5	217.8
Naga	2.8				40.6	4.1	21.3	5.8	1.3	.5		.8			3.3	239.4
Batangas	5.3	.8	1.1	.8		7.9				.3						123.1
Lucena	4.3	3.9	.3							.5		6.1	5			88.7
Atimonan		96.8	38.8	15			5.6					2.3				411.6
Ambulong, Tanauan		1		23.1	45.2					1.5					1	23.1
Canlubang, Calamba		2.8	9.1		22.1	1	10.7		2.5			12.7	43.2		91.4	221
Paracale	1.8	30.3		6.9	4.6	12.7			1.3	.5			17.5		.5	148.8
Santa Cruz, Laguna	3.3	8.1		3.3	.3			6.8	1.5	15	.3	.3	3.8	21.8	13.2	192.6
Manila	1.1	3.8	2	.4	.3	3.3	.5		11.6	6.1	.6	40.5	1.6	.1		179.9
Antipolo	1	1.3	.5	1.3	2	6.9		48.3	13.2	9.7	10.4	6.1			4.8	168
Iba	.5	.5	43.2	3	8.4	1.5	5.8	7.1	.8	17	4.1	19.2			6.1	239.8
San Isidro	6.3	3.6		1.5	13.5		24.1	1.8	2.5	5.1	.8	16.6	8		2	154.1
Tarlac	12.2	3.6	1	13.7	50.8		6.1	2.8	11.1	16.8	.5	4.6				209.6
Baler	11.2	28.2	.8	15.7												300.6
Dagupan			15.5		7.6		1.3	3	20.6	7.4	2.3	3.6				100.1
Bolinao		13.5	51.1	6.1	18.8	.8		2.5	47.5	24.6	7.6		14	4.3	.8	290.1
Baguio	.5	8.3	23.4	8.4	2.1	9.7	2.3	23.6	14.5	20.6	21.4	15.7	7.4	1	.3	276.9
San Fernando, Union		9.4	.4	1.3		42.2		3.8	5.3	19.3	22.8		.3	43.4	8.1	178.9
Echague	10.2	1.8		11.2				24.6	40.6	2.5	26.2	50.8	21.6			223
Candon		12.7	1	4.3				9.7	3.8	33.5	4.6	1.5	5.3	4.8	4.8	144.3
Vigan	.2	6.4	28.7	11.7		1.8	.5	8.4	15	39.8	22.9		8.9			348.9
Tuguegarao		9.6				11.4	8.4	1.3		3.3	11.2					75.9
Laoag	.5	45		17.8	.8	6.9	8.6	64.3	2.1	57.2	46.7		3	5	8.6	285.1
Aparri	.3			9.1	9.1	4.1	4.6	4.8		10.2	10.7					58.1
Cape Bojeador		5.6				1.8		17		19.3	39.8	3.7	1.8	17	3.8	154.4
Santo Domingo, Batanes	2.8	14		3.3	10.2	.5		10.9	13.7		17.6		1.4			88.3

MAXIMUM AND MINIMUM TEMPERATURES AT THE STATIONS OF THE WEATHER BUREAU, JULY, 1916.

Day.	Jolo.		Isabela, Basilan.		Zamboanga. <sup>a</sup>		Davao.		Cotabato.		Cagayan, Misamis.		Dapitan.		Butuan.	
	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.
	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.
1	30.3	20.8	33.1	21.4			31	21	30	22.2	31.4	21.6	31.7	21.8	31.4	22
2	30.4	20.7	31.6	22.6			31.5	21.5	31	23.5	30.3	22	28.4	22.6	32.5	23
3	29.4	22	32	22.1			29.7	21.5	31.1	22.7	28.7	21.5	30	21.7	30.2	23
4	29.4	21.4	32.4	21.6			30.5	21.5	28.8	23	29.9	21.5	31.4	21.4	32	22.5
5	29.1	20.8	33.2	22.6			31.7	21.6	31.1	23.3	29.9	22	32	21.6	30.3	23
6	30.3	21.1	32.6	22.6			29.7	21	29.5	22	31.1	21.6	32.5	21.4	30.5	22.3
7	29.3	21.2	33.1	23.1			30.7	21.6	32.5	22.6	30.9	21.7	32.8	22.4	33	21.9
8	27.2	20.8	33.2	22.8	29	22.1	31.8	21.5	33.1	23	31.5	21.6	33.4	23.4	32.7	22.2
9	30.6	20.9	33.6	23.1	30.5	22.5	31.2	23	33.6	22.2	31.8	23.5	33	23.2	33	23.3
10	29.9	21.5	31.2	22.1	29	24.1	31.7	22	32.6	22.3	31.7	22.2	32.1	20.5	33.2	22.6
11	30.3	21.7	31.6	21.6	28.1	21.8	30.7	22.6	32.1	23	30.9	22.1	29.8	22.5	32.3	22.9
12	29.2	20.8	33.6	21.1	29.8	22.3	31.2	21.2	33	22.7	31.3	21.2	32.2	22.5	30.6	22.2
13	28.9	22	30.2	22.1	31	22.4	27.7	22.4	30.6	23.1	31.3	22.6	32.2	22.6	30.3	23.3
14	28	21.7	33.1	22.1	31.2	22.4	30.7	21.5	32.9	23.1	30.9	23.5	32.3	21.9	32	22.9
15	28.7	20.5	32.8	22.3	28.8	22.8	31.5	22.5	31.2	23.5	30.4	22	31.9	22.3	31	22.6
16	27.9	21.8	30.1	22.1	27	22.1	30.7	22			31.4	22			30	23.7
17	27.4	21.3	30.6	22.6	29.1	22.4	27.7	22			31.1	22.7			31.5	23.3
18	28.4	20.9	32.1	23.1	30	23	30.7	21.5			31	22.6			32.5	23.3
19	30.2	20.7	33.1	22.1	31	23.3	31.7	21			31.3	22.6			32.6	22.9
20	29.5	20.9	33.6	21.6	28.9	22.9	31.7	21.2			31.7	22.7			33.6	23.2
21	28.9	21.1	33.2	22.6	29.8	23	31.7	21.2			31.8	22.5			32.5	23.3
22	29.2	20.7	33.1	21.6	29.5	22.9	32.2	21			32.3	22.2			34.5	23.1
23	29.4	21.3	33.8	22.6	28.4	22.9	32.2	21.5			32.4	22.1			34.6	23.3
24	29.9	20.8	33.1	22.3	28.9	23.5	31.8	21.9			32.4	22.2			34	23.3
25	29.9	21.8	33.6	22.6	28.9	23.5	31.8	21.9			32.7	22.2			34.8	23
26	27.9	21.7	32.6	22.1	27.9	23.9	30.2	22			32.2	22.6			33.3	23.2
27	29.6	21.1	33.1	22.6	30.2	23.3	31.7	21.5			31.7	22			33.2	23.6
28	30.3	22.9	30.6	21.4	27.5	23.9	29.7	21.9			30.9	21.6			31	23.2
29	29.4	22.3	32.1	22.1	28.4	22.8	30.8	22			30.8	22			33.1	23.2
30	28.7	21	28.6	22.6	28.8	23.5	29.7	21.9			31.5	22.5			33.4	23.2
31	30.1	21.2	29.6	21.6	29.5	22.9	31.2	22.5			31.5	22			33.5	23.3
Mean	29.3	21.3	32.3	22.2	29.2	23	30.8	21.7			31.2	22.2			32.4	23

Day.	Dumaguete.		Tagbilaran.		Iwahig.		Surigao.		Maasin.		Cebu.		Iloilo.		San Jose Buenavista.	
	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.
	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.
1	30.5	22.2	31.7	21.7	31.1	21.4	30.6	22.8	31.2	22.5	30	24	31	23.3	32.1	22.3
2	29.3	23.4	28.9	22.7	31.8	22	31.6	22.5	31.6	22.6	29.5	23.4	30.5	23.4	31.1	23.3
3	29	21.4	26.1	22.3	30.6	22.6	29.1	23.2	30	22.8	26.2	23	29	23	30.2	21.9
4	29.5	23	30.2	22.3	30.2	23.4	32	21.9	31.4	22.5	29.1	23.5	28	28	28.7	23.9
5	30	23.1	29.6	22.5	32.2	22	31.3	22.6	32.5	22.6	30.7	22.2	30.4	23.5	31.7	23
6	30.8	23.4	30.7	22.4	32	23.4	33.4	23	32.8	22.5	31.5	24.8	31.5	24.3	31.8	23.4
7	30.9	23.2	31.9	21.7	32.4	22.7	34.8	22.9	32	23	32.2	24.4	31.8	23.5	32.2	22.1
8	30.1	23	30.8	22.4	32.3	22.3	34.9	23.3	33	23	32	25.4	32.4	24.3	32.7	22.5
9	30.6	24.1	31.8	22.8	32.1	23.7	33.6	23.8	33.2	23.8	32.5	24.9	33	25	33.3	24
10	31.1	25.3	31.4	22.4	33	22.9	32	23.7	32.8	23.2	32.9	25	33	25	33.2	23.7
11	31.2	24.5	30.8	22	31.4	22.4	33	23	34.5	24.2	31.8	23.5	31	25	32.7	23
12	30.9	23.8	30.9	23.5	31.9	22.6	34.4	23.6	33.1	24.4	31	25	32.5	24.4	32.7	23
13	30.9	24.2	31.7	23	32.4	23.2	32.9	24	34.5	24.4	32	23.5	32.5	23.2	32.7	22.5
14	30.1	22.2	31.6	23.1	29.2	23.3	33.8	23.4	34	23.3	33	24.4	29.5	23.2	29.1	23.1
15	31.1	23.9	31.3	22.7	31.8	22.3	33.5	23.4	34	23.1	32.1	25.1	31.8	23.5	31.6	22
16	30.6	24	30.5	22.8	31.4	22.3	33.8	23.8	30	23.2	31.5	25.7	29.5	24.2	31.2	23.5
17	29.5	23	28.7	22.7	31.8	23.1	32.5	23.1	30.5	23.5	30.8	25.5	30.5	24.2	31.7	23.5
18	29.2	22.9	29.9	23.5	31.2	22.4	31.4	23.9	33	22.9	29.7	24	30	24	29	23
19	30.4	22.4	30.7	22.7	32	21.9	35.5	23.8	33.8	23.6	33.1	24.5	32.5	23.5	31.7	23.2
20	31.2	23.4	31.2	22.5	32.7	22.1	35.4	23.6	34.2	24	33	24.9	32.7	23.8	31.7	23.6
21	32	23.2	31.3	23	33	22.3	34.5	23.5	33	23.2	31.9	25.2	31	23.5	32.7	23.4
22	32	22.7	31.4	23	32.3	21.9	34.9	23.3	34.4	24	30.5	24.8	31.5	23.6	32.7	23.1
23	32.4	23	32.3	22.5	32.5	21.8	35.4	23.7	34.5	24.8	31.4	25.9	31.7	27	33.2	24
24	32.3	23	33.2	24	33	21.6	34.6	23.6	34	25.8	32.2	26.2	31.5	26.5	32.8	23.1
25	31.5	23.6	31.7	24.3	33.3	22.4	33	23.8	34.5	25	31.9	26.5	31.5	24.4	32.3	23.6
26	31.4	23.3	32.5	24.3	32	23.3	33.1	23.8	34	26.6	31.6	25.3	31.5	23.5	31.6	23.6
27	31.8	23.3	32.3	25.2	30.5	22.9	33.8	23.3	34.5	24.5	31.3	26.5	31.5	23.5	32.2	23.7
28	32.2	22.2	31.9	24.1	32.4	22.5	34.3	24.1	34.5	24.8	30.5	25.5	30.5	24	30.8	23.4
29	32.1	23.4	31.9	25	30.4	22.4	33.7	24.2	35	25.4	32.5	25.9	30.5	24	30.7	22.7
30	31.2	23.7	31.4	24.7	31.5	22.4	34.1	24.3	34	24.3	30.8	25	31.1	24.5	31.8	23.2
31	31.1	23.7	31.4	23.5	32	22.3	36.2	24.1	34.3	24	30.6	25.2	31	24.5	30.2	23.6
Mean	30.9	23.3	31	23.1	31.8	22.5	33.4	23.5	33.2	23.8	31.3	24.8	31.2	24.1	31.7	23.2

<sup>a</sup> The thermometer shelter of this station was in repaired from the 1st-7th.

Maximum and minimum temperatures at the stations of the Weather Bureau, July, 1916—Continued.

Day.	Cuyo.		Ormoc.		Guiuan.		Tacloban.		Capiz.		Borongan.		Catbalogan.		Calbayog.	
	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.
	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.
1	31.9	22.6	30.9	21.3	31.5	22.6	31	22.5	32.2	22.1	31.5	21.7	29.9	22.4	32.7	22.7
2	31	24.8	29.3	22.7	31	23.2	29.8	22.5	29.6	23.1	30.8	22	29.5	22.5	29.3	22.8
3	30.7	23.6	26.9	22.2	29.6	23.3	26.9	23.5	29.8	22.7	28	22.9	26.2	22.5	27.1	22.7
4	27.7	23.3	29.4	22.4	29.8	24.8	30.5	23.2	29.8	23.1	30	22	30	22.5	30.2	22.6
5	30.4	23.1	30.6	22.6	30.9	25	29.8	23.2	31.5	22.8	29.2	21.9	29.1	22.2	29.6	22.7
6	31.9	24.4	31.1	22.6	31.7	23	32	23.7	32.3	22.7	31.4	22	31	23.3	31.8	22.5
7	32.4	23.1	31.8	22.3	32.6	22.6	32.4	22.7	32.3	23.4	31.9	22	32	21.7	31.3	22
8	32.7	24.7	32.2	22	32.9	22.5	32.4	23.2	32.8	24.2	31.5	22.6	32	22.3	31.7	22.6
9	31.5	24.4	32	22.4	33.6	23.5	32.6	24	33.3	24.2	32.1	22.3	31.9	22.4	31.8	22.9
10	33	25.1	31.8	21.8	31.8	23.7	31.7	24.4	32.8	23.7	32.2	22.9	31.3	22	32.1	22.4
11	31	22.7	32.2	22.3	32.3	22.9	31.5	23.4	30.4	23.4	32	23.2	31.9	22.2	31.6	23.3
12	31.8	24.4	31.9	22.7	33	23.1	32.2	24.5	31.4	23.4	32.2	23.4	32.5	23.1	31.3	22.8
13	33.2	24.9	31.7	22.6	32	24.5	31.4	24.1	32.2	23.2	32	23.6	30.6	23	29.8	22.9
14	28.8	25.3	31.2	23.3	33.4	24.5	31	22.6	29.8	23.6	31.4	23.2	32.2	23.6	31	23.7
15	32.5	23.3	31.9	21.6	32.3	23.4	32.9	23.9	32.3	23.5	32	22.9	31.7	22.2	34.1	23.1
16	31	26.5	31.9	23.9	29.8	24.1	30.6	24.3	31.8	24.2	29.6	23.8	30.3	23.2	32.1	24.1
17	31.5	23.5	29.8	23.7	31.3	23.9	31.1	23.8	31.8	24.2	31.4	22.7	30	22.8	30.7	23.8
18	28.7	23.6	30.2	23.7	30.1	23.6	29	23.2	32.2	23.7	28.8	23	30	23.9	29.6	23.4
19	31.2	24.4	31.6	22.9	31.5	22.6	32.1	23.7	32	23.7	31.3	22.8	32.1	22.8	34	23.3
20	32.7	24.5	31.5	22.6	32.9	23.4	31.9	23.8	32.3	23.7	31.9	22.7	31.9	22.4	32.6	23.3
21	31.7	24.4	31.6	21.8	33.4	27.1	33.2	23.2	32.3	22.9	32.6	22.3	31.8	22.4	32.9	23
22	32.6	24.1	31.3	23.8	32.7	25.5	31.9	23.7	32.7	23.5	29.6	22.9	31.9	23.5	32.9	24
23	33.8	26.1	31.8	23.1	33.7	25	32.3	23.3	33.4	23.2	32.4	22.3	32.5	23.4	34.1	25.1
24	33.5	25.8	31.5	21.9	34	27.6	33.5	24	33.7	23.2	34	22.7	32.5	24.4	34.7	24.9
25	31.5	23.9	31.2	24	31.7	24.5	32.6	24.4	34.4	25	33.6	22.7	33.1	23.5	34.9	24
26	31.7	23.6	31.4	23.1	33	25.5	33	23.4	33.3	23.5	33.5	22.7	33	23.9	34.8	24.6
27	31.8	24.4	31.5	22.4	33.2	24.9	33.7	24.1	34.2	23.3	33	24.1	32.3	22.6	34.5	24.7
28	31.2	24.6	30.8	23.6	32.7	27.3	32.9	24	33.3	24.1	33.2	22.6	32.7	23.4	34.5	23.8
29	32	24.1	31.6	24.5	33.3	27.6	33.4	24.3	32.4	23.7	32.5	22.9	32.6	23.3	35	24.4
30	32.3	24.4	31.5	23.2	33.4	24.3	33.5	23.7	32.7	23.9	32.5	22.8	32.6	23.2	34.2	24.1
31	30.8	24.9	30.8	22.7	33.9	23.9	33	24.4	32.4	24.2	33	23.2	32.6	23.4	31.9	23.7
Mean	31.6	24.3	31.1	22.8	32.3	24.3	31.8	23.6	32.2	23.5	31.6	22.8	31.4	22.9	32.7	23.4

Day.	Masbate.		Romblon.		Batag.		Legaspi.		Sumay, Guam.		Calapan.		Virac.		Naga.	
	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.
	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.
1	31	24	33.9	22.2	31	23.5	31.2	24.2	30.4	24.8	32.6	21.5	30	22.1	31.5	21
2	28.8	25	31	23	29.6	23	30.5	23.4	30	25.4	30.2	22.5	30.3	21.8	29.8	20.8
3	30.2	24.4	34.9	23.6	28.7	23	31.6	25.8	30	24.2	32.4	22.5	30.1	22.5	32.8	20.5
4	31.8	24.2	32.9	23.2	29.3	23.6	31.7	23.5	30	24	31.5	23.5	31.6	23.2	33	21.7
5	31.4	24.8	33.6	23.4	27	22.8	32	24.5	29	23.4	32.8	22.5	30.8	22.3	32.9	21.9
6	32.2	22.4	31.4	23.9	31.3	23.9	31.9	23.6	30	24.4	32.3	23.5	31.6	23	32.6	22
7	31.8	23.8	34.3	22.8	31.2	23.8	32.6	22.7	30	24	33	22.9	31.2	22.5	31.5	20.1
8	31.6	25.5	34.9	22.8	31.4	23.8	32.4	24.6	30.2	26	32.1	23.3	32	22.6	33.5	21.2
9	32	25.6	33.8	23.7	31.2	23.8	33	24.4	30	25.2	33.5	22.1	32.3	22	33.2	21
10	32	25	34.6	23.4	30.8	23.8	32.7	25.1	30.6	24.6	33.5	22.8	32.5	23.2	33	20.8
11	31.6	25.6	34.6	23.7	30.4	23.9	31.7	25.6	30.4	24.8	32.5	22.5	32.2	22.8	33	21.4
12	32.2	25.6	33.9	24	30.9	23	31	26.2	30.4	25.6	31.1	22.1	32.4	23.3	33.5	21.1
13	32.4	25.6	34.9	24.9	31.4	23.4	32.6	25.1	30.4	25.4	32.2	23.2	32.7	23.4	33.1	21
14	30.5	25.4	29.8	23.2	30.3	23.8	31.1	25	30.8	24	32.5	23.6	32	24.8	33.4	22.3
15	31.4	25.6	34.5	23.3	31	23.5	32.4	25.4	31	26	32.5	22.5	31.3	23.5	32.4	21.5
16	29.8	26.2	33.7	24	29.9	23.7	31	25.2	28.6	24	33.1	23.5	31	23	30.5	21.8
17	31.6	24.2	34.8	24.3	29.5	23.9	30.2	24.3	28.6	24	33	23.1	30.5	22.8	28.6	21.7
18	31.2	25.5	32.4	23.1	28.9	23.5	29.1	24.5	28.8	23.8	31.8	23	28.5	22.1	29.7	22.2
19	30.6	23.2	32	23.9	29.6	23.7	31	24.6	31	23.6	31	22.9	31	22.5	32.5	21.1
20	30.5	24.2	33.4	23.3	31.3	23.7	32.2	24.7	30.2	23.8	32.5	23	32	23	32	21.4
21	30.6	25	33.7	23.7	31.8	23	32.4	24.5	28.8	23.6	31.4	23	32.8	22.9	32.6	21.5
22	31.8	24.8	34.4	22.9	31.5	23.8	32.6	23.5	28	23.4	31.5	22.1	33.7	23	33.9	20.9
23	32.4	25.2	35	25.3	31.6	23.8	32	25	30.6	24.6	32.1	22.5	33.3	23.8	33.1	22.9
24	32.6	25.8	34.9	25.6	31.9	23.5	32.9	24.4	31	25.6	34.5	23.8	34.3	24.1	33.2	21
25	31.6	24.4	34.3	25.2	32	23.4	32.5	24.5	30.8	24.6	34.5	23	33.6	24.2	32.5	21.9
26	31.5	25.4	35	24	32.8	24.5	32.4	24.6	30.4	24	35	23.5	33.4	24	33.3	22.2
27	32.4	25.8	33.7	23.3	32.6	24	33.2	24.6	30.8	24.4	34	23	34.5	24	33.9	21.9
28	32.4	25.2	34	26.2	32.4	24.2	34	25.4	30.8	24.4	33.1	22.5	32.9	24.1	34.4	22.9
29	31.6	25.4	34	24.7	32.4	23.4	34	25.2	30.6	24.8	33	22.5	32.8	24.6	34	23
30	32.5	25.2	34.4	24.9	33	24.2	33	24.8	30.4	23.8	33.8	22.5	32.4	24.5	34	23.1
31	32.5	23.6	33.8	24.2	32.3	24.2	33.4	24.5	30.2	24.2	33.5	23.2	32.8	23.9	35	21.1
Mean	31.5	24.9	33.8	23.9	30.9	23.6	32.1	24.6	30.1	24.5	32.7	22.8	32	23.2	32.7	21.6

Maximum and minimum temperatures at the stations of the Weather Bureau, July, 1916—Continued.

Day.	Batangas.		Lucena.		Atimonan.		Ambulong, Tanauan.		Canlubang, Calamba.		Paracale.		Santa Cruz, Laguna.		Manila.	
	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.
	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.
1	33.2	22.4	32	22.1	32.8	22.8	33.1	22.4	31.8	22.2	32.1	24	32.1	22.6	32.3	23.5
2	30.9	23.5	29.5	22.6	28.7	23.8	28.9	25.2	22.2	22.2	28.5	23.9	32	23.4	30.7	22.4
3	33.8	22.8	32.5	23.9	32.4	25.5	30.7	22.6	23	23	32	24	30.8	22.7	30.6	23
4		24	29.6	23.6	30.5	24.6	28.2	23.9		22.1	32.5	24.4	30	23.7	30.8	23.5
5	31.4	23	31.2	23.4	32.3	23.6	31.8	22.1	31.6	21.6	32	24	32.3	23.7	32.5	23.1
6	31.7	24.3	31.9	23.5	30.6	24.2	29.7	23.8	31.9?	23.2	31.5	23.8	30.6	24	31.7	24.6
7	32.6	23.6	32.5	22.6	32.4	23.1	32.3	22.3	32.1	21.7	32.1	22.9	33	22.5	32.8	23.7
8	32.6	24.1	32	24.1	31.9	24.2	32.1	23	31.8	22.4	32	24.3	32.4	23.8	33.7	22.8
9	33.1	23.7	33	23.6	32.6	23.9	32.7	23.5	32.1	23	33.1	23.3	33.7	23.8	34.1	24
10	35	23.5	32.8	23.7	32.9	23.7	32.5	24.2	32	23	32.5	23.5	32.2	23.6	32.9	23.2
11	34.9	23.5	32	23.5	31.8	25.6	33	23.4	31.8	23.4	33	24.5	32.1	23.7	32.9	23.7
12	32.4	23.5	33.2	23.9	32.4	23.1	31.6	23.1	30.6	22.8	32.5	24.5	32.4	24.1	33.3	23.8
13	33.4	24	33.4	23.5	32.4	24.2	33.2	23.5	32.8	22.6	32.3	24.6	32.1	23.6	32.4	22.5
14	34.1	24.1	31.6	24.1	30.6	24.6	32.9	23.6	31.8	22.4	32.1	24.7	31.9	23.2	32.3	23.3
15	32	23.8	32	23.5	31.4	24.3	30.6	23.5	31.7	22.4	31.8	24.4	32.1	23.3	33.6	22.8
16	32.6	23.3	31.1	24.3	31	24.3	30.1	23.5	31.5	22.8	30	24.7	32.1	23.3	32.7	23.3
17	32.1	22.8	30.6	23.4	28.6	24.4	30.1	24	31.6	22.8	30	24	32.1	23.4	30	23.5
18	30.6	24.2	30.8	23.4	29.7	23.8	29.4	22.8	30.2	23.1	30	24	25.6	23.4	28.2	23.8
19	31.6	23.8	31.5	23.1	31.9	23.2	33.3	23.4	32	23.4	31.6	23.5	32.1	22.8	31.5	23.5
20	32.4	23.8	32.2	22.6	31.9	23.2	33.3	23.4	32	23.4	32.6	24	32.2	22.8	33	23
21	31.8	23.5	31.5	22.5	32.9	23.9	31.8	22.2	32.8	22.4	32.2	24.5	31.8	22.6	31.5	23.2
22	32.3	23.3	32.5	21.9	33	23.4	33.2	21.6	31.6	21.3	32.2	24	33.4	22.4	32.2	22.8
23	31.9	24.3	32.5	22.5	33	24.2	32.8	24.8	31.5	22.1	34.7	26	32.5	23.5	32	24.5
24	32	24	32.4	22.4	32.3	24.2	31.8	23.9	31.6	22.4	33.2	26	31.3	23.7	31.8	23.8
25	31.8	24	31.7	23.4	31.7	23.4	31.8	23	31.2	23.2	34.4	25.3	31.1	23.4	31.3	24.1
26	32.6	24.1	32.5	22.2	32.4	23.2	32.7	22.5	32.1	23.2	34.5	25.3	31.3	23.3	31.9	23.8
27	32.9	24.9	32.2	24.4	32.6	24.6	31.8	24	32	22.6	34.8	25	31.6	23.3	31.9	24.3
28	34	22.4	32.6	22.1	34.2	23.2	33.6	23.8	31.8	21.9	35.3	24.9	32.5	22.7	32.4	24.2
29	33.5	23.4	31.8	22.1	33.8	23.2	33.7	23	30	22.6	34.8	25.5	31.3	23.3	32	24.7
30	33.8	23.5	32.6	22.4	34.3	23.6	34.2	23.2	31.9	22.2	33.6	25	33	22.9	32.5	24.5
31	33.6	24	33.5	22.7	34.6	23.9	34.2	23.4	33.2	22	33.2	25	33.6	23.4	33	24.8
Mean	32.7	23.7	32	23.1	32	23.8	31.9	23.2	31.6	22.5	32.5	24.4	31.7	23.3	32.1	23.6

Day.	Antipolo.		Iba.		San Isidro.		Tarlac.		Baler.		Dagupan.		Bolinao.		Baguio.	
	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.
	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.
1	32.7	22	33.2	23.3	32.2	23.5	34	23	31	23.3	34.7	23.9	33.3	23.5	24.4	15.6
2	29	21.3	31.4	22	27.9	23	30.2	22.8	31.5	22.1	33.4	23.3	31.2	23.5	21.9	15.6
3	30.8	21.8	32	22.7	29.9	23	32.5	22.5	31.3	22.5	34.8	23.5	33	24.4	24.6	16.7
4	30.1	22.5	32.7	23.7	28.4	23.2	30.5	23.3	30.1	24.1	32.7	24.3	32	24.9	21.8	16.7
5	31.2	22	30.6	23.5	31.9	23	33.5	22.8	32.1	22.8	35.7	23.9	32.3	25.1	24.3	15.7
6	30.8	23	30	23.2	31.1	24.3	34.4	23.4	32	23.1	33.7	24.6	31.8	24	22.8	16.8
7	32.1	22.2	31.7	23	33.6	24.2	36	24	32.7	23.2	35.3	25	32.9	24.9	23.1	16.4
8	32.3	21.9	31.7	22.9	33.9	23.1	35.8	24	33	22.8	35.3	24.6	31.7	23.1	23.3	15.7
9	33.5	22.8	32.2	22.5	34.4	24	35.6	23.5	33.1	23.3	37.3	24.3	32.3	24.6	23.8	16
10	31.8	21.8	32.4	22.9	33.7	22.7	35.5	23	32.7	22.5	35	23.5	33	24.1	22	16
11	32.9	22	32.3	22.3	33.3	23.4	35.2	23	32.4	23.4	36.2	23	33	24.6	25.2	15.7
12	33.5	21.8	32.8	20.2?	33.2	23.6	35.2	23.5	32	23.5	35.7	23.8	33.8	24.4	24.8	15.8
13	32.7	23	32.3	21.2	32.1	23.5	33	22.6	31.1	23.9	35	23.9	34.5	24.5	22.8	15.7
14	31.8	22.9	32.6	23	33.5	23.4	35	23	31.8	23.4	35.3	24.3	34.1	24.9	24.2	16.1
15	32	22.4	31.4	22.2	32.5	22.6	33.5	23	31.9	22.4	33.2	23.1	31.5	24.5	24.7	15.5
16	32.6	22.5	32.3	23	32.9	22.9	35.3	23.5	31.9	23.5	33.7	23.2	33.2	23.6	24.5	15.4
17	29.3	22.6	32.6	23.2	27	23.2	30.6	23.2	29.1	23	34.7	23.9	33.6	24.7	25.3	16.1
18	27.2	22.8	31.4	24.2	26.5	23.5	31.2	22.4	28.8	24.3	35.2	25.4	33.5	24.1	22.8	15.6
19	30.8	21.8	32.6	22.8	33	22.2	35	22.8	30.9	21.8	34.6	23.4	32.6	23.4	23.5	15.7
20	31.3	22.1	31.9	22.2	33.6	23.4	35.8	22.8	32.4	22.5	32.8	23.9	31.9	24.1	22.5	15.5
21	30.9	22.3	31.7	22.5	33.4	23.1	35	23	32.6	23.4	35	24	31.6	24.3	22.6	15.9
22	32.6	21.3	31.5	23.2	33.4	23	34.8	23	33.4	23.5	36.2	23.8	34.6	24.4	24.1	16.7
23	31.6	23.3	31.2	23.8	33	22.8	34.4	23.4	35	23	35.2	23.9	33.5	25.5	23.4	16.7
24	31.1	23	30.4	22.8	32.5	22.8	33	23.1	34.6	24.8	33.8	24.2	32.8	24.9	21.8	16
25	30.1	23	30.7	22.7	31.2	24.1	30.3	23.2	33.1	23.2	33.1	23.2	31.9	24	21.3	15.7
26	30.5	22.7	29.5	22.5	31.8	23.6	32.5	23.2	34.9	22.8	32.5	23	30.7	24	21.9	15
27	30.1	22.8	31.2	22.9	32	23.7	32.2	23.5	34.2	23.9	32.3	23.5	31	23.1	20.4	15.5
28	31.9	22.9	31.3	23.8	31.4	23.4	33.5	23	35.7	24.4	34.9	24.1	32.1	24.1	24.2	15.7
29	30.5	23.5	31.1	23.1	32.3	22.9	33	23.2	34.4	23.9	34	23.5	32.6	24.9	23.4	16.4
30	32.7	23.5	31.4	22.8	33.4	23.7	34.5	23.5	34.6	23.6	34.8	25	31.9	24.6	24	16.4
31	33.2	23.6	31.8	23.1	34.4	23.9	35.5	23.8	35.2	23.4	36.2	25.5	32.7	25.1	24.7	16.7
Mean	31.4	22.5	31.7	22.8	32	23.3	33.8	23.2	32.6	23.3	34.6	24	32.5	24.3	23.4	16

Maximum and minimum temperatures at the stations of the Weather Bureau, July, 1916—Continued.

Day.	San Fernando, Union.		Echagüe.		Candon.		Vigan.		Tuguegarao.		Laoag.		Aparri.		Cape Bojeador.		Sto. Domingo Batanes.	
	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.
1	33.1	24	34	22.5	31.6	24.8	32.6	23.7	35.9	23	35	24	32.8	24.8	-----	25.2	33	26.2
2	33	23.2	33.6	22.3	31.6	24.9	32.5	24	34.8	23.5	32.9	24	30.3	24.8	-----	25.7	32.1	27.3
3	33	24	33.7	22.4	32.6	26	33.2	22.6	34.7	23.4	35.4	24.3	32.8	24.1	-----	25	33.4	27.6
4	33.1	24	30	23.9	31.8	25	33.4	22.3	29.8	23.6	36.4	23.8	32.6	24.8	-----	24.6	32.9	26.6
5	33.8	23.3	35.4	21.9	32	25	34	24.9	35.9	23.6	36.8	25.1	32.4	24	-----	25.8	32.9	26.5
6	32.3	25	30.5	22.3	33	26	32	22.7	31.9	22.8	34	23	32	23.3	-----	23.7	32.9	25
7	33.4	24.9	34.6	22.2	32.2	25.2	33.5	23.6	36.2	22.8	35.5	23	32	23.3	-----	25.4	32.2	25.1
8	32.8	24.3	36	22	32.3	26.5	33.2	24.2	37	23.6	34.3	24.5	32.9	24.3	-----	25.3	33	25
9	34.3	23.9	36	22	32.3	25	34.2	24.1	37.1	23.7	35.9	22.8	33	24.3	-----	24.9	33.1	24.9
10	33.3	23.1	35	22.2	32.6	25	33.7	23.1	37.2	23.7	35.7	23	32.7	24.2	-----	24.6	33.2	25.7
11	32.3	23.2	34.7	22.5	34	24.2	33.4	23	35.2	23	35	22.2	32.4	24	-----	24.6	33.1	26.8
12	33.2	23.5	33.7	22.3	35.7	24.4	34	22	36.7	23.2	34.7	24	32.4	24.8	-----	26	32	24.7
13	33.5	23.3	34.5	22	33.8	23	34	22.5	36.2	22.3	35.3	22.9	32.7	24.2	-----	25.2	33	26
14	33.5	23.5	35.5	23.1	35.4?	24.7	33.4	23.7	38.1	24.1	35.5	24	34.1	24.7	-----	25.4	33.4	26.6
15	33.8	23.5	36	22	32.4	25	33.1	23.7	37.7	23.7	35.2	23.8	32.9	24.8	-----	24.6	33.7	27.5
16	33.2	22.2	32.6	22.2	33	23.5	34	22.8	33.5	23.3	36.1	22.5	32.2	24.6	-----	24.8	33.6	25.6
17	33.5	22.8	31	23	34.6	24	34.2	23.5	30.4	22.8	37	23.6	32.1	24.3	-----	24.7	33.4	26
18	34	24.2	30	22.6	31.8	25.5	34.8	23	31.8	24.7	35	22.9	30.2	24.3	-----	25.6	32.9	24.6
19	32.5	23	34.4	22.1	30.1	24	33.3	23	36	22.4	33.4	22.3	32.3	24.2	-----	23	32.9	24.1
20	32.7	24.3	35.5	22.3	31.3	25	32.5	23.8	37.4	23	33.6	24	32.2	24.3	-----	22.8	32.6	24.5
21	33	23.2	34.6	23.1	31.1	25.4	33.4	23.5	36	23.5	33.5	22.9	32	24.6	-----	24.6	32.2	25.9
22	33.6	24.3	35.6	24	32.1	26	33.6	24.1	38.5	23.3	34.3	23.2	31.7	24.3	-----	25	32.9	25.4
23	33.1	24.9	35.2	22.4	32.8	26	34.3	24.5	35.1	23.1	34.2	22.9	32.5	24.5	-----	24.6	32.2	24.9
24	33.4	24.7	35	22.8	36.4?	25.6	32.4	23	34	23.5	35	23.6	31.2	24.3	-----	25.4	32.5	25
25	31.8	23.5	33.6	22.5	30.1	24.2	33.2	22.9	34.1	23.5	33.1	22.4	30.9	24	-----	23	30.3	25.1
26	31.8	22.9	34	22	30.8	23.9	31.6	22.5	35.5	23.7	30.9	23.1	30.2	24.3	-----	24.8	32.1	24.3
27	32.2	23.3	33.7	22	31.6	24.5	29.1	23	35.6	23.8	28.8	22.9	29.9	24	-----	22.6	31	24.2
28	32.8	24	34.7	23.3	32	25.2	32.9	22.8	35	23.8	31.4	23.4	29	23.6	-----	23	30.6	25.27
29	33.5	24.4	34	22.5	32.2	25.9	33.1	24	36.7	23.9	34	23.9	32.7	24.6	-----	24	31.5	26
30	33.4	24.6	35	24	32.5	25.5	33.1	24.4	38.4	25.4	33	24.2	33.7	25.3	-----	24.2	31.2	26
31	33.5	24.7	35.5	24.4	32.4	26.2	33.6	24.7	38.4	26	34	24.3	32.6	25.7	-----	24.6	31.6	26.2
Mean	33.1	23.8	34.1	22.6	32.5	25	33.2	23.4	35.5	23.5	34.4	23.4	32	24.4	-----	24.6	32.5	25.6

## SEISMOLOGICAL BULLETIN FOR JULY, 1916.

By Rev. MIGUEL SADERRA MASÓ, S. J.,  
*Assistant Director of the Weather Bureau.*

### EARTHQUAKES FELT IN THE PHILIPPINES.<sup>1</sup>

3, 22<sup>h</sup> 53<sup>m</sup> 00<sup>s\*</sup> [4, 6<sup>h</sup> 53<sup>m</sup> 00<sup>s</sup>]. **Butuan** (N Mindanao). Earthquake shocks of intensity II-III. Its origin lay at a distance of about 1,000 kilometers from Manila, it must be placed in the Pacific Ocean off the SE coast of Mindanao, probably in the Great Deep. As Butuan is at a great distance of the said coasts reasonably may be admitted that the shocks were more distinctly felt in the SE part of the Island.

5, 8<sup>h</sup> 39<sup>m</sup> 39<sup>s\*</sup> [5, 16<sup>h</sup> 39<sup>m</sup> 39<sup>s</sup>]. **Ambos Camarines and Albay** (SE Luzon). Earthquake of intensity IV-V, felt chiefly on the eastern part of Camarines and through the Albay Province. The origin seems to have been in the sea, NE of these provinces, presumably near the northern part of the Philippine Deep.

6, 8<sup>h</sup> 16<sup>m</sup> 00<sup>s\*</sup> [6, 16<sup>h</sup> 16<sup>m</sup> 00<sup>s</sup>]. **Ambos Camarines, Albay, and Sorsogon** (SE Luzon). A second earthquake of intensity V, originated in the same Deep as the preceding one, but apparently in a place situated somewhat more toward the S. It shook all the SE provinces of Luzon and was registered also in the Zikawei Observatory. At 9<sup>h</sup> 42<sup>m</sup> 04<sup>s\*</sup> [17<sup>h</sup> 42<sup>m</sup> 04<sup>s</sup>] and 10<sup>h</sup> 00<sup>m</sup> 40<sup>s\*</sup> [18<sup>h</sup> 00<sup>m</sup> 40<sup>s</sup>] occurred two minor aftershocks, felt only in the province of Albay nearest to the epicenter.

7, 7<sup>h</sup> 09<sup>m</sup> [7, 15<sup>h</sup> 09<sup>m</sup>]. **Sorsogon** (SE Luzon). Oscillatory earthquake, direction S-N, intensity III, duration about 3 seconds. It repeated at 9<sup>h</sup> 55<sup>m</sup> [17<sup>h</sup> 55<sup>m</sup>].

9, 2<sup>h</sup> 32<sup>m</sup> [9, 10<sup>h</sup> 32<sup>m</sup>]. **Baguio** (W Luzon). Earthquake of intensity II-III.

10, 1<sup>h</sup> 03<sup>m</sup> 45<sup>s\*</sup> [10, 9<sup>h</sup> 03<sup>m</sup> 45<sup>s</sup>]. **S Luzon**. Earthquake felt in the Province of Batangas with intensity III-IV, and long duration.

12, 0<sup>h</sup> 54<sup>m</sup> [12, 8<sup>h</sup> 54<sup>m</sup>]. **Tacloban** (NE Leyte). Earthquake of intensity III.

13, 14<sup>h</sup> 13<sup>m</sup> [13, 22<sup>h</sup> 13<sup>m</sup>]. **Legaspi** (SE Luzon). Earthquake of intensity III.

13, 15<sup>h</sup> 01<sup>m</sup> 02<sup>s\*</sup> [13, 23<sup>h</sup> 01<sup>m</sup> 02<sup>s</sup>]. **Sulu Sea**. Earthquake originated in the Sulu Sea near the meridian 122° E and the parallel 9° 4': it shook with intensity IV the islands of Cuyo, Panay, Negros and the western part of Mindanao. At Dumaguete (S Negros) the station nearest to the indicated place of origin its intensity reached degree VI-VII. The shocks were perceptible at distances of 400 kilometers from the epicenter practically throughout all Visayan islands, Mindanao and Palawan, they were also recorded by all the seismographs of the Far East. There followed many minor aftershocks the two strongest and felt at distances of 200 kilometers from the epicenter occurred at 15<sup>h</sup> 22<sup>m</sup> [23<sup>h</sup> 22<sup>m</sup>] and 17<sup>h</sup> 02<sup>m</sup> [14, 1<sup>h</sup> 02<sup>m</sup>].

14, 14<sup>h</sup> 47<sup>m</sup> 25<sup>s\*</sup> [14, 22<sup>h</sup> 47<sup>m</sup> 25<sup>s</sup>]. **Sulu Sea**. Earthquake of intensity III-IV; it originated about the same place as the preceding one, but it shook only southern Panay

<sup>1</sup> The intensity of earthquakes is given in the notation known as the Rossi-Forel scale. The time is that indicated by the seismographs at the Central Observatory whenever the disturbance has been registered by them. This fact is denoted by an asterisk (\*). Otherwise the time is that noted by the observer who sent the report. All time indications are in Greenwich mean time (midnight=0<sup>h</sup>), insular time being added in brackets for the convenience of Philippine readers.

and Negros and NW Mindanao to a distance of about 200 kilometers; it was also registered in most of the observatories of the Far East.

17, 8<sup>h</sup> 39<sup>m</sup> 56<sup>s</sup>\* [17, 16<sup>h</sup> 39<sup>m</sup> 56<sup>s</sup>]. **NW Luzon.** Earthquake of intensity III-IV; felt along the NW coasts in the provinces of Ilocos Norte and Ilocos Sur.

17, 15<sup>h</sup> 14<sup>m</sup> [18, 0<sup>h</sup> 54<sup>m</sup>]. **Guam** (Mariana Islands). Earthquake of intensity III.

21, 5<sup>h</sup> 38<sup>m</sup> [21, 13<sup>h</sup> 38<sup>m</sup>]. **Surigao** (NE Mindanao). Oscillatory earthquake, direction S-N, intensity III, duration 4 seconds.

25, 3<sup>h</sup> 40<sup>m</sup> [25, 11<sup>h</sup> 40<sup>m</sup>]. **Samar and Leyte Islands.** Earthquake felt with intensity III-IV, in the southern part of Samar and northern of Leyte. The origin probably lay in the northern portion of the San Pablo Bay. It was registered by the seismograph of Butuan at a distance of 230 kilometers.

26, 12<sup>h</sup> 02<sup>m</sup> [26, 20<sup>h</sup> 02<sup>m</sup>]. **Butuan** (N Mindanao). Oscillatory earthquake, direction NE-SW, intensity III, duration about 3 seconds.

## RECORDS OF THE MICROSCISMOGRAPH.

[Time: Greenwich mean. Midnight=0<sup>h</sup>. Instrument: Wiechert seismograph; 1,000 kilograms.  $A_N$ :  $T_0=6.1$ .  $\epsilon=-1.93$ ,  $\frac{r}{T_0^2}=0.050$ ;  
 $A_E$ :  $T_0=6.1$ .  $\epsilon=2.89$ ,  $\frac{r}{T_0^2}=0.085$ . Alluvium. 2.40 meters above sea level].

No.	Date.	Character.	Phase.	Hour.	Period.	Amplitude.		Remarks.
						$A_N$ $\mu$	$A_E$ $\mu$	
230	3	Iv	e	h. m. s.				
			L	19 05 44				
			M <sub>N</sub>	08 26				
231	3	I	F	08 41	4	8		
			e	22 53 00				
			M <sub>N</sub>	23 09	13	4		Butuan (N Mindanao).
232	5	Iv	F	23 09				
			eP	8 39 39				
			L	40 19				
233	5	Iv	M <sub>N</sub>	40 28	4	29		Ambos Camarines (SE Luzon).
			M <sub>E</sub>	40 31	4	26		End overtaken by following earthquake.
			eP	8 48 33				
234	6	IIv	L	48 53				
			F	57				
			eP	8 16 00				
235	6	Iv	L	8 16 45				
			M <sub>N</sub>	17 21	3	283		Ambos Camarines, Albay and Sorsogon (SE Luzon).
			M <sub>E</sub>	17 32	4	310		
236	6	Iv	F	9 09				
			eP	9 19 54				
			F	23				
237	6	Iv	eP	9 42 04				
			L	42 49				
			M <sub>E</sub>	43 06	2	60		Albay (SE Luzon).
238	6	Iv	F	54				
			eP	10 00 40				
			L	01 23				
239	8	Ir	F	12				
			eP	16 50 16				
			F	54				
240	10	IIv	e	9 44 29				
			L	52 42				
			M <sub>N</sub>	53 23	5	69		
241	11	Iv	M <sub>E</sub>	53 42	6	35		
			F	10 21				
			eP	1 08 45				
240	10	IIv	L	04 01				
			M <sub>N</sub>	04 26	3	974		S. Luzon.
			M <sub>E</sub>	04 27	3	624		
241	11	Iv	F	21				
			eP	7 26 17				
			F	28				



Records of the microseismograph—Continued.

No.	Date.	Character.	Phase.	Hour.	Period.	Amplitude.		Remarks.
						A <sub>N</sub> μ	A <sub>E</sub> μ	
242	13	I <sub>v</sub>	eP	h. m. s.				Sulu Sea.
			L	15 01 02				
			M <sub>N</sub>	02 13				
			M <sub>E</sub>	05 06	9	336		
243	18	I <sub>v</sub>	F	05 14	7		141	
				56				
			eP	18 59 05				
			F	19 01				
244	14	I <sub>v</sub>	eP	9 41 14				
			F	43				
245	14	I <sub>v</sub>	eP	14 47 25				Sulu Sea.
			S	48 34				
			L	30 46				
			M <sub>N</sub>	32 25	7	105		
			M <sub>E</sub>	34 18	9		37	
			F	15 38				
246	16	I <sub>v</sub>	eP	5 25 43				
			F	28				
247	17	I <sub>v</sub>	eP	0 59 42				End overtaken by following earthquake.
			L	1 00 16				
			M <sub>N</sub>	02 22	4	11		
248	17	I <sub>v</sub>	eP	1 08 23				
			F	24				
249	17	I <sub>v</sub>	eP	8 39 56				NW Luzon.
			L	40 35				
			M <sub>N</sub>	41 29	3	79		
			M <sub>E</sub>	41 34	3		42	
			F	53				
250	20	I <sub>r</sub>	e	8 09 51				
			L	15 13				
			M <sub>N</sub>	18 11	8	3		
			F	47				
251	21	I	e	12 37				
			F	13 08				
252	21	I	e	21 53				
			F	22 04				
253	23	I <sub>r</sub>	eP	10 18 53				
			S	23 11				
			L	25 52				
			M <sub>N</sub>	28 08	12	9		
			M <sub>E</sub>	28 12	11		4	
			F	11 13				
254	25	I <sub>v</sub>	eP	10 16 09				
			F	18				
255	26	I <sub>v</sub>	eP	6 53 00				
			F	55				
256	27	I <sub>r</sub>	eP	11 58 00				Malacca Peninsula?
			S	12 02 21				
			L	05 41				
			M <sub>E</sub>	06 22	15		4	
			M <sub>N</sub>	07 26	11	8		
257	28	I <sub>v</sub>	F	36				
			eP	13 19 17				
258	29	I <sub>v</sub>	F	22				
			eP	22 40 42				
259	30	I <sub>v</sub>	F	44				
			eP	5 19 02				
260	31	I <sub>v</sub>	F	5 21				
			eP	3 38 08				
			F	41				

TEMBLORES DE TIERRA SENTIDOS EN FILIPINAS.<sup>1</sup>

3, 22<sup>h</sup> 53<sup>m</sup> 00<sup>s\*</sup> [4, 6<sup>h</sup> 53<sup>m</sup> 00<sup>s</sup>]. Butúan (N de Mindanao). Temblor de tierra de intensidad II-III. El origen de este temblor distaba de Manila unos 1,000 kilómetros por consiguiente debe buscarse en el Pacífico hacia el SE de Mindanao en el Grande Abismo. Es casi seguro que fué más perceptible que en Butúan, en toda la parte SE de la isla.

5, 8<sup>h</sup> 39<sup>m</sup> 39<sup>s\*</sup> [5, 16<sup>h</sup> 39<sup>m</sup> 39<sup>s</sup>]. Ambos Camarines y Albay (SE de Luzón). Temblor de tierra de intensidad IV-V. Sintióse principalmente en la parte oriental de Camarines y en la Provincia de Albay. Su origen parece se hallaba en el Pacífico al NE de las expresadas provincias, probablemente en la parte septentrional del Abismo de Filipinas.

6, 8<sup>h</sup> 16<sup>m</sup> 00<sup>s\*</sup> [6, 16<sup>h</sup> 16<sup>m</sup> 00<sup>s</sup>]. Ambos Camarines, Albay y Sorsogón (SE de Luzón). Temblor de tierra de intensidad V originado al parecer algo más al SE del epicentro del precedente y sentido en todas las provincias del SE de Luzón. Registróse también en el Observatorio de Zikawei. A 9<sup>h</sup> 42<sup>m</sup> 04<sup>s\*</sup> [17<sup>h</sup> 42<sup>m</sup> 04<sup>s</sup>] y a 10<sup>h</sup> 00<sup>m</sup> 40<sup>s\*</sup> [18<sup>h</sup> 00<sup>m</sup> 40<sup>s</sup>] ocurrieron dos repeticiones perceptibles tan solo en la Provincia de Albay más cercana al indicado epicentro.

7, 7<sup>h</sup> 09<sup>m</sup> [7, 15<sup>h</sup> 09<sup>m</sup>]. Sorsogón (SE de Luzón). Temblor oscilatorio, dirección S-N, intensidad III, duración 3 segundos. Repitió con el mismo carácter a 9<sup>h</sup> 55<sup>m</sup> [17<sup>h</sup> 55<sup>m</sup>].

9, 2<sup>h</sup> 32<sup>m</sup> [9, 10<sup>h</sup> 32<sup>m</sup>]. Baguio (W de Luzón). Temblor de tierra de intensidad II-III.

10, 1<sup>h</sup> 03<sup>m</sup> 45<sup>s\*</sup> [10, 9<sup>h</sup> 03<sup>m</sup> 45<sup>s</sup>]. S de Luzón. Temblor de tierra sentido en la Provincia de Batangas con intensidad III-IV, larga duración.

12, 0<sup>h</sup> 54<sup>m</sup> [12, 8<sup>h</sup> 54<sup>m</sup>]. Tacloban (NE de Leyte). Temblor oscilatorio de intensidad III.

13, 14<sup>h</sup> 13<sup>m</sup> [13, 22<sup>h</sup> 13<sup>m</sup>]. Legaspi (SE de Luzón). Temblor de tierra de intensidad III.

13, 15<sup>h</sup> 01<sup>m</sup> 02<sup>s\*</sup> [13, 23<sup>h</sup> 01<sup>m</sup> 02<sup>s</sup>]. Mar de Joló. Temblor de tierra originado en el Mar de Joló cerca del meridiano 122° E y del paralelo 9.°4 N y sentido con intensidad IV en las Islas de Cuyo, Panay y Negros y en la parte W de Mindanao. En la estación de Dumaguete, S de Negros, la más próxima al epicentro tuvo intensidad VI-VII. Fué perceptible a distancias de más de 400 kilómetros del epicentro, prácticamente en todas las Islas Visayas, Mindanao y Palawan y registrado por todos los sismógrafos del Extremo Oriente. Ocurrieron varias repeticiones, perceptibles a distancias de 200 kilómetros. Las dos principales tuvieron lugar a 15<sup>h</sup> 22<sup>m</sup> [23<sup>h</sup> 22<sup>m</sup>] y 17<sup>h</sup> 02<sup>m</sup> [14, 1<sup>h</sup> 02<sup>m</sup>].

14, 14<sup>h</sup> 47<sup>m</sup> 25<sup>s\*</sup> [14, 22<sup>h</sup> 47<sup>m</sup> 25<sup>s</sup>]. Mar de Joló. Temblor de tierra, originado en el mismo centro que el anterior y sentido principalmente en la parte S de Negros y NW de Mindanao, con intensidad III-IV, su radio de acción no pasó de 200 kilómetros. Registróse también en los observatorios del Extremo Oriente.

17, 8<sup>h</sup> 39<sup>m</sup> 56<sup>s\*</sup> [17, 16<sup>h</sup> 39<sup>m</sup> 56<sup>s</sup>]. NW de Luzón. Temblor de tierra de intensidad III-IV sentido a lo largo de las costas NW de Luzón en las Provincias de Ilocos Norte y Sur.

17, 15<sup>h</sup> 14<sup>m</sup> [18, 0<sup>h</sup> 54<sup>m</sup>]. Guam (Islas Marianas). Temblor de tierra de intensidad III.

21, 5<sup>h</sup> 38<sup>m</sup> [21, 13<sup>h</sup> 38<sup>m</sup>]. Surigao (NE de Mindanao). Temblor oscilatorio, dirección S-N, intensidad III, duración 4 segundos.

<sup>1</sup> La intensidad de los terremotos se indica conforme a la conocida escala de Rossi-Forel. Cuanto a la hora de su ocurrencia, adoptamos la indicada por los sismógrafos de este Observatorio siempre que los hayan registrado, distinguiéndola por medio de un asterisco (\*). En caso contrario copiamos la apuntada por los observadores que nos envían las notas. Todas las indicaciones del tiempo se refieren al tiempo medio de Greenwich (medianoche=0<sup>h</sup>). Para conveniencia de los lectores de Filipinas se añade también el tiempo insular.

25, 3<sup>h</sup> 40<sup>m</sup> [25, 11<sup>h</sup> 40<sup>m</sup>]. Sámar y Leyte. Temblor de tierra de intensidad III-IV, sentido en la parte S de Sámar y N de Leyte. Su origen se hallaba hacia la parte N de la Bahía de San Pablo. Registrólo tan solo el sismógrafo de Butúan a unos 230 kilómetros de distancia.

26, 12<sup>h</sup> 02<sup>m</sup> [26, 20<sup>h</sup> 02<sup>m</sup>]. Butúan (N de Mindanao). Temblor oscilatorio, dirección NE-SW, intensidad III, duración 3 segundos.



APR 24 1917

UNIVERSITY OF MICHIGAN  
LIBRARY

THE GOVERNMENT OF THE PHILIPPINE ISLANDS

# WEATHER BUREAU

MANILA CENTRAL OBSERVATORY

---

BULLETIN FOR AUGUST, 1916

---

PREPARED UNDER THE DIRECTION OF

REV. JOSÉ ALGUÉ, S. J.

DIRECTOR OF THE WEATHER BUREAU

MANILA  
BUREAU OF PRINTING  
1917



---

---

**BULLETIN FOR AUGUST, 1916.**





# METEOROLOGICAL BULLETIN FOR AUGUST, 1916.

By Rev. JOSÉ CORONAS, S. J.,  
Chief, Meteorological Division of the Weather Bureau.

## GENERAL WEATHER NOTES.

Pressure and temperature.—The mean atmospheric pressure for this month in the Philippines is somewhat higher than the normal and than the monthly mean for August, 1915. The highest pressures were observed on the 15th in the Visayas and Mindanao, and on the 22d or 31st in Luzon, while the lowest pressures took place throughout the Archipelago on the 11th and 12th.

The mean monthly temperature does not differ much from either that of the preceding year or the August's normal. The extreme monthly temperatures for Manila were 33.5° C. on the 25th and 22.0° C. on the 22d. In Baguio the maximum and minimum temperatures registered during this month were: 24.8° C., 14.3° C. on the top of Mirador, and 26.1° C., 13.7° C. in the valley.

PRESSURE AND TEMPERATURE AT THE FIRST AND SECOND CLASS STATIONS FOR AUGUST, 1916.

Station.	Pressure.						Temperature.					
	Mean.	Departure from Aug., 1915.	Highest mean.	Day.	Lowest mean.	Day.	Mean.	Departure from Aug., 1915.	Highest.	Day.	Lowest.	Day.
	mm.	mm.	mm.		mm.		°C.	°C.	°C.		°C.	
Tagbilaran <sup>a</sup>	758.38	+0.33	759.62	15	756.51	11	27.2	-0.8	33	27	22.3	25
Surigao	58.41	+ .54	59.66	15	56.40	12	27.6	- .4	37	19	22.6	7
Cebu	58.41	+ .51	59.68	15	56.41	12	27.7	-----	33.3	17	22.9	26
Hilo	58.33	+ .41	59.56	15	56.15	11	27.4	- .5	32.5	23	22	29
Ormoc	58.32	+ .43	59.98	15	56.45	12	27.4	+ .1	34	25	21.5	22
Tacloban <sup>c</sup>	58.35	-----	-----	-----	55.77?	11	27.5	-----	35.3?	9	22.4	30
Capiz	58.30	+ .47	59.73	15	55.67	12	26.8	- .2	35.4	10	22.4	25
Calbayog	58.37	+ .62	59.97	15	55.72	11	27.8	- .7	34.6	13	22.3	31
Legaspi	57.80	+ .68	59.54	22	54.70	11, 12	28	+ .1	34.4	21	23.1	23
Atimonan	57.38	+ .60	59.16	26	53.80	12	28	0	34.7	22	22.8	8
Ambulong, Tanauan	57.22	+ .49	58.83	22	53.70	11	27.3	+ .3	34.9	31	21.5	23
Paracale	57.47	+ .57	59.46	22	53.80	11	28.6	+ .5	36.2	20	23.3	21
Manila	57.76	+ .32	59.54	22	53.94	11, 12	27.2	+ .3	33.5	25	22	22
San Isidro	57.77	+ .33	59.59	22	53.78	12	26.9	+ .3	34	1	22.7	21
Dagupan	56.93	+ .39	58.87	22	52.82	11, 12	27.3	+ .3	36.2	26	22	31
Bolinao	57.03	+ .39	59.23	22	52.46	11	26.8	+ .2	33.7	29	22.4	20
Baguio <sup>d</sup>	635.70	+ .19	637.51	22	631.91	11	17.7	- .2	24.8	26	14.3	18
Vigan	756.81	+ .35	759.17	31	752	12	26.5	- .8	34.2	27	21.4	11
Tuguegarao	56.86	+ .21	59.28	26	51.20	12	27.7	+ .1	37.6	29	22	28
Laoag	56.66	-----	59.18	31	51.58	12	26.3	-----	34.9	28	21.7	29
Aparri	56.16	+ .34	59.31	31	50.92	12	27.5	- .1	34	1	23.2	12

<sup>a</sup> 29 days of observation.  
<sup>b</sup> 17 days of observation.

<sup>c</sup> 25 days of observation.  
<sup>d</sup> The barometric readings of this station are not reduced to sea level.

Rainfall.—The monthly amount of rainfall for the northern part of Luzon, north of 16° latitude, is remarkably higher than the normal, and than that of August, 1915, though there was no typhoon or depression crossing the Philippines during this month. In the southern part of Luzon, south of 16° latitude, the total monthly rainfall is generally below that of the preceding year, and also below the normal of this month. As for the Visayas and Mindanao, it may be said that, while the monthly rainfall is for most of the stations above that of August, 1915, the number of stations reporting an amount above or below the normal are almost equally divided.

We consider as very extraordinary the heavy rains observed in the western part of northern Luzon, particularly from the 9th or 10th to the 13th or 14th, when there was no atmospheric disturbance in the Philippines, but only a distant typhoon which was moving eastward across the southernmost part of the Formosa Channel and of Formosa. These rains were so heavy that over 500 mm. of water were collected in one day only in the gauges of Candon, and over 400 mm. in the gauges of Vigan. The total monthly rainfall for these two stations is 1,210.1 and 1,165.1 mm. above the respective normal. It is the highest monthly amount of rainfall ever observed at least since 1895 in Vigan and since 1902 in Candon.

RAINFALL AT VARIOUS STATIONS OF THE WEATHER BUREAU DURING THE MONTH OF AUGUST, 1916.

Station.	Total.	Departure from Aug., 1915.		Departure from normal.	Rainy days.	Departure from Aug., 1915.	Greatest rainfall in a single day.	Day.	Station.	Total.	Departure from Aug., 1915.		Departure from normal.	Rainy days.	Departure from Aug., 1915.	Greatest rainfall in a single day.	Day.
		mm.	mm.								mm.	mm.					
Jolo	408.5	+264.9	+240.2	23	+7	75.4	14	14	Virac	97.5	-27.3	-19.2	10	-2	26.4	28	
Isabela, Basilan	288.7	+102.7	+89.3	22	+11	45.7	5	5	Naga	115	-47.7	-36	16	-1	30.9	28	
Zamboanga	114.5	+65.1	+24	14	+7	40.3	24	24	Batangas	33.1	-80.4	-110	13	0	8.9	29	
Davao	177	-88.5	-24.5	10	-4	62.2	3	3	Lucena	54.7			10		25.7	26	
Cagayan, Misamis	191	5		14	-2	54.6	28	28	Atimonan	63.9	+12.7	-81.1	11	+6	20.3	28	
Butuan	149	+89.7	+46.9	24	+13	50	4	4	Ambulong, Tanauan	244.4	+118.4		14	-5	125.5	23	
Dumaguete	162.7	+125		12	+5	51	25	25	Canlubang, Calamba	78.9			16		24.6	2	
Tagbilaran <sup>a</sup>	104.6	-13.1	-21	10	+3	59.6	31	31	Paracale	79.5	-109.7		7	-7	53.3	28	
Iwahig	207.9	+14.6		12	-7	37.8	4	4	Santa Cruz, Laguna	116.4	-92.6		20	+1	20.3	31	
Surigao	75.8	5.5	-13.5	14	+7	24.4	9	9	Manila	282.3	-131.5	-78.8	24	+1	43.7	22	
Maasin	269.8	+114.7	+62.8	8	-1	87.4	4	4	Antipolo	397.1	-34.3		25	+1	51.3	16	
Cebu	169.5	-16.6	+19.2	19	+8	42.9	4	4	Iba	775.4	-479.1	-213.9	26	-1	111.7	13	
Iloilo	252.5	+140	-74.8	22	+11	39.4	17	17	San Isidro	251.8	+1.2	-36.1	20	-4	56.9	22	
San Jose Buenavista	279.2	+19.4	-209.4	23	+2	98.5	28	28	Tarlac	220.1	-189.3	-135.2	18	-9	50.8	9	
Cuyo	252.2	+33.1	-119.4	21	+2	25.9	5	5	Baler	21.7	-55.5	-121.1	11	-6	7.2	10	
Ormoc	134.9	-115.2	-137.8	16	+1	23.9	5	5	Dagupan	586.7	+77.5	+98.3	24	-1	125.5	11	
Guiuan	119.9	+27.5		15	+3	33.8	27	27	Bolinao	637.5	-45	+68.2	23	-5	107.7	11	
Capiz	320.4	+85.5	+57	20	0	85.8	13	13	Baguio	1335.2	+215.2	+181.8	27	-2	193.5	11	
Borongon	213.1	+97.8	+85.4	14	+6	45.5	25	25	San Fernando, Union	1037.3	+584.7	+329	23	+2	178	10	
Catbalogan	69.9			14		23.2	21	21	Echague	166.2	+47.2	-25.9	17	+5	33.8	4, 25	
Calbayog	151.1	+75.9	-20.9	14	0	37.5	14	14	Candon	1941	+1580.2	+1210.1	23	+2	577.8	10	
Maabte	237	+65.6	+89.5	16	+4	79.2	28	28	Vigan	1864	+1284.8	+1165.1	24	-1	427.7	10	
Romblon	144.2		-14.1	13		92.7	28	28	Tuguegarao	173.2	-65.4	-15.5	11	-8	51	10	
Batag	254.4	+174.1		12	+3	66	31	31	Laoag	1298.3	+774.6	+452.8	23	0	169.7	9	
Sorsogon	230			6		52.1	26	26	Aparri	242.5	+102.2	+15	15	-3	48.5	15	
Legaspi	146.2	-31.9	-22.4	9	-6	55	28	28	Cape Bojeador	632.8			22		105.2	9	
Sumay, Guam	317.6	-118.3	-59.1	20	-1	53.4	9	9	Santo Domingo, Bata-								
Calapan	73.9	+26.1	-26.3	11	0	41.9	27	27	nes	360.5	+248.5	-22.2	24	+7	54.6	24	

<sup>a</sup> 29 days of observation.

#### DEPRESSIONS AND TYPHOONS.

As stated above, there was no depression or typhoon crossing the Philippines during this month. Yet, there could be observed in our weather map of the Far East six depressions or typhoons, whose tracks are published in Plate VII.

The first depression seems to have been of little importance. Its center appeared at 6 a. m. of the 3d to the southeast of the Loochoos, probably near 130° longitude E and 23° latitude N, moving NE until it remained almost stationary from the 5th to the 8th between the Bonins and southern Japan.

The second atmospheric disturbance was apparently a real typhoon at least during the 7th and 8th. It was shown on the 7th to the NE of Guam near 150° longitude E and 18° latitude N; it moved WNW or NW by W on the 7th and 8th and recurved N and NE on the 9th.

The third disturbance was a well developed typhoon, the barometer at the Bonins having been as low as 741.1 mm. (corrected for gravity and reduced to sea level) at 10 a. m. of the 13th. This typhoon came from the SW of the Bonins, and, after moving first to ENE, recurved northward to the east of that group of islands. On the 14th and 15th it was moving NNE to the east of Japan.



On the 10th to 11th a typhoon was formed over the northern part of the China Sea to the N of Pratas or between Pratas and Hongkong. It moved ENE, its center crossing the southern part of Formosa in the early morning of the 13th, then it inclined northward passing near Meiacosima, to the S, during the night of the same day; and finally it recurved northwestward on the 14th to the W of the Loochoos.

Another depression following a track almost identical to the preceding typhoon was observed from the 22d to the 26th. It was probably formed to the north of the Paracels on the 22d to 23rd, it moved eastward across Pratas and the Bashi Channel on the 24th, and recurved northward on the 25th to the SE of Meiacosima.

From the 15th to the 25th weather conditions were much complicated in the Eastern Sea. It seems, however, quite probable that while the Formosa typhoon was filling up on the 15th and 16th over the central part of the Eastern Sea, another cyclonic center made its appearance over the southern part of same to the N of Formosa. This new typhoon moved very slowly eastward from the 16th to the 22d, the center passing over Naze (Oshima) at about 6 a. m. of the 22d, the barometer having fallen there to 729.6 mm. (corrected for gravity and reduced to sea level). The typhoon recurved then to N and NW during the evening and night of the same day, and moved finally WNW on the 24th and 25th, a very queer track for typhoons of the Far East, particularly for the month of August.

## NOTAS GENERALES DEL TIEMPO.

**Presión y temperatura.**—La presión atmosférica media de este mes en Filipinas es algo mayor que la normal y que la media mensual de agosto, 1915. Las presiones más altas se observaron el día 15 en Visayas y Mindanao, y el 22 ó 31 en Luzón, al paso que las más bajas tuvieron lugar en todo el Archipiélago el 11 y 12.

La temperatura media mensual no difiere mucho de la del año pasado ni de la normal de agosto. Las temperaturas extremas del mes en Manila fueron 33.5° C. el día 25 y 22.0° C. el 22. En Baguio las temperaturas máxima y mínima registradas durante este mes fueron: 24.8° C., 14.3° C. en la cumbre del Mirador, y 26.1° C., 13.7° C. en el valle.

**Precipitación acuosa.**—A pesar de no haber habido tifón o depresión alguna que cruzara las Filipinas durante este mes, la cantidad mensual de lluvia en la parte septentrional de Luzón, al norte de los 16° de latitud, es notablemente mayor que la normal y que la de agosto, 1915. En la parte meridional de Luzón, al sur de los 16° de latitud, la lluvia total del mes es generalmente menor que la del año pasado y también menor que la normal de este mes. Cuanto a Visayas y Mindanao, puede decirse que mientras la lluvia mensual es en la mayor parte de las estaciones mayor que la de agosto, 1915, el número de estaciones que registraron una cantidad mayor o menor que la normal están divididas casi por igual.

Consideramos como muy extraordinarias las copiosas lluvias observadas en la parte occidental del N de Luzón, particularmente del 9 ó 10 al 13 ó 14, cuando no había ninguna perturbación atmosférica en Filipinas, y sí sólo un tifón lejano que se movía hacia el E a través del extremo meridional de Formosa y del Canal del mismo nombre. Estas lluvias fueron tan abundantes que en un solo día se recogieron más de 500 mm. de agua en los pluviómetros de Candón, y más de 400 mm. en los de Vigan. La cantidad total de lluvia durante el mes en estas dos estaciones es mayor en 1,210.1 y 1,165.1 mm. que las normales respectivas. Es la mayor cantidad mensual de lluvia observada hasta el presente, al menos desde 1895 en Vigan y desde 1902 en Candón.

## DEPRESIONES Y TIFONES.

Como queda dicho, no hubo depresión o tifón que cruzara las Filipinas durante este mes. Con todo, se echan de ver en nuestro mapa del tiempo del Extremo Oriente seis depresiones o tifones, cuyas trayectorias publicamos en la Lámina VII.

La primera depresión parece haber sido de poca importancia. Su centro apareció a las 6 a. m. del día 3 al SE de Liukiu, probablemente cerca de 130° longitud E y 23° latitud N, moviéndose al NE hasta que permaneció casi estacionario del 5 al 8 entre Bonins y el S de Japón.

La segunda perturbación atmosférica apareció como un verdadero tifón, al menos durante los días 7 y 8. Su centro se hallaba el día 7 al NE de Guam cerca de 150° longitud E y 18° latitud N; se movió al WNW o NW $\frac{1}{4}$ W los días 7 y 8, y recurvó al N y NE el 9.

La tercera perturbación fué un tifón bien desarrollado, habiendo llegado a bajar los barómetros de Bonins a 741.1 mm. (hechas la corrección por gravedad y reducción al nivel del mar) a las 10 a. m. del 13. Este tifón vino del SW de Bonins, y, después de haberse movido al principio al NE, recurvó hacia el N al E de dicho grupo de islas. El 14 y 15 se movía al NNE por el E de Japón.

Del 10 al 11 un tifón se formó en la parte septentrional del Mar de China al N de Pratas o entre Pratas y Hongkong. Se movió al ENE, cruzando su centro la parte meridional de Formosa en la madrugada del 13; luego se inclinó al N, pasando cerca de Meiacosima por el S, durante la noche del mismo día; y finalmente recurvó al NW el 14 por el W de Liukiu.

Otra depresión, que siguió casi la misma trayectoria que el tifón anterior, se observó del 22 al 26. Se formó probablemente al N de Paracels del 22 al 23, se movió al E a través de Pratas y del Canal de Bashi el 24, y recurvó hacia el N el 25 por el SE de Meiacosima.

Muy complicadas fueron las condiciones del tiempo del 15 al 25 en el Mar del Este. Parece, sin embargo, muy probable que mientras el tifón de Formosa se deshacía del 15 al 16 en la parte central de dicho Mar del Este, otro centro ciclónico aparecía en su parte meridional, al N de Formosa. Este nuevo tifón se movió muy lentamente hacia el E del 16 al 22, pasando el centro por Naze (Oshima) a las 6 a. m. próximamente del 22, cuando el barómetro de aquella estación marcaba 729.6 mm. (corregido de gravedad y reducido al nivel del mar). El tifón recurvó entonces al N y NW durante la tarde y noche del mismo día, y se movió finalmente al WNW el 24 y el 25, una trayectoria muy singular para tifones del Extremo Oriente, en especial para los del mes de agosto.

METEOROLOGICAL DATA FOR MANILA CENTRAL OBSERVATORY.<sup>a</sup>

[φ = 14° 34' 41" N; λ = 120° 58' 33" E; barometer above sea, 14.2 meters; gravity correction not applied, -1.72 mm.]

Day.	Pressure (mean).	Air temperature. <sup>b</sup>			Underground temperature.				Relative humidity (mean)	Vapor pressure (mean)	Radiation.			Evaporation. <sup>b</sup>		
		Mean.	Maximum.	Minimum.	0.25 meter.		0.50 meter.				1.50 meters.	2.50 meters.	Minimum on grass	Maximum in sun. Black bulb in vacuo.	Free exposure (total)	Shelter (total).
					8 a.m.	2 p.m.	8 a.m.	2 p.m.								
1	757.80	27.1	32.8	24.3	31	32	31.2	31.3	30.2	28.9	87.3	23.1	22.8	56.4	2.3	1.8
2	57.97	27.8	31.9	24.5	30.7	31.6	31.1	31.2	30.3	29	83	22.9	23.3	53.3	3.8	2.7
3	58.33	27.7	31	25.2	30.8	31.2	31.2	31.2	30.3	29	83	22.8	23.7	52.2	3.3	2.7
4	58.93	27.9	30.9	25.1	30.6	31.4	31.2	31.2	30.3	28.9	82.9	23	24	52.2	3.1	2.5
5	58.26	27	31.4	24.2	30.7	31.2	31.2	31.2	30.3	29	85.6	22.6	23.3	54.5	2.7	2.4
6	58.01	26.8	29.4	23.9	30.3	30.8	31	31.1	30.2	28.9	85.8	22.4	22.3	43	2.6	2
7	58.25	27.8	31.9	23.8	29.9	31	30.8	31	30.3	29	81	22.3	22	54.2	4	2.9
8	58.23	27.8	31.8	23.8	30.3	30.9	30.8	30.9	30.3	28.9	79.4	21.7	22.1	53.6	5.6	3.8
9	56.82	28	31.8	25.1	30.3	31.1	30.8	31.1	30.3	28.9	82.2	23	23.5	55	3	3.2
10	54.73	27.6	30.1	25	30.1	30.5	30.8	30.6	30.3	28.9	84.4	23.1	23.2	44	.7	1.9
11	53.94	27.4	30.6	25	29.3	29.7	30.2	30.5	30.3	28.9	85.6	23.2	23.5	46	.9	2.3
12	53.94	28.4	31.3	25.9	29.2	29.5	30.1	30	30.3	29	81.9	23.6	23.9	53	4.4	3.1
13	55.01	27.4	30	25.5	29.3	29.6	30	30.1	30.3	29	87	23.5	24.8	46.3	1.4	1.7
14	57.54	26.9	30.6	24.5	29.1	29.6	29.9	29.9	30.3	28.9	86.5	22.7	23.5	54	2.2	2.1
15	59.14	27.4	31.5	23.3	29.3	30.3	30	30	30.3	28.9	83.9	22.5	22.6	54	3.5	2.3
16	58.55	27.1	30.6	24.7	29.9	30.7	30.2	30.4	30.3	28.9	85	22.5	24	51.2	3.5	2.4
17	57.88	26.7	30.9	24.2	29.6	30.4	30.5	30.4	30.3	29	85.2	22.1	23.2	55	2.3	2.5
18	57.61	26.5	31.3	23	29.5	30.2	30.3	30.4	30.3	29	85	21.6	23	52.5	2.8	2.3
19	57.64	26.7	31.8	23.1	29.6	30.5	30.2	30.3	30.3	29	86.9	22.4	22.1	53.5	2.6	2.3
20	57.77	28	31.3	24.8	29.6	30.8	30.3	30.4	30.3	29	80.3	22.4	22.4	52	4.1	3.1
21	58.92	27.1	31.6	23.9	30.1	30.8	30.3	30.5	30.2	29	84.1	22.3	22.4	55	3.2	2.1
22	59.54	27.3	32.3	22	30.1	30.9	30.6	30.7	30.1	29	82.2	21.9	21.6	52.9	3.2	2.5
23	58.42	26.8	32	22.2	29.5	30.3	30.5	30.5	30.3	29	82.3	21.3	20.4	51.4	3.4	2.5
24	57.67	27.7	32.5	23.2	29.6	30.9	30.4	30.6	30.2	29	81	22.2	21.3	41	4.1	2.9
25	58.26	27.6	33.5	24.3	30.2	30.3	30.7	30.8	30.2	29	82.7	22.4	22.6	54	3.3	2.4
26	59.10	27.5	32.1	23.6	30.3	31.1	30.7	30.8	30.2	29	81.1	21.8	22	49.4	3.2	2.5
27	58.47	26.5	32.2	23.2	30	30	30.8	30.6	30.1	29.1	86.2	22	21.3	57.6	1.9	1.5
28	57.93	26.3	32.3	22.9	29.7	30.8	30.8	30.8	30.1	29	84.3	21.2	21	53.5	2.6	2
29	58.06	25.2	27.8	23	29.7	29.9	30.7	30.5	30.2	29	90.4	21.4	21.8	35.8	.6	.7
30	58.47	27.1	31.4	23	29.3	30.4	30.3	30.5	30.2	29	82.9	21.8	21.3	53	3.7	2.8
31	59.30	27	33	24.2	30.2	31	30.5	30.6	30.2	29.1	84.2	22.1	21.9	55.7	2.8	2.1
Mean Total	757.76	27.2	31.4	24	29.9	30.6	30.6	30.6	30.3	29	84	22.4	22.7	51.8	2.9	2.4
Departure from normal	+0.43	+0.2	+0.7	+0.3							-1	0			90.8	74

Day.	Prevailing direction.	Wind.			Direction at the time of the maximum velocity.	Amount (mean).	Clouds.		Sun-shine.	Rain, 24 hrs. beginning 6 a. m.		Miscellaneous.
		Total movement.	Maximum hourly velocity.	Form and direction.			Upper.	Lower.		On the tower.	In the park.	
1	E quad.	149.5	19.5	SSW	7.2	ci., A.-Cu. ESE	Cu.-N. E	6 25	2.6	2	● a. □ 3° d° p.	
2	SW	285	24	SW, WSW	7.4	A.-Cu. S, SE	Cu. NW	7 50			● a. ⊕ a. p.	
3	SW	388.5	31	SW	8.3	ci. ESE	Cu. WSW	6 30	22.5	22.6	● a.	
4	SW	506	33	SW	6.9	A.-Cu., ci.	Cu. WSW	6 25	6.2	6.5	● a.	
5	SW	405	33	SW, WSW	8.2	ci.-S. N	Cu. WSW	4 55	11.1	11.8	● a. p.	
6	SW	290.5	23	WSW	9.7	ci.-S. N	N.-cf. WSW	0 00	.3	.2	● a. p.	
7	SW	347	27	SW, WSW	7.8	A.-Cu. N	Cu. WSW	7 25	.1	.1	⊕ a. p° p.	
8	SW, WSW	427	33	WSW	7.1	ci. E	Cu. WSW	6 45			⊕ a. ⊕ a. p° p.	
9	SW	547	37	SW	9.2	A.-Cu. NW	Cu. WSW	4 50	16.5	18.5	⊕ a. p.	
10	SW	632.5	37.5	SW	10	ci.-S	cu.-N.swhbyw	0 00	24.2	29.5	⊕ a. p. ⊕ a. p.	
11	SSW	465.5	36.5	SW	10	ci.-S	Cu.-N. SW	0 00	26.2	28.5	⊕ a. p. ⊕ a. p.	
12	SW	675	35	SW, WSW	10	ci.-S	cu.-N.wquad.	1 05	4.1	4.9	⊕ a. p. ⊕ a. p.	
13	SSW, SW	609	42	WSW	10	ci.-S	cu.-N. pr.-N wsw	0 00	22.6	24.2	⊕ a. p. ⊕ a. p.	
14	SW	498	39	SW	8.5	A.-Cu.	Cu. WSW	5 30	3.5	6.1	⊕ a. p.	
15	WSW	239	24	WSW	8.3	ci.-S	Cu.	6 30	12.2	11.2	● a. p.	
16	SW, WSW	364	30	SW	8.2	A.-Cu. NEbye	Cu.-N. SW	4 30	32.7	34.8	● a. d. p.	
17	WSW	521	36	WSW	8.5	A.-Cu. W	Cu.-N. WSW	4 40	8.4	8.9	⊕ a. p. p° p.	
18	SW	456	36	SW	8.9	A.-Cu. W	Cu. SW	4 05	16.2		● a. p.	
19	SW	325.5	32	WSW	8.3	A.-Cu.	Cu.-N. WSW	5 10	14.4	14.1	● a. p.	
20	SW	357.5	28.5	SW	6.1	A.-Cu. SE	Cu. WSW	8 55	5.8	6.1	● a. p.	
21	SW, WSW	299	22	WSW	7.6	A.-Cu. E	Cu.-N. WSW	5 00	.3	.3	● a.	
22	W quad.	214	21.5	NNE	4.2	ci., ci.-S. NE	Cu. E	8 40	43.7	46.5	⊕ a. p. ⊕ a. p.	
23	W quad.	162	11.5	SSE, SW	5.4	ci.-S. NE	Cu. N	9 00			⊕ a. p. ⊕ a. p.	
24	S quad.	175	16	SSW	6.8	ci. ENE	Cu. E	10 15			⊕ a. p.	
25	E quad.	146	16.5	WSW	8.2	ci. NE	Cu. ESE	6 45			⊕ a. p.	
26	E quad.	128	13	WNW	8.5	ci.-S. NE	Cu. E	4 40			⊕ a. p.	
27	N quad.	91.5	13	WNW	8.9	ci.-S. ENE	Cu. E	3 20	4.3	4.2	⊕ a. p. ⊕ a. p.	
28	NE quad.	113.5	13	W quad.	6.8	ci., ci.-S. SE	Cu. E	7 00	1	.9	⊕ a. p.	
29	NE, SE	52	8	NNW	5.5	ci.-S.	Cu.-N. ESE	0 00	4.1	3.7	● a. d° p.	
30	SW, WSW	161	20	WSW	10	A.-Cu. E	Cu. SE	8 45			● a. p.	
31	N, NE	137	14	ws, wnw	5	ci.	Cu. E	8 10	.5	.5	⊕ a. p.	
Mean Total		328	26		7.9			5 16				
Departure from normal		+1,116.4			0			+22 15	-78.8			

<sup>a</sup> All the mean values given in this table are deduced from hourly observations.  
<sup>b</sup> These values are taken from instruments mounted in the Observatory Park, 1.5 meters above ground.

METEOROLOGICAL DATA FOR MIRADOR OBSERVATORY, BAGUIO.\*

{ $\phi = 16^{\circ} 25' N$ ;  $\lambda = 120^{\circ} 36' E$ ; barometer above sea, 1,512.5 meters; gravity correction not applied,  $-1.65$  mm.}

Day.	Pres- sure <sup>b</sup> (mean).	Air temperature at Mirador (on the top of the mountain).				Air temperature in the valley (near the city hall).				Rela- tive humid- ity (mean).	Vapor pres- sure (mean).	Radiation.		Evaporation.		
		Mean.	Maxi- mum.	Hour.	Mini- mum.	Hour.	Maxi- mum.	Hour.	Mini- mum.			Hour.	Mini- mum on grass.	Maxi- mum in sun. Black bulb in va- cuo. <sup>c</sup>	Free expo- sure (total)	Shel- ter (total)
	mm.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	Per ct.	mm.	°C.	°C.	mm.	mm.	
1	636.22	19.5	23.7	10.30a.	16.8	4.40a.	25.8	11.00a.	16.6	2.00a.	90.2	15.2	15.9	55	1.5	0.8
2	36.29	18.5	22.3	2.00p.	16.6	6.00a.	23.3	0.15a.	16	6.05a.	93.5	14.8	15.4	52.4	.8	.5
3	36.34	18.4	23.4	1.45p.	16.4	6.00a.	23.6	0.25p.	16.3	5.00a.	96.5	15.2	15.7	57.2	.4	.3
4	36.81	18	22.8	11.40a.	16.1	12m.n.	22.7	11.20a.	15.8	6.00a.	97.8	15	15.4	57.7	.4	.3
5	35.82	17.7	22.8	11.00a.	15.6	2.20a.	22.5	0.10p.	15	4.25a.	94.2	14.2	15	61.8	.6	.1
6	35.63	16.5	19.3	11.25a.	15.7	6.00a.	19.8	11.00a.	15.7	1.50a.	98.7	13.8	15.6	42.8	0	0
7	36.07	16.7	19.7	1.30p.	15.4	4.20a.	20.6	0.45a.	15.4	3.00a.	95.2	13.4	15.4	47	.4	.2
8	36.14	17.2	20.9	11.40a.	15.5	4.20a.	21.7	11.00a.	16.6	4.00a.	98.7	14.5	14.8	53.8	.1	.2
9	34.44	17	17.7	12m.n.	16	6.00p.	18.7	11.50p.	16.4	6.10p.	99.2	14.3	16.4	32.5	.1	0
10	32.38	17.4	17.9	12m.n.	16	0.05p.	18.4	10.00p.	17	0.10p.	99.5	14.6	16.5	19.9	0	0
11	31.91	17.1	18.4	1.20p.	15.5	6.00p.	18.7	12m.n.	15	5.45a.	99.2	14.4	16.2	21.6	0	0
12	31.92	17.8	18.4	2.25p.	16	6.00a.	19	11.35a.	16.6	4.45a.	99.3	15.1	16.2	34.8	0	0
13	32.69	17.7	18	2.20a.	16	12m.n.	18.7	4.40p.	16.2	12m.n.	99.8	15	14.7	29	0	0
14	35.14	17	18.2	0.25p.	15.9	6.00a.	18.7	Noon	16	11.30p.	99.5	14.3	16.4	37.6	0	0
15	36.92	18.1	23.3	2.00p.	15.7	3.00a.	23.7	1.10p.	15.7	3.00a.	95.7	14.8	14.9	57.1	1.2	.6
16	36.41	17.2	21.5	1.15p.	16.1	9.00p.	22	11.40a.	16	8.25p.	98.2	14.3	14.8	51.1	.4	0
17	35.46	16.3	18.1	2.00p.	14.7	10.00p.	19.3	0.15p.	15	8.00p.	99.5	13.8	15.7	40.8	0	0
18	35.15	16.1	17.5	1.50p.	14.3	9.30p.	18.8	1.40p.	14.5	10.00p.	98.5	13.4	14.5	33.3	0	0
19	35.33	16.6	18.5	0.25p.	14.8	1.00a.	19.6	0.10p.	14.8	1.00a.	99.2	14	14	42.7	0	0
20	35.67	16	18.9	2.00p.	14.5	5.00a.	19.7	0.20p.	15	6.15a.	98.2	13.3	14.4	42.5	0	0
21	36.67	17.3	21.7	0.35p.	15.3	3.50a.	22.5	0.30p.	15.2	6.10a.	94.3	13.8	14.2	55.2	1.4	.8
22	37.51	18	23.1	1.25p.	15.2	5.50a.	22.9	0.40p.	14.2	6.00a.	90.5	13.9	13.2	60.6	1.7	1
23	36.57	18.3	23.6	1.00p.	15.3	5.30a.	23.7	11.20a.	14.6	5.30a.	88.5	14	13.6	60	1.3	.9
24	35.72	17.8	22.8	11.35a.	15.7	12m.n.	23	11.55a.	15	5.40a.	92.5	14	14.2	61	.8	.7
25	36.50	18	23	1.20p.	15.5	4.25a.	23.5	0.50p.	14.8	6.20a.	89.5	13.8	13.7	58.8	1.3	1
26	37.48	19.1	24.8	11.25a.	16.2	3.10a.	25.4	11.45a.	14.8	5.05a.	84.8	13.9	14.2	57.4	2	1.5
27	36.89	18.6	24.5	0.40p.	15.4	6.00a.	26.1	1.00p.	14.5	5.20a.	88.3	14.1	14.4	57.5	2.5	1.8
28	36.60	18.3	24	1.30p.	16.1	4.10a.	24.8	10.25a.	15.1	4.05a.	87.7	13.7	13.7	61	2.3	1.9
29	36.15	18.2	22.8	9.50a.	16.1	5.30a.	24.4	Noon	13.7	6.00a.	83.7	13.1	13.8	58.3	2.4	1.6
30	36.33	18.6	23.7	2.00p.	15.9	6.05a.	25.2	1.40p.	16.3	6.15a.	85.7	13.8	15.3	57	2.6	1.6
31	37.42	18.7	24.3	10.00a.	15.7	5.30a.	25.1	2.45p.	15.2	5.30a.	82.8	13.3	13.6	57.2	2.1	1.6
Mean	635.70	17.7	21.3		15.7		22		15.5		94.2	14.2	14.9	48.9	0.8	0.6
Total															26.3	17.4

Day.	Wind.				Amount (mean).	Clouds.		Sun- shine.	Rain, 24 hours begin- ning 6 a. m.	Miscellaneous.	
	Prevailing direction. <sup>d</sup>	Total move- ment.	Maxi- mum hour- ly veloc- ity.	Direction at the time of the maximum velocity.		Form and direction.					
		Km.	Km.		0-10.	Upper.	Lower.	h.	m.	mm.	
1	W quad.	258	22.2	W	5.7	Cl.	Cu.-N. WSW	2	35	34.3	≡ a. p. ● 2 1/4 p.
2	W quad.	273.9	21.9	W	7.1	Cl.	Cu.	1	10	13.2	⊕ ≡ d a. p. ● 1 1/4 p.
3	W	282.8	24.3	W	9.6	Cl.-S., Cl.	Cu.-N. WNW	1	50	6.5	d a. p. ≡ 2 a. p. ● 1 1/2 p.
4	W	360.4	38.4	W	10		N.	1	50	52.5	≡ 2 d a. p. ● 2 1/2 p.
5	W	370.9	33.3	W	9.1	Cl.-S.	Cu. WNW	2	30	32.4	⊕ d a. p. ● 2 p.
6	W, SW	655.4	46.2	W	10	Cl.-S.	Cu.-N. WSW	0	00	45	≡ 2 a. p. ● 1 1/2 p.
7	W	741	45.4	SW	9.6	Cl.-S.	N.	0	00	16.4	≡ 2 d a. p. ● 1 1/2 p.
8	SW	758	50.9	W	10		N.	0	10	60.7	≡ 2 a. p. ● 1 1/2 p.
9	SW	1,376.7	72.7	W	10		N.	0	00	113.3	≡ 2 a. p. ● 1 1/2 p.
10	SW	1,595.6	73.4	SW	10		N.	0	00	131.6	≡ 2 a. p. ● 1 1/2 p.
11	SW	1,426.3	72.4	SW	10		N.	0	00	193.5	≡ 2 a. p. ● 1 1/2 p.
12	SW	1,559.8	82.1	SW	10		Cu.-N.	0	00	136.1	≡ 2 a. p. ● 1 1/2 p.
13	SW	1,324.3	75.6	W	10		N.	0	00	125.5	≡ 2 a. p. ● 1 1/2 p.
14	SW	659.9	41.5	SW	10		Cu.-N., N.	0	00	26.6	d a. p. ≡ 2 a. p. ● p.
15	W	447.8	28.8	W	9.3		Cu.-N. SW	0	00	5	d a. p. ≡ 2 a. p. ● p.
16	W	545.3	52.5	W	9.9		N.	0	00	92.8	d a. p. ≡ 2 a. p. ● p.
17	SW, W	877.9	60.4	W	10		N., S.	0	00	34.2	≡ 2 a. p. ● 1 1/2 p.
18	SW, W	1,001.8	62.2	SW	10		N.	0	00	81.6	≡ 2 a. p. ● 1 1/2 p.
19	SW	923.1	52.3	W	10		Cu.-N. WSW	0	00	46	≡ 2 a. p. ● 1 1/2 p.
20	SW	605.6	39.9	SW	10		Cu.-N.	0	00	17	≡ 2 a. p. ● 1 1/2 p.
21	W, SW	376.3	30.4	W	8		Cu.	0	00		d a. p. ≡ 2 a. p. ● p.
22	W	309.6	21.4	W	5.7	Cl.-S.	Cu., Cu.-N. SW	4	40		≡ 2 d a. p. ● p.
23	W	249.5	20.1	W	7.7	Cl.-S.	Cu.-N. WbyS	3	05	11.5	≡ 2 1/4 p. ● 1 1/2 p.
24	W	320.8	30.8	SW	6.7	Cl.-S. NE	Cu., N.	3	25	14.1	≡ 2 a. p. ● p.
25	Variable	197.5	14.5	W	8.7	A.-cu. NE by N, E	Variable	1	40	1.3	≡ 2 a. p. ● p.
26	SE, E	273.8	19.5	W	5.6	Cl.	Cu.	4	40	32.3	≡ 2 a. p. ● p.
27	Variable	244.3	15.9	W	6.6	A.-cu. NE, ENE	Cu.	3	15		⊕ a. p. ≡ 2 a. p. ● p.
28	NE quad.	313.5	24.1	W	5.3	Cl.	Cu. WSW	4	45	6.4	≡ 2 a. p. ● p.
29	Variable	241.8	17.7	W	4.6	Cl.	Cu.-N.	3	35		≡ 2 a. p. ● p.
30	E quad.	314.9	22.7	SE	8	A.-Cu.	Cu.	4	50		≡ 2 a. p. ● p.
31	E	308.6	21.5	SE	4.6	Cl.	Cu. NE	5	05	9.4	≡ 2 a. p. ● p.
Mean		619.2	39.8		8.4			1	35		
Total		19,195.1						49	05	1,335.2	

\* All the mean values given in this table are deduced from six daily observations taken at 2, 6, 10 a. m. and 2, 6, 10 p. m.  
 b The barometric readings of this station are not reduced to sea level.  
 c Maximum of hourly observations taken from 6 a. m. to 6 p. m.  
 d This element is based on hourly observations taken from a quadruple register, which gives only eight possible directions of the wind.



DAILY RAINFALL AT THE STATIONS OF THE WEATHER BUREAU, AUGUST, 1916.

Station.	Day of month.															
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.
Jolo	46.5	0.5	33.3	5.9	0.3	mm.	10.4	mm.	mm.	2.8	mm.	mm.	mm.	75.4	22.9	0.3
Isabela, Basilan	29		23.4	4	45.7		1.5	2.5	7.1	10.4				7.1	13.4	2.3
Zamboanga	1	1	4.8	4										1.8	3.3	24.6
Davao	8.9		62.2	3.8	2.5									8.9	3.8	
Cagayan, Misamis	7.6	3	5	10.4	36.8									4.8	31.7	4.8
Butuan	1.3	.8	1.3	50	23.1	0.3			11.4	2.5			0.3	1.8	1	9.4
Dumaguete	2.3	9.1	5.1	14.7										6.4		*
Tagbilaran	19	4.3		5.6												*
Iwahig			4.8	37.8	25.4		18.6	3.3								2.6
Surigao			3	4.1					24.4	2.5	7.1					1.5
Maasin		29		87.4	8.9								27.2	8.4	78.7	
Cebu	.5	2	3	42.9	4			3			.5			21.6	7.9	4.1
Iloilo	4.6		2.3	6.1	11.9	3				22.8	16	0.5	34.1	5.3	2.3	2.3
San Jose Buenavista	4.3		4.1	38.6	1.3				4.8		52		18.5	9.4	2.3	6.4
Cuyo	2.3	20.1		21.3	25.9					1.3			10.1	16	10.2	16.5
Ormoc	.3			.12	23.9				5.3					19.5	14.2	3
Guiuan	.5		2.8	1	1.3										.5	
Tacloban	6.9		2.9									*	*	*	*	*
Capiz	13.8			6.6		15	1.3				6.6		85.8	15.5	2	2
Borongan	4.6		25.9	3.5										3.8	6.9	12.7
Catbalogan				2.5	.3								5.8		5.3	1.3
Calbayog		14	1	10.7	4.1									37.5	.5	
Masbate	9.4		3.8	13.7	9.4			1.5			4.6		1.8	8.6		
Romblon	3.9									1.3	7.9	1.3	8.7			
Batag	5.1			6.6										24.1		16.5
Sorsogon				50.5												
Legaspi			1.5							15.2		1.8	3			
Sumay, Guam	3.8			3.8			6.4	30.5	58.4	16.5		14		3.8	6.4	38.1
Calapan	1	.5								.8	5.8	1.8		2.3		
Virac										1.8				.8		.5
Naga	5.3	6.8	.8	17.1	.5					1		.5		1.5	1	1.3
Batangas		.5		.3		1				4.6						1.8
Lucena	8.4	3.8			.3									10.7	5	
Atimonan	5.3	2.8											3	7.1	4.1	
Ambulong, Tanauan	19.3		1.5							6.1	10.4	3.1	.8			2.8
Canlubang, Calamba	1.3	24.6								3.8	4.6	4.3	.5	3.3	1.5	6.6
Paracale	3	6.4								6.4				3.8		
Santa Cruz, Laguna			3.6	3.1	4.1				1.5	7.9	8.1	1.8	2.3	11.2	14.5	4.6
Manila	2.6		22.5	6.2	11.1	.3	.1		16.5	24.2	26.2	4.1	22.6	3.5	12.2	32.7
Antipolo	9.1	7.4	39.3	15.7	16.2	3.3	2.5		31.5	20.1	8.9	2.8	14.5	18.3	2.3	51.3
Iba	1.8	6.1	8.3	32.5	64.2	64.3	5.8	40.9	31.2	31.5	20.6	17	111.7	80.8	33.3	44.2
San Isidro	1.3	1	4.5	25.6					7.1	13.9	4.3	2	1.6	55.1	2	17.2
Tarlac	6.6		38.1	1.3	6.6			13	50.8	29.2	19.3	6.6	1.3			2.5
Baler						4.3			2.3	7.2	.3	.5	.8			
Dagupan	29.9		3.6	13.2	17.8	6.7	8.9	21.1	19.9	89.9	125.5	12.2	64.5	2.9	16.3	22.1
Bolinao	21.6	24.7		6.3	72.3	42.9	22.1	8.2	16.3	34.8	107.7	14	18.6	3.5	23.9	30
Baguio	34.3	13.2	6.5	52.5	32.4	45	16.4	60.7	113.3	131.6	193.5	136.1	125.5	26.6	.5	92.8
San Fernando, Union	4.5	57.7	83.8	9.7	34.8	66.7	16.5	28.5	35.8	178	116.3	30.7	101.4	20.6	1	49.5
Echagüe	16.8	13	3	33.8	22.6	6.1			2.3	9.1	1.3			3		1.3
Candon	9.9	2.3		15	58.2	35.3	10.7	57.1	411.7	577.8	209.1	139.7	203.2	34.6	4.3	15.7
Vigan	9.7		14.7	23.1	68.8	171.1	11.1	110.9	139.4	427.7	157.7	59.9	270.8	110.4	10.2	70.4
Tuguegarao		2.5	22.4	5.5		4.8	10.2		26.1	51	10.7			10.1	26.1	
Laosg	1	20.1		11.7	37.7	43.7	75.7	31.9	169.7	98	148.7	110.9	169	21.1	4.5	69.8
Aparri	32			4.8	5			11.7	31.7	6.6	35.3	3.3	2.8	2.5	48.5	7.3
Cape Bojeador			3.3	29.4	51.8	27.7	65.1	34.3	105.2	29.3	27.4	28.7	48.5	9.7	4.6	
Santo Domingo, Batanes		.8	1.1	2.3	.1	2.4	6.6	44.4	3.8	49.8	28.7	40.7	14.2	4.6	1	24.9

\* No observation.

Daily rainfall at the stations of the Weather Bureau, August, 1916—Continued.

Station.	Day of month.															Total.	
	17.	18.	19.	20.	21.	22.	23.	24.	25.	26.	27.	28.	29.	30.	31.		
Jolo	0.8		0.3	75	20.6	7.1	12.7	9.4	13.7	14.5	6.6	2.3		2.8	44.4	408.5	
Isabela, Basilan	41.9		41.9	24.1	18.3		9.2	7.1	25.9	1.5		6.9	0.8	1.3	5.3	288.7	
Zamboanga			3	11.1			4.5	40.3	8.2		5.1				6.3	114.5	
Davao	33		16.3								33.8			3.8		177	
Cagayan, Misamis	25.1	3.8			4				2.9			54.6			1	191	
Butuan	.3	9.1		3	.5	3			.5	9.1	3	9.7		11.4	1	149	
Dumaguete				26.7	1.2		26.9	2.5	51	6.6		6.4			6.1	162.7	
Tagbilaran	*		7.9		.8					11.8	.5	9.3		2.5	59.6	*104.6	
Iwahig		15.7	25.9							25.6		28.7	.5			207.9	
Surigao					2.3				.3	.5	.5	.5		17	14.5	75.8	
Maasin			18.8									11.4				269.8	
Cebu	3				.4	3.3		.5	30	35.3		15.2		1		169.5	
Iloilo	39.4	14.7	15	3.3	3.3	28		1.5	1.8	.8		33.5				252.5	
San Jose Buenavista	.3	6.4	.3		8.9	.5		12.4	6.4	.6	.8	98.5	.8		4.3	279.2	
Cuyo	14.5		23.9	19.3	3.6	3.3	3.3	1	20.3	1	7.1	21.3			6.1	252.2	
Ormoc	2.8	4.1	.3							2.1	16.1	2.8				134.9	
Guiuan	2.3			3.8			.8	3.3	18	12.2	33.8	18			6.9	119.9	
Tacloban				13.2	.4	2.3	7.7	.7	4.5	25.7	4.6	1			5.3	2	
Capiz	31	4.1		5.1	19.6		12.7	1	25.4	30.4	8.1	17.6	.3		18.5	320.4	
Borongan	1.8								45.5	25.1	26.2	25.7	1.8	5.8	23.8	213.1	
Catbalogan	.3				23.2		2.5		.3	11.1	1.5	1.5		10.2	4.1	69.9	
Calbayog				1.5	1		1.8		1.8	20.6	1	28.2			27.4	151.1	
Masbate				49	1.6		4.1	29.7		16		79.2	.5		4.1	237	
Romblon		2.3		.3	.3					3.9	3	92.7	7.2			144.2	
Batag				58.9	10.4					13.7	7.1	23.9	3.8		66	254.4	
Sorsogon						25.1			1.3	52.1		50.5			50.5	230	
Legaspi					1.3					14.5	37.1	55			19.5	146.2	
Sumay, Guam		25.4	6.4	3.8	17.8	2.5				29.2	3.8	3.8		38.1	5.1	317.6	
Calapan										2.3	41.9	7.4	7.6		2.5	73.9	
Virac										16	26.4	2.8			17.5	97.5	
Naga		15.9		.5	8.6	.5	22.6				10.2	30.9			13.3	115	
Batangas						1.8			.5			7.1	8.9		2.5	33.1	
Lucena				1						25.7	.5	2.5	1.3			54.7	
Atimonan				.5						20.3	9.4	9.4			2.5	63.9	
Ambulong, Tanauan							125.5			9.1	5.3	5.1	4.1		24.6	244.4	
Canlubang, Calamba					2.5	4.6	7.4				1	3.3	8.1			78.9	
Paracale				.5								53.3	6.1			79.5	
Santa Cruz, Laguna	.8				.8	5.6		2	.3		1.3	16.5	6.1		20.3	116.4	
Manila	8.4	15	14.4	5.8	.3	43.7					4.3	1	4.1		.5	282.3	
Antipolo	25.9	37.6	11.4	.5	2.3	1		.5				34.8	7.9		32	897.1	
Iba	55.4	59.2	29	6.8	.8		1.3			15			10.9		2.3	775.4	
San Isidro	5.6	7.9	3	12		56.9	20.1	10.2							.5	251.8	
Tarlac	1	2		2.8	2			2.5							30.2	220.1	
Baler		.3				3		2.8					1.3		4.6	21.7	
Dagupan	13.2	20.9	12	14.7	4.8			1					2.8	8.4	54.4	586.7	
Bolinao	30.4	22.6	90.2	32.7		.5		2	2.5					9.7		637.5	
Baguio	34.2	81.6	46	17		5	11.5	14.1	1.3	32.3		6.4		9.4	1,335.2		
San Fernando, Union	32.2	57.6	70.8	20.7			3	12.7							4.8	1,037.3	
Echague						12.4	.8	.5		33.8					3	166.2	
Candon	44	28.4	43.4	24.9				6.6	1.5			1			6.6	1,941	
Vigan	17.2	12.7	115.8	15.2			1	16.6	.3			.5		28.8		1,864	
Tuguegarao						3.8											173.2
Laoag	1.8	84.9	115.5	12				61.1	4.1			2		13.4		1,298.3	
Aparri						3	37.3	15.2									242.5
Cape Bojeador	11.2	4.1	63.7	51.8	26.4		.5			3					6.6	632.8	
Santo Domingo, Batanes	20	2.3	12.7	7			15.9	54.6	19.6						5	2.5	360.5

\* No observation.

<sup>a</sup> 29 days of observation.

<sup>b</sup> 25 days of observation.

MAXIMUM AND MINIMUM TEMPERATURES AT THE STATIONS OF THE WEATHER BUREAU, AUGUST, 1916.

Day.	Jolo.		Isabela, Basilan.		Zamboanga.		Davao.		Cagayan, Misamis.		Butuan.		Dumaguete.		Tagbilaran.	
	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.
	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.
1	29.5	21.3	30.8	21.6	29.3	23.2	30.7	22.6	30.9	21.9	33.5	23.5	31.2	24.2	32.5	23.9
2	30.1	21.4	31.6	22.3	30.6	24	31.5	22.5	31.4	22.2	34.5	22.7	32.4	23.2	31.8	24.2
3	28.7	21.7	31.6	21.6	30.2	23.8	31.7	21.5	31.7	22.2	34	22.5	32	23.5	31.2	23.6
4	29.3	21.3	30.6	22.1	31	22.9	31.5	21	31.6	22.2	34	22.5	32.3	23.3	31.9	22.6
5	30.4	21	29.6	21.1	28.1	22.4	30.7	22.5	30.8	21.2	31.6	22.2	30.7	22.8	31.4	23.3
6	30.9	21.5	32.1	21.1	30.9	23.4	28.9	21	30.9	21.5	31.1	22.1	31.8	22.5	30.9	23
7	30.9	22	33.1	22.6	30.3	23.9	31.7	22.5	31.4	22.1	33.2	22.4	33.1	22.5	32.3	23.3
8	31.9	21.5	31.1	22.1	30.8	23.9	31.2	22.4	32.4	21.8	33.8	22.4	32	23.3	31.5	24.4
9	30.8	22.3	31.6	22.6	29.4	23.4	31.7	22.5	32.9	22.8	33.8	23.4	33	23.8	32.5	25.6
10	30.4	22.4	32.6	22.4	29.3	22.4	30.7	22.3	32.9	23.8	33.1	23.7	34.7	23.5	31.9	25
11	30.5	22.8	30.6	21.1	30.6	22.6	30.7	21.1	32.7	22.4	31	22.5	33.7	23.4	32.5	25.5
12	31.9	23.4	32.6	22.1	29.3	23.7	30.7	22.2	33.1	23	33	22.8	32.8	23.6	32	24.6
13	31.7	23	33.6	21.9	30.1	23.7	31.7	23	33.5	22.5	34.3	23.1	33.3	23.2	32.5	25.5
14	31.9	21.6	33.1	22.6	30.4	24	31.7	22.1	32.5	22.6	33.3	22.8	32.1	23.1	31.9	24.6
15	31.1	21.6	33.6	22.1	31.4	23.5	32.7	22	32.6	22.6	33.2	23.3	31.5	24	32	23.6
16	30.1	21	32.1	22.3	29.4	22.5	31.2	22.5	31.1	22.7	32.6	23.2	30.6	23		
17	31.4	21.8	32.2	22.3	30.5	22.8	31.2	21.9	31.4	21.9	33.1	22.2	32	22.8		
18	29.6	21.9	32.1	22.6	29.6	22.8	31.7	21.5	31.3	21.8	33.1	22.1	31.5	22.4	32.6	23.3
19	31.6	21.5	32.3	22.3	30.4	23.8	30.7	22.3	30.8	22.2	31.2	21.5	31.8	23	31.8	24.6
20	28.6	21.3	30.6	22.6	29.4	23.7	31.2	22.1	31.8	21.7	33.4	22.4	32.2	23.3	31.6	23.5
21	27.8	21.3	32.6	22.4	30.2	22	31.2	22.1	30.8	22	30.3	23.1	29.8	22.8	29.7	22.8
22	30	20.4	33.2	21.8	31.1	22.8	31.2	21	31.9	22	32	22.4	30.8	22.5	30.9	22.4
23	28.4	21	33.6	23.7	30	22.9	32.2	21.5	30.8	21.5	30.1	22.8	30.4	23.3	31.5	23.1
24	27.9	21	32.1	22.7	29.8	22.8	32.2	22	30.5	22.3	33.5	22.9	30.3	23.4	31.4	22.6
25	28.9	20.5	32.6	22.3	29.1	22.6	31.2	22.5	31.3	22.8	33	23.5	29.6	23.7	31.2	22.3
26	29.2	20	30.2	22.1	29.8	22	32.7	21.9	31.1	22	31.3	22.9	29.5	22.6	30.9	23
27	29.8	21.4	33.4	22.6	31.9	22.5	33.7	21.3	31.4	22.4	33.6	22.7	30.8	23.8	33	22.9
28	28.9	20.4	30.6	21.1	28.3	22.2	32	22.2	31.9	22	33.2	22.9	31.8	25	32.4	22.5
29	29.7	20.3	33.6	21.6	32	23.5	32.7	20.6	30.6	21.2	32.3	21.5	32.8	23	30.4	22.6
30	30.9	20.5	33.1	21.5	31.4	23.1	31.9	21.1	31.2	21.4	33.2	21.4	30.8	23.1	32.1	22.4
31	29.5	22.4	32.1	22.1	29.7	23.9	31.7	22.1	31.8	21.8	31.9	22.8	30.4	24.1	31.8	22.5
Mean	30.1	21.5	32.1	22.1	30.1	23.1	31.5	21.9	31.6	22.1	32.7	22.7	31.7	23.3	31.7	23.6

Day.	Iwahig.		Surigao.		Maasin.		Cebu.		Iloilo.		San Jose Buenavista.		Cuyo.		Ormoc.	
	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.
	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.
1	31.8	23.2	35.5	23.8	33.8	23.5	31.2	25.7	30.4	24.5	31.2	22.8	31.7	24.1	31.6	22.8
2	31.7	22.3	34.8	23.4	34.8	22.6	31.9	25.7	30.5	24.5	31.7	23.3	31.8	24.2	31.6	23.6
3	32.8	21.9	33.5	24.3	34.5	23.8	32.1	24.8	31.5	25.5	31.6	23.7	32.1	25.4	31.5	23.9
4	31.8	21.9	34.9	23.8	32	24.5	31.1	23.5	30.7	24.5	31.7	23.9	31.7	24.9	31.2	24.4
5	25.6	22.3	33	23.5	34.5	23.8	30	23	29.7	24.2	30.1	23	29.4	24.1	30	23.3
6	32.9	21	35.2	23.4	34.8	22.4	30.8	26.2	31.2	24.5	31.6	24	31.2	24	30.3	22.9
7	33.6	22.3	33.3	22.6	34	23.5	31.6	23.2	31	25.1	32.2	23.5	31.8	26.6	31.8	22.1
8	32.8	21.5	34.5	23.1	35	23.3	31.4	25.5	31.3	24.9	32.6	23.1	31.7	24.9	31.4	23.2
9	33.3	21.8	34.1	24.6	34.8	24.4	31.1	27.5	31.2	26.5	31.7	24	31.7	26.5	32.9	24.1
10	33.5	22.1	33.5	24.2	33.5	24.8	31	27.1	31.7	23	31.7	27.1	32.3	26.6	32	24.6
11	33.3	22.1	34.2	24.6	32.5	24	31.1	25.1?	30.6	23.6	30.2	24.5	30	26.1	31.6	23
12	33.8	22.1	33.7	23.6	31.5	25.5	30.4	26.5	30.7	23.1	31.6	22.5	30.5	26.8	31.2	26.7
13	31.9	22.9	35	23.7	31	25.8	31.1	25.6	30	24	30.2	25.7	30.4	26.9	31.6	25.1
14	32.1	22.8	35.5	23.8	30.5	23.8	31.4	24.4	30	25.5	30.8	23	29.8	23.9	31.4	24.4
15	32.2	23.5	36.5	23.8	32.6	24	31.2	23.6	30.2	24.3	31.2	23.4	31.5	23.9	31	24.3
16	31.9	22.6	34	23.3	32	23.2	31.7	23.3	30.5	24.3	31.2	24.5	31.1	22.7	30.8	23.7
17	33.3	22.3	34.8	23.7	32.2	23	33.3	25.8	30.2	23.8	30.8	23.6	29.8	24	30.7	24.2
18	32.7	22.4	34.4	23.8	34	23.5	31.5	25.9	29.7	23.6	28.8	24.1	30.3	23.2	31.1	23.9
19	33	22.9	37	23.6	33.8	23.2	30.7	25.4	30.7	23.2	31.3	23.1	30.1	25.3	29.8	24.3
20	33.4	22	35.7	24.1	33.8	24.4	33	24.6	31.7	23.8	32.3	23.6	32.3	24.2	32	23.6
21	31.5	23.6	32.2	23.5	34	24	32.3	24	31	23	31.7	23.4	31.4	23.3	30.8	23.4
22	33	22.6	33.5	23.1	35	23.8	32	25	32.1	23	31.6	23.5	30.5	23.9	31.7	21.5
23	33.1	21.6	33.9	23.4	34.6	23.5	31.5	25.1	32.5	23.8	32.1	23.1	30.7	23.5	32.5	22.8
24	31.8	22.4	34.8	23.3	35	24	33	24.7	32	24	33.2	23	30.7	24	32	23
25	31.9	22	35.5	23.6	33	24.4	32.3	23.3	31.7	23.5	32.2	23.3	31.8	23.8	34	23.2
26	30	22.3	29.5	23.8	31.5	24	28.5	22.9	29.3	24.5	30.1	23.5	29.5	23.4	28	23.6
27	32.4	22.9	34	23.2	32	23.8	31.6	24	31.5	23.6	32.4	22.6	31.7	24.3	31.6	22.4
28	32.4	22.8	31.5	23.5	31.5	23.5	31.8	24.2	32.1	22.4	31.2	24	30.3	23.8	30.7	23.5
29	27.9	22.2	32.8	22.9	32.5	23.1	31	23.5	30.2	22	29.7	22.5	29.3	23.4	31.3	23.6
30	32.4	21.4	34.9	22.9	32	22.8	32.3	24.9	32	23.2	32.2	22.1	32.1	23.1	32	21.9
31	32.5	21.3	29.5	23.5	34	23.2	32	25	32	24.3	31.9	23	32.3	22.6	29.4	22.9
Mean	32.1	22.3	34	23.6	33.2	23.8	31.5	24.8	31	24	31.4	23.6	31	24.4	31.3	23.7

Maximum and minimum temperatures at the stations of the Weather Bureau, August, 1916—Continued.

Day.	Guivan.		Tacloban.		Capiz.		Borongan.		Catbalogan.		Calbayog.		Masbate.		Romblon.	
	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.
	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.
1	33	25.1	32.5	24.1	32.4	24	31.9	22.9	32	22.6	31.8	22.9	31.2	25.4	32.7	23.3
2	33.1	27.1	32.7	24	32.9	23.4	33	22.9	32	23.3	34.1	24.4	31.4	25	34.2	24.6
3	32	27.4	33	24	32.9	24.2	33.2	22.2	32.6	23.4	33.2	25	32.6	25.2	34	26
4	32.8	24.3	32.3	23.5	33.5	23.6	33.2	22.3	32.2	23.6	32.5	25.2	31.2	25.4	34.8	25.3
5	31.6	26	32.6	23.5	32.4	23.5	33.6	22.9	31.7	23.3	32.7	24.8	31.4	23.8	32	25.4
6	33.4	27	33	23.3	34.2	23.7	32.9	23.4	32.7	24.7	32.1	26.6	31.8	24.6	34.5	25.9
7	33.6	26.6	33	23	33.3	22.9	32.9	21.9	33	22.6	34.1	25.6	31.6	24.8	33.5	25.7
8	32.6	27.9	33.3	23.6	34.3	23.9	34.2	22.6	32.9	23.8	34.3	24	32.5	26	33.8	26.9
9	32.8	28.3	35.3	24	34.2	24.2	33.6	23.1	33.4	24.7	34.3	28	32.8	26.2	35.3	25.8
10	31.2	28.1	34.5	24	35.4	23.3	33	22.9	33	25.6	31.6	28.3	32	26.5	35.1	27.4
11	32.2	28.2	34.8	25.5	34.4	25.1	34	22.9	32.7	28	33.5	28.4	33	26.6	31.6	24.7
12	32.3	28.1			33.8	24.2	33.4	22.7	32.3	24.7	31.3	28.3	32.6	24.5	31.2	24.3
13	33.8	27.9			33.8	24.8	34.8	23.2	33.6	24.5	34.6	28.3	33.2		32.4	24.9
14	34.1	27.3			34.2	24.4	34.8	22.7	33.4	22.8	34.1	24.8	33	24	34.5	25.3
15	33.4	24.5			32.7	23.3	33	23.8	32.6	23.7	31.2	24	33	23.4	34.4	25.6
16	33.9	24.9			32.4	22.7	32.6	22.3	32.4	23.3	33.6	23.3	31.8	25.2	33.4	24.4
17	32.4	26.1			32.3	23.3	33.9	22.9	32	24	31.7	24.7	32	26	32.4	25.3
18	32	24	34.6	23.2	32.3	23.4	34.2	22.7	33.2	22.8	32.6	27.4	32.5	26.2	32.8	25
19	31.9	27.5	30.5	24	33	24	29.6	23.6	29.8	24.5	30.9	25.4	31.2	26.2	32.4	25.3
20	33.4	25.6	33.5	23.5	33.8	22.8	33	23.4	32.5	23.2	33.5	24.6	34.6	25.5	33.9	25.2
21	32.2	24.5	31.7	23.4	32.9	22.6	32	22.3	32.3	22.4	31.9	23.9	31.4	21.6	33.5	22.3
22	34.2	23.4	32.9	23.5	32.8	22.6	32.2	21.9	32.5	21.7	32.2	22.7	32.2	24.6	34	23
23	33.7	23	31.8	24.5	31.8	23.9	32	22.5	32.5	22.6	32.7	23.1	32	24.5	33.9	23.7
24	33	23.6	32.1	23	32.7	23.2	32.2	22.9	32.5	23.9	32.4	22.8	31.2	25.4	33.8	22.6
25	33.1	24	32.7	24.3	33.3	22.4	32.5	22.7	33.5	23.6	32.9	23.2	32	25	34.5	23.4
26	29	22.8	25.8	23.1	29	23.8	28.8	22.9	28.1	23.7	28.7	23.2	30.4	23.8	34.8	24.3
27	31.9	23.3	31.6	23.5	31.6	23.2	30.8	22.3	30.8	22.2	31.6	22.4	31.6	23.8	34.4	23.7
28	32.7	23.6	31	22.7	30.2	23.3	31.5	22.6	31	21.9	29.5	23.4	31.8	25.6	31.8	24.3
29	32.7	23.6	31	22.7	30.2	23.3	32	22.3	31.7	22.5	31.4	22.6	31.6	22.4	29.8	22.3
30	33.8	22.3	32.5	22.4	32.9	23.3	32	21.2	32.6	22	33	23	31.2	24.2	34.5	22.1
31	29.9	23.4	28.5	24.1	33	23.7	30.1	23.2	29.2	22	30.4	22.3	32.2	24.6	34.4	22.9
Mean	32.6	25.4	32.4	23.6	32.9	23.5	32.6	22.7	32.2	23.5	32.4	24.7	32	24.9	33.6	24.5

Day.	Batag.		Legaspi.		Sumay, Guam.		Calapan.		Virac.		Naga.		Batangas.		Lucena.	
	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.
	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.
1	32.8	23.8	33.4	25	30.6	24.6	33.3	23.6	34.7	23.8	34	22.1	33.6	25	32	23.8
2	32.8	23.5	32.7	24.5	31	24.2	32	23.1	34.5	24	33.9	22.4	33.5	23.8	32.5	23.1
3	32.3	24	32.6	25.4	31.4	24.2	34.1	22	34	24.2	33.4	23	32.4	24.5	32.4	22.9
4	32.6	23.5	33.9	25.5	31.8	25.4	34.6	22	34.4	24.8	34	22.8	31.5	24.3	32.5	22.6
5	30.9	24	31.5	24.2	30.8	23.6	32.8	21.5	33.4	24	32	22	32.5	24.7	31.2	24
6	32.6	24	32.5	25	30.8	23.7	32.7	23.9	33.9	24.1	32.9	23.6	31.7	24.5	32.8	24.3
7	35	23.6	32.6	25.2	28.6	27.2	30.1	23	34.6	23.9	33.5	23.3	34.3	23.4	32.5	22
8	33.2	24	33	25.5	28.4	24.2	34	21.5	34	23	34	23.2	34.4	27	33.3	21.1
9	33.6	23.9	31.1	25.6	30.2	24	34.4	21.5	32.6	23.7	33.6	24.1	34.5	27.7	33.2	24.2
10	33.3	24.6	32.6	26.2	28.6	22	35	23.5	34.4	24.5	32.8	25.2	34.5	27.7	32.5	25
11	33.9	25.4	32.5	25.4	30.6	21.8	33	24.6	34	23.9	32.5	24.6	31.2	25.7	32.1	25.2
12		25	31.8	26	31.4	24.2	32.3	23.6	34.5	23.7	31.4	25	32.1	26.3	31.5	25.2
13			33.5	26.3	29.8	23.8	35.4	23.2	34.5	24.8	33.3	25.4	32.2	26.6	32.5	24.5
14			33.3	25.5	30.8	24.4	35.2	24.1	35	23.8	33.8	23.9	32	24.3	32.5	24.5
15	32.4	22.4	33.6	24.7	31.4	23.4	35	22.5	32.7	24.5	34.1	22.9	33.5	23	32	23.4
16	32.4	23.5	33.3	24.9	26.4	24.4	35.2	23.6	33.7	23.8	33.8	22.3	33	24.5	32.9	23.6
17	31.9	22.5	32.5	25	30.8	23.8	34	23	34.3	24.4	32.6	22.9	33.4	24.4	32.4	24.7
18	32.4	22.5	31.9	24.9	30.6	24.4	34.7	23.5	34.1	23.8	32.8	21.2	34	24.8	33	24.7
19	33.8	24.5	32.6	25.3	31	23.8	35.6	24	33.6	23.9	33.8	22.4	33.9	24.5	33	24.2
20	32.7	24	34	24.3	27.4	23.2	34	23.2	35.5	24.8	34.9	25.4	34.3	23.8	33	23.8
21	31.6	21	34.4	23.7	31.2	24.2	35.8	23.5	32.6	22	34.6	21	34	23.9	32.2	23.9
22	30.8	23.1	32.9	23.8	30.2	23.6	35.6	21.8	32.3	22.8	35.4	22	33.7	23.1	34	22.4
23	30.2	22.3	33.2	23.1	31	23.4	34	22.9	32.5	23.2	34.6	21	34	22.9	33.7	21.6
24	31.4	23.5	32.5	23.7	30.4	25.8	34.6	22.6	32	23.5	34.4	21.7	34.3	22.8	33.5	22.1
25	31.2	23.9	32.9	23.6	30.2	23.6	34	22.2	32.6	24.9	36.5	21.8	35.7	22.4	33.4	22.4
26	29.7	22.8	31.5	25.2	29.4	22.6	34.4	23.4	32.3	23	34	21.5	35.1	22.9	33	23.3
27	30	23.7	31.9	24.2	30.4	22.4	34.5	22.6	33	22.5	32.6	20.6	35.4	23.8	33.3	22.9
28	29.4	22.8	31.8	23.5	31.2	23.6	34.1	23	29.6	22	29.1	20.5	34.4	23.3	33.1	23.5
29	31.4	22.5	30.5	23.5	31.4	24.2	30.3	23	31.4	22.2	31.8	21.2	30.2	22.8	30.6	23.5
30	31.8	23.2	33.6	23.9	29.6	24.8	32.3	21.6	33	22.6	34.4	21.9	32.5	23.1	31.9	23.2
31	29.9	24	33.4	23.9	27.4	23.4	33.5	21.7	33.3	21.9	33.6	20.9	33.3	23.2	33.7	22.1
Mean	32	23.5	32.7	24.7	30.2	23.9	33.4	22.9	33.5	23.6	33.5	22.6	33.4	24.2	32.7	23.5

Maximum and minimum temperatures at the stations of the Weather Bureau, August, 1916—Continued.

Day.	Atimonan.		Ambulong, Tanauan.		Canlubang, Calamba.		Paracale.		Santa Cruz, Laguna.		Manila.		Antipolo.		Iba.	
	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.
1	32.9	24.4	32.3	22.6	33.5	21.8	33	25.5	31.9	23.2	32.8	24.3	33.6	22.8	31.2	23.7
2	33.5	24.3	32.3	23.8	30.3	23.1	35	24.9	31.8	23.8	31.9	24.5	30.7	23.3	31.2	23.8
3	32.7	23.8	31	23.6	31.6	23.4	35	25.5	31	23.8	31	25.2	30.4	23.3	31.4	24
4	32.9	24.2	30.9	24.4	31.6	23	36	26	31.2	24	30.9	25.1	29.6	23	30.6	23.7
5	32.4	25.7	32	24.2	31.8	23.4	34.2	26	31.6	23.7	31.4	24.2	29.5	23	30.3	23
6	31.9	25.2	29.3	24.3	30.47	23.1	34.1	24.9	29.9	23.6	29.4	23.9	27.6	22.4	30.4	22.5
7	32.4	23.4	31.2	22.7	32	21.6	34.4	25.2	31.3	23.2	31.9	23.8	30.8	23.1	31.6	21.7
8	34.4	22.8	32.2	22.4	32.8	21.6	35.7	24	31.3	22.2	31.8	23.8	30.1	23.2	31.5	24.1
9	33.5	26.1	32.1	25.8	32.8	22.8	34.8	24.7	32.5	23.1	31.8	25.1	31.2	23.2	31.7	23.8
10	32.2	25.8	30.3	24.5	32.1	22.8	34	26	30.9	24.8	30.1	25	29.1	22.7	29.5	22.8
11	33.3	24.3	29.8	26.8	30.1	22.8	33.9	25.9	31.3	23.6	30.6	25	29.6	23.4	29.7	24
12	31.5	26.2	30.7	26	32.5	22.8	33.8	26.4	31.2	25.3	31.3	25.9	29.8	24.2	31	24.2
13	31.8	26.2	29.9	25.2	32.4	23.4	34.6	25.2	31	25.8	30	25.5	28.8	24	29.8	24.6
14	32.5	25.3	31	24.1	31.8	23.1	34.4	25.1	30.9	23.9	30.6	24.5	29.3	23.1	27.9	22.6
15	33.6	24.4	33.4	22.4	30.6	22.4	35.5	25	31.9	23	31.5	23.3	31.2	21.8	30.9	22.2
16	32.8	24.8	33.3	24	31.5	23.6	35.2	25.3	31.5	23.4	30.6	24.7	30.5	21.8	30.5	23.1
17	32.7	24.2	32.1	24.6	33.2	23	35	25	32	24	30.9	24.2	30.2	22	29.2	22.8
18	33.2	26.1	32.3	25.3	31.6	22.8	34.4	25.5	32.3	23.7	31.3	23	30.4	22	29.8	23.2
19	33.2	25.4	32.5	25.5	31.2	22.2	35.2	24.9	32.6	23.8	31.8	23.1	30.8	21.2	30.8	22.4
20	34.2	23.8	34.2	24.2	32.8	21.87	36.2	24.5	32.8	23.7	31.3	24.8	30.9	22.2	30.9	22.8
21	33.8	25	34.2	23.3	32.6	22.4	36	23.3	31.8	23.9	31.6	23.9	30.1	22.6	30.5	22.8
22	34.7	24.1	34.1	22.7	32.6	21.4	34	23.8	32.8	22.7	32.3	22	32.3	22.5	31.9	22.4
23	34.5	23.8	34.3	21.5	32.3	21.5	34	24	32.5	22.5	32	22.2	32.4	21	31.7	22.6
24	33.5	23.5	33.3	21.7	32.6	22.2	34.9	23.5	32.3	22.4	32.5	23.2	32.7	22	31.7	22.3
25	34.6	23.9	34.3	22	32.9	22.1	34.8	23.8	32.8	22.6	33.5	24.3	33.4	23	30.9	23
26	33.5	23.7	32.2	22.8	31.7	22.6	34.2	24.4	32.4	22.9	32.1	23.6	32.8	22.6	32.4	22.1
27	32.4	23.1	31.8	22.1	32.1	22.4	33.6	23.9	32.3	23.6	32.2	23.2	34	22.2	32.8	21.5
28	33	23.7	33.9	22.6	33	22.2	33.1	24.6	33.6	23.1	32.3	22.9	32.2	21.5	32.4	21.5
29	29.8	23.6	29.3	23	32.9	22.3	29.2	23.7	28.8	22.9	27.8	23	28	22	31.4	21
30	32.5	22.9	32.4	22.1	32	22.3	32.7	23.6	32.8	22.7	31.4	23	32.2	21.5	30.7	22.6
31	34.5	23.2	34.9	22.7	33.1	22.2	32.2	23.6	33.1	22.3	33	24.2	33	22.8	31.7	21.2
Mean	33	24.4	32.2	23.6	32.1	22.5	34.3	24.8	31.8	23.5	31.4	24	30.9	22.6	30.9	22.8

Day.	San Isidro.		Tarlac.		Baler.		Dagupan.		Bolinao.		Baguio.		San Fernando Union.		Echague.	
	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.
1	34	24.5	36.6	23.8	35.5	24.9	34.6	22.5	32.6	25.4	23.7	16.8	33.5	24.8	35.3	24.3
2	32.9	24.8	36.5	24.2	36.7	24.7	33.7	24.1	31.7	24.5	22.3	16.6	32.5	24.5	34.9	23.5
3	31.1	25	33.8	24.7	35.1	25	33	25.5	31.6	24.6	23.4	16.4	31.8	24.3	34.9	24.4
4	32.6	24.2	33.7	23.8	35.3	26	32.7	24.5	31.6	25	22.8	16.1	32.8	24.2	35	23.4
5	31.9	24.2	33.5	24	35.5	25.2	32.8	24.4	30.9	23.8	22.8	15.6	32.6	23.5	34.6	22.5
6	30.5	23.7	33.6	23.4	34.1	25.3	31.2	23.9	30.4	23.3	19.3	15.7	29	23.2	34	24
7	32.8	23.4	33	23.2	35	24.4	33.8	23.9	30	23	19.7	15.4	32.5	23	35.1	23.5
8	32.9	23.4	35	23.3	35	25.8	32.2	24.3	31.3	24.4	20.9	15.5	33	24.2	35.7	23.5
9	32.6	23.8	33.2	23.5	34.7	26.2	30.7	24.5	29.7	24.8	17.7	16	31	24.9	33.4	24.1
10	29.1	23.5	28	23.4	31.8	25.4	26.2	23.9	27.5	24.8	17.9	16	27.9	24.8	27	24
11	28.7	23.6	30.2	23	33	24.6	25.8	22.9	27.8	23.6	17.9	15.5	27.5	23.5	29	23.5
12	31.2	24.6	31	23.2	35.4	24.6	31.7	24	29.7	25	18.3	16	29.7	23.1	35.3	23.1
13	29.1	24.8	28.6	23.5	31.7	25.4	28.2	25	30.2	24.9	18	16	29.1	24.8	34	23.4
14	30.8	23.7	31	23.4	34.5	24.4	30.9	24.5	29.1	25	18.2	15.9	30.4	24.3	35.1	24.5
15	31.1	23.6	32.7	23.5	34.3	25	33.8	23.9	31	23.6	23.3	15.7	33.3	24.6	36.5	23.3
16	31.4	24.2	33.5	23.2	34.9	24.7	32.7	24	32	24.1	21.5	16.1	33.5	25.5	35.9	22.9
17	30	23.8	30.2	23.4	34	25.2	32.2	23.9	28.8	23.9	18.1	14.7	31.2	24	34.5	23.9
18	30	23.5	31.2	23.5	34.7	25.9	30.9	23.7	30.1	24	17.5	14.3	31	23.6	34.5	22.9
19	30.8	23	33.5	23.2	34.5	25	30.7	23.5	29.8	24.1	18.5	14.8	31.5	23.8	35.4	22.8
20	30.3	22.9	32.5	23.8	35	24.2	33.1	23.6	27.6	22.4	18.9	14.5	29.5	22.5	36.5	22
21	32	22.7	33	22.4	35.4	24	32.8	23.4	31.1	22.6	21.7	15.3	32.7	23.5	36	22.3
22	33.1	23.5	35.2	22.6	34.6	23	33.2	24.5	31.5	23.7	23.1	15.2	32.9	23.5	34.6	23.3
23	32.4	22.9	33.8	23.5	34	23.5	32	25.3	32	24.4	23.6	15.3	32	24.5	33.6	22.8
24	32.2	23.4	34	24	34.9	22.8	34.2	24.9	31.4	23.8	22.8	15.7	32.8	24.7	36	23.2
25	32.5	23.8	33.5	24.2	34.7	23.5	33.6	24	32	24	23	15.5	32.9	23.3	32.8	22.5
26	33.6	23.4	35.7	23.1	33.2	23.1	36.2	24.5	32.8	23.5	24.8	16.2	32.8	23.5	34.6	22
27	32.7	22.8	36.5	22.5	34.1	21.9	35	24.7	32.8	25	24.5	15.4	32.9	23.8	33.4	21.6
28	33.6	23	33.2	23	33.5	22	34.7	24.6	33.2	24	24	16.1	33.4	24.1	34.8	20.4
29	29.1	23.2	33.3	23.4	30.6	22.5	35.2	24	33.7	24.8	22.8	16.1	32.9	23	33.3	22.8
30	32.2	23.5	35.5	23.4	33.5	22.9	33.6	24.6	31.9	24.2	23.7	15.9	33.6	24.2	35.4	23
31	33.9	23	36.5	22	35.7	22.3	34.3	22	32.2	23.9	24.8	15.7	33	23.3	34.3	23
Mean	31.6	23.7	33.3	23.4	34.4	24.3	32.4	24.1	30.9	24.1	21.3	15.7	31.8	24	34.4	23.1

Maximum and minimum temperatures at the stations of the Weather Bureau, August, 1916—Continued.

Day.	Candon.		Vigan. <sup>1</sup>		Tuguegarao.		Laoag.		Aparri.		Cape Bojeador.		Santo Domingo, Batanes.	
	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.
1	32.6	26	33.9	24.7	36.7	25.4	33.9	24	34	25.2	33.8	24.4	31.6	26.5
2	32.5	25.4	33.1	24.5	37.5	24.6	34.1	24.3	33.3	24.5	33	24.1	31.7	27
3	32.6	25.9	32.6	24.6	37	25.4	32.6	24.2	32.7	25.2	31.8	23.8	31	26.3
4	32.1	26?	30.1	23.5	35.1	23.9	30.5	25	31.4	25.8	29.4	23.9	30.2	26.2
5	32	24.1	29.6	22.8	35	23.3	30.8	23.8	32.4	24.3	30.7	23.6	30.5	25.9
6	31.6	24.5	29.5	22	35.4	25	28.9	23	32.4	24.3	28.5	22.8	30.4	25.8
7	31.4	24.6	30.1	21.8	35	24.8	25.7	22.3	31.1	24.8	26	22.4	29.8	25.9
8	31.7	24.5	28.1	23.1	35.6	25	29.9	22.9	33	25.5	27.8	22.4	30.3	25.2
9	32.2	25.1	30.8	21.8	29	24	28.3	22.7	27.8	23.8	27.8	22.8	29.3	25.6
10	29	23.5	25.3	21.7	25.6	23.5	24.3	22.5	28.1	23.6	26.4	22.2	29.5	25.3
11	28.5	24.1	27.1	21.4	26.8	23.5	27.8	22.9	27.5	23.6	28.2	23	30.2	24.4
12	29.4	25	30.6	21.5	34	24	28.2	22.9	30.2	23.2	29.2	22.4	30	24.2
13	29	25	27	23	29.8	24.9	26.5	23.8	29.7	24.8	28.2	22.8	29.8	24
14	32.4	24.9	27.6	21.9	34.8	24.5	28	23	32.2	24.3	28.3	23.2	29.8	25.4
15	32.1	24.6	31	22.2	35	24	31.9	22.5	33.7	24.6	29.6	23.2	30.4	25
16	32.6	25.8	30.9	22.7	35.2	23.9	32.1	23.5	32.6	24.3	30.6	24.1	29.5	26
17	31.8	24.6	29.5	22.3	35	25	29.4	23	31.3	25.1	28.5	22.8	30.5	26.4
18	32	24.5	30.6	23.5	34	24	30.9	23.6	31.6	26.4	29.8	23.8	29.9	25.6
19	32.3	25.2	28.5	21.6	35.6	24	28.6	21.8	31.8	24.8	29.8	21.8	29.6	25.6
20	29.1	24	29.2	21.7	36.2	24	30.1	22.1	31.8	25.6	28.5	22.2	29.8	25.5
21	31.2	23.7	31.3	22.4	33.8	24	31.5	22.7	32	24.3	30.2	22.2	30.5	26.5
22	32.2	24.6	32.5	23.7	36	24	33.1	23	33	24.7	31.5	24.6	30.6	26.6
23	31.4	25.4	32.4	24	34.3	24	33.3	24	32.2	23.8	28.2?	24.6	30.8	24.8
24	31.7	26	32.2	24	35.2	24	33.1	23.2	32.5	24	30.8	24	28	24.3
25	33.1	24.5	33.2	22	35	23.3	33.3	22.9	31.3	23.7	31.8	22.6	30.2	25.2
26	32.7	24.7	33	23.7	35.4	24.3	33.2	23.1	31.7	24.2	32.8	22.2	30.6	24.9
27	34	24	34.2	22.8	35.4	22.5	34	22.8	31.8	23.7	31.4	23.8	31.8	25.1
28	31.7	26	33.6	24.7	37.3	22	34.9	23.6	33	24.3	33.4	24.8	32	25
29	33.6	23.9	33.1	22.6	37.6	22.1	34	21.7	32.6	23.8	33.2	24	32	25.5
30	35.6	25.2	32.6	23.2	35.6	24.3	34.5	23.2	32.2	24.2	34.2	24.2	32.6	25.1
31	32.5	24	33.3	22.6	36.8	24.6	34.5	23.3	32	24.3	34.2	23.8	31.4	24.7
Mean	31.8	24.8	30.9	22.8	34.5	24.1	31	23.1	31.7	24.5	30.2	23.3	30.5	25.5

<sup>1</sup> The maximum and minimum temperatures for the 24th and 25th, are taken from a self-recording apparatus.

## SEISMOLOGICAL BULLETIN FOR AUGUST, 1916.

By Rev. MIGUEL SADERRA MASÓ, S. J.,  
Assistant Director of the Weather Bureau.

### EARTHQUAKES FELT IN THE PHILIPPINES.<sup>1</sup>

3, 9<sup>h</sup> 55<sup>m</sup> [3, 17<sup>h</sup> 55<sup>m</sup>]. **Cabo Bojeador** (NW Luzon). Earthquake of intensity III, duration 6 seconds. It repeated with the same intensity but shorter duration at 17<sup>h</sup> 45<sup>m</sup> [4, 1<sup>h</sup> 45<sup>m</sup>].

4, 16<sup>h</sup> 27<sup>m</sup> [5, 0<sup>h</sup> 27<sup>m</sup>]. **Romblon Island**. Subsultory earthquake of intensity II-III.

5, 3<sup>h</sup> 55<sup>m</sup> 09<sup>s\*</sup> [5, 11<sup>h</sup> 55<sup>m</sup> 09<sup>s</sup>]. **Butuan** (N Mindanao). Earthquake of intensity II-III. The seismographic records of Butuan, Manila and other Observatories of the Far East show that the origin of this earthquake must be looked for in the Pacific, off the east coast of Mindanao.

7, 7<sup>h</sup> 08<sup>m</sup> 40<sup>s\*</sup> [7, 15<sup>h</sup> 08<sup>m</sup> 40<sup>s</sup>]. **Samar and Leyte**. Earthquake of intensity V-VI felt chiefly in the southeastern part of Samar. It evidently had the origin in the Pacific Ocean, not far from the eastern coast of Samar where the *Philippine Deep* reaches depths of 8,000 meters within 50 kilometers from the coast. Toward the W the isoseismal III embraced the whole extension of both islands Samar and Leyte.

At 11<sup>h</sup> 23<sup>m</sup> 38<sup>s\*</sup> [19<sup>h</sup> 23<sup>m</sup> 38<sup>s</sup>] occurred a second earthquake originated also in the Deep but farther to the E, near 127° E and 11° 2' N. This was lightly felt in different stations of southern Luzon, Visayan Islands and Mindanao.

8, 14<sup>h</sup> 40<sup>m</sup> [8, 22<sup>h</sup> 40<sup>m</sup>]. **Cabo Bojeador** (NW Luzon). Earthquake shocks of intensity II-III.

8, 18<sup>h</sup> 54<sup>m</sup> 15<sup>s\*</sup> [9, 2<sup>h</sup> 54<sup>m</sup> 15<sup>s</sup>]. **N Luzon**. Earthquake with its origin in the western part of Babuyan Islands at about 19° N, 121° E. It was felt in the northernmost part of Luzon, Ilocos Norte, Mountain, and Cagayan Provinces, with intensity VI-VII, but this decreased so rapidly that the shocks were very slightly perceptible outside of the mentioned provinces. It was recorded at Taihoku and Zikawei. An aftershock occurred at 21<sup>h</sup> 32<sup>m</sup> [9, 5<sup>h</sup> 32<sup>m</sup>].

8, 21<sup>h</sup> 26<sup>m</sup> [9, 5<sup>h</sup> 26<sup>m</sup>]. **Batangas** (S Luzon). Earthquake of intensity III, felt principally in the western part of Batangas Province, in the region of the Taal Volcano. It repeated on the following date 9th, at 8<sup>h</sup> 19<sup>m</sup> [16, 19<sup>m</sup>].

11, 5<sup>h</sup> 30<sup>m</sup> [11, 13<sup>h</sup> 30<sup>m</sup>]. **Batangas** (S Luzon). Earthquake shocks of intensity II-III, felt in the same region as the preceding ones.

14, 23<sup>h</sup> 38<sup>m</sup> 53<sup>s\*</sup> [15, 7<sup>h</sup> 38<sup>m</sup> 53<sup>s</sup>]. **SE Luzon**. Earthquake of intensity V-VI felt in the provinces of Albay and Sorsogon. Its origin lay NE of Ticao Island, it was distinctly felt through the whole southern and southeastern part of Luzon and the adjacent islands, Masbate, Burias, and Marinduque. A less strong repetition occurred at 23<sup>h</sup> 51<sup>m</sup> 01<sup>s\*</sup> [15, 7<sup>h</sup> 51<sup>m</sup> 01<sup>s</sup>].

<sup>1</sup>The intensity of earthquakes is given in the notation known as the Rossi-Forel scale. The time is that indicated by the seismographs at the Central Observatory whenever the disturbance has been registered by them. This fact is denoted by an asterisk (\*). Otherwise the time is that noted by the observer who sent the report. All time indications are in Greenwich mean time (midnight=0<sup>h</sup>), in-sular time being added in brackets for the convenience of Philippine readers.

15, 3<sup>h</sup> 06<sup>m</sup> [15, 11<sup>h</sup> 06<sup>m</sup>]. **Butuan** (N Mindanao). Earthquake of intensity II-III.

15, 17<sup>h</sup> 31<sup>m</sup> 11<sup>s\*</sup> [16, 1<sup>h</sup> 31<sup>m</sup> 11<sup>s\*</sup>]. **SE Luzon**. Earthquake of intensity III-IV originated in the same place of those felt on the 14th. It shook only the nearest provinces of Camarines, Albay, Sorsogon and Masbate.

15, 21<sup>h</sup> 32<sup>m</sup> [16, 7<sup>h</sup> 12<sup>m</sup>]. **Guam** (Mariana Islands). Earthquake of intensity II-III.

16, 11<sup>h</sup> 39<sup>m</sup> 53<sup>s\*</sup> [16, 19<sup>h</sup> 39<sup>m</sup> 53<sup>s\*</sup>]. **Aparri** (NE Luzon). Oscillatory earthquake, direction E-W, intensity IV, short duration.

17, 1<sup>h</sup> 48<sup>m</sup> 17<sup>s\*</sup> [17, 9<sup>h</sup> 48<sup>m</sup> 17<sup>s\*</sup>]. **NW Luzon**. Earthquake felt with intensity III-IV in the Ilocos Norte Province, it had probably the same origin as those occurred on the 8th.

17, 1<sup>h</sup> 59<sup>m</sup> [17, 9<sup>h</sup> 59<sup>m</sup>]. **Masbate Island**. Earthquake shocks of intensity III.

18, 2<sup>h</sup> 45<sup>m</sup> [18, 10<sup>h</sup> 45<sup>m</sup>]. **Cabo Bojeador** (NW Luzon). Earthquake of intensity II-III.

26, 23<sup>h</sup> 43<sup>m</sup> 38<sup>s\*</sup> [27, 7<sup>h</sup> 43<sup>m</sup> 38<sup>s\*</sup>]. **N Luzon**. Earthquake shocks felt with intensity V in the extreme northeastern part of the Cagayan Province and with intensity III-IV in the rest of the same province and in Ilocos Norte. The origin probably lay in the Pacific; it was recorded at the Zikawei Observatory.

29, 17<sup>h</sup> 31<sup>m</sup> [30, 1<sup>h</sup> 31<sup>m</sup>]. **Butuan** (N Mindanao). Oscillatory earthquake, direction N-S, intensity III, duration 5 seconds.

## RECORDS OF THE MICROSCISMOGRAPH.

[Time: Greenwich mean. Midnight=0<sup>h</sup>. Instrument: Wiechert seismograph; 1,000 kilograms.  $A_N$ :  $T_0=6.1$ ,  $\epsilon=1.93$ ,  $\frac{r}{T_0^2}=0.050$ ;  
 $A_E$ :  $T_0=6.1$ ,  $\epsilon=2.89$ ,  $\frac{r}{T_0^2}=0.035$ . Alluvium. 2.40 meters above sea level.]

No.	Date.	Character.	Phase.	Hour.	Period.	Amplitude.		Remarks.
						$A_N$ $\mu$	$A_E$ $\mu$	
261	2	Iv	eP F	h. m. s. 1 33 55 36				
262	3	IIr	eP S L M <sub>N</sub> M <sub>E</sub> F	1 36 39 41 36 46 22 48 07 48 09 2 58	7 7	142 87		
263	3	Iv	eP F	15 14 29 17				
264	5	Iv	eP L M <sub>N</sub> M <sub>E</sub> F	3 55 09 57 40 58 56 59 02 4 22	6 7	30 14		Butuan (N Mindanao).
265	5	Iv	eP F	4 29 18 31				
266	7	Iv	eP L M <sub>N</sub> F	7 08 40 09 53 10 30 19	3	9		Samar and Leyte Islands.
267	7	Iv	eP S L M <sub>N</sub> F	11 23 38 25 00 26 18 27 05 12 25	7	89		Samar and Leyte Islands.
268	8	Ir	e F	4 30 28 5 02				
269	8	IIv	eP L	18 54 15 55 09				N Luzon. Maximum and end in both components lost by the pens thrown off through the force of the shock.
270	8	Iv	eP L F	23 03 32 03 56 08				Vicentini seismograph.
271	11	Iv	eP L M <sub>N</sub> F	21 31 44 32 07 32 16 34	2	16		



## Records of the microseismograph—Continued.

No.	Date.	Character.	Phase.	Hour.			Period.	Amplitude.		Remarks.	
								A <sub>N</sub> μ	A <sub>E</sub> μ		
272	14	II <sub>v</sub>	eP	h.	m.	s.				SE Luzon. End overtaken by the following earthquake.	
			L	23	38	53					
			M <sub>E</sub>		39	29					
			M <sub>N</sub>		40	47	6		241		
273	14	I <sub>v</sub>	eP	23	51	01				SE Luzon.	
			L		51	37					
			M <sub>E</sub>		52	53	6		129		
			M <sub>N</sub>		53	21	6	171			
	15		F	0	22						
274	15	I <sub>v</sub>	eP	17	31	11				SE Luzon.	
			F		34						
275	15	I <sub>v</sub>	eP	21	00	32					
			F		03						
276	16	I <sub>v</sub>	eP	11	39	53				Aparri (NE Luzon).	
			L		40	42					
			M <sub>N</sub>		41	46	5	7			
			F		46						
277	16	I <sub>v</sub>	eP	22	16	25					
			F		19						
278	17	I <sub>v</sub>	eP	1	48	17				NW Luzon.	
			L		48	50					
			M <sub>N</sub>		49	42	4	15			
			F		53						
279	22	I <sub>v</sub>	eP	20	37	20					
			L		37	32					
			M <sub>N</sub>		38	00	4	22			
			F		40						
280	25	I <sub>v</sub>	eP	8	03	53					
			F		06						
281	25	I <sub>u</sub>	e	10	04	49					
			S		12	16					
			L		19	55					
			M <sub>N</sub>		24	18	15	6			
			F		51						
282	26	II <sub>v</sub>	eP	23	43	38				N Luzon.	
			L		44	27					
			M <sub>E</sub>		44	51	5	94			
			M <sub>N</sub>		45	03	5	105			
			F		57						
283	27	I <sub>r</sub>	e	22	48	46					
			M <sub>N</sub>		57	10	7	11			
			F	23	27						
284	28	II <sub>r</sub>	e	6	47	17				End overtaken by the following earthquake.	
			M <sub>N</sub>		7	09	06	13	46		
			M <sub>E</sub>		09	17	16	21			
285	28	II <sub>r</sub>	eP	7	29	52					
			L		31	43					
			M <sub>E</sub>		33	13	5	421			
			M <sub>N</sub>		33	17	6	368			
			F	9	01						
286	28	I <sub>v</sub>	eP	12	14	10					
			F		16						
287	29	I <sub>v</sub>	eP	18	50	55					
			L		51	56					
			M <sub>N</sub>		52	53	5	46			
			F	19	25						
288	30	I	e	23	15	11					
			M <sub>N</sub>		21	30	8	4			
			F		28						

TEMBLORES DE TIERRA SENTIDOS EN FILIPINAS.<sup>1</sup>

3, 9<sup>h</sup> 55<sup>m</sup> [3, 17<sup>h</sup> 55<sup>m</sup>]. **Cabo Bojeador** (NW de Luzón). Temblor de tierra de intensidad III, duración 6 segundos. Repitió con la misma intensidad, pero menor duración a 17<sup>h</sup> 45<sup>m</sup> [4, 1<sup>h</sup> 45<sup>m</sup>].

4, 16<sup>h</sup> 27<sup>m</sup> [5, 0<sup>h</sup> 27<sup>m</sup>]. **Isla de Romblón**. Temblor de tierra susultorio de intensidad II-III.

5, 3<sup>h</sup> 55<sup>m</sup> 09<sup>s\*</sup> [5, 11<sup>h</sup> 55<sup>m</sup> 09<sup>s</sup>]. **Butúan** (N de Mindanao). Temblor de tierra de intensidad II-III. El origen de este temblor, según los registros sismométricos de Butúan, Manila y otros Observatorios del Extremo Oriente se hallaba lejos en el Pacífico hacia el E o NE de Mindanao.

7, 7<sup>h</sup> 08<sup>m</sup> 40<sup>s\*</sup> [7, 15<sup>h</sup> 08<sup>m</sup> 40<sup>s</sup>]. **Islas de Sámar y Leyte**. Temblor de tierra de intensidad V-VI sentido principalmente en la parte SE de Sámar. Su origen se hallaba evidentemente en el Mar Pacífico, no lejos de la costa de Sámar donde, el Abismo de Filipinas alcanza profundidades de 8,000 metros a menos de 50 kilómetros de distancia. La isosisma III abarcaba completamente por el W las Islas de Sámar y Leyte.

A 11<sup>h</sup> 23<sup>m</sup> 38<sup>s\*</sup> [19<sup>h</sup> 23<sup>m</sup> 38<sup>s</sup>] ocurrió un segundo terremoto originado sin duda en el mismo epicentro del Abismo pero más lejos de Sámar hacia el E, cerca del meridiano 127° E y del paralelo 11°.2 N. Fué débilmente perceptible en varias estaciones del S de Luzón, Islas Visayas y Mindanao.

8, 14<sup>h</sup> 40<sup>m</sup> [8, 22<sup>h</sup> 40<sup>m</sup>]. **Cabo Bojeador** (NW de Luzón). Temblor de tierra de intensidad II-III.

8, 18<sup>h</sup> 54<sup>m</sup> 15<sup>s\*</sup> [9, 2<sup>h</sup> 54<sup>m</sup> 15<sup>s</sup>]. **N de Luzon**. Temblor de tierra de intensidad VI-VII, originado en la parte occidental de las Islas Babuyanes hacia los 19° N y 121° E. Sintióse con intensidad VI-VII en la parte más septentrional de Luzón perteneciente a las Provincias de Ilocos Norte, Montañosa y Cagayán, decreciendo su intensidad tan rápidamente hacia el S que apenas fué perceptible fuera de las citadas provincias. Registróse en Taihoku y Zikawei. Repitió con menos intensidad a 21<sup>h</sup> 32<sup>m</sup> [9, 5<sup>h</sup> 32<sup>m</sup>] siendo solamente perceptible en la parte NW de Luzón.

8, 21<sup>h</sup> 26<sup>m</sup> [9, 5<sup>h</sup> 26<sup>m</sup>]. **Batangas** (S de Luzón). Temblor de tierra de intensidad III sentido principalmente en la parte W de la Provincia de Batangas en la región del Volcán de Taal. Repitió el día siguiente 9 a 8<sup>h</sup> 19<sup>m</sup> [16<sup>h</sup> 19<sup>m</sup>].

11, 5<sup>h</sup> 30<sup>m</sup> [11, 13<sup>h</sup> 30<sup>m</sup>]. **Batangas** (S de Luzón). Temblor de tierra de intensidad II-III sentido en la misma región que los precedentes.

14, 23<sup>h</sup> 38<sup>m</sup> 53<sup>s\*</sup> [15, 7<sup>h</sup> 38<sup>m</sup> 53<sup>s</sup>]. **SE de Luzon**. Temblor de tierra de intensidad V-VI en las Provincias de Albay y Sorsogón. El epicentro se hallaba al NE de la Isla de Ticao, fué perceptible en toda la parte S y SE de Luzón y en las islas adyacentes de Masbate, Burias y Marinduque. Repitió con menor intensidad a 23<sup>h</sup> 51<sup>m</sup> 01<sup>s\*</sup> [15, 7<sup>h</sup> 51<sup>m</sup> 01<sup>s</sup>].

15, 3<sup>h</sup> 06<sup>m</sup> [15, 11<sup>h</sup> 06<sup>m</sup>]. **Butúan** (N de Mindanao). Temblor de tierra de intensidad II-III.

15, 17<sup>h</sup> 31<sup>m</sup> 11<sup>s\*</sup> [16, 1<sup>h</sup> 31<sup>m</sup> 11<sup>s</sup>]. **SE de Luzon**. Temblor de tierra de intensidad III-IV originado en el mismo centro que los del día 14 y sentido en las provincias más cercanas, Camarines, Albay, Sorsogón y Masbate.

15, 21<sup>h</sup> 32<sup>m</sup> [16, 7<sup>h</sup> 12<sup>m</sup>]. **Guam** (Islas Marianas). Temblor de tierra de intensidad II-III.

<sup>1</sup> La intensidad de los terremotos se indica conforme a la conocida escala de Rossi-Forel. Cuanto a la hora de su ocurrencia, adoptamos la indicada por los sismógrafos de este Observatorio siempre que los hayan registrado, distinguiéndola por medio de un asterisco (\*). En caso contrario copiamos la apuntada por los observadores que nos envían las notas. Todas las indicaciones del tiempo se refieren al tiempo medio de Greenwich (medianoche=0<sup>h</sup>). Para conveniencia de los lectores de Filipinas se añade también el tiempo insular.

16, 11<sup>h</sup> 39<sup>m</sup> 53<sup>s\*</sup> [16, 19<sup>h</sup> 39<sup>m</sup> 53<sup>s</sup>]. **Aparri** (NE de Luzón). Temblor oscilatorio, dirección E-W, intensidad IV, duración corta.

17, 1<sup>h</sup> 48<sup>m</sup> 17<sup>s\*</sup> [17, 9<sup>h</sup> 48<sup>m</sup> 17<sup>s</sup>]. **NW de Luzón**. Temblor de tierra sentido en la parte septentrional de la Provincia de Ilocos Norte con intensidad III-IV, su origen era el mismo que el de los temblores del 8.

17, 1<sup>h</sup> 59<sup>m</sup> [17, 9<sup>h</sup> 59<sup>m</sup>]. **Isla de Masbate**. Temblor de tierra de intensidad III.

18, 2<sup>h</sup> 45<sup>m</sup> [18, 10<sup>h</sup> 45<sup>m</sup>]. **Cabo Bojeador** (NW de Luzón). Temblor de tierra de intensidad II-III.

26, 23<sup>h</sup> 43<sup>m</sup> 38<sup>s\*</sup> [27, 7<sup>h</sup> 43<sup>m</sup> 38<sup>s</sup>]. **N de Luzón**. Temblor de tierra sentido con intensidad V en el extremo NE de la isla y con intensidad III-IV en el resto de la Provincia de Cagayán y en Ilocos Norte. Su origen parece se hallaba en el Mar Pacífico; fué registrado por los sismógrafos de Zikawei.

29, 17<sup>h</sup> 31<sup>m</sup> [30, 1<sup>h</sup> 31<sup>m</sup>]. **Butúan** (N de Mindanao). Temblor oscilatorio, dirección N-S, intensidad III, duración 5 segundos.







5-1.5919  
p. 556

THE GOVERNMENT OF THE PHILIPPINE ISLANDS

# WEATHER BUREAU

MANILA CENTRAL OBSERVATORY

---

BULLETIN FOR SEPTEMBER, 1916

---

PREPARED UNDER THE DIRECTION OF

REV. JOSÉ ALGUÉ, S. J.

DIRECTOR OF THE WEATHER BUREAU

MANILA  
BUREAU OF PRINTING  
1917





---

---

**BULLETIN FOR SEPTEMBER, 1916.**



# METEOROLOGICAL BULLETIN FOR SEPTEMBER, 1916.

By Rev. JOSÉ CORONAS, S. J.,  
Chief, Meteorological Division of the Weather Bureau.

## GENERAL WEATHER NOTES.

Pressure and temperature.—The mean monthly atmospheric pressure for the Philippines is somewhat lower than that of September of the preceding year and than the normal for this month, the differences being greater in northern Luzon owing to a typhoon which passed near Aparri on the 4th. The highest pressures were generally observed on the 1st in central and northern Luzon, and on the 12th in southern Luzon, the Visayas and Mindanao. The lowest pressures were recorded on the 4th in northern Luzon, and on the 23d or 24th in central and southern Luzon, the Visayas and Mindanao.

The mean monthly temperature was somewhat lower than the normal and than that of the preceding year. The extreme monthly temperatures for Manila were 33.3 °C. on the 7th, and 22.3 °C. on the 9th, 18th, and 30th. The absolute maximum and minimum temperatures of the month for Baguio were 24.2 °C., 14.6 °C. on the top of Mirador, and 25.3 °C., 13.7 °C. in the valley.

PRESSURE AND TEMPERATURE AT THE FIRST AND SECOND CLASS STATIONS FOR SEPTEMBER, 1916.

Station.	Pressure.						Temperature.					
	Mean.	Departure from Sept., 1915.	Highest mean.	Day.	Lowest mean.	Day.	Mean.	Departure from Sept., 1915.	Highest.	Day.	Lowest.	Day.
	mm.	mm.	mm.		mm.		°C.	°C.	°C.		°C.	
Tagbilaran <sup>a</sup>	757.23	-0.56	759.24	12	755.60	23	26.6	-0.5	33.5	20, 27	21.7	12
Surigao	57.21	-.37	59.22	12	55.18	23	27	-1	35.1	17	22.6	30
Cebu	57.23	-.49	59.26	12	55.21	23	27.6	-.4	33.4	5	22.5	12
Iloilo	57.11	-.47	59.28	12	54.72	24	26.7	-.5	32.7	6	21.6	26
Ormoc	57.43	-.50	59.65	12	55.39	23	26.9	-.2	32.6	19, 30	21.9	9
Tacloban	57.06	-.38	59.35	12	54.78	23	26.8	-.9	33.5	20	22.1	4
Capiz	57.14	-.62	59.52	12	54.41	24	26.4	-.4	34.9	5	22.1	17
Calbayog	57.16	-.45	59.57	12	54.75	24	26.9	-.3	35.2	19	22.3	9
Legaspi	56.75	-.40	59.40	12	53.81	24	26.8	-.7	34.9	20	22.3	17
Atimonan	56.36	-.72	59.16	12	52.02	24	26.7	-.3	33.6	20	22	18
Ambulong, Tanauan	56.22	-.56	58.88	12	51.78	24	25.9	-.8	34.9	9	21.6	17
Paracale	56.57	-.69	59.66	12	52.29	24	26.9	-.6	34.6	21	23	9, 30
Manila	56.68	-.77	59.43	1	51.93	24	26	-.8	33.3	7	22.3	9, 18, 30
San Isidro	56.78	-.77	59.66	1	51.89	24	25.9	-1.1	32.6	20	22.4	4, 9
Dagupan	55.82	-.76	58.76	1	50.61	24	26.7	-1	34.8	10	21.8	4
Bolinao	55.92	-.91	58.95	1	50.68	24	26.5	-.8	33.4	11	22.1	6
Baguio <sup>b</sup>	634.63	-.95	637.22	1	630.18	24	17.7	-.7	24.2	7, 11	14.6	6
Vigan	755.72	-1.06	758.68	1	750.11	24	26.9	-.7	33.7	2	22	5, 29
Tuguegarao	56.12	-1.11	59.63	1	48.79	4	26.8	-.8	36.8	12	22.4	13, 16
Laoag	55.74	-----	58.84	12	48.96	4	27.3	-----	35.8	15	22.1	18
Aparri	55.88	-1.29	59.66	1	45.37	4	26.7	-.8	32.5	11	22.1	28

<sup>a</sup> 29 days of observation.

<sup>b</sup> The barometric readings of this station are not reduced to sea level.

Rainfall.—With a very few exceptions, the total amount of rainfall for this month is greater than that of the preceding year. A good number of stations, however, reported a monthly amount below the normal for September. Daily rainfalls amounting to more than 100 mm. were recorded in all the stations of the western part of Luzon north of Manila during the typhoon which passed near the northern coast of Luzon on the 4th of this month.

RAINFALL AT VARIOUS STATIONS OF THE WEATHER BUREAU DURING THE MONTH OF SEPTEMBER, 1916.

Station.	Total.	Departure from Sept., 1915.	Departure from normal.	Rainy days.	Departure from Sept., 1915.	Greatest rainfall in a single day.	Day.	Station.	Total.	Departure from Sept., 1915.	Departure from normal.	Rainy days.	Departure from Sept., 1915.	Greatest rainfall in a single day.	Day.
	mm.	mm.	mm.		mm.	mm.			mm.	mm.	mm.		mm.	mm.	
Jolo	247.4	+112.7	+78.1	19	0	65	12	Virac	283.4	+143.5	+119.2	19	-3	59.7	13
Isabela, Basilan	194.7	-41.8	-5.8	21	+3	37.1	21	Naga	418.4	+234.5	-162.6	20	-3	86.1	13
Zamboanga	80.7	+23.4	+17.1	12	-1	18.6	10	Batangas	317.2	+72.2	-16	24	+2	41.2	23
Davao	247.4	+120.5	+57.5	11	+3	56.6	27	Lucena	260.7	.....	.....	22	.....	77.7	14
Cagayan, Misamis	192.5	+43.5	.....	19	.....	65.5	1	Atimonan	287.3	+49.3	+10.2	16	-1	95.5	14
Butuan	205.7	+95	+55.7	21	+4	57.9	7	Ambulong, Tanauan	345.2	+24.3	.....	23	+4	62.3	14
Dumaguete	154.6	+9.9	.....	16	.....	28.2	7	Canlubang, Calamba	303.6	.....	.....	26	.....	53.4	28
Tagbilaran*	223.1	+70.7	+42.8	12	.....	62.5	10	Paracale	291	+77.9	.....	17	-1	59.6	13
Iwahig	213.5	+46.8	.....	21	+3	39.1	13	Santa Cruz, Laguna	298.9	+56.7	.....	17	.....	49.1	14
Surigao	118.5	+42.1	-36.5	14	+3	33	21	Manila	372.6	+106.1	.....	27	+4	74.2	4
Maasin	187.2	+52	+85	7	-1	36.3	10	Antipolo	641.3	+100.8	.....	27	+4	67.3	23
Cebu	290.9	+23.8	+55.4	15	-1	59.7	11	Iba	808.3	+374.1	-43.2	24	+2	118.6	24
Iloilo	321.9	+88.1	+5.3	18	+3	104.1	24	San Isidro	373.2	+204.2	+45.6	23	+6	56.4	26
San Jose Buenavista	635.6	+317.8	+104.2	21	.....	155.7	22	Tarlac	457.4	+197.2	+107.9	24	+2	53.1	4
Cuyo	419	+198.7	+32.7	23	-3	85.3	22	Baler	469.6	+288.4	+143.1	22	+4	68.1	22
Ormoc	278.8	+106.4	4	20	0	75.2	13	Dagupan	620.5	+405.8	+148.4	23	+4	115.1	4
Guiuan	284.9	+76.5	.....	18	+6	91.9	12	Bolinao	902.2	+511.2	+342.2	23	+2	229.4	5
Tacloban	182.3	+8.4	-19.6	22	+5	28.7	9	Baguio	648.4	+45.6	-206.5	24	-1	177.3	3
Capiz	178.4	-33.8	-119.2	21	-2	20.9	14	San Fernando, Union	452.8	+101.2	+4.5	21	+2	131.1	3
Borongan	223.3	+108.8	+21.9	19	+4	34.8	3	Echague	162.9	-58.1	-28.2	18	-1	51	29
Catbalogan	339.5	.....	.....	20	.....	104.4	21	Candon	429.3	+162.9	-54.1	18	+6	161.3	4
Calbayog	371.1	+106.7	+91.4	21	+2	177.9	22	Vigan	474.2	+290.4	-54.3	21	+7	182.3	4
Masbate	316	+196.8	+126.3	21	+1	91.9	24	Tuguegarao	250.2	+108.4	-18.5	15	+4	51.8	27
Romblon	402.4	+187.6	+180.9	21	+1	72.1	14	Laoag	773.3	+300.1	+102.1	20	+4	447.6	4
Batag	252.8	+139.8	.....	14	+7	49.5	5	Aparri	472.2	+397	+182.3	17	+7	107.7	3
Sorsogon	556.1	.....	.....	19	.....	110.5	14	Cape Bojeador	527.5	.....	.....	16	.....	127	4
Legaspi	318.2	+57.2	+63.8	19	-3	55.9	13	Santo Domingo, Batanes	473.1	+325.9	+114.9	21	+4	97.2	4
Sumay, Guam	586.6	+280.4	+233	25	+4	74.9	18								
Calapan	307.8	+157.2	+59.4	23	+2	62	16								

\* 29 days of observation.

DEPRESSIONS AND TYPHOONS.

Several depressions and typhoons were observed during this month in our weather maps of the Far East, although only one well-developed typhoon crossed the Philippines on the 4th between Luzon and the Balintang Channel. The tracks of all these depressions and typhoons may be seen in Plate VIII.

A TYPHOON ACROSS THE BABUYANES ISLANDS, SEPTEMBER 1 TO 8 1916.

This is the only well-developed typhoon which has crossed near the Island of Luzon in 1916. The first evident signs of this disturbance were shown in our weather map for 2 p. m. of the 2d, and the first typhoon warning was issued at 3 p. m. of the same day. The center of the typhoon was then situated to the E of southern Luzon near 14° latitude N and 129° longitude E moving NNW. On the 3d the typhoon inclined more and more to the W, thus approaching the northern part of Luzon, and crossing near the northern coast through the Babuyan Islands in the morning of the 4th. In plate IX we publish the isobars for 6 a. m. and 2 p. m. of the 4th, 6 a. m. of the 5th, and 4 p. m. of the 7th.

Since the afternoon or the evening of the 3d the typhoon moved W by N keeping this direction across the China Sea on the 5th to 7th. In the afternoon of the 7th it entered the coast of China to the north of Hainan. The barographic record obtained at the station of Quang-tcheou-Wan is included in Plate IX.

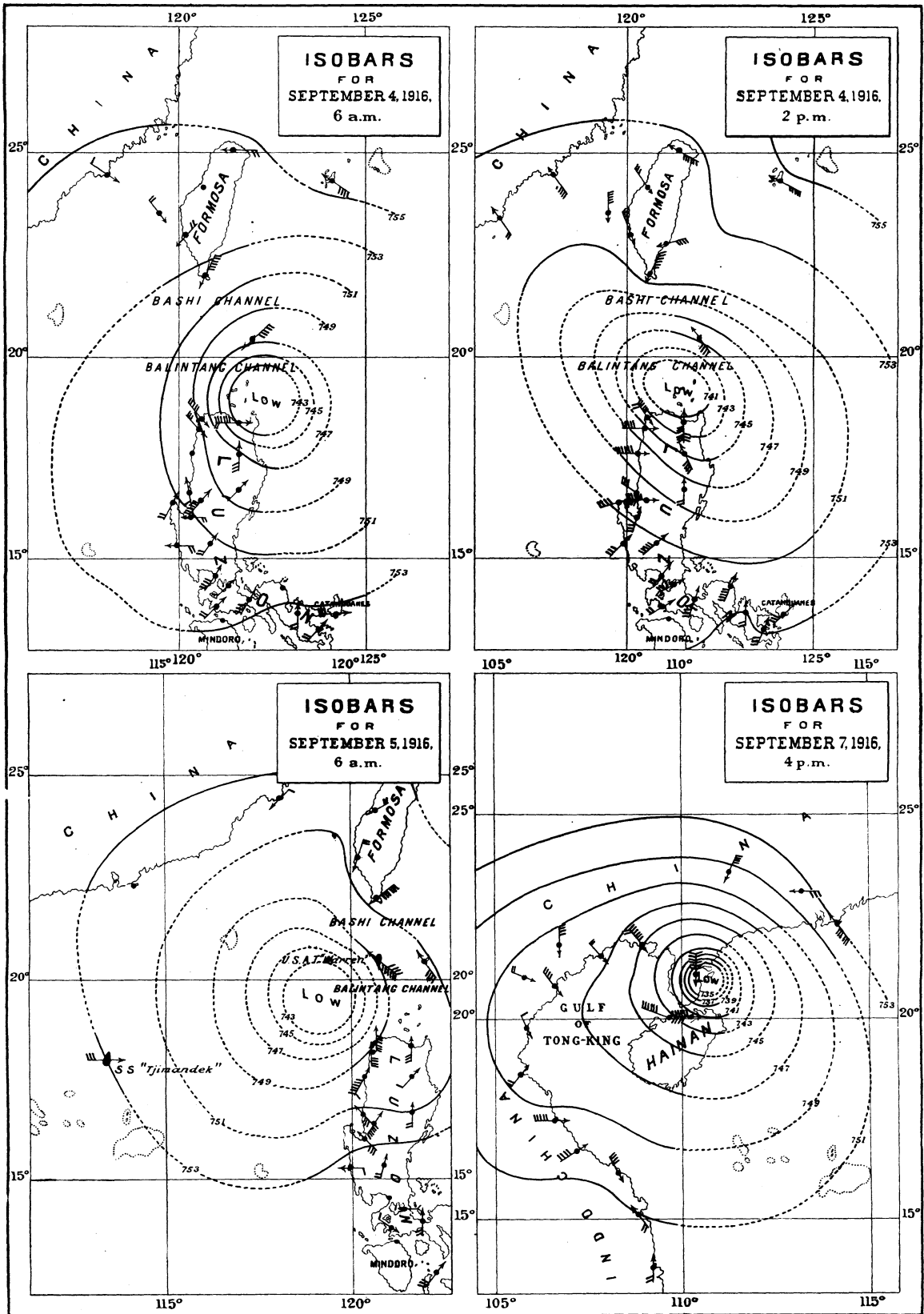
TWO LOW-PRESSURE AREAS OVER LUZON, SEPTEMBER 14 AND 23, 1916.

We consider together these two depressions or low-pressure areas which crossed Luzon during this month because they were of a very similar character, both having developed later into real typhoons in the China Sea. Whether they ever had the development of a typhoon before reaching the Philippines, it is impossible for us to decide owing to the lack of observations from the Pacific Ocean.



ISOBARS FOR THE TYPHOON OF SEPTEMBER 4 TO 7, 1916.

Plate IX.



N.B. - The barometric readings have been reduced to standard gravity.

The first of these depressions appeared to the E of southern Luzon on the 13th; it crossed to the S of Manila on the 14th in the form of a low-pressure area of very little importance; it moved W by N on the 15th across the China Sea; and, inclining more to the W on the 16th, it advanced very slowly for three days while it seemed to have developed into a regular typhoon. On the 19th the typhoon inclined to the N toward the western part of Hainan.

The second depression seems to have come from the Ladrone Islands, where it was probably formed on the 15th to 17th. It moved W and traversed the northern part of Luzon on the 23d in the form of a low-pressure area of little importance; but developed into a real typhoon in the China Sea, west of the northern part of Luzon, on the 24th to 25th. The typhoon continued moving westward, and passed over the southern part of Hainan and of the Gulf of Tongking on the 27th and 28th.

A DEPRESSION OVER THE PACIFIC AND THE EASTERN SEA, SEPTEMBER 17 TO 25, 1916.

This depression seems to have formed over the Pacific to the E of Luzon on the 17th or 18th of this month. It moved almost due north until the 21st, when it inclined somewhat to the NW. Then the depression crossed the Eastern Sea in a NNW direction on the 22d and 23d; and on the 24th it recurved NE, finally filling up on the 25th near the southern part of Korea.

TWO DISTANT DEPRESSIONS OR TYPHOONS RECURVING OVER THE PACIFIC, SEPTEMBER 24 TO 30, 1916.

These two depressions or typhoons existed simultaneously for several days over the Pacific. A few observations received from Yap show the first of these disturbances passing to the south of that station on the 24th to 25th moving W or WNW. On the 25th it began to incline northward, until it finally recurved northeastward on the 28th, to the east of Balintang Channel. The center of this depression appeared in our weather map of the 30th to the N of the Bonin Islands. The other depression or typhoon was probably formed on the 25th to the W of the southern part of the Ladrone Islands near 15° latitude N and 140° longitude E. It seems to have moved WNW on the 25th, and to have recurved N and NE on the 26th and 27th, its center passing between Japan and the Bonins on the 28th moving ENE.

## NOTAS GENERALES DEL TIEMPO.

**Presión y temperatura.**—La presión atmosférica media de este mes en Filipinas es algo inferior a la del año pasado y a la normal de septiembre, siendo mayores las diferencias en el N de Luzón a causa del tifón que pasó cerca de Aparri el día 4. Las presiones más altas se observaron generalmente el día 1.º en el centro y N de Luzón, y el 12 en el S de Luzón, en Visayas y Mindanao. Las presiones más bajas se registraron el día 4 en el N de Luzón, y el 23 ó 24 en el centro y S de Luzón, en Visayas y Mindanao.

La temperatura media mensual fué algo menor que la del año pasado y que la normal de septiembre. Las temperaturas extremas de Manila fueron 33.3° C. registrada el día 7, y 22.3° C. observada los días 9, 18, y 30. Las máximas y mínimas absolutas de Baguio fueron 24.2° C., 14.6° C. en la cumbre del Mirador, y 25.3° C., 13.7° C. en el valle.

**Precipitación acuosa.**—La cantidad total de lluvia de este mes es, con muy pocas excepciones, mayor que la del año pasado. Un buen número de estaciones, sin embargo, acusaron una cantidad mensual menor que la normal de septiembre. Lluvias diarias mayores de 100 mm. se registraron en todas las estaciones de la parte occidental de Luzón al N de Manila durante el tifón que pasó cerca de la costa septentrional de dicha isla el día 4 de este mes.

## DEPRESIONES Y TIFONES.

Varias depresiones y tifones se observaron durante este mes en nuestros mapas del tiempo del Extremo Oriente, aunque solamente un tifón bien desarrollado atravesó las Filipinas el día 4 entre Luzón y el canal de Balintang. Véanse las trayectorias de estas depresiones y tifones en la Lámina VIII.

## UN TIFÓN A TRAVÉS DE LAS ISLAS BABUYANES, SEPTIEMBRE 1 AL 8, 1916.

Este es el único tifón bien desarrollado que ha cruzado cerca de la Isla de Luzón en 1916. Los primeros indicios claros de esta perturbación se notaron en nuestro mapa del tiempo de 2 p. m. del día 2, y el primer aviso de tifón se dió a las 3 p. m. del mismo día. El centro del tifón se hallaba entonces al E de la parte sur de Luzón, cerca de 14° latitud N y de 129° longitud E, moviéndose al NNW. El tifón se inclinó más y más al W el día 3, acercándose a la parte norte de Luzón y pasando cerca de la costa norte de esta isla, a través de las Islas Babuyanes, en la mañana del día 4. En la Lámina IX publicamos las isobaras de 6 a. m. y 2 p. m. del día 4, 6 a. m. del 5 y 4 p. m. del 7.

El tifón se movió al W½NW desde la tarde o noche del 3, conservando esta dirección al atravesar el Mar de China del 5 al 7. Penetró en la costa de China la tarde del 7 al N de Hainán. La curva barográfica obtenida en la estación de Quang-tcheou-Wan puede verse reproducida en la Lámina IX

## DOS ÁREAS DE BAJA PRESIÓN SOBRE LUZÓN, SEPTIEMBRE 14 Y 23, 1916.

Consideramos aquí juntas estas dos depresiones o áreas de baja presión por haber sido muy parecidas entre sí, y haberse convertido ambas en verdaderos tifones en el Mar de China después de atravesar la Isla de Luzón. Por falta de observaciones del Océano Pacífico nos es imposible determinar si llegaron nunca a adquirir el desarrollo de un verdadero tifón antes de llegar a Filipinas.

La primera de estas depresiones apareció al E de la parte sur de Luzón el día 13; pasó por el S de Manila el 14 en forma de un área de baja presión de muy poca importancia; se movió al W½NW el 15 a través del Mar de China; e inclinándose más al W el 16, avanzó muy lentamente los tres días siguientes mientras parecía haberse convertido en un tifón bien desarrollado. El día 19 se inclinó la trayectoria al N en dirección a la parte occidental de Hainán.



La segunda depresión parece haber venido de las Islas Marianas, donde se formó probablemente del 15 al 17. Se movió al W y atravesó la parte norte de Luzón el 23 en forma de un área de baja presión de poca importancia, pero se desarrolló en un verdadero tifón en el Mar de China, al W de la parte norte de Luzón, del 24 al 25. El tifón siguió moviéndose hacia el W y atravesó la parte sur de Hainán y del Golfo de Tongking el 27 y 28.

UNA DEPRESIÓN EN EL PACÍFICO Y MAR DEL ESTE, SEPTIEMBRE 17 AL 25, 1916.

Esta depresión parece haberse formado en el Pacífico al E de Luzón el día 17 ó 18. Se movió casi directamente al N hasta al 21, en que se inclinó algo al NW. La depresión cruzó entonces el Mar del Este con una dirección NNW durante los días 22 y 23, y recurvó al NE el 24, deshaciéndose finalmente el 25 cerca de la parte sur de Korea.

DOS DEPRESIONES O TIFONES LEJANOS QUE RECURVARON EN EL PACÍFICO, SEPTIEMBRE  
24 AL 30, 1916.

Estas dos depresiones o tifones existieron simultáneamente por varios días en el Pacífico. Algunas observaciones que recibimos de Yap indican el paso de la primera de estas perturbaciones por el S de aquella estación del 24 al 25, moviéndose al W o WNW. El 25 comenzó a inclinarse al N, hasta que recurvó por último al NE el 28 por el E del canal de Balintang. El centro de esta depresión apareció en nuestro mapa del tiempo del día 30 al N de las Islas Bonin. La otra depresión o tifón estuvo formándose probablemente el día 25 al W de la parte sur de las Islas Marianas, cerca de 15° latitud N y de 140° longitud E. Parece haberse movido al WNW el 25 y haber recurvado al N y NE el 26 y 27, pasando su centro entre Japón y Bonin el 28 en dirección al ENE.

METEOROLOGICAL DATA FOR MANILA CENTRAL OBSERVATORY.\*

[φ=14° 34' 41" N; λ=120° 58' 33" E; barometer above sea, 14.2 meters; gravity correction not applied, -1.72 mm.]

Day.	Air temperature. <sup>b</sup>				Underground temperature.				Relative humidity (mean).	Vapor pressure (mean).	Radiation.			Evaporation. <sup>b</sup>		
	Pressure (mean).	Mean.	Maximum.	Minimum.	0.25 meter.		0.50 meter.				1.50 meters.	2.50 meters.	Minimum on grass.	Maximum in sun. Black bulb in vacuo.	Free exposure (total).	Shelter (total).
					8 a.m.	2 p.m.	8 a.m.	2 p.m.			8 a.m.	8 a.m.				
1	759.43	26.1	31	23.6	30	30.5	30.6	30.6	30.2	29	87.1	21.6	21.5	53.5	1.6	1.6
2	57.45	26.9	31	23	29.9	30.5	30.5	30.6	30.2	29.1	84.1	22	21.2	53	2.3	1.9
3	55.26	27.1	30.6	24.6	30	30.5	30.5	30.5	30.3	29	85.4	22.7	22.7	53	2.9	2.6
4	54.85	25.7	28.5	22.7	29.5	29.6	30.5	30.4	30.2	29	90.5	22.2	23	43.6	.5	1.2
5	56.62	25.9	31	23.2	28	28.7	29.7	29.6	30.2	29.1	89.8	22.3	21.8	46.5	1.1	1.1
6	57.56	27	32.9	23	28.6	29.7	29.6	29.6	30.2	29.1	85.1	22.3	21.1	54.5	2.6	2.2
7	58.36	26.7	33.3	23.3	29.2	30.2	29.8	29.9	30.2	29.1	84.6	21.8	21.4	56.2	2.4	2.2
8	58.36	25.7	31.6	22.8	29.2	30.2	29.8	30.1	30.2	29.1	89.6	21.8	21.3	52.5	1.6	1.3
9	57.79	26.1	32.3	22.3	29.1	30.2	29.8	30.1	30.1	29	86	21.3	20.6	54.8	2.4	2
10	57.74	25.9	31.5	22.2	29.3	29.9	29.9	30.2	30.1	29	90.1	22.2	22	51	1	.9
11	58.22	26.3	31.8	23.4	29.2	30.1	29.9	30	30	29	89.2	22.5	22.2	53	1.9	1.5
12	59.39	26.5	30.5	23.8	29.4	30.2	29.9	30.1	30	29.1	85.5	21.8	22.8	56.5	2.3	1.8
13	58.21	25.9	30.8	23	29.5	30.1	30	30.1	30	29	89.5	22	21.2	53.6	1.4	1.1
14	56.64	24.5	29	23	29.3	29.3	29.8	30.1	30	28.9	92.9	21.1	21.9	45	.6	.9
15	56.67	25.1	30.3	23.2	28.5	29.2	29.7	29.7	30	29	90.8	21.4	22.2	52.4	1.5	1.3
16	57.72	25.7	30.8	23	28.5	29.6	29.5	29.8	30	29.1	89.6	21.9	21.8	55.2	1.3	1.4
17	57.41	25.9	30.6	23.5	28.9	29.6	29.5	29.8	30	28.9	87.4	21.5	22.6	54.3	2	1.7
18	56.72	26.8	31	22.3	29	30	29.7	29.8	30	29	82.8	21.5	20.7	51	3.4	2.5
19	56.85	27.2	31	23.9	29.3	30.1	29.8	30.1	29.9	29	84.5	22.5	22.2	57	2.9	2.2
20	57.16	27.7	31.8	23.9	29.3	30.4	29.8	30	29.9	29.1	83.7	23	22.5	54.5	3.5	2.4
21	56.17	27.1	32.5	23.7	29.6	30.8	30	30.1	29.9	29	85.7	22.6	22.2	52.4	2.8	2.1
22	54.82	26.3	31.4	23.7	29.7	31	30.3	30.4	29.9	29.1	89.5	22.6	22.1	54.5	1.9	1.3
23	53.37	26.1	30.4	24.4	29.5	30.2	30.1	30.2	30	29	91.2	22.8	23.6	51	1.3	1.2
24	51.93	25.6	28	24.3	29.2	29.3	29.7	29.8	29.8	28.8	91	22.1	23.5	39.9	.3	1.3
25	52.91	25.8	29.3	24.1	28.5	29.1	29.7	29.6	29.9	28.9	88	21.6	23.1	47.5	.7	1.5
26	55.46	24.7	27.1	23.3	28.3	28.6	29.6	29.5	30	28.9	92.8	21.4	22.1	39.3	.1	.7
27	57.11	25	28.5	23	27.5	28.2	28.9	29	29.9	28.9	90.6	21.4	22.2	42.7	.6	1.1
28	56.76	24.8	28.1	23.4	27.7	28	28.8	28.9	29.9	29	93.2	21.6	22.7	45	.3	.6
29	56.33	24.7	28.4	23.3	27.5	28.3	28.8	28.7	29.8	28.9	92.9	21.4	22.3	48.2	.7	.9
30	57.38	26.3	32.3	22.3	27.6	29.2	28.8	28.8	29.8	28.9	88.1	22.1	20.3	54.2	2.3	1.9
Mean	756.68	26	30.6	23.3	29	29.7	29.8	29.9	30	29	88.4	22	22	50.9	1.7	1.5
Total															50.2	46.2
Departure from normal	-0.74	-0.8	-0.1	-0.3							+2.6	-0.4				

Day.	Wind.				Clouds.			Sunshine.	Rain, 24 hours beginning 6 a. m.		Miscellaneous.
	Prevailing direction.	Total movement.	Maximum hourly velocity.	Direction at the time of the maximum velocity.	Amount (mean).	Form and direction.			On the tower.	In the park.	
						Upper.	Lower.				
1	NNW	117	14	E	9.2	ci.-s., a.-cu. SE	Cu. ENE	h. m.	mm.	mm.	☉ ☁ ☁ ☁ p.
2	W quad.	147.5	17	WSW	8.7	ci.-s., a.-cu. SE	Cu.-N. NE	2 15	4.8	4.3	☉ a. ☁ d p.
3	SW	473	42	SW	9.7	ci.-s.	Cu. W	0 50	.6	19.8	☉ a. ☁ ☁ ☁ p.
4	SSW	478.5	33.5	SW	10	ci.-s., a.-cu. NW by N	Fr.-N. WSW	0 05	74.2	74.2	☉ a. d p. ☁ p.
5	S quad.	130	21	SW	10	ci.-s.	cu.-s.-cu. SW	0 00	1.6	1.2	☉ a. d p.
6	SE	168	14	SSE	7.8	ci.-s. NW	Cu. S	5 45	.1	.1	☉ a. ☁ d p.
7	Variable	140	12	NE	8.5	ci.-s. NE	Cu. ESE	6 00	12.2	11.2	☉ a. ☁ ☁ ☁ p.
8	Variable	98	18.5	SE	8.6	ci. NNE	Cu. SSE	6 30	8.8	8.6	☉ a. ☁ ☁ p.
9	W quad.	92.5	12.5	W	5.7	ci. SSE	cu.-s., a.-cu. SSE	7 10	14.5	15	☉ a. ☁ ☁ p.
10	N quad.	76	9	NNE	8.7	ci.-s., a.-cu. SSE	Cu.-N. ESE	1 45	.8	.5	☉ a. d p.
11	S quad.	126.5	16.5	SSW	9.6	ci.-s.	Cu.-N., Cu. ESE	2 15	5.7	5.3	☉ a. ☁ ☁ p.
12	WSW	132.5	13	SW	9.1	ci.-s. E	Cu. E, ESE	2 50			d. a. d p.
13	N quad.	116.5	14	WNW	7.7	A.-cu., ci.-s.	Cu., Cu.-N. ENE	5 15	4.4	4.4	☉ a. p.
14	NNW	139	17.5	NNW	9.9	ci.-s.	N. ENE	0 05	36.4	37.1	☉ a. p.
15	ENE, ESE	142	17	ESE	10	ci.-s.	cu.-N. ESE	0 20	16.2	17.5	d. a. p.
16	E quad.	125	15	E	9.2	A.-Cu. SW	Cu.-N. S	2 20	4.2	4.2	☉ a. p.
17	W quad.	131	10.5	W	9.1	ci., ci.-cu. NNE	Cu. W	3 45			d. a.
18	WSW	200	22	WSW	4.5	ci. NE	Cu. N	7 20			☉ a.
19	WSW	223.5	24	WSW	7	ci.-s.	Cu. WSW	3 50			☉ a.
20	SW, WSW	213.5	22	SW	4.8	ci. E	Cu. W	9 20			☉ a. p.
21	N quad.	183	20	WNW	5.8	ci. E	Cu. NW	7 05	.4	.5	☉ a. ☁ ☁ p.
22	NW quad.	152.5	20	WNW	7.7	ci. E	Cu. NW	4 35	12.4	11.7	☉ a. p.
23	SE, SSW	197.5	22	SSW	9.7	ci.-s.	cu.-N. WSW, SW	2 00	8.7	7.9	☉ a. p.
24	SE, SSW	299.5	29	WSW	10	ci.-s.	Fr.-N. SW	0 00	41.3	41.1	☉ a. a. p.
25	S quad.	397.5	37	SW	10	ci.-s.	Fr.-N. SW	0 00	15.2	14.9	☉ a. a. p.
26	S quad.	227.5	19.5	SSW	10	ci.-s.	N., Fr.-N. SW	0 00	43.6	43.9	☉ a. p.
27	SSW	225.5	23	SSW	10	ci.-s.	S.-Cu. SW	0 00	22.6	22	☉ a. p.
28	N quad.	131	14	NW	9.8	ci.-s.	cu.-N., Fr.-N. W	0 00	14.8	14.1	☉ a. p.
29	SSW	162	17	SSW	9.7	A.-Cu.	Cu.-N. SW	0 30	4.4	3.5	☉ a. p.
30	E quad.	137.5	16.5	SW	5.1	ci. E	Cu. SE	8 10	7.6	6.4	☉ a. p.
Mean		186.1	19.4		8.5			3 04			
Total		5,583.5						92 10	372.6	370	
Departure from normal		-2,440.2			+0.8			-43 15	+0.1		

\* All the mean values given in this table are deduced from hourly observations.  
 b These values are taken from instruments mounted in the Observatory Park, 1.5 meters above ground.

METEOROLOGICAL DATA FOR MIRADOR OBSERVATORY, BAGUIO.<sup>a</sup>

[φ=16° 25' N; λ=120° 36' E; barometer above sea, 1,512.5 meters; gravity correction not applied, -1.65 mm.]

Table with columns: Day, Air temperature at Mirador (Mean, Maximum, Hour, Minimum, Hour), Air temperature in the valley (Maximum, Hour, Minimum, Hour), Relative humidity (mean), Vapor pressure (mean), Radiation (Minimum on grass, Maximum in sun, Black bulb in vacuo), and Evaporation (Free exposure total, Shelter total). Rows include daily data from 1 to 30 and Mean/Total values.

Table with columns: Day, Wind (Prevailing direction, Total movement, Maximum hourly velocity, Direction at the time of the maximum velocity), Clouds (Form and direction: Upper, Lower), Sunshine (h. m.), Rain, 24 hours beginning 6 a. m. (mm.), and Miscellaneous. Rows include daily data from 1 to 30 and Mean/Total values.

<sup>a</sup> All the mean values given in this table are deduced from six daily observations taken at 2, 6, 10 a. m. and 2, 6, 10 p. m.
<sup>b</sup> The barometric readings of this station are not reduced to sea level.
<sup>c</sup> Maximum of hourly observations taken from 6 a. m. to 6 p. m.
<sup>d</sup> This element is based on hourly observations taken from a quadruple register, which gives only eight possible directions of the wind.

DAILY RAINFALL AT THE STATIONS OF THE WEATHER BUREAU, SEPTEMBER, 1916.

Station.	Day of month.															
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.
Jolo	8	15.2	0.3	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.
Isabela, Basilan	4.3				18.3	2	7.4	.8	3.8	30.5	30.7	.8			2.1	0.5
Zamboanga	1.5				14		1.4		10.8	18.6	9.3		0.3			
Davao				11.4	12.7		4.8		45.7	37.8			55.9	12.4		
Cagayan, Misamis	65.5		25.1		8.4	2.3	4.8	7.6	6.4	6.3	.8	9.9		1.3	3.8	4.1
Butuan	41.4					1.8	57.9	2.3	17			24.9		2	1	1
Dumaguete	9.9						28.2	6.9	3	4.1	19.3	12.8	1.5	2		
Tagbilaran							4.1	13.2	8.4	62.5	31	1.3	22.1	42.2	4.6	.8
Iwahig	13.4	2.3	.3	2.5				.5	7.1	10.2	16.3	32.1	39.1	7.9		
Surigao	3.8						16.8	3	15.3	36.3	1	8.7	24.4	33.8		
Maasin	34.5								23.9	3.5	59.7	3.3		.8		
Cebu	28.9	.5					4.3	14.7	2.3	18	2.1	.8	19.1	12.4	2.3	
Iloilo	4.1	1.3	8.4				2.5		36	3.5	36	3	48	44.4	30.2	
San Jose Buenavista	10.4		4.1			27.9	.3		26.5	64.8	2.1	.3	57.4	1.8	5.8	.8
Cuyo	31	2.5		2			37.3	10.7	30	7.1	.8		30	7.1	.8	
Ormoc	22.1	7.1	1.3				32.5	19.6	15	10.4	.3		71.1	75.2	29.3	
Guluan	3.9				7.9		11.2	2.5	33	6.9	36.8	91.9	9.4	3	28.4	2
Tacloban	2.7	5.6	24.8			.9	9.4	2.6	28.7	27	1.1	10.7	9.4	3.2	1.1	
Capiz	16.8	3.9	5.1			.5	9.4	10	8.3	11.7	9.7	2.6	15	20.9	.5	8.1
Borongan	.5	11.2	34.8		.3		23.9	2.5	23.9	10.9	8.9	20.5	12.5	19.1		
Catbalogan	3.3					5.1	8.9	12.7	2.5	12.2	.5	3	22.8			11.4
Calbayog	3.3	3.8					2.8	.8	1.5	2.8	30.5	2.3	17.5	32.8	1	
Masbate	.3	36.1			2.3			.3	2.8	3.8	3.3	20.8	39.4	39.4	5.6	
Romblon	30.7	5.8	6.4	1.5			28.7	.3	6.9	41.9	17.7	.4	39.4	72.1	3.4	
Batag	33.7				49.5			28.2	30.7	3.8	2.5	1.5	44.7		3.8	
Sorsogon	6.4	50.5	56.1	7.4			7.4	50.8	7.4			31.2	110.5	47.5	31	
Legaspi	7.7	2.1	37				4.3	3.8	4.6	39.4			55.9	.8	2.3	
Sumay, Guam	19			5.1	22.9	22.9	6.4	13.9	21.5	3.8	45.7	3.8	10.2	7.6	22.9	
Calapan	17.8			10.4	.5	33.8	22.6	.8	1.8	36.8	1.3	6.6	7.1	11.7	1.8	62
Virac	7.9	1.1	4.4	.8			2.5		27.2	4.6	16	18.8	59.7	36.1	6.6	24.1
Naga	2	3	3.3				38.3	21.6	14.5	22.9	22.9	86.1	15.2	25.9	43.2	
Batangas	20.3	1.5		2.5	1.6		25.9	2.8	4	1.5	1.3	4.1	20.4	14.9	16.5	12.5
Lucena	6.6			3.8			4.3	19.3		11.1	6.1	13.2	13.2	77.7	32.8	11.9
Atimonan	21.6			8.1			7.6		9.1	1.3	1	23.8	21.1	95.5	9.9	25.4
Ambulong, Tanauan	3		10.5	8.9	1.8		5.8	3.6		32.5	1	8.4	8.4	62.3	9.1	21.6
Canlubang, Calamba	2.5		4.3	4	.5		21.6		1.5	8.4	3.3	3.6	3	42.9	5.3	9.4
Paracale	29.2	12.7				54.6			5.6	10.9	2.3	10.7	59.6	3.8	11.2	23.8
Santa Cruz, Laguna	9.4		6.1	2.3			3.3		14.2	6.9	6.7		4.1	49.1	6.1	23.4
Manila	4.8	.6	17.1	74.2	1.6	.1	12.2	8.8	14.5	.8	5.7		4.4	36.4	16.2	4.2
Antipolo	34.8	1	35.8	42.2	1.3	16	29.2	9.4	2.8	7.9	37.1	1.5	25.4	42.2	6.1	39.8
Iba	2.6		21.3	48.1	115.6	109	1.3	1	.2	3.6	6.9		2.5	4.4	11.9	7.9
San Isidro	1	5.3	25.4	52.7	10.4	8.7	1.3	.5		1.8	6.3	1.1	1.8	15.6	2.9	31.7
Tarlac	30	3.8	51.3	53.1	20.3		41.7	6.1	10.7		1.5		17.8	10.2	2.3	31
Baler	42.2		8.1	15.3	10.2	1.1	1.3		21.6	9.1	27.4		8.9	48.8	38.3	66.3
Dagupan	2.5	13.2	105.1	115.1	29			2.5	2.8	.8	10.2	2.5		1.1	7.1	21.1
Bolinao			157.2	56.2	229.4	3		1.3	3	2.8	6.9	.8	67.3			3.3
Baguio	31.3	10.7	177.3	139.4	28		3.6	4.1	14	2.6	3	13.5	18.8		.8	30.3
San Fernando, Union	.6	3.3	131.1	51.6	59.7		1.5	1		.5	7.4	6.9	2		25.1	41.7
Echague			14	10.6			6.4	31.5	4.1	.5			6.1	9.2	5.8	12.7
Candon	3.8	11.4	19.8	161.3	90.9		2.5	2.5	1			6.1		1.3	9.7	52.1
Vigan	3.1		30.1	182.3	93.1			.8			2.5	28.5	1.4	2.9	11	8.4
Tuguegarao	1.3		34.6	35.6			3.3		1.8				4.1	7.9		
Laog	4.8		13	447.6	39.2			13.2	.3			11.7			2.3	15.7
Aparri	2.5	50.8	107.7	107					8.4						1.6	1.8
Cape Bojeador		2.5	10.7		10.7		27.1					8.5				.8
Santo Domingo, Batanes	1.9	13	38.5	97.2		1.1	9.3	3.8		3.7			12.2	6.1	11.3	20.8

Daily rainfall at the stations of the Weather Bureau, September, 1916—Continued.

Station.	Day of month.														Total.
	17.	18.	19.	20.	21.	22.	23.	24.	25.	26.	27.	28.	29.	30.	
Jolo.....	7.6	8.6	8.6	14	2.8	43.5	7.9				44.2	1.3	8.7	mm.	247.4
Isabela, Basilan.....	5	3.6	3.8	5.6	37.1	13.2	1		18		10.2	0.5			194.7
Zamboanga.....		.8	14.8		.3			3.8	5.1						80.7
Davao.....	2.5	3.3							4.3	56.6					247.4
Cagayan, Misamis.....	.8		3			30.5		5.3			4.1	2.5			192.5
Butuan.....	.8	.3	18.3		.8	21.1	1.5	1			3.1	.3	7.4	.5	205.7
Dumaguete.....							12.9	14.2	4.6		3.3	15.8	6.4	9.7	154.6
Tagbilaran.....					.5			9.9			3.8	24.1			223.1
Iwahig.....		18	13.2			18	18.9	7.1	4.6				2.1	1.3	213.5
Surigao.....				9.9	33	.3		15.2	.8	3		16.5			118.5
Maasin.....			11.2					31.7							187.2
Cebu.....		23.9		2.8			10.7				7.4	41.7		4.9	230.9
Iloilo.....						15	19.1	104.1	4.3	69.1		2.3			321.9
San Jose Buenavista.....			18.5	5.8	12.5	155.7	41.7	6.3	6.8	94.2	18.1	17			635.6
Cuyo.....	1.8			.8	1.8	85.3	21.9	16.2	4.6	29	4.1	42.7	23.6		419
Ormoc.....			15.7	4.8	12.8	5.9	1	1		14.7		2.5	.5		278.8
Guiuan.....	3.3		11.4				4.6	13		9.4				1.3	284.9
Tacloban.....	2				3.9	6.7	8	6.5	.3	2.5			.4	3	132.3
Capiz.....						12.2	6.8	9.9	3.1	4.3		17	2.6		178.4
Borongan.....	4.3					1.8	9.1	1.8		9.4		2.8	25.1		223.3
Catbalogan.....				49.3	104.4	27.1	8.1	1.3	.5	11.9		43.9	2.8	7.8	339.5
Calbayog.....		1.5		1	22.9	177.9	38	1	9.2	2.3	5.8	12.4			371.1
Masbate.....		.3			19.3	42.2	14.3	91.9	1	1		14.8	1	6.6	316
Romblon.....						16.6	23.3	40.5	42.4	10.7	3	10.9	2.5		402.4
Batag.....					4.6	36.1	3		5.1				5.6		252.8
Sorsogon.....				2.3	3.3	51.1	10.1	3.6	52.1		25.1	2.3			556.1
Legaspi.....				5.6	3.8	41.5	29.4	44.2	2.5	2.8		16.5	14		318.2
Sumay, Guam.....	41.9	74.9	64.8	29.2	16.5	20.3	3.8	43.1	14	50.8			16.5	5.1	586.6
Calapan.....	5					30.5	35.6	4.3	2.8	7.1		.8	.5	10.7	307.8
Virac.....						8.9	3.6	14	44.8	1.8				.5	283.4
Naga.....				2		8	14	30.5	29	.3		.5	45.1		418.4
Batangas.....					.5	22.1	41.2	38.2	12.7	5.6	.8	39.1	25.9	1.3	317.2
Lucena.....		2		3		24.9	6.6	2.6	1.5	.8		.5	14	2.3	260.7
Atimonan.....						17.7		6.6	14.9		1.3	22.4			287.3
Ambulong, Tanauan.....	18.8			1		19.1	26.4	15.5	28.4	10.2	5.8	12.2	1.5	37.8	345.2
Canlubang, Calamba.....	16.3		3.3	3	.8	28.7	9.9	23.1	10.4	18.3	4.3	53.4	16		303.6
Paracale.....						10.6	.3		2.3			4	32.1	17.3	291
Santa Cruz, Laguna.....	5		3.8		4.6	49	3.6	18	17.6	6.3	5.9	28.2	25.7	4.1	298.9
Manila.....					4	12.4	8.7	41.3	15.2	43.6	22.6	14.8	4.4	7.6	372.6
Antipolo.....	1.8			1.3	9.1	57.7	67.3	47.7	36.6	20.8	31.7	28.4	6.4		641.3
Iba.....	22				1.5	26.1	29.8	118.6	53	66.8	38.4	109.7	6.1		808.3
San Isidro.....	2.8				1	8	1.5	25.9	47.5	21.6	20.8	56.4	15.2	10.4	373.2
Tarlac.....			7.6	10.2	6.1	7.6	6.9	22.9	30.5	50.8	16.2	17.3	1.5		457.4
Baler.....						68.1	.6	2	11.2	8.3	5.1	64.8	10.4	.5	469.6
Dagupan.....			8.1		15.3	2.5	54.7	57	32.2	57.1	20.1	47.3	13.2		620.5
Bolinao.....	3.1		1.5		6.9	23.8	5.1	84.1	123.9	44.9	36.6	41.6	1.8	3.1	902.2
Baguio.....		3			1	10.1	13.7	37.3	20.8	12.7	28.3	14.8	32		648.4
San Fernando, Union.....						3	1.5	23.6	49.3	16.3	9.4	8.2	9.1		452.8
Echagüe.....	.5					2.3	.5	.3	.3		4.8	2.3	51		162.9
Candon.....						31.5	9.2	12.2			5.6	7.1	1.3		429.3
Vigan.....					8.5	6.5	51.8	12.4	6.1	1.3	12.4	4.7	6.1	3	474.2
Tuguegarao.....		5.4				13.2	15.7	3		50.2	51.8	15.7	6.6		250.2
Laoag.....	19.8	23.3		9.1	31	36.1	7.1		4.4	.3	65.5	24.1	4.8		773.3
Aparri.....	2.8	.8				25.2	21.7	2.3	7.1	10.5	10.6	12.6	98.8		472.2
Cape Bojeador.....					6.6	93.7	73.4	5.3	3.8	13	88.5	17.3	38.6		527.5
Santo Domingo, Batanes.....	2.8					35.8	6.6	13	46.4	61		7.9	43.4	37.3	473.1

MAXIMUM AND MINIMUM TEMPERATURES AT THE STATIONS OF THE WEATHER BUREAU, SEPTEMBER, 1916.

Day.	Jolo.		Isabela, Basilan.		Zamboanga. <sup>a</sup>		Davao.		Cagayan, Misamis.		Butuan.		Dumaguete.		Tagbilaran.	
	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.
	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.
1	28.8	21.3	33.1	22.3	28.4	22.9	32.2	22.4	31.8	22.7	33	23.8	29.8	23	29.9	22.6
2	29.4	20.7	33.6	23.1	32.2	22.2	33.7	21.5	30.8	21.7	32.3	22.4	30.9	22.7	29.9	22.6
3	31.6	21	33.1	22.6	29.6	24	32.2	20	31.1	21.8	32.6	22	34	22.1	32.5	24.4
4	31.7	21.9	32.1	22.1	31	23.9	32.6	21.5	31.4	21.6	32.5	23	32.8	22.4	31.1	23
5	31.9	21	33.1	22.5	30.8	21.6	27.7	21	31.3	21.8	31.6	23.4	30.9	23.4	31.4	22.5
6	32.6	22.5	33.6	22.1	30.4	25	32.7	20.5	31.2	21.5	32.2	23.1	30.8	24.6	31.5	23.4
7	32	22.1	33.2	21.1	30.4	24.6	32.2	22.9	31.3	23	33.1	23.5	31.4	24	31.6	23.5
8	29.4	21.9	32.6	22.6	30.8	23.3	32.7	22	31	22	31.6	23.3	29.9	22.3	30.3	23.4
9	30.1	21.2	33.1	21.5	29.4	22.9	31.2	21.4	30.7	21.1	32.5	22.4	30.9	23.4	30.3	22.5
10	31	21.8	32.1	21.6	29.5	22.8	29.2	21.1	30	21.1	28.7	22.7	29.8	22.3	29.3	22.5
11	28.4	21.5	32.6	22.1	29.5	22.4	31.8	22.3	30.6	21.6	31.5	22.9	30	23	30.5	22
12	30.1	20.9	33.1	22.4	30.8	23.5	32.2	21.4	30.6	22.3	32	22.5	28.8	22.5	30.6	21.7
13	29.8	21.4	32.6	22.1	29.5	22.5	30.7	22.6	30.8	22	30.8	22.5	30.1	22.4	31.2	22.6
14	29.9	20	32.8	22.3	28.9	22.9	32.2	21.2	30.8	21.8	33.2	22.8	31.8	22.7	30.6	22.4
15	30.3	20.6	31.6	21.6	30.3	23.1	31.7	22.5	31.5	21.8	32.6	22.2	31.1	22.6	31.5	23.8
16	30.5	21.5	32.1	22.1	30	23.8	32.7	22.4	31.4	22	34.6	22	30.5	23.1	32.2	23.5
17	30	21.2	31.6	22.6	29.3	23	31.7	22.2	31.6	23.5	33.5	22.8	31.4	23.8	30.9	23.5
18	30.1	21.7	32.1	22.5	28.6	23.4	31.7	22.2	31.8	23	33.2	23.6	33.3	22.6	31.7	23.5
19	28.7	22.2	31.8	22.9	29.5	23.5	31.7	21.5	32	22.3	33.1	22.9	33	23.5	32.5	23.5
20	30.9	21.7	31.6	22.6	30	23	31.8	22.3	32.6	22.9	32.5	22.7	32.4	23.8	33.5	24.5
21	29	21	30.6	22.8	28	28	29.7	22.3	30.4	23.5	29.2	23.2	31.8	23.3	31.9	23.5
22	28.4	20.97	31.1	23.1	28	24	29.2	22.5	31.2	23.2	31.1	23.1	31.1	24.1	32.6	24.9
23	31.2	22.4	31.4	24.1	29	26.1	32.2	22.2	30.9	22	32.4	22.9	29.2	23.5	31.3	24.8
24	30.9	22.6	31.8	23.1	29.2	24.3	30.5	21.5	33	22.8	32.4	23.3	29.8	23.4	31.2	23.6
25	29.7	23.8	32.6	23.1	28	22.6	31.9	21.9	32	22.4	32.3	22.9	29.6	23.6	31.3	24.2
26	31.8	23.3	31.5	22.9	30.8	24.1	32.7	21.5	32.6	22.5	32.2	24	32.8	22.8	32.3	22.9
27	30.8	22.1	32.9	22.8	29.8	23.5	31.7	23.4	33	22.5	33.1	24.3	31.5	23.2	33.5	23
28	31.7	21.3	32.1	21.1	30	23.1	27.7	22	32.5	24	31.8	22.6	32.3	22.6	32.9	22.5
29	30.5	22.3	32.6	22.6	28.8	24	31.2	21.8	31.7	22.7	32.3	22.8	31.3	23.1	30.8	22.7
30	29.8	21.6	34.1	23.1	31.3	23.5	32.7	22	31.1	21.5	33.6	21.8	30.8	22.9	-----	-----
Mean	30.4	21.6	32.4	22.4	29.4	23.4	31.5	21.9	31.4	22.3	32.2	22.9	31.1	23.1	31.4	23.2

Day.	Iwahig.		Surigao.		Maasin.		Cebu.		Iloilo.		San Jose Buenavista.		Cuyo.		Ormoc.	
	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.
	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.
1	28.1	21.3	30.3	23.8	32.8	22.8	30.5	22.6	30.6	24	31.7	23.2	31	24	30.1	23.1
2	30.3	21.3	32	22.7	34	22.5	30.9	23.9	30.4	23.5	31.6	23	30.7	24.1	30.4	22.8
3	31.4	21.9	34.9	22.8	33.5	22.8	31.9	25.8	30.2	26	30.7	24	30.4	25.3	30.4	24.7
4	32.1	21.6	34.1	23.3	34.5	24.5	33	25.9	31.7	23.6	31.2	25.6	30.5	26.5	31.5	24.2
5	32.6	22	33.5	23.6	34.1	24.5	33.4	24.9	31.4	25.3	31.8	22.6	31.4	26.9	31.7	22.9
6	32.5	22.2	33.3	24.3	35	23.5	32.3	25.9	32.7	24.4	32.7	24	32.2	25.5	32	23
7	32.4	21.2	35	23.9	34.6	24.1	32	25.7	32.4	24.1	31.8	23	32.7	24.1	31.1	23.4
8	31.4	22.2	33	22.9	31.5	23.8	31.8	23.1	30	24.3	30.1	23.2	27.9	23.6	29.9	23.5
9	32.9	22.7	33.5	23.7	32	23.5	32.6	22.6	31.7	23.9	32.7	23	32.2	23.7	31.9	21.9
10	29.5	22.4	31.4	23.1	31.5	22.8	29	23.5	30	24	30.2	23.5	29.4	24.4	28.8	23.8
11	27.8	22.4	32.1	23.2	32	22.2	31.9	23.4	29.3	22.7	28.8	23	30.9	23.3	29.4	22.9
12	32.2	22.2	31.5	23.3	32.2	23.5	31	22.5	29	23.1	31.2	23.4	28.7	23.8	31.6	23.4
13	31.4	21.6	32.1	22.7	31.5	21.9	31	23	31.2	22.5	31.2	23.2	30.5	24	29	23.8
14	31.4	21.4	34.9	23.4	32	22.6	29.5	24	29	22.8	29.8	23	29.6	23.2	29.5	23.3
15	31.6	21.1	33.3	23.8	34	23	30.9	24.3	29	23.5	27.6	22.8	28.9	23.6	31	23.6
16	32.4	21.3	33.8	23.8	34	23.4	32.1	24.6	31.6	24	30.6	22.2	29.8	23.7	31.8	23
17	32.6	20.6	35.1	23.8	35	22.8	32	24.5	32	23.4	32.2	22.6	30.5	23.4	32.2	22.7
18	32.8	20.9	34	23.8	34.5	24	31.6	24	31.4	23.5	32.7	23.5	32.9	23.2	32.1	22.9
19	32.8	21	34.1	24.4	33	24.3	31.7	25.1	31.8	23.3	33.2	23	32.9	24.1	32.6	22.8
20	32.5	21.1	33.9	26.3	35	24.4	32.5	25.5	31.6	24.8	32	23.1	33.3	24.4	31.5	23.8
21	33.3	22.4	31	24.3	34.2	24.6	31.2	26.2	30.7	23.2	29.7	23.5	30.5	25	29.8	25.3
22	32.2	23.3	31.2	23.6	31	23.3	32	26.5	29.5	24.4	27.2	23.6	27.9	26.5	29.1	24.3
23	30.3	23	33	25.8	30.6	24.5	30.4	23.8	29	23.5	27.8	23.5	27.4	24.2	30.9	25.2
24	29.1	23.7	29.3	23.6	30	26	29.3	25.6	28.2	22.5	28.3	24.1	30.8	24.1	30.4	26.5
25	31.4	23.5	33	23.7	32	24.4	30.1	25.1	29.6	23.8	30.2	24.6	30.7	24.6	31	26.6
26	31.5	22.1	31.7	24	32.4	24	30.6	24.9	29.7	21.6	30.2	23.1	28.3	24.2	30.8	24.9
27	32.1	21.3	32.7	24.3	32.5	24.9	31.1	24.5	28	23.5	29.6	22.5	28.5	22.1	31.2	24.1
28	33.4	23.4	32.5	23.8	33	23.5	30	23.6	31	25.2	31	22.6	29.5	23	32.1	23.3
29	28.9	23.4	31.4	23.1	34	23.6	31.5	24.4	29.7	24.4	29.2	23.1	25.7	22.4	31.9	23.4
30	31.3	21.6	32.9	22.6	35	23.4	32.3	24.1	30.5	23	31.2	22.5	31.1	22.9	32.6	22.5
Mean	31.5	22	32.8	23.7	33	23.6	31.3	24.4	30.4	23.7	30.6	23.3	30.2	24.1	30.9	23.7

<sup>a</sup> The maximum temperatures from the 17th to 28th, are taken from a self-registering apparatus.

Maximum and minimum temperatures at the stations of the Weather Bureau, September, 1916—Contd.

Day.	Guiuan.		Tacloban.		Capiz.		Borongan.		Catbalogan.		Calbayog.		Masbate.		Romblon.	
	Maxi-mum.	Mini-mum.	Maxi-mum.	Mini-mum.	Maxi-mum.	Mini-mum.	Maxi-mum.	Mini-mum.	Maxi-mum.	Mini-mum.	Maxi-mum.	Mini-mum.	Maxi-mum.	Mini-mum.	Maxi-mum.	Mini-mum.
	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.
1	30.2	24.2	30	23.5	31.5	23.6	29.6	22.8	30.3	22.7	30.6	23.6	31.2	24.2	33.8	23.8
2	31.1	23.1	31	22.3	31.5	23.3	32.6	22.3	30.9	21.8	32.1	23	31.6	25	32	23.5
3	32.4	27.3	31	23.4	31.7	23.1	32	22.9	32.1	24.8	31.2	24.6	30	24.6	31.8	24.3
4	33.3	27.4	32.2	22.1	33.7	23.6	32.6	21.2	32	23.8	32.9	26	31.4	26.5	32.7	23.5
5	31.4	23.7	31.9	24	34.9	23.5	31.7	22.4	32.5	23.3	31.6	23.9	32.2	24.6	35.2	25.7
6	33.2	25.5	32.1	25	33	23.7	32.2	23.3	32.7	22.7	32.4	23.4	31	25.5	35.8	23.7
7	32	23	32.6	23.5	32.4	23.7	32.5	22.7	32.5	23.2	31.7	23.4	32.2	25.6	34.4	23.9
8	31.2	22.8	32	24	31.3	23.5	30.9	22.7	30.6	22.4	31.8	22.9	30.8	25.8	33.4	23.5
9	31.8	23.1	32	23.5	32.6	23.8	32.1	22.8	30.5	22.4	34.7	22.8	32	24.5	35.1	23.1
10	31.4	23.5	30.8	22.6	31	23.4	32	23.1	30.2	22.5	30.9	23.6	30.6	24.5	31.5	23.9
11	28.8	24.5	28.1	22.9	32.4	23	32	22.7	29.8	22.8	30.4	23.3	30.6	23.8	32.6	23.7
12	30.8	23.5	30	22.7	30.8	23.7	31	22.9	29.5	22.6	30.6	23.4	28.8	24	32.7	23.2
13	29.5	24.2	30.6	22.5	31.7	23.2	28.2	22.3	27.9	22.8	31.6	23.1	30.8	24.4	33.6	23.3
14	32.1	22.8	31.6	22.5	29.4	23.3	29.9	21.9	31.4	23.1	30.2	23.9	29	23.8	29.5	22.8
15	29.8	23.2	30.1	23	31.6	22.4	29.3	22.7	30.7	22.6	30.2	23.4	31.5	23.6	31.5	22.4
16	31.3	23	32.5	23.5	31.9	23.2	31.5	22	32.2	22.2	31.6	23.3	31	24.6	33.4	23
17	32.6	22.7	33.1	23.5	32.3	22.1	32.2	22.3	31.6	22	33.4	23.4	31.4	24.8	33.5	23.3
18	32.5	23.5	33	24	33.4	22.7	32.8	22.6	31.9	21.8	31.4	23	31.4	24.6	34.4	23.1
19	32.6	23.6	33.2	23.6	34	22.8	32.9	22.3	32.1	24.1	35.2	23.9	32.6	25.8	35.3	23.7
20	31.9	23	33.5	25	34	24.1	34.8	23.5	32.6	25.5	34	25.2	32.2	27.2	35	24.4
21	32.3	27.5	29.9	24.4	33.3	23.7	31.9	24	30	24.5	31.4	25.3	31.8	26.5	34	24.4
22	30.6	27.1	29.9	24.5	29.9	24.2	30.1	24	28.7	23.7	27.2	24.8	27.8	23.8	30.3	24.4
23	31.7	26.1	32.2	23.6	30.5	23.5	32	23.2	31	23	28.7	23.8	31.2	24.4	31.5	23
24	30.4	24.5	31	23.5	32.5	23.5	32	22.9	30.5	24.5	29.7	26.6	30.5	24.8	31.6	24
25	30.9	23.8	31.2	23.5	32.5	23.8	31.8	23	30.5	25.2	29.3	23.6	30.2	24.6	32.4	22.8
26	31.9	26.5	31	23.7	33.9	23.3	33.2	23.1	32.5	25.2	30.6	25.8	30.4	25.6	30.5	22.7
27	31.6	22.9	30.7	22.5	32.3	24.3	32.1	22	29.6	22.6	30.7	23.7	31	25.2	30.7	22.5
28	32.2	25.2	32.3	23	32.4	23.3	31.6	22.6	30.5	24.3	31.2	23.8	30.2	26.2	34.3	24.7
29	31.8	24.5	31.7	23.4	31.3	23	31.4	23.3	30.6	23	31.8	23.6	29.4	23.8	30.5	23.2
30	33.8	22.6	32.6	22.2	32.9	22.8	32	21.4	31.5	22.2	31.1	23.3	31	24.8	33.3	23.4
Mean	31.6	24.3	31.5	23.4	32.2	23.4	31.6	22.7	31	23.2	31.3	23.9	30.9	24.9	32.9	23.6

Day.	Batag.		Sorsogon.		Legaspi.		Sumay, Guam.		Calapan.		Virac.		Naga.		Batangas.	
	Maxi-mum.	Mini-mum.	Maxi-mum.	Mini-mum.	Maxi-mum.	Mini-mum.	Maxi-mum.	Mini-mum.	Maxi-mum.	Mini-mum.	Maxi-mum.	Mini-mum.	Maxi-mum.	Mini-mum.	Maxi-mum.	Mini-mum.
	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.
1	28.3	22.3	30.5	23	31.5	24.4	30.2	23.2	33.6	23	30.3	22.6	30	21.6	33	22.9
2	28.5	22.9	30.1	23.2	30.4	23.6	30.3	24	32.5	22.5	29.6	22.7	29.1	21.8	31.6	23.2
3	29.4	23.8	29.4	23	29.7	24.1	30.8	23.4	33.8	22.9	29.7	23.4	29.6	22.5	31.3	23.8
4	32.5	23.4	22	22	31.9	23.5	30.8	25.2	33.5	24.1	32.3	23	32.3	24	30.7	23.8
5	30.8	23.5	30.5	24	34	24.4	29	24	32.9	23	31.6	24.4	34.5	23	31.9	23.7
6	29.8	23	(a)	23.2	32.9	23.6	30.8	24.4	32.3	22	31.6	24.1	35	21.8	33.2	22.9
7	30.6	24		23.5	32.5	25.4	30.8	24.2	33.1	21.9	32	22.7	33.3	21	32.6	23.7
8	30.9	23.5		23	31.8	24.4	30.8	24.8	33.1	22.6	31	22	32	21	32	22.2
9	30.3	23.1		22	33.4	23.6	29.8	23.8	32	22.5	33.2	20.9	34	24	32.5	21.9
10	30.5	23.8		24.1	32	23.9	29.8	23.4?	32.7	23	31.9	22.5	32.4	21.7	33.1	23.3
11	29.6	23.7		23.2	30.3	23.5	29.8	23	32.5	22.5	30.7	23.5	32.5	21.4	33.3	23.5
12	28.8	22.8		23.5	29.7	23.6	27.8	23.6	30.5	23	29.4	21.9	29.6	21	31.4	23.4
13	27.8	23.1		22.5	32.8	23.7	23.8	23.8	32.1	22.5	30.3	21.9	30.5	21.4	31.4	23.7
14	30.1	22.3		23	29.4	23.5	29	24	29	22.1	30.5	22.4	31.2	21.7	30.3	23.3
15	29.3	24.2		22.5	29.5	23.6	30.2	22.8	29	22.2	28.6	22.2	29.4	21.8	29.1	22.8
16	30.4	24	30	23	30.5	23.6	30.4	23	30.8	23	30	22.2	30.8	21.6	30.6	23.4
17	31.6	24.8	31	21.6	32.5	22.3	29	23.2	30.6	22.6	31.5	20.9	31.8	21	30.7	22.7
18	31.8	23	31.5	22	34.3	23.5	29.8	22.8	33.5	21.5	33.4	21	33.9	21	32.2	22.1
19	31.6	23	32	24.2	33.8	25.2	29.8	22.4	33.6	21.5	33.4	22.4	34.3	21	32.3	23
20	31.7	22.8	32.5	25.1	34.9	25.4	30	21.4?	35.1?	23	34	22.4	34	22.7	32.9	23.5
21	28.8	25.8	32	24.4	33.2	25.5	28.8	22.8	35.7	23	33.8	23.3	33.1	22.9	32.6	24.5
22	26.2	22.2	30	24.5	28	24.2	27.2	22.8	36?	22	28.3	30	30	23.2	31.9	25.5
23	28.9	22.7	29	21	29.4	23.7	29.6	23	31.1	22.5	30	23	28.3	22.2	28.8	23.4
24	30.2	23.6	29.2	21.2	30.8	23.4	29.4	24.2	31.3	23	29.5	23.8	31.4	22.5	26.6	26
25	29	23.7	29.9	23	31.8	23.5	29.2	23.6	29.4	23	28.5	23.2	31.4	22.5	29	24
26	30.4	22.6	29.9	22.5	30.6	24	29.4	23.6	28.6	23	31.4	21.7	30.4	22.5	27	23.3
27	30.3	22.5	31	24	28.9	24.6	30.4	23.4	33.5	23.3	32	23.6	32.3	23	31.3	23.5
28	28.8	23.3	30.2	24.6	31.7	23.2	30.8	23.4	36.5?	23.3	30.5	22.7	30	22.6	31.9	24.2
29	31.7	23.2	30.1	22.7	29.5	23.4	30	23.2	33	22	33	22.4	32.1	21.4	22.5	22.5
30	30.9	23	32	22.5	32	23.9	30.2	23.4	32.1	22.4	31.8	22.5	33.4	21.5	32	22
Mean	30	23.3	30.5	23.1	31.5	23.9	29.7	23.5	32.4	22.6	31.1	22.7	31.7	22.1	31.2	23.4

<sup>a</sup> The maximum thermometer of this station was broken.

Maximum and minimum temperatures at the stations of the Weather Bureau, September, 1916—Contd.

Day.	Lucena.		Atimonan.		Ambulong, Tanauan.		Canlubang, Calamba.		Paracale.		Santa Cruz, Laguna.		Manila.		Antipolo.	
	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.
	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.
1	32.7	22.6	30.5	23.4	31.5	22.5	31	22.1	31.8	24.4	30.5	22.2	31	23.6	30.2	21.6
2	30.8	22.7	29.5	23.9	32	22.9	30.9	22.2	27.2	23.5	30.3	22.9	31	23	30.3	21.8
3	30.9	23.3	31.3	25.3	30.7	23.3	32.1	22.4	28.6	24.9	30.3	24.4	30.6	24.6	29	23.2
4	32.4	24.7	31.3	25.7	28.4	24.2	28.8	23.1	31.2	25.6	28.6	23.9	28.5	22.7	27.8	22.1
5	31.5	23.5	31.3	25.4	30.4	23	30.1	22.8	33.8	24.5	29	23	31	23.2	29.7	21.5
6	32.3	24.1	33.2	24.3	34.3	22.8	32.9	22.7	33.8	23.6	31.6	23.3	32.9	23	31.9	23
7	33.5	23.1	33	23.3	32	23	31.3	22.6	31.9	23.2	30.6	23.1	33.3	23.3	32.7	22
8	32.1	22.5	32.1	23.4	32.4	22.2	31.4	21.5	31.8	24.4	31.5	22.9	31.6	22.8	32.9	21.2
9	32.5	21.9	33.1	23.1	34.9	22.4	32.3	21.8	32	23	32.4	22.1	32.3	22.3	32.5	21
10	32.5	23.5	31.7	23.8	31.2	22.8	29.6	22.1	29.7	24.6	29.5	23.6	31.5	23.2	31.5	20.8
11	31.2	23.6	31.6	24.3	29.9	23.3	31.8	21.6?	32	24	31	24	31.8	23.4	31.9	22
12	28.9	23.9	28.5	24	31.2	22.4	29.8	22.6	28.2	23.8	30	24	30.5	23.8	30.7	21.9
13	31	22.9	31.4	22.9	31	23.1	31	22	31.9	23.4	30.8	23.3	30.8	23	31.2	21.7
14	29.1	23	28.1	22.8	28.5	23	30.8	22.3	29	23.3	27.2	22.7	29	23	28.5	21.2
15	28.3	22.1	28.4	22.2	27	22.7	27.8	22.1	28.5	23.2	28.3	21.8	30.3	23.2	29.3	21.5
16	31.3	22.7	29.4	22.9	27.5	22.8	28.8	22.3	30	23.5	29.5	22.7	30.8	23	30.6	22
17	29.9	22.7	30.5	23.1	30.6	21.6	29.4	21	30.8	23.1	30.1	22.6	30.6	23.5	31	21.8
18	31.3	21.2	31.9	22	31	21.8	30.5	21.2	32.7	23.1	31	22.1	31	22.3	31.5	20.6
19	31.7	21.5	32.4	22.5	32	22.5	30.1	21.9?	34.2	24.3	31.5	22.8	31	23.9	31	22.3
20	33	21.7	33.6	23.1	32.7	23.2	31.3	21.8	33.6	24.6	31.5	23.2	31.8	23.9	31.3	22.3
21	33.2	23	33	23.2	33	23	32.2	23.1	34.6	25.9	31.7	24.2	32.5	23.7	31.5	22.6
22	33.6	23.6	33	24	32.5	23.2	31.9	23.4	32	24.9	30.8	24.7	31.4	23.7	30.8	22.1
23	30	22.3	31.4	23.6	29.8	23.3	29.6	22.5	32.3	24.5	30	22.7	30.4	24.4	30.6	22
24	29.5	23.7	30.6	24.8	29.2	24	30.3	23.5	32	25.5	29.8	23.9	28	24.3	28.6	22.5
25	28.6	23.2	29.1	25	27.2	24.1	28.9	23.4	32.3	25.3	28.3	24.1	29.3	24.1	28	22.5
26	28	23.5	28.9	23.8	25.4	23.5	26.5	22.6	31.2	25	27.6	23.3	27.1	23.3	26.5	22.3
27	30.6	23.4	30.9	23.2	30.2	23	30	22.4	30.7	24.2	29.3	23.3	28.5	23	28.2	21.6
28	30.7	24.4	30.7	23	30.9	23.2	27.5	22.5	29	24.1	28.4	23.5	28.1	23.4	28.7	21.6
29	27.6	22.7	29.3	22.4	26.5	23	27.9	22.4	30	23.8	28.1	22.9	28.4	23.3	29.5	21.5
30	31.1	21.9	32.2	22.3	32.1	21.9	30.9	22.1	31.4	23	31.3	22.1	32.3	22.3	32.5	21
Mean	31	23	31.1	23.6	30.5	22.9	30.2	22.3	31.3	24.1	30	23.2	30.6	23.3	30.3	21.8

Day.	Iba.		San Isidro.		Tarlac.		Baler.		Dagupan.		Bolinao.		Baguio.		San Fernando, Union.	
	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.
	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.
1	32.1	21.3	30.4	22.9	30.5	22	31.4	22.8	32.7	22.5	33.3	23.8	21.8	15.7	33.3	24.5
2	32.6	22.5	32.1	23.5	33.8	23.3	34.5	22.8	33	23.6	33.3	24.7	21.8	15.5	33.5	23.5
3	32.1	23	32	23.6	34	23.8	33.4	25	31	22.5	28.7	24.4	20	15.7	32.5	25.1
4	25.5	22.1	28.4	22.4	26	22.2	30.4	23.6	27.7	21.8	28.1	24	17.9	15.8	27	23
5	27.6	22.5	27.5	22.9	26.5	22.2	28.4	22.9	25.7	23	25.3	23	17.5	15.9	25.8	23.4
6	31.3	22.3	32.6	23.5	33.2	22.5	32.7	22.7	32.9	23	31.1	22.1	21.5	14.6	33.5	23.5
7	32	23.3	32	23.3	33.5	22.8	29.2	22.8	34.7	24.2	33.3	24.6	24.2	15.3	33	24.3
8	32	21.2	31.2	22.5	33.5	22.6	33.6	22	32.7	24.1	32.8	24.3	22.8	15.3	32.1	22.6
9	31.9	21.8	32.4	22.4	34	23.3	33.7	22.6	34.7	24.1	32.3	25	22.7	15.5	32.5	23.5
10	32.3	22.4	29.4	23.9	33.5	23	31.7	23.2	34.8	24.1	33.3	24.1	23.5	16.1	33	23.5
11	32.2	22.9	30.8	24	32	23.5	29.6	24.1	33.6	24.4	33.4	24.1	24.2	16	32.7	23.3
12	29.3	23	31	23.1	33.2	23.3	32.3	22.5	34.2	24	32.7	24.3	23.2	15.8	31.9	24.2
13	31.7	22.6	32.3	23.4	35	23.1	32	23	33.7	24.4	31.8	23.2	23.7	15.4	31.5	22.8
14	28.3	22.8	26.5	23.9	26.8	23.2	28	23.1	30.7	24.6	30.6	22.9	22.1	15.6	31.4	23.8
15	30.2	23.2	29.7	23.4	30	23.5	28	23.9	31.2	23.5	30.6	24.6	21.6	15.9	31.6	24.8
16	31.6	22.5	31.1	23.2	30.5	23.3	28	23	32.1	23.3	31.8	24.4	21.7	15.8	32	23.5
17	30.7	22.5	30	22.5	31.2	22.6	31	21.8	31.3	22.9	30.8	23.3	21.8	15	30.5	23.1
18	31.7	21.6	31.4	23.2	33.5	22.5	32.5	21.8	32.2	23.2	32.8	22.4	23.3	15	32	23.5
19	31.5	22.5	31.4	23.7	33	22.4	33	22.8	33.2	24	32.3	23.3	22.5	14.9	32.8	22.7
20	32	22.9	32.6	24	33	22.3	34	23.2	32.4	24.1	32.8	24.3	22.4	15.7	32.9	24
21	32.3	22.7	32.4	24	34	22.4	34.7	24.8	32.1	25.4	32.5	24.4	23	15.7	32.9	25
22	30.4	23.1	31.5	23.7	31.5	22.4	35.5	24.5	31.6	25	30.7	25	23.3	16.3	32.5	24.3
23	31.7	23.5	30.4	24	30.6	23.5	30.7	23.8	34.1	23.9	32.8	25.2	22.1	16.3	32.5	24.3
24	29.9	23	28.4	24	29.2	23.6	31	23.2	32.6	24	28.8	24.5	21.2	16.5	32.5	24.5
25	28	23.1	27.4	23.5	28	23.4	29.3	23.7	27.2	23.7	25.4	23.6	18.1	15.7	27.9	23.7
26	28.8	23	26.1	23.2	27.2	23	28.9	23.4	30.6	23.4	29.2	23.5	22.4	15.6	32.5	23.8
27	29.9	22.7	26.5	23.1	27.5	23.3	27.5	23	27.2	23.5	27.3	24	19.2	15.4	30	23.5
28	26.1	22.8	27.4	23.1	27.3	23.2	31.5	23.3	24.8	23.3	24.6	23.4	17.8	15.7	25.7	23.8
29	29.4	21.8	29.9	23.4	31.3	22.6	32.2	23	31.7	23	31.6	22.5	20.3	15.3	31	22.7
30	31.7	23	31.3	23	32.7	22.8	32.4	23.3	31.7	23.5	31.5	23.6	23.3	15.7	32.6	22.7
Mean	30.6	22.6	30.2	23.3	31.2	22.9	31.4	23.2	31.6	23.7	30.8	23.9	21.7	15.6	31.5	23.7



METEOROLOGICAL BULLETIN.

Maximum and minimum temperatures at the stations of the Weather Bureau, September, 1916—Contd.

Day.	Echague.		Candon.		Vigan.		Tuguegarao.		Laoag.		Aparri.		Cape Bojeador.		Sto. Domingo, Batanes.	
	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.
	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.
1	32.5	22.3	31	24.9	32.3	23.8	35.6	24.4	34.3	23.9	30.6	24.3	32.2	24.6	32.4	22.8
2	34.5	23.3	31.2	24.4	33.7	24	32.5	23.4	34.9	23.5	29.9	24.3	33.5	24.8	31.7	24.4
3	32.2	23.6	32.9	26	32.9	24	31	23.8	33.2	24.2	29.5	25	32.8	23.8	31.9	24.5
4	29.4	22.5	28.5	25.2	27.7	22.4	25.2	22.6	25.8	23	26.9	23.1	29	23.5	28.3	22.6
5	29.9	22.1	27.5	23.7	26.8	22	30.6	23	25	23	29.2	22.8	29	23.5	30.9	25.8
6	34	22.9	32	23.4	33.2	22.7	33	23.7	34.3	22.7	31.8	23.6	32.6	24.6	30.9	25.3
7	33.7	22.2	32	25	32.2	23.6	35.7	23.2	34.4	24.2	31.7	23.8	33	24.6	31.7	25
8	32	22.8	32.8	24	32.3	22.6	32.5	23.6	34.9	22.8	29.8	23.2	30.2	22.8	31	25.1
9	33.1	23.4	32	24.5	32.4	23.1	33	23.7	35.1	24	30.1	24	30.5	23.5	30.6	24
10	33.4	23.3	31.8	25	33.6	24	34.4	23.2	35.1	24.9	32.4	23.8	33.2	24.8	31.9	24.9
11	33.7	22.7	32.4	25.5	33.1	23.8	34.7	23.3	35.1	24.8	32.5	24.8	33	24.8	32.2	25.6
12	33.5	22.4	31.5	25.6	32.8	22.2	36.8	23.2	34.3	24.3	32.4	25.1	32.6	24.6	32.4	25.4
13	33.8	22.8	31.5	24.5	31.6	22.5	35.1	22.4	33.9	23.9	31.8	24.3	33.2	23.2	32	24.6
14	29.3	23.3	31.5	25.5	32.2	23.7	29.8	23.5	34.3	24	30.3	24.3	32	22.8	31.6	24.4
15	29.9	23.6	31.5	26.5	32.2	22.3	32.4	24.1	35.8	24.5	29.8	24.5	33.8	22	31.2	24.9
16	31.5	22	31	24.5	32.7	22.3	32.8	22.4	34.1	24	31.3	23.3	33.8	23.8	31.5	24.5
17	30.9	22.1	30.9	24.5	30.7	22.5	33	22.6	32.3	23	30	22.8	32	22.8	29.8	22.7
18	32.6	22.5	30	24	32.8	22.3	34	23	32.1	22.1	29.3	23.3	32.2	22.4	31.3	25
19	34	24	31.2	24.5	33.2	22.8	34	23.2	33.3	23	30.3	23.8	32.5	23.8	31.2	25.1
20	34.4	25	32.2	24.7	32.7	23.5	34.8	23.3	33.9	23	30.8	23.8	32.5	24.4	31.4	25.2
21	34	25	33	25.5	33.2	24.3	35	24.1	33.5	24	30.9	24.3	31.8	24.8	31	25.4
22	32.7	23.7	32.7	25.5	32.1	23.9	34.3	24.1	32.2	24.5	30.1	24.3	33.5	24.4	31.3	25.4
23	28.4	24.3	32.5	25.5	33.2	23.3	29.2	24.1	34.1	24.2	31	24.5	30.7	23	28.6	24.9
24	33.7	23.6	30	25.5	28.9	22.6	33.6	24.3	31.5	23.9	30.9	24.3	31.2	22.8	29.5	24.5
25	28.5	24.2	27.7	25	28	23.3	28.8	24.6	28.5	24.5	27.3	24.6	29.8	23.5	28.5	25.1
26	31.4	22.9	32.5	24.5	31.8	24	31.5	23.8	32.5	24.2	28.3	24.4	30.8	23.8	28	23.7
27	30.5	22.9	32.6	25.4	30	23.8	32.4	22.7	31.6	24.2	30.4	23.4	32.2	22.8	28.2	22.4
28	30.5	22.9	27.6	24.6	28	22.6	32	22.5	30.2	23	29.6	22.1	30.2	21.4	30.5	24.8
29	29.5	22.2	29.8	24	30.3	22	30	23.5	31.6	22.3	27.3	23.2	28	23	29.2	25
30	33.5	22.3	31	24.9	30.7	22.9	34	23.4	33.2	23.9	31	23.2	30	23	26.6	23.6
Mean	32	23.1	31.2	24.9	31.6	23.1	32.7	23.4	32.8	23.7	30.2	23.9	31.7	23.6	30.6	24.6



## SEISMOLOGICAL BULLETIN FOR SEPTEMBER, 1916.

By Rev. MIGUEL SADERRA MASÓ, S. J.,  
*Assistant Director of the Weather Bureau.*

### EARTHQUAKES FELT IN THE PHILIPPINES.<sup>1</sup>

1, 3<sup>h</sup> 38<sup>m</sup> [1, 11<sup>h</sup> 38<sup>m</sup>]. Agusan Valley (E Mindanao). Earthquake shocks of intensity III-IV; their origin seemingly lay in the Butuan Bay.

2, 7<sup>h</sup> 41<sup>m</sup> [2, 15<sup>h</sup> 41<sup>m</sup>]. Naga (SE Luzon). Oscillatory earthquake, direction SE-NW, intensity III, duration 4 seconds.

3, 7<sup>h</sup> 55<sup>m</sup> [3, 17<sup>h</sup> 34<sup>m</sup>]. Guam (Mariana Islands). Earthquake of intensity III.

3, 10<sup>h</sup> 17<sup>m</sup> 18<sup>s\*</sup> [3, 18<sup>h</sup> 17<sup>m</sup> 18<sup>s</sup>]. Laoag (NW Luzon). Oscillatory earthquake of intensity III; it originated in the China Sea.

7, 11<sup>h</sup> 08<sup>m</sup> 52<sup>s\*</sup> [7, 19<sup>h</sup> 08<sup>m</sup> 52<sup>s</sup>]. S Luzon. Earthquake of intensity III, felt in the province of Batangas and northern part of Mindoro Island. Its origin was in the Mindoro Strait. At 11<sup>h</sup> 10<sup>m</sup> 19<sup>s\*</sup> [19<sup>h</sup> 10<sup>m</sup> 19<sup>s</sup>] occurred a second shock of intensity III-IV, which affected the same region.

8, 16<sup>h</sup> 07<sup>m</sup> 29<sup>s\*</sup> [9, 0<sup>h</sup> 07<sup>m</sup> 29<sup>s</sup>]. Camarines and Albay (SE Luzon). Oscillatory earthquake, with NNE-SSW direction at Legaspi and ENE-WSW at Naga; it did not exceed intensity III-IV. Probably it originated in the sea near the NE coast of Camarines.

8, 19<sup>h</sup> 10<sup>m</sup> 00<sup>s\*</sup> [9, 3<sup>h</sup> 10<sup>m</sup> 00<sup>s</sup>]. Iba (W Luzon). Oscillatory earthquake, direction SW-NE, intensity III-IV, short duration. A light repetition occurred at 19<sup>h</sup> 20<sup>m</sup> 12<sup>s\*</sup> [3<sup>h</sup> 20<sup>m</sup> 12<sup>s</sup>].

9, 8<sup>h</sup> 22<sup>m</sup> 28<sup>s\*</sup> [9, 16<sup>h</sup> 22<sup>m</sup> 28<sup>s</sup>]. S Luzon. Earthquake of intensity IV in the province of Batangas and N Mindoro, its epicenter lay also in the Strait, separating this Island from Luzon.

9, 13<sup>h</sup> 17<sup>m</sup> [9, 21<sup>h</sup> 17<sup>m</sup>]. Iba (W Luzon). Earthquake shocks of intensity II-III.

9, 16<sup>h</sup> 42<sup>m</sup> 53<sup>s\*</sup> [10, 0<sup>h</sup> 42<sup>m</sup> 53<sup>s</sup>]. Butuan (N Mindanao). Earthquake of intensity II. This earthquake had its origin in the Pacific at a great distance from Mindanao, it was not reported by any other station. At Butuan on account of the alluvial soil the seismic vibrations seem to increase their amplitude and make themselves perceptible while they pass unnoticed in other places.

11, 5<sup>h</sup> 37<sup>m</sup> 46<sup>s\*</sup> [11, 13<sup>h</sup> 37<sup>m</sup> 46<sup>s</sup>]. S Luzon. Earthquake shocks of intensity III felt in the same region and originated in the same place as those experienced on the 7th and 9th. Four minutes earlier at 5<sup>h</sup> 33<sup>m</sup> 24<sup>s\*</sup> [13<sup>h</sup> 33<sup>m</sup> 24<sup>s</sup>] the seismographs of Manila and Ambulong had recorded another light disturbance from the same origin.

12, 17<sup>h</sup> 11<sup>m</sup> 53<sup>s\*</sup> [13, 1<sup>h</sup> 11<sup>m</sup> 53<sup>s</sup>]. N Luzon. Earthquake felt through all the northern provinces lying above the 16° N parallel. The epicenter was in the Mountain Province near 17.5° N and 121° E, where exists a well known and active center. The greatest intensity of the shocks near the epicenter probably was not below grade VI-VII. At 19<sup>h</sup> 44<sup>m</sup> 25<sup>s\*</sup> [13, 3<sup>h</sup> 44<sup>m</sup> 25<sup>s</sup>] a repetition took place, which was felt only in the Mountain

<sup>1</sup>The intensity of earthquakes is given in the notation known as the Rossi-Forel scale. The time is that indicated by the seismographs at the Central Observatory whenever the disturbance has been registered by them. This fact is denoted by an asterisk (\*). Otherwise the time is that noted by the observer who sent the report. All time indications are in Greenwich mean time (midnight=0<sup>h</sup>), insular time being added in brackets for the convenience of Philippine readers.

Province, where some reports show that many minor aftershocks were also noticed. This earthquake was registered outside of the Philippines in some of China and Japan observatories.

13, 1<sup>h</sup> 50<sup>m</sup> [13, 9<sup>h</sup> 50<sup>m</sup>]. **Agusan Valley (E Mindanao)**. Earthquake of intensity V, with the epicenter in the central part of the valley at a distance of less than 100 kilometers from Butuan: in this station the intensity of the shocks was II-III, while at La Esperanza, some 35 kilometers farther south it reached number IV.

13, 8<sup>h</sup> 05<sup>m</sup> [13, 16<sup>h</sup> 05<sup>m</sup>]. **Ormoc (W Leyte)**. Oscillatory earthquake, direction NW-SE, intensity III, duration 5 seconds.

13, 19<sup>h</sup> 32<sup>m</sup> 42<sup>s\*</sup> [14, 3<sup>h</sup> 32<sup>m</sup> 42<sup>s</sup>]. **Iba (W Luzon)**. Earthquake of intensity III.

14, 1<sup>h</sup> 36<sup>m</sup> 58<sup>s\*</sup> [14, 9<sup>h</sup> 36<sup>m</sup> 58<sup>s</sup>]. **W Luzon**. Earthquake shocks of intensity III felt along the Zambales Province and the western part of Cavite and Batangas. The origin lay in the China Sea at a distance of some 160 kilometers west of Manila.

16, 6<sup>h</sup> 51<sup>m</sup> 44<sup>s\*</sup> [16, 14<sup>h</sup> 51<sup>m</sup> 44<sup>s</sup>]. **Laoag (NW Luzon)**. Earthquake of intensity III, duration 6 seconds.

18, 17<sup>h</sup> 06<sup>m</sup> 18<sup>s\*</sup> [19, 1<sup>h</sup> 06<sup>m</sup> 18<sup>s</sup>]. **Iba (W Luzon)**. Earthquake of intensity III, short duration. The place of origin was the same where originated the shocks of the 14th. Some hours later, at 20<sup>h</sup> 47<sup>m</sup> 35<sup>s\*</sup> [19, 4<sup>h</sup> 47<sup>m</sup> 35<sup>s</sup>] the seismographs of Manila and Ambulong registered a light aftershock from the same origin.

24, 16<sup>h</sup> 36<sup>m</sup> [25, 0<sup>h</sup> 36<sup>m</sup>]. **Butuan (N Mindanao)**. Earthquake of intensity IV; the origin was very near, probably toward northwest.

30, 9<sup>h</sup> 12<sup>m</sup> [30, 18<sup>h</sup> 51<sup>m</sup>]. **Guam (Mariana Islands)**. Earthquake of intensity II-III.

Remarks.—The seismic activity of this month may be considered as extraordinary; although there was but one extensive earthquake yet minor shocks of volcanic character, on account of their small extension, were exceptionally frequent in SW Luzon. They were 12 in all, and on the 9th not less than six were registered in the Observatory. That same date was also the day of greatest seismicity in Mindanao Island, the seismograph at Butuan registering ten disturbances, all of them originated within that island and in the neighbouring seas. Even the station of Guam reported the highest number of disturbances of the year, the days 19 and 20 being the most disturbed with three and five shocks, respectively.

#### RECORDS OF THE MICROSEISMOGRAPH.

[Time: Greenwich mean. Midnight=0<sup>h</sup>. Instrument: Wiechert seismograph; 1,000 kilograms.  $A_N$ :  $T_0=6.1$ ,  $\epsilon=1.93$ ,  $\frac{r}{T_0^2}=0.050$ ;  
 $A_E$ :  $T_0=6.1$ ,  $\epsilon=2.89$ ,  $\frac{r}{T_0^2}=0.035$ . Alluvium. 2.40 meters above sea level.]

No.	Date.	Character.	Phase.	Hour.	Period.	Amplitude.		Remarks.
						$A_N$ $\mu$	$A_E$ $\mu$	
289	3	I <sub>r</sub>	eP	h. m. s.				Laoag (NW Luzon).
			S	7 21 12				
			L	27 17				
			M <sub>E</sub>	32 45				
			M <sub>N</sub>	39 01	16		5	
F	39 34	16	7					
290	3	I <sub>v</sub>	eP	8 12				
			L	10 17 18				
			M <sub>N</sub>	18 11				
			M <sub>E</sub>	18 28	4	39		
			F	18 48	4		44	
291	3	I <sub>v</sub>	eP	26				
			L	15 36 20				
			M <sub>E</sub>	36 42				
			M <sub>N</sub>	36 52	2		68	
			F	36 57	3	72		
			44					

## Records of the microseismograph—Continued.

No.	Date.	Character.	Phase.	Hour.	Period.	Amplitude.		Remarks.
						A <sub>N</sub> μ	A <sub>E</sub> μ	
292	5	I <sub>r</sub>	e S L M <sub>N</sub> F	22 21 29				
				26 56				
293	6	I <sub>r</sub>	e S L M <sub>N</sub> F	31 22				
				34 25	10	14		
294	7	I <sub>v</sub>	eP L M <sub>E</sub> M <sub>N</sub> F	23 12				
				8 17 43				
295	7	II <sub>v</sub>	eP L M <sub>E</sub> M <sub>N</sub> F	23 36				
				26 40				
296	8	I <sub>v</sub>	eP L F	29 01	12	4		S. Luzon. End overtaken by following earthquake.
				53				
297	8	II <sub>v</sub>	eP L M <sub>E</sub> M <sub>N</sub> F	11 08 52				S. Luzon.
				09 06				
298	8	I <sub>v</sub>	eP L F	09 08	3	76		Camarines and Albay (SE Luzon).
				09 14	2	58		
299	8	I <sub>v</sub>	eP L F	11 10 19				Iba (W Luzon). End overtaken by following earthquake.
				10 33				
300	9	I <sub>v</sub>	eP L M <sub>N</sub> F	10 37	4	279		Iba (W Luzon) a light repetition.
				11 09	4	132		
301	9	I <sub>v</sub>	eP L M <sub>N</sub> F	19 10 00				S. Luzon.
				10 17				
302	9	I	e M <sub>N</sub> F	10 27	4	165		End overtaken by following earthquake.
				10 33	4	141		
303	9	I	e M <sub>N</sub> F	19 20 12				Butuan (N Mindanao).
				20 23				
304	9	I <sub>r</sub>	eP S L M <sub>N</sub> F	22 34 07				S Luzon, foreshock.
				34 18				
305	11	I <sub>v</sub>	eP L M <sub>N</sub> F	37				S Luzon.
				8 22 28				
306	11	II <sub>r</sub>	eP L M <sub>N</sub> F	22 44				S Luzon.
				22 53	2	158		
307	11	II <sub>r</sub>	eP S L M <sub>N</sub> F	30				N Luzon.
				22 58	2	158		
308	12	II <sub>v</sub>	eP L M <sub>N</sub> M <sub>E</sub> F	12 22 45				N Luzon, aftershock.
				23 01				
309	12	I <sub>v</sub>	eP L M <sub>N</sub> M <sub>E</sub> F	23 16	2	66		
				29				
310	12	I <sub>v</sub>	eP L M <sub>N</sub> M <sub>E</sub> F	12 31 49				
				38 16	9	4		
311	12	I	e M <sub>N</sub> F	12 46 12				
				53 47	9	5		
312	12	I <sub>r</sub>	eP S L M <sub>N</sub> F	13 21				
				16 42 53				
313	12	I <sub>v</sub>	eP L M <sub>N</sub> F	44 45				
				46 07				
314	12	I <sub>v</sub>	eP L M <sub>N</sub> F	47 00	7	6		
				57				
315	12	I <sub>v</sub>	eP L M <sub>N</sub> F	5 33 24				
				37				
316	12	II <sub>r</sub>	eP L M <sub>N</sub> F	5 37 46				
				38 00				
317	12	II <sub>r</sub>	eP L M <sub>N</sub> F	38 17	2	158		
				48				
318	12	II <sub>r</sub>	eP S L M <sub>N</sub> F	6 35 55				
				38 07				
319	12	II <sub>v</sub>	eP L M <sub>N</sub> M <sub>E</sub> F	40 15				
				42 14	10	197		
320	12	II <sub>v</sub>	eP L M <sub>N</sub> M <sub>E</sub> F	7 40				
				17 11 53				
321	12	I <sub>v</sub>	eP L M <sub>N</sub> M <sub>E</sub> F	12 36				
				12 48	3	381		
322	12	I <sub>v</sub>	eP L M <sub>N</sub> M <sub>E</sub> F	12 50	5	370		
				29				
323	12	I <sub>v</sub>	eP L M <sub>N</sub> M <sub>E</sub> F	19 44 25				
				48				

## Records of the microseismograph—Continued.

 $A_N: T^{\circ}=6.19, \epsilon=1.966, \frac{r}{T_{\text{Co}_2}}=0.053; A_E: T^{\circ}=5.96, \epsilon=2.267, \frac{r}{T_{\text{Co}_2}}=0.056.$ 

No.	Date.	Character.	Phase.	Hour.	Period.	Amplitude.		Remarks.
						$A_N$ $\mu$	$A_E$ $\mu$	
310	13	Iv	eP F	<i>h. m. s.</i> 10 58 13 11 00				
311	13	Iv	eP L F	19 32 42 33 02 36				Iba (W Luzon).
312	13	Iv	eP F	19 37 24 39				
313	14	IIIa	eP L	1 36 58 37 16				W Luzon. Maxima and end lost by the pens thrown off by the force of the shock.
314	15	IIr	e S L M <sub>N</sub> M <sub>E</sub> F	7 06 47 11 50 15 55 21 06 21 21 8 17		11 12	42 14	Hachijioshima Islands (Japan).
315	16	Iv	eP L M <sub>N</sub> F	6 51 44 52 26 53 43 7 03		4	18	Laoag (NW Luzon).
316	18	IIv	eP L	17 06 18 06 34				Iba (W Luzon). Maxima and end lost by the force of the shock.
317	18	Iv	eP F	20 47 35 51				
318	19	Iv	eP F	0 51 14 54				
319	30	I	e F	16 38 31 53				

TEMBLORES DE TIERRA SENTIDOS EN FILIPINAS.<sup>1</sup>

1, 3<sup>h</sup> 38<sup>m</sup> [1, 11<sup>h</sup> 38<sup>m</sup>]. Valle del Agusan (E de Mindanao). Temblor de tierra de intensidad III-IV; su origen probablemente se hallaba en la bahía de Butúan.

2, 7<sup>h</sup> 41<sup>m</sup> [2, 15<sup>h</sup> 41<sup>m</sup>]. Naga (SE de Luzón). Temblor oscilatorio, dirección SE-NW, intensidad III, duración 4 segundos.

3, 7<sup>h</sup> 55<sup>m</sup> [3, 17<sup>h</sup> 34<sup>m</sup>]. Guam (Islas Marianas). Temblor de tierra de intensidad III.

3, 10<sup>h</sup> 17<sup>m</sup> 18<sup>s\*</sup> [3, 18<sup>h</sup> 17<sup>m</sup> 18<sup>s</sup>]. Laoag (NW de Luzón). Temblor oscilatorio de intensidad III; su origen se hallaba en el Mar de la China.

7, 11<sup>h</sup> 08<sup>m</sup> 52<sup>s\*</sup> [7, 19<sup>h</sup> 08<sup>m</sup> 52<sup>s</sup>]. S de Luzón. Temblor de tierra de intensidad III, sentido en la Provincia de Batangas y en la parte N de Mindoro. Su origen se encontraba en el estrecho de Mindoro. A 11<sup>h</sup> 10<sup>m</sup> 19<sup>s\*</sup> [19<sup>h</sup> 10<sup>m</sup> 19<sup>s</sup>] repitió con intensidad III-IV afectando la misma región.

8, 16<sup>h</sup> 07<sup>m</sup> 29<sup>s\*</sup> [9, 0<sup>h</sup> 07<sup>m</sup> 29<sup>s</sup>]. Camarines y Albay (SE de Luzón). Temblor oscilatorio, dirección NNE-SSW en Legaspi y ENE-WSW en Naga, intensidad III-IV. Su origen probablemente estaba situado en el mar cerca de las costas del NE de Camarines.

8, 19<sup>h</sup> 10<sup>m</sup> 00<sup>s\*</sup> [9, 3<sup>h</sup> 10<sup>m</sup> 00<sup>s</sup>]. Iba (W de Luzón). Temblor oscilatorio, dirección NW-SE, intensidad III-IV, duración corta. Repitió con menos intensidad a 19<sup>h</sup> 20<sup>m</sup> 12<sup>s\*</sup> [3<sup>h</sup> 20<sup>m</sup> 12<sup>s</sup>].

9, 8<sup>h</sup> 22<sup>m</sup> 28<sup>s\*</sup> [9, 16<sup>h</sup> 22<sup>m</sup> 28<sup>s</sup>]. Sur de Luzón. Temblor de tierra de intensidad IV sentido en toda la Provincia de Batangas y en la parte N de Mindoro; el epicentro se hallaba también en el estrecho que separa esta isla de la de Luzón.

9, 13<sup>h</sup> 17<sup>m</sup> [9, 21<sup>h</sup> 17<sup>m</sup>]. Iba (W de Luzón). Temblor de tierra de intensidad II-III.

9, 16<sup>h</sup> 42<sup>m</sup> 53<sup>s\*</sup> [10, 0<sup>h</sup> 42<sup>m</sup> 53<sup>s</sup>]. Butúan (N de Mindanao). Temblor de tierra de intensidad II. Este temblor tuvo su origen lejos en el Pacífico y no consta fuese perceptible en ninguna otra parte de Mindanao. Las formaciones de aluvión de Butúan parece se prestan de un modo particular al desarrollo de amplitud de vibraciones sísmicas que en otras partes son completamente imperceptibles a los sentidos.

11, 5<sup>h</sup> 37<sup>m</sup> 46<sup>s\*</sup> [11, 13<sup>h</sup> 37<sup>m</sup> 46<sup>s</sup>]. Sur de Luzón. Temblor de tierra de intensidad III sentido en la misma región que los de los días 7 y 9 y originado en el mismo centro. Cuatro minutos antes a 5<sup>h</sup> 33<sup>m</sup> 24<sup>s\*</sup> [13 33<sup>m</sup> 24<sup>s</sup>] los sismógrafos de Manila y Ambulong habían registrado un choque de menos intensidad del mismo origen.

12, 17<sup>h</sup> 11<sup>m</sup> 53<sup>s\*</sup> [13, 1<sup>h</sup> 11<sup>m</sup> 53<sup>s</sup>]. Norte de Luzón. Temblor de tierra sentido en todas las provincias septentrionales desde el paralelo 16° N. El epicentro se hallaba en la Provincia Montañosa hacia el paralelo 17.5° N y meridiano 121° E donde existe un centro ya conocido. Su intensidad máxima en el epicentro no bajaría de VI-VII. A 19<sup>h</sup> 44<sup>m</sup> 25<sup>s\*</sup> [13, 3<sup>h</sup> 44<sup>m</sup> 25<sup>s</sup>] ocurrió una repetición perceptible tan sólo dentro de la cordillera. De sitios cercanos al epicentro se sabe que fueron perceptibles otras varias réplicas muy ligeras. Este temblor se registró en varios de los observatorios de China y Japón.

13, 1<sup>h</sup> 50<sup>m</sup> [13, 9<sup>h</sup> 50<sup>m</sup>]. Agusan (E de Mindanao). Temblor de tierra de intensidad V originado en la parte central del valle a menos de 100 kilómetros al S de Butúan; en esta estación su intensidad fué de II-III, mientras que en La Esperanza, distante 35 kilómetros hacia el S, ya llegó a intensidad IV.

13, 8<sup>h</sup> 05<sup>m</sup> [13, 16<sup>h</sup> 05<sup>m</sup>]. Ormoc (W de Leyte). Temblor oscilatorio, dirección NW-SE, intensidad III, duración 5 segundos.

<sup>1</sup> La intensidad de los terremotos se indica conforme a la conocida escala de Rossi-Forel. Cuanto a la hora de su ocurrencia, adoptamos la indicada por los sismógrafos de este Observatorio siempre que los hayan registrado, distinguiéndola por medio de un asterisco (\*). En caso contrario copiamos la apuntada por los observadores que nos envían las notas. Todas las indicaciones del tiempo se refieren al tiempo medio de Greenwich (medianoche=0<sup>h</sup>). Para conveniencia de los lectores de Filipinas se añade también el tiempo insular.

13, 19<sup>h</sup> 32<sup>m</sup> 42<sup>s\*</sup> [14, 3<sup>h</sup> 32<sup>m</sup> 42<sup>s</sup>]. Iba (W de Luzón). Temblor de tierra de intensidad III.

14, 1<sup>h</sup> 36<sup>m</sup> 58<sup>s\*</sup> [14, 9<sup>h</sup> 36<sup>m</sup> 58<sup>s</sup>]. W de Luzón. Temblor de tierra, sentido en las costas de Zambales y en las occidentales de Cavite y Batangas. Su origen se hallaba en el Mar de la China al W de Manila y a unos 160 kilómetros de distancia.

16, 6<sup>h</sup> 51<sup>m</sup> 44<sup>s\*</sup> [16, 14<sup>h</sup> 51<sup>m</sup> 44<sup>s</sup>]. Laoag (NW de Luzón). Temblor de tierra de intensidad III, duración 6 segundos.

18, 17<sup>h</sup> 06<sup>m</sup> 18<sup>s\*</sup> [19, 1<sup>h</sup> 06<sup>m</sup> 18<sup>s</sup>]. Iba (W de Luzón). Temblor de tierra de intensidad III, duración corta, originado en el Mar de la China en el mismo sitio que el del día 14. Unas horas después, a 20<sup>h</sup> 47<sup>m</sup> 35<sup>s\*</sup> [19, 4<sup>h</sup> 47<sup>m</sup> 35<sup>s</sup>] los sismógrafos de Manila y Ambulong registraron otro movimiento del mismo origen.

24, 16<sup>h</sup> 36<sup>m</sup> [25, 0<sup>h</sup> 36<sup>m</sup>]. Butúan (N de Mindanao). Temblor de tierra de intensidad IV, el origen parece se hallaba muy cerca hacia el NW.

30, 9<sup>h</sup> 12<sup>m</sup> [30, 18<sup>h</sup> 51<sup>m</sup>]. Guam (Islas Marianas). Temblor de tierra de intensidad II-III.

**Observación.**—La actividad sísmica de este mes ha sido extraordinaria; sólo ocurrió un terremoto de alguna extensión pero los que podemos llamar de carácter volcánico, por su poca intensidad y extensión, fueron excepcionalmente frecuentes en el SW de Luzón. El día 9 representa el de mayor actividad, puesto que se registraron en Manila hasta seis perturbaciones sísmicas de origen regional o cercano. Por singular coincidencia en la misma fecha se registraron también en Butúan diez perturbaciones originadas dentro de la Isla de Mindanao y en los mares vecinos. También en Guam ocurrieron un número extraordinario de sismos; siendo los días 19 y 20 los de mayor actividad, pues se registraron tres en el primero y cinco en el segundo de dichos días.



51,5919  
P536

JUN 30 1917  
UNIV. OF MICHIGAN  
LIBRARY

THE GOVERNMENT OF THE PHILIPPINE ISLANDS

# WEATHER BUREAU

MANILA CENTRAL OBSERVATORY

---

BULLETIN FOR OCTOBER, 1916

---

PREPARED UNDER THE DIRECTION OF

REV. JOSÉ ALGUÉ, S. J.

DIRECTOR OF THE WEATHER BUREAU

MANILA  
BUREAU OF PRINTING  
1917



---

---

**BULLETIN FOR OCTOBER, 1916.**



# METEOROLOGICAL BULLETIN FOR OCTOBER, 1916.

By Rev. JOSÉ CORONAS, S. J.,  
Chief, Meteorological Division of the Weather Bureau.

## GENERAL WEATHER NOTES.

Pressure and temperature.—Owing to the big typhoons we had in the Philippines in October, 1915, and to the lack of typhoons this year, the mean monthly atmospheric pressure is quite above that of the preceding year. It does not differ much, however, from the normal of October. The highest pressures of the month were recorded on the 25th and 26th, while the lowest pressures took place generally on the 16th and 17th in Luzon, and on the 15th or 19th in the Visayas and Mindanao.

The mean monthly temperature is somewhat lower than that of October, 1915, and than the normal for this month, the greatest differences being a little above 1° C. The absolute maximum and minimum temperatures of the month for Manila were 33.8° C. and 21.6° C. registered on the 1st and 28th respectively. The extreme monthly temperatures for Baguio were 25.3° C., 14° C. on the top of Mirador, and 25.9° C., 14° C. in the valley.

PRESSURE AND TEMPERATURE AT THE FIRST AND SECOND CLASS STATIONS FOR OCTOBER, 1916.

Station.	Pressure.						Temperature.					
	Mean.	Departure from Oct., 1915.	Highest mean.	Day.	Lowest mean.	Day.	Mean.	Departure from Oct., 1915.	Highest.	Day.	Lowest.	Day.
	mm.	mm.	mm.		mm.		°C.	°C.	°C.		°C.	
Zamboanga.....	757.97	—	759.30	26	756.24	19	26	—	32.9	27	21.6	25
Tagbilaran <sup>a</sup> .....	57.76	+0.66	59.29	25	56.44	19	26.4	-0.5	35.5	11	22.3	10, 29
Surigao.....	57.85	+ .97	59.35	25	56.85	15	26.6	- .9	34	10	22.4	29
Cebu.....	57.92	+1.02	59.41	25	56.76	15	27.3	- .6	33.2	23	22.9	7, 30
Iloilo.....	57.78	+1.01	59.25	26	56.46	19	26.8	- .1	35	23	22.7	9
Ormoc.....	58.05	+ .92	59.59	26	56.90	31	26.2	- .7	33.9	1	21.3	4, 25
Tacloban.....	57.99	+1.40	59.67	26	56.69	15	26.6	- .5	33.5	11	22.4	4
Capiz.....	58.08	+1.22	59.71	26	56.84	19	26.8	0	35.9	5	22.6	5, 7
Calbayog.....	58.17	+1.50	59.99	26	56.91	31	25.9	-1	35.1	6	21.7	4
Legaspi.....	58.10	+1.94	60.23	26	56.94	16	26.9	- .7	35	7	22.2	7
Atimonan.....	58.20	+2.06	60.36	26	56.43	16	26.8	0	32.8	25	22.4	6, 9, 11
Ambulong, Tanauan.....	57.68	+2.01	59.54	26	56.14	16	26.3	- .1	34.2	1	21.5	3
Paracale.....	58.41	+2.05	60.75	26	56.61	16	26.6	- .4	33.3	10	22.3	6
Manila.....	58.33	+1.93	60.42	26	56.59	16	25.9	- .7	33.8	1	21.6	28
San Isidro.....	58.59	+1.98	60.90	26	56.82	16	25.9	- .7	32.5	1	22	7
Dagupan.....	57.67	+2.05	59.59	26	56.10	16	27.1	- .7	34.7	1	22.5	10
Bolinao.....	57.86	+2	59.84	26	56.16	17	27.1	- .7	34.7	25	22.4	23
Baguio <sup>b</sup> .....	636.33	+1.65	638.17	26	634.59	17	18.1	- .4	25.3	29	14	10
Vigan.....	757.84	+2.25	759.81	26	755.97	17	27.2	- .9	35	26	21.3	7, 12
Tuguegarao.....	58.99	+2.71	61.85	26	56.56	10	25.9	-1.2	35	1	20.5	8
Laog.....	57.99	—	59.85	26	56.13	17	27.2	—	36.9?	15	20	29
Aparri.....	59.07	+2.89	62.08	26	56.18	10	26.1	-1.1	31.3	25	21.3	5

<sup>a</sup> 30 days of observation.

<sup>b</sup> The barometric readings of this station are not reduced to sea level.

Rainfall.—The total amount of rainfall for this month is above the normal in a great majority of the stations of Luzon, while in the Visayas and Mindanao the number of stations reporting a monthly amount of rainfall greater than the normal almost equals the number of stations reporting a smaller amount. The total amount of rainfall for Manila was 39 mm. above the normal; that of Baguio, on the contrary, was 236.7 mm. below it.

## RAINFALL AT VARIOUS STATIONS OF THE WEATHER BUREAU DURING THE MONTH OF OCTOBER, 1916.

Station.	Total.	Departure from Oct., 1916.	Departure from normal.	Rainy days.	Departure from Oct., 1916.	Greatest rainfall in a single day.	Day.	Station.	Total.	Departure from Oct., 1916.	Departure from normal.	Rainy days.	Departure from Oct., 1916.	Greatest rainfall in a single day.	Day.
	mm.	mm.	mm.		mm.	mm.			mm.	mm.	mm.		mm.	mm.	
Jolo	347.7	+134.5	+132.6	26	+8	62	20	Calapan	255.9	-60.3	-16.8	25	+2	59.4	25
Isabela, Basilan	418.5	+158.9	+159.3	26	+9	142.7	21	Virac	694.5	-----	+372.3	28	-----	184.6	15
Zamboanga	87	-88.8	-19.5	14	-5	17.8	20	Naga	263.8	-16.4	+14.4	23	-----	60.5	8
Davao	336.5	+55	+82.1	16	+3	65	28	Batangas	155.6	-415.1	-54.2	24	-3	30	1
Cagayan, Misamis	126.1	-131	-----	18	0	42.2	15	Lucena	350.3	-----	-----	26	-----	72.2	21
Butuan	137.8	-115.4	-22	24	+3	18.5	17	Atimonan	318	-238.2	-56.6	19	-3	89.1	30
Dumaguete	340.3	+150	-----	22	+3	72.4	23	Ambulong, Tanauan	236.6	-89	-----	21	+4	45.9	16
Tagbilaran*	132.9	-79.5	-137.7	11	-5	50.4	28	Canlubang, Calamba	208.6	-----	-----	26	-----	38.1	18
Iwahig	217.1	+29.4	-----	20	-4	40.4	31	Paracale	678.9	+194	-----	27	+7	259	8
Surigao	191.5	-25.3	-42.9	21	+3	38.6	26	Santa Cruz, Laguna	325.6	+22	-----	29	+7	33.8	30
Maasin	226.7	-83.3	-4.6	14	+2	49.5	2	Manila	223.6	+58.2	+39	25	+6	43	21
Cebu	335.5	+136.4	+121.7	22	+5	49.9	2	Antipolo	201.7	-11.3	-----	29	+8	44.2	16
Iloilo	299.2	-32.7	+45.9	17	-5	54.8	24	Iba	193.9	+4.4	+29.8	19	+2	80.1	17
San Jose Buenavista	283.9	-780.5	-62	18	-11	87.6	23	San Isidro	253	+88.5	+73.9	24	+3	45.5	4
Cuyo	450.4	-100.7	+198.2	19	-2	79.5	24	Tarlac	122.4	-32.8	-52.5	14	+0	24.4	17
Ormoc	98.2	-157.9	-141.8	17	-3	19.8	20	Baler	648.4	+218	+280.3	27	+4	104.6	17
Guiuan	322.3	+3.5	-----	24	+2	40.7	23	Dagupan	223.4	+62.6	+25.3	14	-4	58.2	18
Tacloban	184.2	-55	-23.3	25	+2	41.2	16	Bolinao	282.6	+29.2	+96.6	11	-7	90.9	5
Capiz	267.6	+46	-178	29	+7	52.5	24	Baguio	205.5	-677.3	-236.7	21	-4	30.3	9
Borongan	380.7	+143	+55.6	28	+9	55.1	23	San Fernando, Union	203.3	-217.2	+39.7	17	+1	60.7	10
Catbalogan	147.6	-----	-----	22	-----	32.5	30	Echague	322.4	+74	+104.8	24	+6	39.6	1
Calbayog	337.8	-133.7	+72.3	25	+1	44.3	15	Candon	235.8	-293.7	+34.8	12	0	89.4	10
Masbate	157.2	-92.2	+18.6	21	+4	41.4	16	Vigan	137.1	-406.4	-39.6	10	-1	65.5	10
Romblon	328.9	-99.4	+19.3	28	+4	62.3	25	Tuguegarao	368.7	-140.9	+91.8	18	+9	160.3	4
Batag	526.8	+162.7	-----	21	+6	91.2	8	Laog	317.3	-167.6	+46.9	9	-2	142.5	5
Sorsogon	720.1	-----	-----	-----	-----	97.3	30	Aparri	557.6	+387.5	+258	25	+8	227.7	5
Legaspi	453.2	+88.5	+113.7	25	+7	62.8	25	Cape Bojeador	470.8	-----	-----	6	-----	320.2	9
Sumay, Guam	293.5	-123.2	-63.6	26	+3	30.5	9	Santo Domingo, Bata-	692.6	+214.6	+341.4	26	-1	112.5	6
								nes							

\* 30 days of observation.

## DEPRESSIONS AND TYPHOONS.

There was no real typhoon during this month in the Philippines, but only one depression which passed north of Luzon very near the Balintang Channel, and another formed over the Sulu Sea. Besides, there could be observed in our weather maps of the Far East two other depressions: one over the China Sea and the other over the Pacific. The tracks of all these depressions will be published in the Bulletin for next month. Plate X, together with the tracks of the depressions and typhoons of November and December.

## A DEPRESSION OR TYPHOON OVER THE PACIFIC—OCTOBER 5 TO 11, 1916.

This depression was clearly shown by the observations made at the Loochoos and the Bonins, although it is impossible to decide whether it had the development of a regular typhoon at least on the 5th and 6th. It was probably situated on the 5th near 130° longitude E and 18° or 19° latitude N. After having moved northward on the 5th, it recurved northeastward on the 6th, advancing rather slowly on the following days, until it probably filled up between the Bonins and Japan on the 11th.

## A DEPRESSION OVER OR VERY NEAR THE BALINTANG CHANNEL—OCTOBER 7 TO 14, 1916.

This depression was probably situated on the 7th nearly 300 miles east of the Visayas; it moved NNW on the 7th and 8th; and, inclining westward on the 9th, it passed N of Luzon very near the Balintang Channel in the morning of the 10th. The observations made at Aparri and Santo Domingo, Batanes, show perfectly well the passing of the center of this depression between these two stations. On the 11th there was a complete recurving of the track to the NE, the depression crossing the southern part of Formosa during the night of the same day.

## TWO DEPRESSIONS IN THE CHINA SEA—OCTOBER 7 TO 9 AND 19 TO 24, 1916.

Although we have but a few data referring to these two depressions, it would seem that they were of no great importance. The first was probably formed on the 7th to the W of northern Palawan and moved W on the 7th and NNW on the 8th, filling up on the 9th between Hainan and the coast of Indochina. The second depression seems to have appeared on the 19th over the southern part of the Sulu Sea; it passed through Balabac Island or Balabac Strait in a WNW direction on the 20th; then it moved W across the China Sea, and finally traversed the southernmost part of Indochina during the night of the 23d.

## NOTAS GENERALES DEL TIEMPO.

**Presión y temperatura.**—Aunque la presión atmosférica media de este mes no difiere mucho de la normal de octubre, es, sin embargo, bastante mayor que la del año pasado, debido a los notables tifones que tuvimos en Filipinas en octubre de 1915, y a la ausencia de los mismos en 1916. Las presiones más altas del mes se registraron el día 25 y 26, al paso que las más bajas tuvieron lugar generalmente el 16 y 17 en Luzón, y el 15 ó 19 en Visayas y Mindanao.

La temperatura media mensual es algo inferior a la de octubre, 1915, y a la normal de este mes, siendo las diferencias más grandes algo mayores de 1° C. La máxima y mínima absolutas en Manila fueron respectivamente 33.8° C. observada el día 1.º, y 21.6 registrada el 28. Las temperaturas extremas de Baguio fueron 25.3° C., 14° C. en la cumbre del Mirador, y 25.9° C., 14° C. en el valle.

**Precipitación acuosa.**—La cantidad total de lluvia de este mes, es superior a la normal en la mayor parte de las estaciones de Luzón, mientras que en Visayas y Mindanao el número de estaciones que dieron una cantidad de lluvia mensual mayor que la normal es casi igual al número de estaciones que acusaron una cantidad menor. La cantidad total de lluvia caída en Manila fué mayor que la normal en 39 mm.; por el contrario, la de Baguio fué menor que su normal correspondiente en 236.7 mm.

## DEPRESIONES Y TIFONES.

No hubo durante este mes ningún tifón de importancia en las cercanías de Filipinas. Solamente se observó una depresión que pasó al N de Luzón muy cerca del Canal de Balintang, y otra formada en el Mar de Joló. Además, se pudieron notar en nuestros mapas del tiempo del Extremo Oriente otras dos depresiones: una en el Mar de China, y la otra en el Pacífico. Incluiremos las trayectorias de estas depresiones en el Boletín de noviembre, Lámina X, juntamente con las de las depresiones y tifones de noviembre y diciembre.

## UNA DEPRESIÓN O TIFÓN EN EL PACÍFICO—OCTUBRE 5 AL 11, 1916.

Las observaciones de las Islas Liuku y Bonín indicaron claramente esta depresión, aunque es imposible determinar con ellas solas si tuvo el desarrollo de verdadero tifón al menos los días 5 y 6. Su centro se hallaba probablemente el 5 en los alrededores de 130° longitud E y de 18° ó 19° latitud N. Después de haberse movido al N el 5, recurvió hacia el NE el 6, avanzando con alguna lentitud en los días siguientes, hasta que se deshizo probablemente entre Bonins y Japón el día 11.

## UNA DEPRESIÓN EN EL O CERCA DEL, CANAL DE BALINTANG—OCTUBRE 7 AL 14, 1916.

Se hallaba probablemente esta depresión el día 7 a unas 300 millas al E de las Islas Visayas; se movió al NNW el 7 y 8; e inclinándose hacia el W el 9, pasó al N de Luzón, muy cerca del Canal de Balintang, en la mañana del 10. Las observaciones verificadas en Aparri y Santo Domingo, Batanes, demuestran claramente el paso del centro de la depresión entre estas dos estaciones. El día 11 tuvo lugar una completa recurva de la trayectoria al NE, pasando la depresión a través de la parte sur de Formosa durante la noche del mismo día.

## DOS DEPRESIONES EN EL MAR DE CHINA—OCTUBRE 7 AL 9 Y 19 AL 24, 1916.

Aunque poseemos muy pocos datos referentes a estas dos depresiones, con todo, parece poder asegurarse que no fueron de grande importancia. La primera se formó probablemente el día 7 al W de la parte norte de Palawan; se movió hacia el W el mismo día, y al NNW el día 8, deshaciéndose entre Hainán y la costa de Indochina el 9. La segunda depresión parece haber aparecido el día 19 en la parte sur del Mar de Joló; pasó por la isla o el estrecho de Balabac en dirección al WNW el 20; luego se movió al W a través del Mar de China, y finalmente atravesó la parte más meridional de Indochina durante la noche del 23.



METEOROLOGICAL DATA FOR MANILA CENTRAL OBSERVATORY.<sup>a</sup>

[ $\phi=14^{\circ} 34' 41''$  N;  $\lambda=120^{\circ} 58' 33''$  E; barometer above sea, 14.2 meters; gravity correction not applied,  $-1.72$  mm.]

Day.	Pres- sure (mean).	Air temperature. <sup>b</sup>			Underground temperature.				Relative humid- ity (mean)	Vapor pres- sure (mean)	Radiation.			Evaporation. <sup>b</sup>		
		Mean.	Maxi- mum.	Mini- mum.	0.25 meter.		0.50 meter.				1.50 meters.		Mini- mum on grass	Maxi- mum in sun. Black bulb in vacuo.	Free exposure (total)	Shelter (total).
					8 a.m.	2 p.m.	8 a.m.	2 p.m.			8 a.m.	8 a.m.				
	mm.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	Per ct.	mm.	°C.	°C.	mm.	mm.	
1	758.38	27.4	33.8	22.8	28.3	29.8	28.8	29.2	29.7	28.9	81.4	21.7	21.5	55.5	2.8	2.6
2	58.57	25.8	31.5	23.2	28.8	29.8	29.5	29.8	29.5	29	90.2	22.2	20.5	52.6	1.6	1.3
3	58.44	25.4	30.4	22.5	28.4	29.5	29.4	29.7	29.6	28.9	90.1	21.6	20.6	52.3	1.3	1.2
4	58.69	24.7	27.3	23.2	28.5	28.9	29.4	29.4	29.5	28.9	92.4	21.3	22.2	34.5	.5	.9
5	58.64	24.5	27.2	22.5	28.1	28.4	29.1	29.1	29.5	28.9	91.9	20.9	21.8	37.5	.5	.6
6	57.80	25.6	30.5	23.4	28.3	29.2	28.8	29.1	29.5	28.9	89.4	21.7	22.6	55.5	1.3	1.2
7	57.79	25.8	31.2	22.1	28.3	29.4	29.1	29.3	29.5	28.9	86	21.1	21	53.2	2.3	1.8
8	58.25	25.1	28.3	23.2	28.5	28.8	29.2	29.1	29.5	28.9	88.4	20.9	22	43.5	.9	.9
9	58.45	24.7	26.6	23	28.1	28.4	29	29.1	29.4	28.9	92.6	21.4	22.6	35	1	.8
10	59.12	26.5	30	24.3	27.9	28.9	28.8	29	29.4	28.9	85.7	22	23.8	51.7	2.4	1.8
11	58.49	26.6	31.5	22.7	28.3	29.3	28.9	29.1	29.4	28.9	84.2	21.6	21.3	53.5	2.6	2.1
12	58.07	26.1	31.3	22.4	28.5	29.6	29	29.3	29.3	28.9	86.8	21.5	21	54	1.8	1.7
13	58.42	26.2	31.3	22.4	28.4	29.5	29.2	29.4	29.3	28.9	87.4	22	21	53	1.8	1.6
14	58.13	26.6	30.8	23.3	28.5	29.5	29.2	29.3	29.3	28.9	83.5	21.4	21.6	51.3	2.4	1.8
15	57.34	25.9	30	23.4	28.7	29.3	29.4	29.5	29.3	28.9	88.8	21.8	22.2	49	.9	1.2
16	56.59	25.6	28.6	23.5	28.5	29.1	29.2	29.3	29.4	28.9	89.8	21.8	22.4	40.8	1.3	1.1
17	57.07	25.3	30	23.4	28.2	28.9	29.1	29.1	29.4	28.9	91.5	21.8	22.8	50.7	1	1
18	57.67	26	31.8	23.6	28.3	29.6	29	29.2	29.3	28.9	88.7	20	22.3	54.9	1.6	1.2
19	56.93	27.4	33	23.2	28.4	29.8	29.2	29.4	29.3	28.8	82.8	22.1	21.8	54.8	3.6	2.5
20	57.50	27.6	33	24.2	28.8	29.9	29.3	29.5	29.3	28.8	81.4	22	22.7	57.6	3.3	2.6
21	58.90	25.3	29.6	23.2	28.8	29.2	29.5	29.5	29.3	28.8	89.6	21.4	21.2	46.9	.3	1.1
22	58.26	25.1	28.3	23.4	28.3	28.7	29.2	29.2	29.3	28.8	92.5	21.9	22.5	42.5	.7	.7
23	58.12	25.7	30	23	27.9	28.8	28.9	29.1	29.3	28.7	90.8	22.2	20.2	50.7	1	.9
24	58.80	25.9	30.3	23.7	28.3	28.9	28.9	29.1	29.3	28.8	91.8	22.8	22.5	49	.9	1
25	59.26	27.3	32.3	23.2	28.3	29.4	29	29.1	29.3	28.8	79.3	21	21.6	55.5	4	3.1
26	60.42	26.3	32	23.2	28.6	29.5	29.2	29.2	29.3	28.7	83.6	20.9	21.3	56.7	2.9	2.5
27	59.42	25.3	30.7	21.8	28.5	29.2	29.2	29.2	29.3	28.6	87.4	20.8	20.2	54.3	1.1	1.2
28	58.39	25.7	32.5	21.6	28.2	29	29.1	29.1	29.2	28.5	88.3	21.5	20.1	56.4	1.5	1.5
29	59.20	26.4	31.4	22.9	28.5	29.2	29	29.1	29.1	28.6	82.1	20.7	21.2	55.8	1.1	.9
30	59.24	25.7	29.7	22.5	28.3	28.9	29	29.2	29.2	28.4	84.4	20.5		49.5	1.8	2
31	57.77	24.8	30.2	23.2	28.1	28.7	28.9	29.1	29.1	28.5	91.8	21.2	22.5	51	.7	.9
Mean Total	758.33	25.9	30.5	23	28.4	29.2	29.1	29.3	29.4	28.8	87.6	21.5	21.7	50.3	1.6	1.5
Departure from normal	-0.32	-0.8	-0.6	-0.1							+3.9	-0.1			50.9	45.7

Day.	Wind.				Amount (mean).	Clouds.		Sun- shine. <sup>c</sup>	Rain, 24 hrs. beginning 6 a. m.		Miscellaneous.
	Prevailing direction.	Total move- ment.	Maxi- mum hour- ly veloc- ity.	Direction at the time of the maximum velocity.		Form and direction.			On the tower.	In the park.	
						Upper.	Lower.				
		Km.	Km.		0-10.			h. m.	mm.	mm.	
1	E quad.	137.5	12.5	SW	4.2	Ci.-S.	cu., cu.-N. ESE	10 20	28.7	32.5	☉ <sup>2</sup> a. ☐ ☉ <sup>2</sup> p.
2	W quad.	116.5	15	W	6.9	Ci.	cu. NNW	6 05	9.8	9.6	☐ ☉ <sup>2</sup> p.
3	S quad.	103.5	15	S	9.8	Ci.-S.	N., cu.-N. N	1 30	3.2	3.2	d a. ☐ p.
4	S, NE	88.5	10	NE	10	Ci.-S.	N., fr.-N. NE	0 00	1.6	1.8	d a. p.
5	NE	72.5	14.5	NE	9.1	Ci.-S.	Fr.-N. WSW	0 00	5.4	5.8	☉ a. d a. p.
6	SSE	73.5	9	SSE	9.1	A.-Cu.	cu., cu.-N. E	2 30	1.7	1.7	d ☐ ☉ <sup>2</sup> p.
7	NE quad.	118.5	11.5	W	6.8	A.-Cu.	cu. E	3 35			☐ ☉ <sup>2</sup> p.
8	S	79	7	SW	9.9	Ci.-S.	Fr.-N. ENE	0 00	2	1.8	d <sup>o</sup> p.
9	S, NE	58	9	NE	10	Ci.-S.	N., cu.-N. E	0 00	6	5.6	☉ <sup>2</sup> a.
10	SSW	257.5	19	SW	8.6	Ci.-S.	cu. WSW	2 00			d <sup>o</sup> p.
11	WNW	132.5	22	WNW	8.6	Ci.-S.	cu. E	4 10			☉ <sup>2</sup> a.
12	NE	116.5	16	WNW	6	Ci.	cu. E	4 20	1.3	1.1	☐ ☉ <sup>2</sup> p.
13	NE, NNE	91.5	15	W	6.7	Ci.	cu., cu.-N. E	2 30	.7	.7	☐ ☉ <sup>2</sup> p.
14	NE quad.	66.5	9.5	SE	8.2	Ci., Ci.-S.	cu. E	1 35			d <sup>o</sup> a. ☐ p.
15	W quad.	114.5	12	SW	8.6	A.-Cu.	cu.-N. NE	2 20	11.5	11.3	☉ <sup>2</sup> a. ☐ ☉ <sup>2</sup> p.
16	N, NW	76.5	10	NW	9.8	Ci.-S.	cu.-N. E	0 00	37.1	37.8	d <sup>o</sup> a. d <sup>o</sup> p.
17	S quad.	96	12.5	S	10	Ci.-S.	cu.-N. SW	0 45	7.4	6	☉ <sup>2</sup> a. ☉ <sup>2</sup> p.
18	ESE	117.5	14.5	ESE	8.3	A.-Cu.	cu.-N. S	3 30	15.6	16.2	☐ ☉ <sup>2</sup> p.
19	ESE	188	20	ESE	5.8	Ci.	N cu. ESE	8 00			☐ p.
20	E	172	17	ESE	6.4	Ci.	cu. ESE	5 30			☐ p.
21	NE, ENE	130.5	13	NNE, NE	9.4	Ci.	cu.-N. E	1 20	43	44.7	☐ a. ☉ <sup>2</sup> a. p. ☐ ☉ <sup>2</sup> p.
22	N	55.5	6.5	WNW	9.8	Ci.-S.	cu.-N. ESE	0 00	2.3	2.3	☉ a. d p.
23	N quad.	52	8	WNW	9.7	Ci.-S.	cu., cu.-N. E	1 10	4.7	4.5	☉ a. p.
24	N quad.	93.5	13	NW	9.4	Ci.-S.	cu., cu.-N. E	0 15	2.3	2.1	d <sup>o</sup> a. ☐ ☉ <sup>2</sup> p.
25	ESE	216.5	20.5	ESE	3.3	Ci.	cu. E	10 15	1.3	1.5	☐ p.
26	ENE	147	19.5	ENE	7.6	Ci.-S.	cu. E	5 45	.1	.3	d <sup>o</sup> a. p.
27	NE quad.	76.5	12	SSW	7.7	Ci.-S.	cu., cu.-N. E	4 20	4.3	4.3	☉ <sup>2</sup> a. p.
28	W quad.	89	13	W, NNW	6.5	Ci.	cu.-N. E	6 50	11.2	11.7	☉ <sup>2</sup> a. ☐ ☉ <sup>2</sup> p.
29	NNE	106.5	14.5	NNE	4.7		cu. E	7 40	.8	1	p <sup>o</sup> d <sup>2</sup> p.
30	NE	123.5	15.5	NNE	8.7	Ci.-S.	cu., cu.-N. E	0 35	4.3	4.1	☉ <sup>2</sup> a. ☐ ☉ <sup>2</sup> p.
31	N quad.	67	11.5	N	10	Ci.-S.	cu.-N. E	0 45	17.3	17.1	☉ a. p.
Mean Total		110.8	13.5		8.1			3 09	223.6	228.7	
Departure from normal		-1,824.4			+1.4			-69 44	+39		

<sup>a</sup> All the mean values given in this table are deduced from hourly observations.  
<sup>b</sup> These values are taken from instruments mounted in the Observatory Park, 1.5 meters above ground.  
<sup>c</sup> The sunshine observations on the 12th to 14th have been taken from the records of the quadruple register.

METEOROLOGICAL DATA FOR MIRADOR OBSERVATORY, BAGUIO.\*

[ $\phi=16^{\circ} 25' N$ ;  $\lambda=120^{\circ} 36' E$ ; barometer above sea, 1,512.5 meters; gravity correction not applied, -1.65 mm.]

Day.	Pressure <sup>b</sup> (mean).	Air temperature at Mirador (on the top of the mountain).				Air temperature in the valley (near the city hall).				Relative humidity (mean).	Vapor pressure (mean).	Radiation.		Evaporation.		
		Mean.	Maximum.	Hour.	Minimum.	Hour.	Maximum.	Hour.	Minimum.			Hour.	Minimum on grass.	Maximum in sun. Black bulb in vacuo. <sup>c</sup>	Free exposure (total).	Shelter (total).
	mm.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	Per ct.	mm.	°C.	°C.	mm.	mm.	
1	636.68	18.9	23.7	11.00a.	15.9	6.00a.	24.8	11.00a.	15.5	5.50a.	88.3	14.2	13	58.1	2.4	1.3
2	36.83	18.8	23.3	0.05p.	16.5	6.10a.	23.9	11.30a.	16.4	12m.n.	91.5	14.8	13.2	61.8	1.3	1
3	36.23	18.1	22.8	2.45p.	15.9	5.40a.	24.4	3.00p.	15	5.35a.	90	13.9	13.4	55	1.1	.7
4	36.18	17.1	18.8	0.45p.	16.3	6.50a.	20.2	11.35a.	15.9	1.30a.	97.5	14.1	14.8	34	0	.2
5	35.92	16.2	18.8	2.40p.	15.1	4.50a.	19.6	3.00p.	15.1	6.00a.	96.7	13.3	14.1	37.7	0	.1
6	35.32	16.6	19.8	10.20a.	15.4	12m.n.	21.3	2.00p.	15.3	12m.n.	96.2	13.5	13.8	48.8	.3	.5
7	35.60	17.5	22.5	1.25p.	15.1	6.00a.	23	1.40p.	14.7	5.30a.	86.3	12.7	13.6	56.7	2.7	2
8	36.12	17.8	21.8	11.40a.	15.4	3.10a.	23	11.40a.	14.7	2.00a.	85.8	13.1	13.6	51.1	1.7	1.1
9	35.96	17	19	11.25a.	15.9	4.20a.	20	2.40p.	15.7	2.10a.	96.3	13.9	14.5	33.8	0	0
10	36.04	15.6	17.1	1.05p.	14	9.00p.	18.4	0.20p.	15	9.00p.	98.8	13	15.1	33	0	0
11	36.73	18	22.3	3.00p.	14.9	6.00a.	23.4	2.40p.	15.5	5.35a.	82.5	12.7	13.7	54	3.3	1.8
12	36.52	18.8	23.5	1.00p.	16	6.00a.	24.3	2.10p.	14.5	6.00a.	82.7	13.4	13.4	57	1.9	1.5
13	36.92	19.1	25.2	1.00p.	15.9	5.05a.	25.4	1.40p.	14.7	5.30a.	84	13.7	13.8	55.3	4.5	2.5
14	36.49	18.8	24.7	11.10a.	15.4	5.20a.	25.6	1.25p.	15.3	6.20a.	79.5	12.8	13.9	56.6	5.5	3
15	35.78	18.5	24.3	10.25a.	15.3	6.50p.	25.9	11.20a.	14.6	6.40a.	79.2	12.4	13.7	55	2.5	1.6
16	35	17.8	21.9	9.10a.	16.1	0.40a.	21.5	9.25a.	15.7	4.00a.	92.3	14	15.6	46.7	.5	.5
17	34.59	17.1	19.5	1.00p.	16	12m.n.	20.9	0.05p.	16.7	4.30a.	98	14.2	14.7	40	0	0
18	35.56	17.3	20.3	1.45p.	15.8	7.45a.	21.4	0.25p.	16.4	0.05a.	94.3	13.8	14	45	1.6	1.3
19	35.25	18.1	23	0.55p.	15.9	6.00a.	22.9	0.20p.	16.3	5.50a.	89.8	13.8	15.5	50	3	1.9
20	35.75	18.6	23.8	1.50p.	15.8	3.00a.	24	11.20a.	16	2.40a.	79	12.5	14.6	56.1	8.5	4.6
21	36.32	18.6	23.8	1.05p.	15.9	4.00a.	25	1.50p.	16.2	5.15a.	74.7	11.8	14.6	55	5.5	4.5
22	36.06	17.5	19.2	2.25p.	15.5	6.00a.	20.5	2.10p.	15.7	6.00a.	82.2	12.2	14.4	34.7	6.9	4.4
23	36.20	18.8	24.3	0.10p.	16.5	12m.n.	25	11.45a.	16.7	12m.n.	82	13.2	15.1	58.2	5.5	3.5
24	37.12	19.4	24.8	1.55p.	16.3	1.10a.	25.5	1.20p.	16.5	1.20a.	78.7	13	15.4	56.4	6	3.5
25	37.52	19.2	24.7	11.50a.	16.7	2.20a.	25.4	0.40p.	16.9	12m.n.	77.2	12.7	15.3	58.1	7.5	4
26	38.17	18.4	22.9	1.05p.	15.7	6.00a.	24.7	0.40p.	15.7	12m.n.	71.2	11	14.1	54.8	9.8	5.4
27	36.74	18.6	24.2	11.40a.	15.4	5.15a.	24.4	Noon	14.5	5.00a.	66	10.4	12.1	66.9	9.8	5.3
28	37.52	18.5	24.9	11.15a.	15.5	0.35a.	25	11.25a.	15.3	3.30a.	78.3	12.4	13.4	59.7	5.2	3.3
29	37.27	18.6	25.3	10.45a.	15.1	5.00a.	25.7	11.35a.	14	5.40a.	82.3	13	12.4	55.1	4.4	2.5
30	37.36	18.7	23.9	10.00a.	15.5	1.55a.	25.2	0.20p.	14	6.30a.	80.2	12.8	13.9	60.2	4.1	2.5
31	36.02	18.4	24.8	11.00a.	15.6	4.00a.	25.5	1.20p.	14.5	6.45a.	77.8	12.2	13	56.5	3.8	2.4
Mean	636.33	18.1	22.5		15.7		23.4		15.5		85.1	13	14.1	51.3	3.5	2.2
Total															109.3	66.9

Day.	Wind.				Amount (mean).	Clouds.		Sunshine.	Rain, 24 hours beginning 6 a. m.	Miscellaneous.
	Prevailing direction. <sup>d</sup>	Total movement.	Maximum hourly velocity.	Direction at the time of the maximum velocity.		Form and direction.	Upper.			
		Km.	Km.		0-10.			h. m.	mm.	
1	W, E	391.4	28.2	SE	6.3	Ci.	Cu.	4 50	2.8	☉ a. ☐ ☐ p.
2	Variable	263.3	19	NW	7.7	Ci.	Cu.-N.	3 45	5	☐ ☐ ☐ ☐ p.
3	W quad.	252.4	19.6	W	8.1	Ci.-S., A.-Cu.	Cu.-N.	1 30	11.3	☉ a. p. ☐ ☐ ☐ ☐ p.
4	W	178.1	12.7	W	9.7	A.-Cu.	Cu.-N.	0 00	11.7	☉ ☐ ☐ p.
5	W quad.	231.3	16.6	W	10		N.	0 00	13	☉ a. p. ☐ ☐ p.
6	E	306.2	39.1	E	9.7	A.-Cu.	N.	0 15	15.5	☉ a. p. ☐ ☐ p.
7	E	446.4	34.4	E	6.9	Ci.-S.	NE	3 00	1	☉ a. p. ☐ ☐ p.
8	E	210	19.8	E	9.4	A.-Cu.	Cu.-N.	0 25	.5	☉ a. p. ☐ ☐ p.
9	W	260.2	23.8	W	10		N.	0 00	30.3	☉ a. p. ☐ ☐ p.
10	SW	573.7	36.4	SW	10		N.	0 00	21.1	☉ a. p. ☐ ☐ p.
11	W	233.6	22.7	SW	8.3	A.-Cu.	Cu.-N.	5 05		☉ a. p. ☐ ☐ p.
12	Variable	237.9	20.3	W	6.1	Ci.-S.	Cu.-N.	4 25	14.7	☉ a. p. ☐ ☐ p.
13	E	286.4	23.1	SE	3.6	Ci.-S.	Cu.	5 40		☉ a. p. ☐ ☐ p.
14	E	414.8	32	E	3.6	Ci.-S.	Cu.	4 15		☉ a. p. ☐ ☐ p.
15	E, W	349.6	22.3	E	6	Ci.	Cu.	3 15	26.5	☉ a. p. ☐ ☐ p.
16	E	192.1	12.9	E	7.7	Ci.-S.	Cu.-N.	0 10	13.5	☉ a. p. ☐ ☐ p.
17	Variable	210.5	21.7	SE	10		N.	0 00	23.3	☉ a. p. ☐ ☐ p.
18	SE	407.8	32.4	E	9.7	Ci.-S.	Cu.-N.	0 00	1	☉ a. p. d p.
19	E	622.7	50.7	E	8	Ci.-S., A.-Cu.	Cu.	0 45	7.4	☉ a. p. ☐ ☐ p.
20	E	808.6	53.6	E	4.1	Ci.	Cu.-N.	4 25		☉ a. p. ☐ ☐ p.
21	E	848.2	58.1	E	4.7	Ci.-S.	Cu.-N.	5 10	1.8	☉ a. p. ☐ ☐ p.
22	E	1,014.1	61.2	E	10	Ci.-S.	Cu.-N.	0 00	1	☉ a. p. ☐ ☐ p.
23	E	611.4	42.3	E	6.1	Ci.-S.	Cu.	3 55	1.8	☉ a. p. ☐ ☐ p.
24	E	578.3	51.5	E	2.9	A.-Cu.	Cu.	4 55		☉ a. p. ☐ ☐ p.
25	E	670.7	39.4	E	3	A.-Cu.	Cu.	4 50		☉ a. p. ☐ ☐ p.
26	E	660.9	49.1	E	1.1	A.-Cu., Ci.-S.	Cu.	6 25		☉ a. p. ☐ ☐ p.
27	E	537.6	34.1	E	2.4	Ci.-S. NbyE	Cu. E, ENE	6 15		☉ a. p. ☐ ☐ p.
28	E	441.4	38.6	E	4.4	Ci.-S.	Cu. E, ENE	2 50	.5	☉ a. p. ☐ ☐ p.
29	E, SW	333.6	21.7	W	3.1	Ci., Ci.-S.	Cu.-N.	4 20		☉ a. p. ☐ ☐ p.
30	E, SW	261.8	19.9	W	4.9	A.-Cu.	NE	3 35		☉ a. p. d p.
31	E	309.3	19	E	3.9	A.-Cu.	Cu.-N.	4 25	1.8	☉ a. p. ☐ ☐ p.
Mean		424	31.5		6.5			2 51		
Total		13,144.3						88 25	205.5	

a All the mean values given in this table are deduced from six daily observations taken at 2, 6, 10 a. m. and 2, 6, 10 p. m.  
 b The barometric readings of this station are not reduced to sea level.  
 c Maximum of hourly observations taken from 6 a. m. to 6 p. m.  
 d This element is based on hourly observations taken from a quadruple register, which gives only eight possible directions of the wind.

DAILY RAINFALL AT THE STATIONS OF THE WEATHER BUREAU, OCTOBER, 1916.

Station.	Day of month.															
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.
Jolo	9.1	5.3	1.8	0.3	55.9	3	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.
Isabela, Basilan	2.5	11.5			18.8	10.2	25.1	3.5	8		34.8	0.3	12.2	6.6	2.3	0.8
Zamboanga	16.8	3.9				6.1						1.5	5.6	69.6	29.9	10.9
Davao					8.1	2.5				14.2		24.9	13.2		21.8	36.8
Cagayan, Misamis	4.1	6.5	2.5										15.5		42.2	
Butuan		10.1	3.5			5.6	6.9	1.8		4.6	17.6	.3	6.3	1.8	9.2	
Dumaguete	23.9	15.2	4.8			1.7	3.3	6.9				8.1	22.4	2.8	15.5	1
Tagbilaran		1.8								1		.5				
Iwahig				23	7.4	10.3	4.8					.3			10.9	32.8
Surigao		17	3.3				.5			13.2	2.3		16	11.9	1.3	1.5
Maasin		49.5	8.4										7.6	16.8		7.1
Cebu		49.9	19.5	.3			20.6	19.9			.3	.8	6.4	6.6	25.9	39.7
Iloilo	7.9	38.6	1.8	19			9.9						25.9	4.6		13.7
San Jose Buenavista	18.5	8.6	2.3			2.5						3	14	26.9	.8	
Cuyo	4.6	15.7	16.8		10.9	15.2			17				38.4	55.4	16.5	.8
Ormoc		1.8	15.2			2.3			16.3				.6		.3	
Guiuan	1	12.5	7.6				37.6			3	2.8	15.5	9.2	27.1	26.4	6.9
Tacloban		1.7	5.1				3.1	1.7	1			3.3	4	11.2	6.1	9.5
Capiz	1.8	1	17.8	1	.6	.8	1.8	22.1		17.5	24.9	2.3	1.3	20.5	3.3	2.6
Borongan		.5	5.3	1.8	13.5		13.7	1.3		.8	9.4	21.8	7.7	23.6	29.3	43.2
Catbalogan	10.2	10.5	25.9				11.9	.5			.8	3.6	1.5	1.5	9.1	
Calbayog	2	15	26				23.3	4.1		4.1	13.7	22.9	2.8	19.6	44.3	7.6
Masbate			19.6	1.8		.3	1.3	1.3		2.8			6.3		4.3	41.4
Romblon	.8	4.3	8.1	4.8	.5	2.3	10.9	3.8	3	1.5			3	26.7	5.8	13.5
Batag							71.1	91.2				3.3	3.8	39.4	34	36
Sorsogon			50					2.3				4.6	1.3	45.7	50.5	28.4
Legaspi			4.8	.5			9.7	3.8		1		1.8	7.3	6.9	34.6	11.5
Sumay, Guam		24.1	3.8	11.4	14	3.8		5.1	30.5	12.7	3.8	12.7	17.7	5.1		3.8
Calapan	6.6		1.5	.8	1.6	6.1		2	2.1		2				3.8	1.5
Virac		29.5	10.4			1	16.5	11.4	2.3	1.3	7.6	.5	29.4	28.7	184.6	114
Naga		12.9	12.7	10.6	1.8	9.7	8.6	60.5	1			2.5	10	8.4	11.7	26.2
Batangas	30	2.3	26.7	1		15.5	6.9	1.3	1.3				5.4	.8	5.1	8.1
Lucena		.3	.3	47.5	.6		3	12.2	1.5			2.8	.8	2.8	1	15.3
Atimonan			3.8	11.4			12.7	37.6					7.9	3.3	10.4	11.5
Ambulong, Tanauan	1.5	38.4	8.6		6.6	4.8	15.3	4.8	3.3				5.4		2.3	45.9
Canlubang, Calamba	6.4		20.8	.8	10.9	6.6	.5	3.8	6.3				.8	7.3	5.1	20.3
Paracale		5.1	10.9	2	21.3	17.8	80.8	259	32.6				7.9	14.8	18.4	13.5
Santa Cruz, Laguna	4.6	4.3	1.6	.8	5.1	26.6	2.3	12.2	5.1		.8		16	7.1	13.9	12.2
Manila	28.7	9.8	3.2	1.6	5.4	1.7		.5	3	11.8		1.3	.7		11.5	37.1
Antipolo	2.3	20.3	4.4	2.3	6.7	.5	3.8	8.1	3.8	1.5	.8		1.5	6.9	.8	44.2
Iba		3.3	17.4	.9	2.3	11.2		.5	3	11.8	25.6		3		17.8	5.1
San Isidro	2.8	1.8	17	45.5	24.4	4.6	.3	2.5	18.8						23.9	8.2
Tarlac		3	1.3	3	14.7	11.2		1.3	10.9	.8					15.5	10.4
Baler		19	2.3	76.2	7.1	30.4	25.7	5.4	12.9	.5			21.6	4.6	22.1	49.8
Dagupan		1.8	4.1	1	47.1	8.1			38.9	3				1.3	41.9	2
Bolinao			11.9	10.2	90.9	38.4		.5	41.1	46.4	10.4					
Baguio	2.8	5	11.3	11.7	13	15.5	1	.5	30.3	21.1		14.7			26.5	13.5
San Fernando, Union		.8	.5	10.2	13.9	28.7			18.8	60.7	3.8				.5	3
Echagüe	39.6		8.9	33.3	9.2		3.8	1.3	22.1	1.3			.3	5.8	4.6	34.3
Candon			2	26	12	24.1			5.1	89.4	10.2					7.6
Vigan				3.6	16	7.2			13.5	65.5	.3					4.8
Tuguegarao		10.2	20.6	160.3		3.8		13.2	47.8	2.5					2.3	37.9
Laoag				.3	142.5	32			56.1	56.1	.5					
Aparri	20.1	14.7	.5	56.5	27.7	1.8		4.8	110.5	12.9		25.9	9.1	.5	1	5.1
Cape Bojeador		5.1			27.5				320.2	64.1						
Santo Domingo, Batanes	.1		1	2	9.4	112.5	18.3	2	26.9	65.3	1.8		47.2	42.1	61	46.5

\* No observation.

## Daily rainfall at the stations of the Weather Bureau, October, 1916—Continued.

Station.	Day of month.														Total.	
	17.	18.	19.	20.	21.	22.	23.	24.	25.	26.	27.	28.	29.	30.		31.
Jolo	4.3	14.7	7.1	62	1.3			14.5	14.9	0.3	3.8	17.8	36.8	27.7	2.8	347.7
Isabela, Basilan	12.2	.5	2.8	10.2	142.7	5.3		12.9	8.1	7.1	12.7	8	9.7	1.3	3	418.5
Zamboanga			9.9	17.8	3.3			8	1.3	1	1.8	6.1	16.2			87
Davao	6.4		32	6.4	35.6		40.4	6.1	20.6		2.5	65				336.5
Cagayan	5.3	6.4	5.1	2.1	2.3	3	5.3	3.7	11.9		2.8	8	6.1		.5	126.1
Butuan	18.5	.3	9.2	6.6	11.7	2.8	1.5	1.8	1.1	12.5	.8	3		.3		137.8
Dumaguete	49.3	7.9	.8	1.5	54.9		72.4	18.4	3.3	17.3		3.8	5.1			340.3
Tagbilaran		1			20.6		4.2	36.1	5.6	9.9		50.4	1.8			132.9 <sup>a</sup>
Iwahig	8.2	17.1		3.5	2.8	10.1		1	29.9	.8	5.8	3.2	3.8	1	40.4	217.1
Surigao	1.9	.8	15.5	12.9	10.2	1.8	4.1	7.6	2.8	38.6	9.8	18.5				191.5
Maasin	10.2		13.5		17.3		20.8	30.5		8.9	5.1	7.4	23.6			226.7
Cebu	11.7		3.1	8.7	3.5		35.8	24.6	3.3	4.1	6.1			13	31.7	335.5
Iloilo					2.3	2.8	45	54.8	51	1.5			2.8	7.7	10.2	299.2
San Jose Buenavista		5.1	5.3		6.9	7.9	87.6	66	12.7	7.6			5	4	7.4	283.9
Cuyo		27.4			74.9	3.6	2.5	79.5	.8	10.2				4	56.2	450.4
Ormoc	2.3		2.8	19.8	9.9		2.9	.8			.8	5.1	2.3	14.2		98.2
Guiuan	18	7.9	3.5	19.8	31.8	2.3	40.7	9.1	8.4	13.7	13.2	5	3.8			322.3
Tacloban	4.6	.1	1.1	5.9	18.5		9.8	11.6	16.9	8.2	5.7	1.6	4.6	.7	11.5	184.2
Capiz	.3	.6	9.5	14	13	7.2	.8	52.5	23.9	5.6	1.3		4.8	6.4	8.4	267.6
Borongan	26.7	7.9	7.2	19.9	14	1.5	55.1	2.8	18.8	14.2	32.5	4.6	1.5	.8	1.3	380.7
Cathalogan	2.3		.5	5	7.4		6.8	7.1	4.6	.8	3.3	5	1.3	32.5		147.6
Masbate	.8	25.9	8.7	2.3	7.2		20.3	7.9	21.6	.3	17	12	10.4	18		337.8
Romblon	10.5	.5		3.6	13.4		13.5	4.8	8.4	6.4	2.8		8.9	4.5	.8	157.2
Batag		2.8	4.8	1.8	57.2	1.1	1.5	21.3	62.3	36.1	6.6		.5	8.9	2.3	328.9
Sorsogon	6.4	2.5	6.6	19.6	35.8		27.4	20.8	11.5	6.4	1.3	23.1	28.7	14.2	526.8	
Legaspi	3.6		24.9	41.1	43.7	3.6	1.8		78.7	46	38.6	51.1	50.3	97.3	47.9	720.1
Sumay, Guam	5.3	4.3	6.9	18.6	48.8	42.7	17.2		62.8	30.5	47.7	5.1	15	14.8	16.1	453.2
Calapan	10.2	6.3	12.7	1.3	12.8	6.4	8.9		14	12.7	10.1	12.7	25.4	11.5	293.5	
Virac	36	2.5	7.9	7.1	24.6	5.1	15.2	31.7	59.4	15	6.1	7.9		3.6	2	255.9
Naga	8.1	5.9	18	26.6	28.7	3.3	35.3	1	37.8	41.1	8.1	6.1	9.1	5.9	22.3	694.5
Batangas	28.9	26.1		2.8	13.8	.8	2.1		.8			2.5	5.6	3.8		263.8
Lucena	1	4.6	1.8	8.4	4.8	6.1		6.3	.8	4.8	.5	7.9	3.3	5.8		155.6
Atimonan	29	18.3	4.1	3.6	72.2	1.3	.5	3.3	3.6		6.9	2.5	68.1	43.7	21.1	350.3
Ambulong, Tanauan	21	5.3			31.8	3.6	1.3			1.5	10.1		21.3	89.1	17.3	318
Canlubang, Calamba	10.7	5.8	1	8.8	29.7	6.4	3.8	3.1	5	6.1	1	1.5	9.6	3.6	6.9	236.6
Paracale	5.8	38.1	7.1	14	31.3	16.8	25.8	8.6	9.9	4.1	22.2	2.1	3	17.1	26.7	678.9
Santa Cruz, Laguna	18.8	4.6	.8	24.9	32	5.6	20.6	4.3	6.9	24.4	18.8	2.3	1.5	33.8	13.7	325.6
Manila	7.4	15.6			43	2.3	4.7	2.3	1.3	.1	4.3	11.2	.8	4.3	17.3	223.6
Antipolo	5.6	11.7	1		28.5	3.5	3.3	4.8	2.3	1.8	3.3	.8	2.5	12.7	12	201.7
Iba	80.1	.2			4.3	.3	1								5.3	193.9
San Isidro	17.5	12.7	1.3	4.6	28.9	7.9	9.4	5.8	7.9	4.6	1/	3			1.3	253
Tarlac	24.4				20.1	2.8	3									122.4
Baler	104.6	34.5	24.7	43.5	22.6	9.4	17.5	29.2	47	15.8	8.6	9.9		2	1.5	648.4
Dagupan	10.6	58.2	4.6		.8											223.4
Bolinao	19.6		12.4		.8											282.6
Baguio	23.3	1	7.4		1.8	1	1.8					5			1.8	205.5
San Fernando, Union	33.8	15.7	.3		2		3.3							2		203.3
Echagüe	34.9	20	11.7	2.3	24.1	23.1	26.7	1.5	.8			1.3		4.3	17.2	322.4
Candon	34	12.2					11.2	2								235.8
Vigan	21.9	3.8					.5									137.1
Tuguegarao	15.5	15.8		1.5	16	8.4	3.6				2.5		3.8		3	368.7
Laoag		28.2					1.1	.5								317.3
Aparri	6.6	1.1		8.6	1.3	.5	3.3		.5		.3		1.3	13.5	29.5	557.6
Cape Bojeador		48.8													5.1	470.8
Santo Domingo, Batanes	62.5	14.8	76.9	32.9		13.6	.3		5.5	23.1	2.5	3	4.7	16.7		692.6

<sup>a</sup> 30 days of observation.

MAXIMUM AND MINIMUM TEMPERATURES AT THE STATIONS OF THE WEATHER BUREAU, OCTOBER, 1916.

Day.	Jolo.		Isabela, Basilan.		Zamboanga. <sup>a</sup>		Davao.		Cagayan, Misamis.		Butuan.		Dumaguete.		Tagbilaran.	
	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.
	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.
1	30	21.2	34.6	23.1	31	23.1	33.7	21.2	31.6	22	33.5	23.3	30.5	23.6	32.3	23.4
2	29	21	32.6	22.1	28.2	22.7	31.7	22.5	31.8	21.8	32.5	23.2	31	23.3	32.3	23.4
3	29.4	21.4	32	22.3	28.9	22.5	33.2	21.5	28.5	22	29.7	23.3	29.4	22.7	29.6	22.6
4	29.3	20.3	32.1	21.3	29.5	22.6	33.7	21	30.4	21.5	33.1	22.2	31	22.4	31.8	22.5
5	29.8	20.4	27.6	21.1	29.3	22.7	33.7	21	31.5	22.2	34.1	22.6	31.5	23.2	32.6	22.6
6	29.9	20.7	30.1	21.1	29.3	23.1	32.7	22.5	31.5	22.5	33.6	23.2	31.3	22.8	32.3	23.5
7	30.2	20.9	31.1	21.1	29.6	22.2	32.7	20.3	31	21.5	31.9	23.5	31.1	22.8	32.8	22.7
8	30.4	21	32.1	21.6	29	23	32.2	22	32.2	22.6	29.2	23.1	31.8	21.7	32.7	23
9	29.8	21.5	34.6	21.1	30.1	23.5	34.2	21.4	31.8	22	33.6	22.5	31.2	21.9	33.3	22.5
10	30.1	21.1	33.4	22.1	28.9	23.4	33.7	21.9	31.6	22.2	32.6	22.5	31.1	21.9	32.4	22.3
11	31.8	22.4	34.1	22.8	31	22.6	31.7	21.3	31.8	22.2	32.8	22.8	30.8	24.9	33.5	22.4
12	28.9	21	32.1	22.6	29.5	23.9	33.2	21.5	31.6	22.1	32.2	23.2	31.4	24.8	31.2	23.5
13	28.1	21.3	31.6	22.6	29.5	23.3	32.7	22.5	32	22.9	32.4	23.4	31	24.6	31.4	23.4
14	28.7	20.4	31	21.6	29.6	22.8	33	21.5	30.8	21.5	32.7	22.7	30.2	22.6	32.7	23.4
15	30.4	21.7	30.9	21.6	28.8	23	32	22.5	31.4	22.9	32.9	22.9	30.3	23.5	32.2	23.2
16	30.5	21.6	30.2	21.7	28.4	23.6	32.7	22.5	31	22.5	32.2	23.2	30.5	23.3	31.4	23.3
17	28.9	21.8	30.8	23.1	28.2	23.5	28.2	22.9	31.1	23	32.5	23.5	29.9	23.4	31.3	23.4
18	29	21.4	32.6	22.7	28.2	23.5	30.7	22.2	30.8	23.2	32.4	23.4	30.8	23	32.3	23.5
19	29.7	21.7	32.2	22.9	29.9	23.4	32.7	22.9	30.7	22.6	32.1	23.1	30.7	24.7	32.7	23.5
20	29.1	22.5	29.6	24.3	31.8	22	31.7	22.5	31.9	23.1	32.4	23.4	31.7	24.7	32.8	23.5
21	29	22.3	30.8	22.5	30.2	21.8	28.7	22	30.4	22.9	29.1	22.5	30.5	25.4	31.5	23.2
22	30.7	22.5	32.1	22.6	30.2	23	32.2	22	30.4	23	32.5	22.9	30.5	22.8	31.4	22.5
23	29.9	21.7	30.6	23.1	30.2	23.2	32.2	22	31.2	22.4	29.9	22.5	30.5	23.7	31.2	23
24	27.5	22	31.6	22.1	29.2	22.9	31.8	22	29.1	23.5	29.4	22.9	27.9	22.7	28.5	22.6
25	28.8	21.1	31.1	21.3	29.8	21.6	31.7	21.9	30.4	22.8	31.9	23	30.3	22.8	31.3	23.3
26	29.8	20.9	32.1	21.6	30	22.9	32.2	21.8	29.9	22.4	31.5	22.4	30.4	22.7	31.5	22.8
27	28.4	23.3	32.2	22.3	32.9	23.5	31.7	22	31.4	22.5	31.1	22.5	29.4	29.8	22.6	22.6
28	29.3	21.5	31.4	22.1	30.8	23.2	32.7	21.5	30.9	21.6	31.5	22	30.2	24.4	31	22.4
29	27.7	21	31.8	23.1	27.7	23.1	31.7	22.5	30.6	21.6	33.1	22.4	30.7	23	31.7	22.3
30	27.8	21.5	31.6	22.1	30.9	22.2	29.7	21.9	30.2	21.4	32.6	22.2	31.5	23.3	31.8	22.6
31	29.4	21.4	30	22.4	30.2	22.4	32.2	21.2	30.8	21.5	32.9	21.8	30.3	21.9	30.5	22.5
Mean	29.4	21.4	31.6	22.2	29.8	22.9	32.2	21.9	31	22.3	31.9	22.8	30.6	23.3	31.7	22.9

Day.	Iwahig.		Surigao.		Maasin.		Cebu.		Iloilo.		San Jose Buenavista.		Cuyo.		Ormoc.	
	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.
	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.
1	32.6	21.3	33.1	23.3	35.2	23	32.3	25.5	32.5	24.5	32.3	23.4	32	22.8	33.9	22.1
2	31.5	21.1	33.1	23.8	34.8	24.1	31	23.3	32.3	23	31.3	24.1	31.8	23.7	33.2	21.9
3	32.4	20.5	32.6	23	34	23.4	26.7	23.2	28.8	24	30.5	23	27.3	23.4	27.7	22.1
4	32.6	21.5	31.4	23.2	34.5	23.8	31.2	22.9	30.5	24.1	30.8	22.1	29.5	23	32.2	21.3
5	31.4	21.9	32.4	23.2	35	23.8	32.4	24.7	30.2	23.8	31.9	23.1	31.5	24.2	33.1	21.4
6	31.2	21.2	32.3	23.3	34.8	24.2	30.9	24.7	30	23.8	31.3	22.6	27	23.9	32.3	22.8
7	31.1	22	32.6	23.3	33.4	24.2	30.2	22.9	31.5	23.6	31.7	21.5	31.3	22.5	32.7	21.4
8	31.6	20.9	32.2	23.7	33.5	24	31.4	23.9	31.5	23.3	32.5	21.8	29.5	22.4	31.3	22.9
9	32	21.2	32.8	23.6	34.5	24	32.6	24.2	31.1	22.7	33.2	22.9	29.8	23	32.8	23.3
10	32.3	21.7	34	23.3	34	23.8	31	25.6	32.5	23.5	32.4	22.6	31.8	22.8	33.4	22.2
11	32.7	21.2	33.1	23.7	33	24	31.7	25.5	31.7	23.7	32.8	23	31.6	25	33.4	22.1
12	32	22	33.1	23.6	35.3	23.8	31.6	25.8	32	24.7	33.7	23.5	31.5	27.2	33.6	23
13	31.9	22.4	32	24	34.8	24	32.3	24.6	31.5	24	32.6	23.8	29.9	27.1	32.2	22.3
14	31.6	22.3	31.6	23.3	31.5	24.2	29.9	24.1	31.5	23	32.2	23.5	30.7	24.2	32.1	21.9
15	30.1	23.5	30.6	23.7	33	23.4	32.8	24.5	31.4	23.8	31.8	22.6	30.5	23.6	33	22.3
16	33.2	22.4	29.2	23.3	32.1	24.2	31	24	31	24.2	32.3	23.6	30.9	24.8	29.4	23
17	31.8	22.1	32.4	23.5	34	24	31.6	23.7	31.5	23.2	32.8	22.9	30.3	24.1	31.2	22.4
18	30.8	22.4	32.5	23.4	34.5	24.4	31.3	24.8	32.5	24.4	32.2	24.4	30.3	23.9	32.8	23.1
19	32.8	22.8	31.3	23.9	34	22.6	31.4	25.4	31.7	25.2	32.1	23.5	31.9	23.9	32.5	22.8
20	31.1	21.9	32.3	23.3	32	25.2	31	23.4	32.6	25.2	33.8	23.7	32.2	25.3	31.9	23.3
21	31.4	22.9	29.2	23.3	31.5	23.8	29.6	23.5	31.6	24.7	33.6	23.5	30.8	25.1	30.7	22.8
22	30.8	22.5	31	22.8	34.2	24	32.3	24.8	32	24	31.3	24.1	28.7	23.3	32.3	22.6
23	31.8	21.2	30.7	23.8	33.5	23.6	33.2	25.3	33	24.2	31.7	23.5	31.1	23.6	32.2	22
24	29.8	21.8	29.7	23.3	30.5	23.2	26.6	23.5	27	23.6	27.2	23.4	27	24.7	30.4	22.6
25	26	22.9	32	23.4	32	23	30.7	24.3	31.5	23.4	30.3	23.6	28.8	23	32.9	21.3
26	26.3	21.8	32	23.4	32	22.8	30.3	24.3	30.5	23.2	31.2	23	31	24.1	32.8	23.1
27	31.4	22.8	29	23.2	32.2	23.2	29.5	24.2	29	24.3	32.4	23.6	29.7	22.6	31.8	23.4
28	28.9	22.9	32.4	23.3	32.4	23.2	30.9	24.8	31.6	24.5	32.2	22.5	30.3	26.5	31.3	22.4
29	29.9	21.4	31	22.4	32.5	22.3	30.9	24.9	31.2	24	33.3	22.5	30.7	26.6	32.7	21.8
30	29.7	21	30.8	23.3	34	22.5	30.6	22.9	30.5	23.5	32.6	22.2	30.3	26.6	32.2	21.6
31	24.5	22.1	31.6	23.7	34.6	22.4	32.6	23.3	30.8	23.5	32.2	22.5	29.4	25.2	32.8	21.4
Mean	30.9	21.9	31.6	23.4	33.5	23.6	31	24.3	31.2	23.9	32	23.1	30.3	24.2	32.2	22.3

<sup>a</sup> The maximum temperatures from the 5th to 20th are taken from a self-recording instrument.

Maximum and minimum temperatures at the stations of the Weather Bureau, October, 1916—Continued.

Day.	Guiuan.		Tacloban.		Capiz.		Borongan.		Catbalogan.		Calbayog.		Masbate.		Romblon.	
	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.
	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.
1	33.9	23.9	32.5	24.5	33.3	24	32.1	22.7	32.7	23	32.2	23	32.6	25.6	34.2	23.2
2	32.2	22.8	32.4	23.7	32.4	24.2	32	22.7	31.2	22.2	31.7	22.7	33.6	25.6	33.2	23.3
3	29.8	23	28	22.5	31.2	23.8	29.2	23.4	30.7	22.8	29.5	22.5	31.4	23.4	31.9	23.2
4	33.1	23.2	31.6	22.4	31.2	22.8	32.1	21.5	31.5	21.9	30.7	21.7	29.8	23.5	30.4	23.2
5	33.8	24.3	32.9	23.4	33.9	22.6	32	22	32.5	22.8	31.4	23.4	32	24.2	32.5	23.2
6	33.2	22.6	32.9	23.9	32.7	23.2	31.6	23.2	31.5	24.4	33.1	23.4	31.6	25.2	32.9	23.2
7	32.2	22.9	32	23.4	32.5	22.6	31.7	22	31.1	21	32.8	21.9	31.4	24.2	34.1	22.3
8	30.2	23.4	32	22.9	30.8	23.7	32.6	22.3	29.6	23	31.3	22.9	30.2	24.4	30	23.2
9	33.3	25.5	32.3	22.5	32.8	23.4	32.1	22.2	32	23.9	31.4	24.1	29.6	24.8	32.8	23.3
10	33.3	23.6	32.9	24	33.3	23.6	32.4	23	33	23.2	33	22.8	30.8	23.4	34.5	23.4
11	32.3	23.7	33.5	23.4	32.5	23.6	31.7	23.4	31.6	23.1	30	23.2	31.8	26.5	33.8	23.2
12	32.5	24.2	32.5	24.3	32.3	24.2	32	23.7	33.3	22.7	32.8	23.4	31.8	26.2	34	25.2
13	31.3	23.9	31	23.7	32.8	25	30.2	23.2	28.5	22.5	29.8	23.4	30.4	25.8	34.4	23.9
14	33	23.4	32.4	23.5	28.8	24	31	22.6	31.5	23.1	31	22.6	30.4	25.4	32.4	23.4
15	30.1	23.7	32.4	23.6	31.4	24.3	29.9	22.8	31	22	33	22.8	30	25.2	34	24
16	29	25	27.8	24.3	31.8	23.7	28	23.4	30.2	23.5	30	23.7	30.2	23.8	33.5	23.7
17	30.1	23.9	27.6	23.5	32.8	22.8	30.6	23.2	29.5	22.9	30.3	23	29.4	24	32.3	23.4
18	33.3	23.6	30.7	23.6	32.1	24.4	30.6	23.2	32.4	23.2	30.5	23.4	31.2	25.4	31.8	24.3
19	31.8	23.3	32	24	32.4	25.2	30.8	23.3	31.8	23.2	31.1	23.6	31.4	26	34.8	24.6
20	31.8	25.5	31.9	24	32.9	24.9	31.7	24.1	32.3	23.6	32.2	23.2	31.2	26.6	34.1	25
21	32.6	23.6	29.3	23.3	31.2	23.4	30.6	23	30.7	23.2	30.6	23.5	31.4	23.8	33	25.2
22	32.6	23.4	31.8	23.5	30.8	24	30.2	22.8	31	22.3	31.2	22.9	29	24.5	30	23.7
23	30.7	24.2	27.4	23.7	32.6	24.4	28.2	22.6	29.7	22.4	29.2	22.9	31	25.6	33.7	24.9
24	29.7	23.8	28.5	24	31.7	24	29.1	22.7	29.5	23.4	30	23.1	31.2	25.2	33	24.4
25	31.4	22.5	31.2	23.1	32.4	23.2	31.1	22	31.1	22	30.5	22.1	31.6	24.6	33.4	23.3
26	31.7	23.1	32	23.8	30.7	23.3	30.6	22.9	30.7	22.8	29.4	23	29.8	24.5	32	22.4
27	31.9	23.6	30.4	23.8	31.4	25.5	31.5	23.5	31.5	22.7	30.2	23.5	30	24.4	33.7	23.4
28	31.6	24.4	32.8	23.9	31.2	25.6	31.7	23.8	32.4	22	31.1	23.5	31	25	34.3	24.2
29	31.8	23.7	29.8	23.6	32.6	24.6	31.7	22.7	30.2	21.4	32.4	22.7	30.8	26	35	24.2
30	31.9	23.1	31.5	23.3	32.3	24	31.5	22	29.4	21.6	32.2	23.1	29.6	25.2	33	24.3
31	32.7	21.8	32	22.5	31.2	24.2	31.2	21.9	31.7	21.7	30.5	22.9	30.6	25	32.6	24.2
Mean	31.9	23.6	31.2	23.5	32	23.9	31	22.8	31.2	22.7	31.1	23	30.9	24.9	33.1	23.8

Day.	Batag.		Sorsogon.		Legaspi.		Sumay, Guam.		Calapan.		Virac.		Naga.		Batangas.	
	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.
	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.
1	30.7	24.3	33	23.8	32.4	24.4	30.2	23.4	32.4	21.9	32.6	24.4	34.1	21.3	34	22.4
2	32	24.4	32.5	21.5	32.8	24.3	29.2	24.6	32.5	23.4	32.4	22.2	32.9	21.4	31.9	23.4
3	30.4	23.6	30	21.5	29.5	22.8	30.2	24.2	31	22.5	29.1	22.4	27.5	20.7	30.2	22.8
4	30.4	21.8	30	21	31	22.5	29.4	24.6	30.5	23.9	30.5	22.2	29.5	21	28.6	22.7
5	32	23.4	31	22.5	32.9	23	28.2	23.4	30.5	22.5	31.5	22.4	32.2	21.3	29.6	22.7
6	31.8	24.4	30	22.7	32.4	23.6	27.6	24.4	31.5	22.5	30.3	23	32.6	21.1	30.8	23.2
7	30	24	32	22.2	33	22.2	29.2	23	31.7	21	31	21.1	31.5	19.9	32.4	22.2
8	27.3	22.2	31.2	22	29.5	23.5	30.4	25.8	31.1	22	29.3	22.4	26.7	21.5	29	22.3
9	28	22.6	31.5	22.2	31.4	23.6	29.2	25	30.5	22.8	30	22.5	30	21.5	29	23.2
10	30.4	23.9	32.6	21.2	32.6	23.6	30.2	22.8	32	22.5	31.7	22.5	33.8	21.8	31	23.5
11	31.2	25	32.6	23.4	32.4	25	30	20.6	32.1	21.6	32.1	22.4	32	20.6	32.5	21.5
12	30.6	24.3	31.5	23.4	32.3	25.9	29.2	23.4	32.2	22.5	32	22.6	32.5	21.8	33.5	22.4
13	27.8	24	30.6	23.4	29.4	23.9	29.8	22.2	33.6	23.8	29.1	22.9	30.5	21	33.6	22.8
14	29.6	22.3	30.6	23	31.2	24.5	29.8	22.8	32.5	26	30.1	23.5	31.9	21.9	32.5	23.6
15	27.7	23.3	31.6	23	27.9	24.3	29.6	25.6	32.7	24	27.3	22.5	31.3	21.8	33	22.7
16	29.4	23.3	30.6	22	28.9	23.6	30	25.6	32.6	22.5	28.1	22.8	30.3	22.2	31	22.4
17	28.4	23.5	31.4	22.5	31	22.9	29.6	25.6	31.1	23	30	22.7	30.3	22	31	23.7
18	30.3	22.9	31.6	24.2	31.4	24.6	29.6	24.6	32.4	22.5	31	22.6	31.8	21.8	33.3	22.5
19	30.3	24.2	31	24.1	31.5	25.9	29.6	24.8	32.6	23.6	31.8	22.7	33.5	21	33.6	24.5
20	30.3	25	31.5	22	31.9	25.3	30	25.6	32.8	24	31.6	23.4	33.2	21.5	32.8	24.5
21	30.3	24.7	31.5	23.8	31.8	24.5	27.8	26	33	23.6	31.5	23.5	31.9	21.7	33.2	23.6
22	27.8	23	31	23.9	28.9	24.3	29.6	24.8	34.5	23.5	28.3	23.4	29	22.1	32.3	23.3
23	30	24.8	31.5	23.8	30.6	25.6	28.8	24.4	32.2	23.8	29.7	23	31.3	21.1	33.5	22.7
24	39.3	23.9	31	24	30.6	25.4	29.4	24.8	32.2	23.8	30.6	22.4	31.8	21.7	31	23.4
25	30.2	23.9	31.5	24	32.4	23.9	30	26	33.2	23.5	30.6	24.7	32.9	21	32.8	23.9
26	26.7	22.4	29.8	22.5	29.1	22.8	29.8	25.6	32.6	22.5	29.2	22	28.9	21.5	33.3	23.3
27	29.8	24	29.9	23.5	29.8	23.4	29.6	24	33.5	23.4	31.4	22.8	32.7	20.9	31.8	22.6
28	29.9	24.4	31	23	32.1	25.4	29.2	22.8	33.5	25.2	31.7	22.5	32.3	20.7	31.8	23.1
29	30.6	24.4	29.9	23	32	25.8	27.6	23.2	32.5	24.1	32.5	21.9	31.9	19.7	32.6	22.4
30	29.8	23.2	29.7	22.5	28.9	24.1	28.8	24	34.2	23.2	30.2	23	29	21.8	30.9	22
31	29.2	23.4	28.5	21.4	29.9	25	29.4	24	33	23.5	29.3	22.5	30.6	21.5	29.8	22.8
Mean	29.7	23.7	31	22.8	31	24.2	29.4	24.2	32.3	23.2	30.5	22.7	31.3	21.3	31.8	23

Maximum and minimum temperatures at the stations of the Weather Bureau, October, 1916—Continued.

Day.	Lucena.		Atimonan.		Ambulong, Tanauan.		Canlubang, Calamba.		Paracale.		Santa Cruz, Laguna.		Manila.		Antipolo.	
	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.
	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.
1.....	32.9	23.1	32.2	22.7	34.2	22	32.1	22.1	31.6	23.5	32.5	22.6	33.8	22.8	33.2	22.1
2.....	32.5	23.3	32.7	23.7	32.7	22	32.3	21.6	32.4	24.1	32.7	23.8	31.5	23.2	32.2	22.7
3.....	29	22.2	27.9	23.1	29.9	21.5	29.5	21.5	26.6	23.5	28.9	22.7	30.4	22.5	30.2	21.1
4.....	27.5	23	29.3	23.2	28.2	22.5	28.1	22.5	28	23.4	27.8	23.7	27.3	23.2	27	21.9
5.....	29.3	22.3	29.9	22.8	30.5	22.8	27.9	22.6	31	22.8	27.1	23.4	27.2	22.5	27.2	21.2
6.....	31	22.7	30.8	22.4	31.7	22.5	31.6	22.2	30.1	22.3	31.4	22.5	30.5	23.4	31.6	22.2
7.....	31.5	22.9	31	22.5	32.2	21.7	30.6	21.2	31.4	22.5	31.5	22.1	31.2	22.1	32.5	20.6
8.....	27.8	23	27.5	23.2	26.7	22	27.27	22.1	26.8	23	27	22.9	28.3	23.2	27.3	21.1
9.....	29	22.6	29	22.4	27.6	22.3	27.57	21.6	29.4	23.6	26.8	22.5	26.6	23	26.3	21.4
10.....	30.5	23	32.5	23.7	31.2	23.6	30.9	23.3	33.3	23.5	30.5	23.2	30	24.3	30.2	22.8
11.....	32.3	21	31.9	22.4	33.2	22	31.8	20.9	31.5	23.4	31.9	22.4	31.5	22.7	31.2	20.5
12.....	32.1	24	31.7	26.8	32.9	23.5	31.8	21.2	31.7	24.4	31.7	23.7	31.3	22.4	32.4	20.7
13.....	30.6	24	29.5	25.9	32.8	24.8	31.9	22.3	30.5	25.9	30.9	23.2	31.3	22.4	33.2	21.5
14.....	30.8	24	31.2	25.6	30.7	24.6	30.1	23.8	30.2	24	29.8	24.1	30.8	23.3	30.3	21.8
15.....	31.4	23.6	32.2	25.5	30.7	24.2	30.1	22.4	29.7	23.9	27.9	23.8	30	23.4	31.3	21.7
16.....	30.5	22.6	28.8	23.6	31.3	23.2	30.4	22.6	29	24	29	23.3	28.6	23.5	29	22.4
17.....	29.5	23.1	28.2	23.2	31.6	23	30	22.8	29.9	23.4	28.5	23.5	30	23.4	30.1	22.5
18.....	31.2	23.3	29.6	23.2	31.7	23.4	29.9	22.8	30.3	24.1	29.8	23.2	31.8	23.6	32.8	22.2
19.....	32.5	23.9	31.5	23.1	33	24	31.1	23.1	31.2	23.3	31.8	24.3	33	23.2	32.6	22.2
20.....	32.5	24.3	31.5	23.7	33.2	24.2	31.4	23.2	30.7	24.3	32	24.4	33	24.2	32.8	23.2
21.....	32.5	23.8	32.3	24.8	32	23.9	29.5	23.2	29.9	24	30.6	23	29.6	23.2	31.6	22
22.....	30.5	23.6	29.8	25	29.3	23.7	29.8	23.1	27.6	23.7	28.1	23.3	28.3	23.4	29.7	22
23.....	32	23	30.7	23	31.8	23.4	29.7	23	30.2	25	29.1	23.9	30	23	30.3	22
24.....	30.5	24.4	29.7	26.5	31.3	24	30.4	23	30.4	24.5	30.8	24.1	30.3	23.7	32.1	22.3
25.....	31.5	24.4	32.8	24.4	33	24.7	31.2	22.6	31.2	25.5	31	23.9	32.3	23.2	31.8	22.8
26.....	30.9	23.9	30.7	23.2	31	24.2	30.1	22.6	30.8	24.2	29.5	23.3	32	22.9	31.8	22.1
27.....	31.5	23.4	31.2	26	31	23.9	29.6	22.3	30.1	24.5	28.1	23.2	30.7	21.8	31.6	21
28.....	30.5	23.5	31.4	25.8	31.3	23.9	31	22.4	31.3	26.2	31	23.8	32.5	21.6	32.8	21.2
29.....	30	23.4	30.2	25.8	31.2	24.2	30.4	21.6	31	26.2	29.8	22.3	31.4	22.9	31.8	21
30.....	29.9	22.6	29.2	23.7	29.3	23.9	29.6	21.6	30	24.5	29.3	22.9	29.7	22.5	30.2	21
31.....	27.3	23	26.8	23.9	26.4	23.5	26.4	22.4	28.4	24.2	26.2	23.2	30.2	23.2	30.7	21.7
Mean.....	30.7	23.3	30.4	24	31.1	23.3	30.1	22.4	30.2	24	29.8	23.3	30.5	23	30.9	21.8

Day.	Iba.		San Isidro.		Tarlac.		Baler.		Dagupan.		Bolinao.		Baguio.		San Fernando, Union.	
	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.
	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.
1.....	31.4	22.5	32.5	23	33.4	23.2	32.8	23.2	34.7	24	32	24.1	23.7	15.9	32.2	23.5
2.....	31.8	22.2	31.5	23.9	34	23.5	33	23.7	32.2	25.5	32.5	24.5	23.3	16.5	32.4	24.8
3.....	31.4	22.2	28.6	22.7	31	23.6	29	22.3	32.3	24.1	32.9	25.2	22.8	15.9	32	23.5
4.....	28.7	22.7	25.7	23	26.7	23.2	27.6	23	29	23.5	30.8	24.3	18.8	16.3	30.6	23.8
5.....	29.6	23.1	26	22.1	31.7	22.4	28.2	22.4	28.9	22.8	29.6	23.6	18.8	15.1	31	23.5
6.....	30.3	23	30.6	22.4	31.7	22.5	30.5	22.6	33	22.6	30.8	23.4	19.8	15.4	31.2	23.5
7.....	32.7	22	30.6	22	31.5	22.5	31.1	22	32.7	22.7	30.9	22.6	22.5	15.1	30.5	21.8
8.....	31.3	22.2	28	23.4	29.8	23	28.1	21.7	33.2	24.5	32.6	24	21.8	15.4	30.8	23.7
9.....	27.8	23	25	22.5	26.7	23	26.8	22.3	29.1	24.3	29.3	24.6	19	15.9	30.3	24.1
10.....	29.2	22.4	29.6	23.4	30.2	23.5	30.8	22.9	28.7	22.5	25.6	23.4	17.1	14	26	23
11.....	32.1	21.7	30.6	22.6	32.2	22.8	31.6	21.8	31.7	23.1	31.6	22.9	22.3	14.9	30.7	22.7
12.....	32	22.1	32.2	22.5	34	22.2	31.7	22	32.4	23.5	32.1	23.3	23.5	16	31.7	22.5
13.....	32.2	22.4	32.4	23.4	34.2	23.5	32.4	22.7	34.3	25	32.1	25.3	25.2	15.9	31.6	23.5
14.....	32.6	23.5	31.5	23.7	33.3	23.4	31.2	23.5	34.4	23.9	33.2	24.1	24.7	15.4	31.9	23.8
15.....	31.9	23.6	30.4	23.4	33	23.2	31.5	23	33.1	23	32.9	24.1	24.3	15.3	31.9	22.5
16.....	30.8	22.5	28.2	23.4	32.2	23.3	28.2	23.7	32.7	23.3	32.6	24.6	21.9	16.1	32.2	22.5
17.....	28.8	23.4	28.6	24	29.4	23.7	27.6	23	28.1	23.7	30	24.1	19.5	16	29.5	23.9
18.....	29.7	22.5	30.8	23.4	30	23.4	27.3	23.5	30.7	23.4	30.1	24	20.3	15.8	31	23.9
19.....	34.1	23	30.9	23.4	32.5	23	30	23.6	34.4	23.6	31.1	24.6	23	15.9	30.2	23.4
20.....	34.4	23.2	30.7	24	32.4	23.1	30.2	23.5	34.3	24.2	33.4	24	23.8	15.8	31.7	23.5
21.....	32.3	24.5	26.6	23.3	31	23.2	30.7	23.5	34.3	24	33	24.3	23.8	15.9	32	23.6
22.....	29.7	23.5	26.4	23.1	28.2	22.4	28	23.6	30.2	23.5	29.1	24.1	19.2	15.5	29	24
23.....	31.4	22.5	29.1	23.2	30.4	22.2	27.8	23.2	33.6	23.6	32.2	22.4	24.3	16.5	32.3	23
24.....	32.1	23.5	31.5	23.6	32.2	23.5	30.2	23.9	33.7	24	32.9	24.6	24.8	16.3	31.8	23.4
25.....	34.6	24	30.2	23.5	32.6	23.5	30.4	24.4	34.6	24.1	34.7	24.8	24.7	16.7	33	24
26.....	33.8	24.3	29.9	23.3	31.5	23.4	29.7	23.3	34.2	24.2	33.7	24.9	22.9	15.7	32.5	24
27.....	32.3	22.6	31	22.6	32.5	22.7	30.7	23.2	33.7	22.9	32.6	23.4	24.2	14.4	32	23
28.....	32.5	21	30.9	22.5	34.5	22.1	30.5	22.9	33.3	23	33.4	22.5	24.9	15.5	31.5	21.6
29.....	32.5	22.7	32.1	22.2	34.5	22	35.2	21.5	33.7	22.6	33.2	24.8	25.3	15.1	32	21.7
30.....	31.5	21.2	31.2	22.5	34.7	22	31.5	22.2	34.3	23.4	33.1	22.9	23.9	15.5	32.1	22.8
31.....	31.7	22	30.3	23	34	22	30.6	23	32.7	23.2	32.5	22.8	24.8	15.6	32	22.3
Mean.....	31.5	22.7	29.8	23.1	31.8	22.9	30.2	22.9	32.5	23.6	31.8	23.9	22.5	15.7	31.3	23.3

Maximum and minimum temperatures at the stations of the Weather Bureau, October, 1916—Continued.

Day.	Echague.		Candon.		Vigan.		Tuguegarao.		Laoag.		Aparri.		Cape Bojeador.		Santo Domingo, Batanes.	
	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.
	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.
1	34.5	22	31	25.4	32	23.6	35	23	33.2	24.5	30.7	24.3	32.5	24.8	31.1	24
2	33	22.9	32	25	32.1	22.9	32.8	24	33.4	23.6	29.3	23.9	32	24.2	29.1	24.8
3	31.6	22.9	32.8	25.2	32	23.3	28	23.2	34.9	24.1	30.1	24.2	29.8	23.4	29.4	24.8
4	25	22.6	32.9	24.6	30.9	22.4	25.2	22.4	30.7	23	27.5	24.1	29	23.8	28	24
5	25.5	21.8	30.5	23.6	29.8	21.7	25	21.5	25.2	21.9	26.1	24.1	26.6	23.6	28	23.5
6	31.7	21.8	30.7	23.6	31.4	21.5	31	22.7	30.2	21.9	25.9	22.5	28.2	21.4	27	23.9
7	33.5	21.4	31.5	23	30.3	21.3	31.6	22.5	31.1	21.9	29.9	22.5	29.8	22.4	28.1	23.4
8	28.5	22.6	30	24.2	31.5	22.3	29.8	20.5	34.2	21.7	29.5	23.3	29.8	23.6	28	23.4
9	26	22.3	30	24.5	31.2	23	25.8	22.9	27.3	22.9	26.3	23.8	29.8	23	30.4	24.4
10	29.7	22.6	27.6	24	26	21.9	28.6	22.8	27.5	22.4	26.3	23.2	27.6	23.6	29.7	25.8
11	34	22	30.1	23.5	31.7	21.5	33.1	23	29.5	21.8	30.8	23.5	28	21.8	28.5	24.2
12	33.5	21.6	31.1	24	30.9	21.3	33.5	23.5	32.2	22	30.1	23.8	31.4	24	29.6	25.5
13	32.4	24.3	31.5	24	31.8	22.5	33.7	23.8	34.6	22.6	30.2	24.1	29.8	24	31	23.7
14	30	22.9	31.8	25	32.2	23.4	32.5	32	22.8	36	22.1	30.1	24.3	24	27	23.9
15	31.6	22.2	30.5	24.2	33.8	23.5	32	22.6	36.9	22.1	30.9	23.8	30.4	24	27	23.9
16	26.7	23.4	30.1	25.2	32.2	23.3	26.6	23.5	34	23	28.8	24.4	29.2	23.8	29.4	23.9
17	25.4	23	29.7	25.5	30.4	22.5	26.4	23.1	31.9	25.4	26.2	23.7	29	24	28.3	23.4
18	30.6	22.8	29.8	24	30.5	22.5	30.5	23	31.1	23.4	28.2	23.3	29.8	23.7	27.4	23.2
19	33	22.3	30.5	24.6	29.3	22.8	33.3	22.7	30.4	23.4	30.7	22.8	30.6	22.4	27.6	23.3
20	30.9	22.5	31.5	24.5	31.4	23.2	31.3	22.6	33.4	23.7	30.5	23.5	31.4	24.2	27.4	22.9
21	26.5	22.3	31.5	24.5	32.2	22.8	31.8	22.5	36	24.2	31.1	23.2	31.5	24.2	31	24
22	32	22.9	30	25	32.1	24.9	28.2	23.3	35.3	25	29.1	23.4	31.6	24.5	31.1	25
23	30.5	22.2	31.1	25.5	31.7	24.7	28.8	23.7	33.8	24.9	27.5	23.7	31.6	24.5	31.4	23.5
24	32.8	23.2	31.7	25.2	32.7	23.5	33	22.6	33.1	23.5	31.1	23.7	32.6	23.8	31.4	25.6
25	32	24	31.1	25.2	32.8	23.9	33.6	23.9	36.6	23	31.3	23.7	32.8	24.6	31.4	25.9
26	31.5	23.3	32	24.6	35	23.3	32.8	22.7	36	22.2	30.9	23.3	31.5	24.1	30.5	25.5
27	31.5	21.4	31.7	23.7	32.7	22.3	33.4	22.5	36.4	22	30.7	23.2	32	23.8	30.8	24.5
28	29.8	22.5	31.9	23.2	34.9	23.7	32	22.6	36.7	21	30.9	23.8	30.8	23.4	31.4	24.7
29	32	22.1	31.5	24.2	33.9	23	32.5	22.7	36.6	20	30.5	22.5	30.5	23.2	29.8	23.5
30	31.4	22.6	32.3	23.5	34.3	24	31.6	21.5	35.9	21.7	30.4	23.9	31	23.8	30	22.9
31	31.5	22.8	32	23	33.4	22.5	30	23.2	36.1	21	30.2	24.1	29.8	23.8	28.1	23.9
Mean	30.6	22.6	31	24.4	31.8	22.9	30.8	22.8	33.2	22.8	29.4	23.5	30.3	23.6	29.4	24.2



# SEISMOLOGICAL BULLETIN FOR OCTOBER, 1916.

By Rev. MIGUEL SADERRA MASÓ, S. J.,  
*Assistant Director of the Weather Bureau.*

## EARTHQUAKES FELT IN THE PHILIPPINES.<sup>1</sup>

- 1, 7<sup>h</sup> 36<sup>m</sup> [1, 15<sup>h</sup> 36<sup>m</sup>]. Baguio (W Luzon). Earthquake shocks of intensity II-III.
- 2, 6<sup>h</sup> 00<sup>m</sup> [2, 15<sup>h</sup> 39<sup>m</sup>]. Guam (Mariana Islands). Earthquake of intensity IV-V, felt throughout the whole island and originated at some distance to the ESE.
- 4, 11<sup>h</sup> 51<sup>m</sup> 11<sup>s\*</sup> [4, 19<sup>h</sup> 51<sup>m</sup> 11<sup>s</sup>]. Butuan (N Mindanao). Oscillatory earthquake of intensity III-IV. The origin was placed rather far from Butuan in the Philippine Deep of the Pacific.
- 5, 3<sup>h</sup> 23<sup>m</sup> [5, 11<sup>h</sup> 23<sup>m</sup>]. Cabo Bojeador (NW Luzon). Earthquake of intensity III, duration 3 seconds.
- 5, 16<sup>h</sup> 37<sup>m</sup> 16<sup>s\*</sup> [6, 0<sup>h</sup> 37<sup>m</sup> 16<sup>s</sup>]. Baguio (W Luzon). Oscillatory earthquake of intensity II-III. The seismographic records of Manila and Baguio show that the epicenter of this shock was placed toward the E of the last station, in the Province of Nueva Vizcaya.
- 5, 21<sup>h</sup> 18<sup>m</sup> [6, 5<sup>h</sup> 18<sup>m</sup>]. Butuan (N Mindanao). Oscillatory earthquake, direction E-W, intensity III, duration 4 seconds.
- 9, 4<sup>h</sup> 49<sup>m</sup> [9, 12<sup>h</sup> 49<sup>m</sup>]. Butuan (N Mindanao). Earthquake shocks of intensity III. The origin lay in the Pacific.
- 10, 14<sup>h</sup> 31<sup>m</sup> 49<sup>s\*</sup> [10, 22<sup>h</sup> 31<sup>m</sup> 49<sup>s</sup>]. Panay Island. Earthquake shocks felt with intensity III at Iloilo and Capiz. They do not seem to have been perceptible in the Antique Province; the origin must be sought toward the NE of the island. It was also recorded at Butuan.
- 10, 17<sup>h</sup> 40<sup>m</sup> [11, 1<sup>h</sup> 40<sup>m</sup>]. Cuyo Island. Oscillatory earthquake, direction E-W, intensity IV, duration 6 seconds.
- 17, 21<sup>h</sup> 37<sup>m</sup> [18, 5<sup>h</sup> 37<sup>m</sup>]. Capiz (N Panay). Oscillatory shocks of intensity III.
- 19, 17<sup>h</sup> 08<sup>m</sup> 32<sup>s\*</sup> [20, 1<sup>h</sup> 08<sup>m</sup> 32<sup>s</sup>]. Laoag (NW Luzon). Earthquake of intensity III-IV.
- 21, 17<sup>h</sup> 31<sup>m</sup> 43<sup>s\*</sup> [22, 1<sup>h</sup> 31<sup>m</sup> 43<sup>s</sup>]. S Luzon. Earthquake of intensity III felt in the Batangas Province; its epicenter was in the tectonic line of the Taal volcano, some distance SW of it. At 18<sup>h</sup> 27<sup>m</sup> 48<sup>s\*</sup> [22, 2<sup>h</sup> 27<sup>m</sup> 48<sup>s</sup>], occurred a second and greater earthquake; it reached intensity IV with rumblings at Batangas, but it was not perceptible outside of that province. Its origin lay in the same place of the first one.
- 26, 1<sup>h</sup> 38<sup>m</sup> 31<sup>s\*</sup> [26, 9<sup>h</sup> 38<sup>m</sup> 31<sup>s</sup>]. NE Mindanao. Earthquake of intensity IV at Surigao and Butuan. The origin seems to have been toward the E of Surigao near the deepest region of the Philippine Deep.
- 26, 18<sup>h</sup> 20<sup>m</sup> [27, 3<sup>h</sup> 59<sup>m</sup>]. Guam (Mariana Islands). Earthquake of intensity II. The seismographic records of Manila, Agaña (Guam) and Zikawei place the origin a little more than 500 kilometers west of Guam.
- 28, 3<sup>h</sup> 29<sup>m</sup> 53<sup>s\*</sup> [28, 11<sup>h</sup> 29<sup>m</sup> 53<sup>s</sup>]. Surigao (NE Mindanao). Earthquake shock of intensity III-IV, duration very short. From the seismographic records of Manila and Butuan may be deduced that this earthquake originated near the same place of the one felt on the 26th.

<sup>1</sup> The intensity of earthquakes is given in the notation known as the Rossi-Forel scale. The time is that indicated by the seismographs at the Central Observatory whenever the disturbance has been registered by them. This fact is denoted by an asterisk (\*). Otherwise the time is that noted by the observer who sent the report. All time indications are in Greenwich mean time (midnight=0<sup>h</sup>), insular time being added in brackets for the convenience of Philippine readers.

RECORDS OF THE MICROSEISMOGRAPH.

[Time: Greenwich mean. Midnight=0h. Instrument: Wiechert seismograph; 1,000 kilograms.  $A_N$ :  $T_0=6.19$ ,  $\epsilon=1.966$ ,  $\frac{r}{T_0^2}=0.053$ ;  
 $A_N$ :  $T_0=5.96$ ,  $\epsilon=2.267$ ,  $\frac{r}{T_0^2}=0.056$ . Alluvium. 2.40 meters above sea level.]

No.	Date.	Character.	Phase.	Hour.	Period.	Amplitude.		Remarks.
						$A_N$ $\mu$	$A_E$ $\mu$	
320	2	I	e F	<i>h. m. s.</i> 7 33 28 41				
321	2	I	e F	8 02 36 11				
322	2	Iv	eP F	10 16 33 20				
323	3	Iu	e L M <sub>E</sub> M <sub>N</sub>	1 46 47 2 07 19 29 06 45 52 49 35	23 23		3 4	End overtaken by following earthquake.
324	3	Iv	eP L M <sub>E</sub> F F	3 08 59 09 24 09 36 15 50	3		37	New earthquake. This end belongs to the former one.
325	8	Iv	eP F	5 28 20 31				
326	4	I	e F	11 51 11 12 04				Butuan (N Mindanao).
327	5	Iv	eP F	16 37 36 40				Baguio (W Luzon).
328	6	Iv	eP F	4 43 17 45				
329	8	Iv	eP F	11 49 19 52				
330	10	Iv	eP L M <sub>N</sub> F	14 31 49 32 42 32 53 38	3		6	Panay Island.
331	11	Ir	e F	18 16 56 51				
332	13	Iv	eP F	8 19 15 23				
333	14	Iv	eP F	9 37 39 40				
334	14	Iv	eP F	15 59 20 16 02				
335	18	Iv	eP F	9 48 38 51				
336	19	Iv	eP L M <sub>N</sub> F	17 08 32 09 25 09 42 16	3		36	Laoag (NW Luzon).
337	19	I	e F	17 50 52 18 06				
338	20	IIv	eP L	8 34 23 34 41				Maxima and end in both components lost by the pens thrown off by the force of the shock.
339	20	Iv	eP L M <sub>N</sub> F	17 16 24 16 54 17 12 23	3		15	
340	21	I	e F	19 11 48 37				
341	21	IIIa	eP L F	17 31 43 31 59 45				S Luzon. Maxima and end in both components lost by the pens thrown off by the force of the shock.
342	21	IIv	eP L M <sub>E</sub> M <sub>N</sub> F	18 27 48 28 04 29 28 29 30 36	4 4		361 349	S Luzon, second earthquake.

Records of the microseismograph—Continued.

No.	Date.	Character.	Phase.	Hour.			Period.	Amplitude.		Remarks.
								A <sub>N</sub> μ	A <sub>E</sub> μ	
343	21	Ir	e S L M <sub>N</sub> F	19	31	25	14	7		
					35	55				
					40	23				
				20	16					
344	22	Iv	eP L F	0	32	29				
					32	54				
					36					
345	23	Iv	eP L M <sub>E</sub> M <sub>N</sub> F	0	24	11	6	23	25	
					24	23				
					25	26				
					25	27				
					31					
346	24	Ir	e S L M <sub>N</sub> M <sub>E</sub> F	23	36	21	11	18	15	
					38	43				
					40	42				
					41	34				
					41	38				
	0	16								
347	25	Iv	eP F	18	19	12				
					21					
348	26	Iv	eP S L M <sub>N</sub> F	1	38	31	5	7	NE Mindanao.	
					39	43				
					40	54				
					41	10				
					52					
349	26	Ir	eP S L M <sub>N</sub> M <sub>E</sub> F	3	20	39	5	67	41	
					23	26				
					25	23				
					26	11				
					26	38				
	4	02								
350	26	Ir	e F	5	51	29				
					6	12				
351	26	Iv	eP S L M <sub>N</sub> F	18	25	19	6	10		
					26	58				
					29	18				
					30	21				
					19	03				
352	26	Iv	eP F	22	03	41				
					06					
353	27	I	e F	3	04	04				
					15					
354	28	Iv	e L F	3	29	53			Surigao (NE Mindanao).	
					31	12				
					41					
355	30	Ir	eP S L M <sub>N</sub> F	1	54	46	6	20		
					57	48				
				2	00	57				
					03	08				
					31					
356	31	Ir	eP S L M <sub>N</sub> F	0	52	43	8	12	Felt at Manado (Celebes).	
					55	03				
					57	32				
				1	01	14				
					18					
357	31	Iv	eP L F	15	29	17				
					29	29				
					32					
358	31	Ilu	eP S L M <sub>E1</sub> M <sub>N1</sub> M <sub>N2</sub> M <sub>E2</sub> M <sub>N3</sub> M <sub>E3</sub> F	15	39	28	22	13	10	
					46	11				
					53	14				
					54	28				
					54	36				
					58	48				
					59	44				
				16	00	58				
					01	11				
					17	12				

TEMBLORES DE TIERRA SENTIDOS EN FILIPINAS.<sup>1</sup>

1, 7<sup>h</sup> 36<sup>m</sup> [1, 15<sup>h</sup> 36<sup>m</sup>]. **Baguio** (W de Luzón). Temblor de tierra de intensidad II-III.  
 2, 6<sup>h</sup> 00<sup>m</sup> [2, 15<sup>h</sup> 39<sup>m</sup>]. **Guam** (Islas Marianas). Temblor de tierra de intensidad IV-V, sentido en toda la isla y originado a poca distancia hacia el ESE.

4, 11<sup>h</sup> 51<sup>m</sup> 11<sup>s\*</sup> [4, 19<sup>h</sup> 51<sup>m</sup> 11<sup>s</sup>]. **Butúan** (N de Mindanao). Temblor oscilatorio de intensidad III-IV. El origen de este temblor se hallaba lejos de Butúan en el Abismo de Filipinas del Mar Pacífico.

5, 3<sup>h</sup> 23<sup>m</sup> [5, 11<sup>h</sup> 23<sup>s</sup>]. **Cabo Bojeador**. (NW de Luzón.) Temblor de tierra de intensidad III, duración 3 segunda.

5, 16<sup>h</sup> 37<sup>m</sup> 36<sup>s\*</sup> [6, 0<sup>h</sup> 37<sup>m</sup> 36<sup>s</sup>]. **Baguio** (W de Luzón). Temblor oscilatorio, intensidad II-III. Los registros sismográficos de Manila y de Baguio indican que el epicentro de este temblor estaba al E de Baguio en la Provincia de Nueva Vizcaya.

5, 21<sup>h</sup> 18<sup>m</sup> [6, 5<sup>h</sup> 18<sup>m</sup>]. **Butúan** (N de Mindanao). Temblor oscilatorio, dirección E-W, intensidad III, duración 4 segundos.

9, 4<sup>h</sup> 49<sup>m</sup> [9, 12<sup>h</sup> 49<sup>m</sup>]. **Butúan** (N de Mindanao). Temblor de tierra de intensidad III. Su origen se hallaba en el Pacífico.

10, 14<sup>h</sup> 31<sup>m</sup> 49<sup>s\*</sup> [10, 22<sup>h</sup> 31<sup>m</sup> 49<sup>s</sup>]. **Isla de Panay**. Temblor de tierra de intensidad III tanto en Iloílo como en Cápiz. No parece que fué perceptible en Antique; su epicentro probablemente estaba hacia el NE de la isla. Registróse también en Butúan.

10, 17<sup>h</sup> 40<sup>m</sup> [11, 1<sup>h</sup> 40<sup>m</sup>]. **Isla de Cuyo**. Temblor oscilatorio, dirección E-W intensidad IV, duración 6 segundos.

17, 21<sup>h</sup> 37<sup>m</sup> [18, 5<sup>h</sup> 37<sup>m</sup>]. **Cápiz** (N de Panay). Temblor oscilatorio; intensidad III, duración 5 segundos.

19, 17<sup>h</sup> 08<sup>m</sup> 32<sup>s\*</sup> [20, 1<sup>h</sup> 08<sup>m</sup> 32<sup>s</sup>]. **Laoag** (NW de Luzón). Temblor de tierra de intensidad III-IV.

21, 17<sup>h</sup> 31<sup>m</sup> 43<sup>s\*</sup> [22, 1<sup>h</sup> 31<sup>m</sup> 43<sup>s</sup>]. **S de Luzón**. Temblor de tierra de intensidad III sentido en la Provincia de Batangas, el epicentro se hallaba en la línea tectónica del Volcán de Taal, hacia el SW del mismo. A 18<sup>h</sup> 27<sup>m</sup> 48<sup>s\*</sup> [22, 2<sup>h</sup> 27<sup>m</sup> 48<sup>s</sup>] ocurrió un segundo temblor mucho más fuerte que el primero, de intensidad IV y con ruido subterráneo en Batangas, el cual, sin embargo, no fué perceptible fuera de la provincia; su origen estaba en el mismo sitio que el del anterior.

26, 1<sup>h</sup> 38<sup>m</sup> 31<sup>s\*</sup> [26, 9<sup>h</sup> 38<sup>m</sup> 31<sup>s</sup>]. **NE de Mindanao**. Temblor de tierra de intensidad IV en Surigao y en Butúan. El origen estaba el E de Surigao hacia la parte más profunda del Abismo de Filipinas.

26, 18<sup>h</sup> 20<sup>m</sup> [27, 3<sup>h</sup> 59<sup>m</sup>]. **Guam** (Islas Marianas). Temblor de tierra de intensidad II. Los registros sismográficos de Agaña (Guam), Manila y Zikawei indican que el epicentro se hallaba al W de Guam a más de 500 kilómetros de distancia.

28, 3<sup>h</sup> 29<sup>m</sup> 53<sup>s\*</sup> [28, 11<sup>h</sup> 29<sup>m</sup> 53<sup>s</sup>]. **Surigao** (NE de Mindanao). Temblor de tierra de intensidad III-IV, duración muy corta. Los registros sismográficos de Manila y Butúan indican que este temblor tuvo origen en el mismo sitio que el del 26.

<sup>1</sup> La intensidad de los terremotos se indica conforme a la conocida escala de Rossi-Forel. Cuanto a la hora de su ocurrencia, adoptamos la indicada por los sismógrafos de este Observatorio siempre que los hayan registrado, distinguiéndola por medio de un asterisco (\*). En caso contrario copiamos la apuntada por los observadores que nos envían las notas. Todas las indicaciones del tiempo se refieren al tiempo medio de Greenwich (medianoche=0<sup>h</sup>). Para conveniencia de los lectores de Filipinas se añade también el tiempo insular.





551.3917  
P556

AUG 18 1917

LIBRARY

THE GOVERNMENT OF THE PHILIPPINE ISLANDS

# WEATHER BUREAU

MANILA CENTRAL OBSERVATORY

---

BULLETIN FOR NOVEMBER, 1916

---

PREPARED UNDER THE DIRECTION OF

REV. JOSÉ ALGUÉ, S. J.

DIRECTOR OF THE WEATHER BUREAU

MANILA  
BUREAU OF PRINTING  
1917





---

---

**BULLETIN FOR NOVEMBER, 1916.**



# METEOROLOGICAL BULLETIN FOR NOVEMBER, 1916.

By Rev. JOSÉ CORONAS, S. J.,  
Chief, Meteorological Division of the Weather Bureau.

## GENERAL WEATHER NOTES.

Pressure and temperature.—The mean atmospheric pressure for this month in the Philippines is somewhat lower than that of the preceding year, and much lower still than the normal for November. The highest pressures of the month were generally observed on the 13th and 22d while the lowest took place on the 16th, 26th and 27th.

The mean monthly temperature is also somewhat lower than that of November, 1915, the difference being greater than 1° C. in three of our stations. The extreme monthly values for Manila were 32° C. on the 4th and 19.5° C. on the 14th. The absolute maximum and minimum temperatures for Baguio were 26° C., 11.2° C. on the top of Mirador, and 26.3° C., 10.5° C. in the valley.

### PRESSURE AND TEMPERATURE AT THE FIRST AND SECOND CLASS STATIONS FOR NOVEMBER, 1916.

Station.	Pressure.						Temperature.					
	Mean.	Departure from Nov., 1915.	Highest mean.	Day.	Lowest mean.	Day.	Mean.	Departure from Nov., 1915.	Highest.	Day.	Lowest.	Day.
	mm.	mm.	mm.		mm.		°C.	°C.	°C.		°C.	
Zamboanga	757.24	---	758.75	18	755.54	26	26.1	---	32.9	12, 14	22.1	26
Tagbilaran	56.99	-0.82	58.54	22	54.86	27	26	-0.7	33.3	5	20.9	26
Surigao	56.85	-.97	58.51	22	54.15	27	26.3	-.5	33.1	20	22.1	23
Cebu	57.06	-.77	58.58	22	54.82	26	26.8	-1.2	33	1	22	13
Iloilo	57.10	-.68	58.37	18	55.29	27	26.2	-1	32.5	7	21.5	26
Ormoc	57.12	-.94	58.69	22	54.78	27	25.9	-.4	33.8	4	19.9	6
Tacloban	56.94	-.92	58.73	13	54.06	27	26.2	-.7	32.7	9	22.3	23
Capiz	57.42	-.85	59.21	13	55.40	27	26.5	-.6	33.2	9	22	23
Calbayog	57.10	-.95	58.99	13	54.22	27	25.9	-.2	34.4	9	21.5	25
Legaspi	57.16	-.83	59.20	13	54.26	27	26.4	-1.2	33	8	20.4	7
Atimonan	57.57	-.90	60	13	55.47	27	26.4	-.3	32.6	8	21.9	30
Ambulong, Tanauan	57.15	-.65	59.44	13	55.49	27	26.4	+.3	33.6	8	21.5	8
Paracale	57.72	-.87	60.25	13	55.35	27	26.2	-.6	31.9	8	22.2	30
Manila	57.71	-.77	59.99	13	55.91	27	25.7	-.3	32	4	19.5	14
San Isidro	57.94	-.77	60.44	13	56.07	16	26	-.4	32.7	18	19	14
Dagupan	57.07	-.67	59.50	13	55.20	16	27	-.1	35.3	4	19.8	30
Bolinao	57.43	-.60	59.78	13	55.65	26	27.4	+.3	33.3	2, 3	20.9	13
Baguio <sup>a</sup>	635.69	-.73	637.38	13	634.12	16	17.7	-.5	26	4	11.2	30
Vigan	757.57	-.56	760.04	13	755.59	26	26.2	-1	33.8	12	18	30
Tuguegarao	59.04	-.81	62.40	13	56.78	16	24.4	-1.3	33.5	3	18.3	30
Laoag	58.20	---	60.95	13	56.32	26	25.3	---	---	---	17.9	7
Aparri	59.40	-.74	62.94	13	57.18	7	24.8	-1	31.5	3	19.8	30

<sup>a</sup> The barometric readings of this station are not reduced to sea level.

Rainfall.—The monthly amount of rainfall was generally greater than that of the preceding year and than the normal for November in the Visayas and Mindanao, but lower in Luzon. The total rainfall collected in the Manila gauges during the month is 101.6 mm. and 21.8 mm. below that of November, 1915, and below the normal respectively.

RAINFALL AT VARIOUS STATIONS OF THE WEATHER BUREAU DURING THE MONTH OF NOVEMBER, 1916.

Station.	Total.	Departure from Nov., 1915.		Rainy days.	Departure from Nov., 1915.	Greatest rainfall in a single day.	Day.	Station.	Total.	Departure from Nov., 1915.		Rainy days.	Departure from Nov., 1915.	Greatest rainfall in a single day.	Day.	
		mm.	mm.							mm.	mm.					
Jolo	234.5	+127.9	+56.4	23	+11	57.9	5	Calapan	252.7	+34.2	-34.8	18	-5	47.8	20	
Isabela, Basilan	144.6	+26.3	-11.4	12	-4	33	21	Virac	264.6	-246.3	-106.7	25	-1	42.4	9	
Zamboanga	117.1	+67.5	+19.3	14	+2	48	20	Naga	274.3	-109.6	+18.4	21	0	63.2	27	
Davao	175.5	-22.6	+12.6	9	-4	67.6	4	Batangas	116.3	-154.8	-70.3	14	-6	28.4	25	
Cagayan, Misamis	144	+106.6		18	+8	33.8	15	Lucena	131.9			19		19.8	14	
Butuan	269.9	+113.2	+9.9	23	+5	52.8	9	Atimonan	601	+24	-144.3	19	-5	203.2	20	
Dumaguete	157.5	+61.6		14	-3	80.3	20	Ambulong, Tanauan	103.3	-92.3		12	-5	26.7	20	
Tagbilaran	87.1	+12.9	-81.4	12	0	31.5	10	Canlubang, Calamba	78.5			18		17.5	22	
Iwahig	75.9	-53.5		16	+1	22.4	30	Paracale	585.7	-114.2		28	+1	93.9	28	
Surigao	400.9	-218.3	+7	19	-1	108	28	Santa Cruz, Laguna	120.5	-138.7		20	-7	48.3	22	
Maasin	528.2	+392.6	+224.4	13	+5	310.9	29	Manila	106.5	-101.6	-21.8	15	0	21.6	22	
Cebu	251.1	-213.2	+103.1	21	+10	82.4	29	Antipolo	127.9	-120.8		15	-8	28.7	22	
Iloilo	184.1	-123.6	+12.9	18	+9	29.7	4	Iba	71.7	54.7	+23.9	10	-2	28.4	22	
San Jose Buenavista	303	-236.7	+132.7	20	+8	51.1	18,26	San Isidro	49.5	86.8	+40.2	11	+5	19.8	22	
Cuyo	166.9	+109.6	+41.5	16	+5	35.6	15	Tarlac	33.6	-155.5	-46.7	6	-5	25.4	18	
Ormoc	200	-84.4	-13.9	20	-3	42.2	29	Baler	255.1	-257.2	-81.9	11	-6	98.3	23	
Guiuan	333.6	+35.3		24	+3	38.9	11	Dagupan	24.9	-168	-39.3	5	-6	11.7	17	
Tacloban	286.8	+95.1	+16.3	25	+3	50.6	10	Bolinao	10.6	-199.9	-37	4	-5	4.8	23	
Capiz	309.6	+86.7	+42.4	24	0	73.2	17	Baguio	117.2	-28.2	+25.7	11	-2	46.3	18	
Borongan	374.1	+10.2	-107	21	-4	76.7	12	San Fernando, Union	66.1	+34.4	+24.9	4	-3	49.3	22	
Catbalogan	198.7			19		36.3	28	Echague	192.8	-134.6	-27.2	22	+3	30.5	22	
Calbayog	191.4	-162.9	-68.9	19	-4	29.1	27	Candon	20.8	-22.7	-25.6	5	-1	11.4	22	
Masbate	141.9	-27.6	-41.3	17	+3	39.2	22	Vigan	36.6	-9.3	-1.9	5	-2	33.4	21	
Romblon	121.7	-306.2	-152.7	24	-3	30	3	Tuguegarao	304.7	-241.1	+31.8	15	-6	67.3	14	
Batag	373.5	-94.9		21	+1	127	27	Laoag	54.9	-8.4	+16.3	12	+5	35	20	
Sorsogon	417.6			13		98.6	28	Aparri	91.9	+95.7	-106.8	23	-8	49.6	14	
Legaspi	268.5	-77.8	-65.5	21	-3	71.1	22	Cape Bojeador	07.6			17		67.3	21	
Sumay, Guam	469.8	-280.2	+229.7	23	+4	224.8	2	Santo Domingo, Batanes	3	2400.6	+31.1	+58	26	+3	71.4	22

DEPRESSIONS AND TYPHOONS.

Prescinding from a few other depressions or low-pressure areas of very little importance, we shall mention here two typhoons and one depression which recurved in the Pacific, two depressions in the China Sea and one low-pressure area across the Philippines. Their tracks may be seen in Plate X together with the tracks of the depressions and typhoons for October and December.

TWO TYPHOONS OVER THE PACIFIC, NOVEMBER 1 TO 12 AND 23 TO 30, 1916.

From some observations we have received from Yap, Western Carolines, it would seem certain that the first of these two typhoons was formed between Guam and Yap on October 30 to November 2. The center of the typhoon was situated nearer to Yap than to Guam, probably in about 141° longitude E and 10° or 11° latitude N. In the following table we give some of the observations taken at Guam and Yap from October 30 to November 5.



## METEOROLOGICAL OBSERVATIONS FOR OCTOBER 30 TO NOVEMBER 5, 1916.

Date and hour.	Sumay, Guam, Ladrone Islands.					Yap, Western Carolines.				
	Pressure.	Wind.		Weather.	Rainfall, 24 hours begin- ning 6 a. m.	Pressure.	Wind.		Weather.	Rainfall, 24 hours beginning 6 a. m.
		Direction.	Force.				Direction.	Force.		
October 30:	<i>mm.</i>				<i>mm.</i>	<i>mm.</i>				<i>mm.</i>
6 a. m. -----	757.50	ESE	0-12. 2	o	-----	756.71	Calm	0-12.	o	-----
2 p. m. -----	55.90	ENE	3	o	25.4	55.36	Calm	-----	c	-----
October 31:										
6 a. m. -----	56.45	ESE	1	o	-----	55.95	Calm	-----	o	-----
2 p. m. -----	54.80	ESE	3-4	o	11.5	54.03	Calm	-----	c	3.8
November 1:										
6 a. m. -----	55.32	ENE	1	o	-----	54.28	Calm	-----	o	-----
2 p. m. -----	54.05	ENE	4	o	3.8	52.67	Calm	-----	o	48.2
November 2:										
6 a. m. -----	54.60	E	3-4	o	-----	53.50	Calm	-----	o	-----
Noon -----	53.52	E-ESE	6	o, q	-----	52.89	N	2	o	-----
12.30 p. m. -----	53.20	ESE	6	o, q	-----	52.77	NNW	2	o, p	-----
2 p. m. -----	53.93	ESE-SE	6	o, q	-----	52.30	Calm	-----	o	-----
8 p. m. -----	56.95	S	4	o	224.8	54	Calm	-----	o, r	19.4
November 3:										
6 a. m. -----	58	E	5-6	o, q	-----	52.73	SW	2	o	-----
Noon -----	56.50	E	4	o	-----	52.23	SW	4	o, p	-----
2 p. m. -----	56.57	E	4	o	-----	51.74	SW	5	o, p, q	-----
4 p. m. -----	56.17	E	3	o	1.3	51.90	SW	4	o, p	-----
6 p. m. -----						52.92	SW	5	o, q	-----
8 p. m. -----						53.83	SW	4	o, r	45
November 4:										
6 a. m. -----	58.55	E	1	o	-----	53.75	SSW	4	o	-----
2 p. m. -----	55.98	E	2	o	16.5	53.72	S	5	o, q	25.9
November 5:										
6 a. m. -----	57.87	SSE	1	o	-----	55.15	SSE	4	o	-----
2 p. m. -----	56.08	ESE	1	o	-----	55.04	SE	4	o	1.5

The typhoon moved WNW until the 4th when it inclined NW; then it inclined more to the N on the 5th, and finally recurved northeastward on the 8th and 9th. The center of the typhoon was passing at 6 a. m. of the 11th near to the S of Hatidyozima where the barometer had fallen at 10 a. m. of the same day to 736.5 mm.

Judging from the weather maps of Japan, it is probable that, while this typhoon was still east of the Philippines on the 4th to 7th, a depression appeared to the southeast of the Loochoos, it being impossible, however, with the few data we have on hand to trace its approximate track.

The second typhoon of the Pacific was probably formed S of Yap on the 23d, as it is shown by the observations taken in that station where there was a moderate falling of the barometer with winds from NE which veered later to SSE and S. This typhoon moved first NW and then recurved N and NE like the preceding one, though it did not approach so much to the Loochoos or to Japan. Its center passed N of the Bonins on the 30th. It would seem that previous to this typhoon, another depression of little importance moved northeastward to the northwest of the Bonins on the 29th.

## ONE DEPRESSION OVER THE PACIFIC, NOVEMBER 15 TO 18, 1916.

This depression appeared on the 15th between Guam and the Bonins near 141° longitude E and 21° or 22° latitude N. It probably moved W on the 15th, inclined northward on the 16th, and finally recurved northeastward on the 17th.

## TWO DEPRESSIONS OVER THE CHINA SEA, NOVEMBER 1 TO 4 AND 23 TO 26, 1916.

These two depressions were apparently of very little importance. The first was probably formed W. of Palawan Island on the 1st to 2d and moved W by N toward southern Indochina. The second appeared on the 23d near 115° longitude E and 14° latitude N: it moved NW and probably filled up on the 25th to 26th in the neighbourhood of the Paracels.

## A LOW-PRESSURE AREA ACROSS THE PHILIPPINES, NOVEMBER 15 AND 16, 1916.

A moderate falling of the barometer was observed at 6 a. m. of the 15th in the central part of the Philippines with clear signs of a depression or typhoon over the Pacific to the east of San Bernardino Strait. Fortunately, however, our weather map for 2 p. m. of that day showed that there was at that time no real typhoon, but only a low-pressure area near or over San Bernardino Strait. It moved westward near the southern coast of Luzon.

## NOTAS GENERALES DEL TIEMPO.

**Presión y temperatura.**—La presión atmosférica media de este mes en Filipinas es algo inferior a la del año pasado y mucho más aún a la normal de noviembre. Las presiones más altas se observaron generalmente los días 13 y 22, al paso que las más bajas tuvieron lugar el 16, 26 y 27.

La temperatura media mensual es también algo menor que la de noviembre, 1915, siendo las diferencias mayores de 1° C. en tres de nuestras estaciones. Los valores extremos de Manila fueron 32° C. y 19.5° C. observados el día 4 y 14 respectivamente. Las máximas y mínimas absolutas de Baguio fueron 26° C., 11.2° C. en la cumbre del Mirador, y 26.3° C. 10.5° C. en el valle.

**Precipitación acuosa.**—La cantidad de lluvia mensual fué generalmente mayor que la del año pasado y que la normal de noviembre en Visayas y Mindanao, pero menor en Luzón. El total de lluvia recogida durante el mes en los pluviómetros de Manila es menor que el de noviembre, 1915, en 101.6 mm., y que la normal de este mes en 21.8 mm.

## DEPRESIONES Y TIFONES.

Prescindiendo de algunas depresiones o áreas de baja presión de muy poca importancia, mencionaremos aquí dos tifones y una depresión que recurvaron en el Pacífico, dos depresiones en el Mar de China y un área de baja presión sobre Filipinas. En la Lámina X pueden verse las trayectorias de estos tifones y depresiones juntamente con las de octubre y diciembre.

## DOS TIFONES EN EL PACÍFICO, NOVIEMBRE 1 AL 12 Y 23 AL 30, 1916.

De algunas observaciones que hemos recibido de Yap, Carolinas Occidentales, parece deducirse que el primero de estos tifones estuvo formándose entre Guam y Yap del 30 de octubre al 2 de noviembre. El centro del tifón se hallaba más cerca de Yap que de Guam, probablemente en los alrededores de 141° longitud E y de 10° u 11° latitud N. Damos en el texto inglés algunas de las observaciones tomadas en Guam y Yap desde el 30 de octubre hasta el 5 de noviembre.

El tifón se movió al WNW hasta el día 4 en que se inclinó al NW; inclinóse más al N el día 5, y recurvó finalmente hacia el NE el 8 y 9. El centro del tifón estaba pasando a las 6 a. m. del día 11 al S y cerca de Hatidyozima, donde el barómetro había bajado a 736.5 mm. a las 10 a. m. del mismo día 11.

A juzgar por los mapas del tiempo de Japón, es probable que mientras este tifón estaba aún al E de Filipinas del 4 al 7, apareció una depresión al SE de Liukiu; pero es imposible con los pocos datos que poseemos trazar su trayectoria con la debida aproximación.

El segundo tifón del Pacífico estuvo formándose probablemente al S de Yap el día 23, según se deduce de las observaciones verificadas en aquella estación, donde hubo una bajada regular de los barómetros con vientos del NE que rolaron más tarde al SSE y S. Este tifón se movió primero al NW y luego recurvó como el anterior al N y NE, aunque sin acercarse tanto ni a Liukiu ni al Japón. Su centro pasó al N de las Islas Bonín el día 30. Parece que antes que se acercara este tifón a dichas islas, otra depresión de poca importancia apareció el 29 al NW de las mismas moviéndose al NE.

## UNA DEPRESIÓN EN EL PACÍFICO, NOVIEMBRE 15 AL 18, 1916.

Apareció esta depresión el día 15 entre Guam y Bonín cerca de 141° longitud E y de 21° ó 22° latitud N. Se movió probablemente al W el mismo día 15, luego se inclinó hacia el N el 16, y finalmente recurvó al NE el 17.



## DOS DEPRESIONES EN EL MAR DE CHINA, NOVIEMBRE 1 AL 4 Y 23 AL 26, 1916.

Fueron de muy poca importancia, al parecer, estas dos depresiones. La primera estuvo formándose probablemente al W de la Isla de Palawan del 1 al 2, y se movió al W $\frac{1}{4}$ NW hacia la parte S de Indochina. La segunda apareció el 23 cerca de 115° longitud E y de 14° latitud N: se movió al NW, y se rellenó probablemente del 25 al 26 en los alrededores de Paracels.

## UN ÁREA DE BAJA PRESIÓN A TRAVÉS DE FILIPINAS, NOVIEMBRE 15 Y 16, 1916.

A las 6 a. m. del día 15 se observó un descenso regular de los barómetros en la parte central de Filipinas con indicios claros de una depresión o tifón en el Pacífico al E del estrecho de San Bernardino. Afortunadamente, sin embargo, nuestro mapa del tiempo de 2 p. m. de aquel día dejó fuera de toda duda que no existía por entonces un verdadero tifón, sino una simple área de baja presión en el, o cerca del, estrecho de San Bernardino, la cual avanzó hacia el W cerca de la costa S de Luzón.

METEOROLOGICAL DATA FOR MANILA CENTRAL OBSERVATORY.\*

[φ=14° 34' 41" N; λ=120° 58' 33" E; barometer above sea, 14.2 meters; gravity correction not applied, -1.72 mm.]

Day.	Pres- sure (mean).	Air temperature. b			Underground temperature.				Relative humid- ity (mean).	Vapor pres- sure (mean).	Radiation.			Evaporation. b		
		Mean.	Maxi- mum.	Mini- mum.	0.25 meter.		0.50 meter.				1.50 meters.	2.50 meters.	Mini- mum on grass.	Maxi- mum in sun. Black bulb in vacuo.	Free ex- posure (to- tal).	Shelter (total).
					8 a.m.	2 p.m.	8 a.m.	2 p.m.								
	mm.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	Per ct.	mm.	°C.	°C.	mm.	mm.	
1	756.44	26	30.6	23.2	27.9	28.8	28.8	28.9	28.2	28.6	87	21.5	22.3	50.9	1.9	1.4
2	57.07	26.1	31	23.2	28.2	29	28.8	28.9	29.2	28.6	85.3	21.2	22.2	58.5	2.6	2
3	58.21	26.2	31.2	22.9	28.3	29	28.9	29.1	29.1	28.6	86.6	21.7	22	58.5	1.8	1.6
4	57.82	26.8	32	23.2	28.5	29.5	29	29.2	29.1	28.6	79.5	20.6	21.9	53.8	3.1	2.4
5	57.10	26.2	31.5	22	28.5	29.3	29	29.2	29	28.7	83.5	20.9	20.2	56.4	3	2.3
6	56.90	26.5	31.5	22	28.5	29.5	29.1	29.3	28.9	28.6	83.9	21.4	20.1	51.5	3.2	2.4
7	56.65	26.9	31.1	23.2	28.7	29.8	29.2	29.4	29.1	28.6	82.7	21.7	21.8	53	3.1	2.7
8	57.31	26.4	31.5	22.4	28.5	29.7	29.3	29.4	29	28.6	80	20.1	20.5	51.4	2.9	2.2
9	58.44	26.5	31.4	22	28.5	29.6	29.3	29.4	29	28.6	83.9	21.4	20.3	50.3	2.5	2
10	58.85	25.5	29.5	22.8	28.6	29.3	29.4	29.4	29.1	28.6	89.2	21.6	22.2	46.8	1.3	1.1
11	58.95	24.9	30.6	21.6	28.2	29.2	29.3	29.2	29.1	28.6	82.5	19	19.8	55.4	3.6	2.1
12	59.61	24.9	29.9	21	28	28.5	29.1	29.1	29.1	28.5	80	18.5	19.2	50.5	3.3	2.9
13	59.99	25.4	30	21	27.9	28.8	28.9	29.1	29.1	28.5	76	18.1	21	52.5	2.9	2.4
14	59.32	24.7	30.5	19.5	27.5	28.4	28.8	28.8	29	28.5	78.1	17.8	17.6	44.3	3.6	2.9
15	57.33	25.9	30.5	22.3	27.5	28.3	28.6	28.7	28.9	28.4	74.9	18.4	20.2	47.4	4.2	3.2
16	55.94	25.9	30.1	21.8	27.5	28.4	28.5	28.7	29	28.4	81.4	20.1	20.1	45.3	3.1	2.3
17	56.43	26.6	31.2	22.8	27.7	29.1	28.6	28.9	29	28.5	82.3	21	21	51.3	2.9	2.2
18	57.86	26.6	31.1	23	27.9	29.3	28.8	28.8	29	28.5	84.2	21.8	21.4	51	2.4	1.8
19	58.23	25.5	30.5	22.9	28.2	29.2	28.8	29	28.9	28.4	90.1	21.8	21.3	51.3	1.1	1.1
20	58	25.7	29.8	22.7	27.9	28.7	28.8	28.9	28.8	28.4	90.4	22	21.4	48.2	1.3	1.1
21	58.58	25.4	30.2	23.3	27.8	29	28.8	28.8	28.8	28.4	88.6	21.2	22.1	54.1	1.5	1.2
22	58.79	24.7	29	22.2	27.7	28.3	28.8	28.8	28.9	28.3	90.8	20.9	20.6	44.8	8	8
23	58.36	25.2	29.9	23	27.4	28.5	28.6	28.6	28.8	28.3	88.1	20.9	22	47.1	1.6	1.3
24	58.21	25.9	31.4	21.9	27.5	28.6	28.5	28.6	28.8	28.3	86.5	21.3	20.2	52	3.4	3
25	57.34	25.1	31	22.7	27.6	28.5	28.6	28.6	28.9	28.3	89.8	21.2	22.3	55.8	9	8
26	55.94	25.1	30.8	21.7	27.5	28.3	28.5	28.5	28.9	28.4	86.1	20.2	20.1	53	2.1	1.8
27	55.91	25.5	31.7	21.2	27.4	28.5	28.4	28.6	28.8	28.2	84	20.2	19.5	52	2.4	2
28	56.14	25.6	31	22.4	27.5	28.6	28.5	28.6	28.8	28.2	88.2	21.4	20.9	54.5	1.7	1.5
29	57.03	25.6	30.8	21.5	27.5	28.5	28.6	28.7	28.7	28.2	79.9	19.3	19.5	50.6	3.5	2.6
30	58.55	23.9	30.3	20	27.4	28.4	28.4	28.7	28.7	28.3	73	15.8	18.6	51.7	4.2	2.5
Mean	757.71	25.7	30.7	22.2	27.9	28.9	28.8	28.9	29	28.5	83.9	20.4	20.7	51.3	2.5	2
Total														75.9	59.6	
Departure from normal	-1.65	-0.2	+0.3	0							+1.4	+0.1				

Day.	Prevailing direction.	Wind.			Direction at the time of the maximum velocity.	Amount (mean).	Clouds.			Sun- shine.	Rain, 24 hours beginning 6 a. m.		Miscellaneous.
		Total move- ment.	Maxi- mum hour- ly veloc- ity.	0-10.			Form and direction.		On the tower.		In the park.		
							Upper.	Lower.					
1	Variable	115	12.5	NW	9.2	Ci.-S.	Cu.-N.	E	2 50			●° a.	
2	NE quad.	121	12.5	WSW	6.9	Ci.-S.	Cu.	E	5 10			●° p.	
3	N	84.5	14.5	WNW	5.2	Ci.	Cu.	E	7 15	14.2	14.2	●° p.	
4	Variable	114	12	SW	3.8	Ci.	Cu.	ENE	8 05			○ a.	
5	W quad.	157	16	WNW	3.8	Ci.	Cu.	NE	9 40			○ a.	
6	W quad.	192.5	15	SW	2.8	Ci.	Cu.	NW	9 25			○ a.	
7	SE, SW	214	19	SW	3.9	Ci.	Cu.	E	9 00			○ a.	
8	SW, WSW	152.5	12	WSW	2.4	Ci.	Cu.	NE	9 30			○ a.	
9	NE	131.5	13	WSW	5.8	Ci.	Cu.	E, ENE	8 20	5.6	5.8	●° p.	
10	SE, SW	90.5	8.5	SW	9.6	Ci.-S.	Cu.	NE	0 35			●° a. ●° p.	
11	NE	124	14	NNE	6	Ci.	Cu.	E	5 35			○ a. ●° p.	
12	NNE	158	17	NE	8.1	A.-Cu.	N.-cf.	EbyN	4 45	.8	1	○ a. ●° p.	
13	N	128	10.5	N	7.8	A.-Cu.	Cu.	E	3 35			○ a. ●° p.	
14	N quad.	129	16	NE	3.8	A.-Cu.	Cu.	ENE	7 50			○ a. ●° p.	
15	NNE	269	25	NNE	5.7	A.-Cu.	Cu.	NE	5 50			○ a. ●° p.	
16	SW	187	17	SW, WNW	7	Ci.	Cu.	sw, nw	4 40	3.6	3.6	○ a. ●° p.	
17	WSW, W	150	14	W	3.3	Ci.	Cu.	E	9 05			○ a. ●° p.	
18	SW quad.	154	20	SW	4.8	Ci.	Cu.	N	7 40	17.3	19	○ a. ●° p.	
19	NNE, WSW	105	12	WSW	7.2	A.-Cu.	Cu.	ESE	4 40	16.6	15.5	○ a. ●° p.	
20	Variable	99	10.5	SSW	8.9	Ci.	Cu.	N	1 40	.2	.3	○ a. ●° p.	
21	Variable	109	12	WNW	8.8	Ci.-S., A.-cu.	Cu., Cu.-N.	ESE	3 45	7.2	7.6	○ a. ●° p.	
22	N quad.	117	11	NE	9.5	Ci.-S., Ci.	N.-cf.	E	0 05	21.6	19.9	○ a. ●° p.	
23	N quad.	135	12	WNW	9.4	Ci.-S.	Cu.-N.	SE	3 05	1	1.2	○ a. ●° p.	
24	WNW	126	13	WNW	7.2	Ci.-S., ENE	Cu.	E	6 35	2.8	2.8	○ a. ●° p.	
25	E quad.	111	11	NE	8.4	A.-Cu.	Cu., Cu.-N.	E	1 15	3.3	3.2	○ a. ●° p.	
26	NE quad.	125	18	NE	5.5	Ci.	Cu.	NE	7 25	4.6	4.3	○ a. ●° p.	
27	W quad.	129	16	W, NW	3.2	Ci.	Cu.	NE	8 05	7.4	7.1	○ a. ●° p.	
28	Variable	131.5	15	NE	7.2	A.-Cu.	Cu., Cu.-N.	NE	5 35	.3	.3	○ a. ●° p.	
29	N quad.	158.5	17	W	8.2	Ci.-S.	Cu.		5 20			○ a. ●° p.	
30	NNE	173	17	NNE	7.4	Ci.-S., NEbyE	Cu.	NE	3 45			○ a. ●° p.	
Mean		139.7	14.4		6.4				5 40				
Total		4,190.5							170 05	106.5	105.8		
Departure from normal		-577.6			+0.1				+6 19	-21.8			

\* All the mean values given in this table are deduced from hourly observations.

b These values are taken from instruments mounted in the Observatory Park, 1.5 meters above ground.



DAILY RAINFALL AT THE STATIONS OF THE WEATHER BUREAU, NOVEMBER, 1916.

Station.	Day of month.															
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.
	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.
Jolo	3.3			40.4	57.9	0.3	5.6	5.4	0.3	16.8	1.3		10.4	4.1	13.4	
Isabela, Basilan				15.5		.8	32.5		3						5.3	
Zamboanga				12.7		2.8		3.6	4			7.9			2	
Dayao		12.2		67.6			8.9	5.1		14.7			1.8		14.5	
Cagayan, Misamis	3.3	1.3	3.6				7.6	2	13.5	8.6	10.7	2.2		2	33.8	2.3
Butuan		5	26.4	.5				30.5	52.8	.5		9.9	7.7	17.3	5.1	.3
Dumaguete	3.5	3.6	3.8	3				7.9	.8	31.5	19	3.8	4.6	5.1	22.6	.8
Tagbilaran	1.3	2.3								16.8			4.6	5.6	2.3	
Iwahig	4.1			1.3			4.8			1.5	3.3	1.5				.3
Surigao	.8	9.7	.5					1.5			15	15.3	15	14.7	23.5	5.4
Massin								5.6	21.3		36.1	19.6	32.1	6.4	19	.3
Cebu		3.8	1		.3	8.6	20.5	14.5	4.8	14.2	10.6	1.5	15.7	14.3	16.2	.3
Iloilo	1.3	7.6	7.9	29.7		3.8					4.3	8.9	19	5.6	4.3	9.4
San Jose Buenavista	26.7	3.9	31.3	16		12.7					48	1.8	.3		34.3	1.8
Cuyo	17.1	14.5	3.6	.8						8.6				5	35.6	
Ormoc	.6	1	13.5							14.2	4.4	4.4	2.3	3.5	1.3	9.9
Guiuan	31.7	10.2	13			6.9	4.1		5.9	7.6	38.9	20.1	24.9	8.1	14.5	.3
Tacloban	.8	1.8	1					10.2	1.1	50.6	12	19	19.8	13.5	6.8	.3
Capiz	13	22.9	.3	.5	.3	2.3		.3	.3	11.1	17			5	22.1	2
Borongan	13	5.8	3.8					10.2	6.6	38.4	18.3	76.7	21.1	12.7		.8
Catbalogan			6.6						33.8	6.9	2.3	4.3	3.5	6.6	8.1	3.6
Calbayog	17.8	1.3	10.4			1.3				3.5	1.5	14.2	2.3	1.8	24.1	4.3
Masbate	6.9		4.3	1.3						30.7	.3	2.8	2.3	1.8		
Romblon	7.9	1.6	30	.5		4.8	.3			3.3	.3		1.1	3	5.3	
Batag	16.3	66.1	2.8	2.5						20.3		2.5	11.5	2.5	26.7	
Sorsogon			2.2			4.1							23.4	29.2	26.7	
Legaspi	21.9	25.1	9.9			4.5				1.3		3	15.7	11.1	9.7	12.4
Sumay, Guam	3.8	224.8	1.3	16.5			5.1			1.3	2.5	21.5	1.3	7.6	20.3	12.7
Calapan	29.2	18.3	.3			8.9				.3	1.6	5.1	10.1	19.6	5.6	11.9
Virac	22.3	5.6	17.7			6.9				42.4		.8	9.4	15	4.8	13.8
Naga	3.6	2.3	.8	.8						7.4			1.3	18.5	5.8	2.6
Batangas										1.3	2.3		1.6	8.1	5	
Lucena	2.3		7.4	1.5						5.1	5.8	2.5	17.2	12.9	19.8	1.8
Atimonan			20.6	7.4						33.8	4.1	22.9	104.7	35.3	56.4	13.5
Ambulong, Tanauan			2.8			2.3				1.5	4.3		2.3			
Canlubang, Calamba	2.3	1.3	1							6.4	2.8		3		4.6	4.3
Paracale	24.6	26.2	26.1	.5	.5	1		1.5		2.3	50.8	40.7	26.9	9.4	90.6	12
Santa Cruz, Laguna	4.1	1.5	11.5							4.3	7.9		4.6	.8	6.4	.5
Manila			14.2							5.6						
Antipolo	2.3	3.8								13.5	1.3				2.8	
Iba	2.5			.1						14.5	.3					7.1
San Isidro	1.8	4.6								10.7						
Tarlac										1.8						
Baler	6.9	1.8	1.5							7.6					3	
Dagupan										2.3						
Bolinao										2.8						
Baguio										4.6						
San Fernando, Union																
Echagüe	.5		5.3		.8			5.8	19.6		7.6	6.3	7.1	12.4	19.3	6.3
Candon															1	
Vigan										1						
Tuguegarao	20.1						10.2			10.7			1.8	67.3	33.8	
Laoag	1.5						3	.5		6.1				1.8	1.3	
Aparri	14.4	1.6		2.3	2.6		3.9	14	.8	1.3	2.5	5.1	17	49.6	42.1	32.7
Cape Bojeador	1.5						3.3	3.8	4.1				3.3	28.4	13.7	18.5
Santo Domingo, Batanes		1.5	.7				12.6	2.5	.8	6.3	10.5	.4	9.8	11.2	8.5	47.9

Daily rainfall at the stations of the Weather Bureau, November, 1916—Continued.

Station.	Day of month.														Total.
	17.	18.	19.	20.	21.	22.	23.	24.	25.	26.	27.	28.	29.	30.	
Jolo	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.
Isabela, Basilan	2.3	10.7	2.1	27.5	1.8				0.5	7.4	7.9	1.3	11	2.8	234.5
Zamboanga			24.4	33	4.1						10.4	5.6	3.6	6.4	144.6
Davao			48	12.7	1					3	6.4			9.9	117.1
Cagayan, Misamis	0.5			11.9											175.5
Butuan			33.8	2.5	1.8	4.6		24.1					19.6	3.5	144
Dumaguete			1.3	80.3		1.1	2.8	12.4	3	3		6.6	45.2	9.1	269.9
Tagbilaran								2					5.1		157.5
Iwahig		1.1	3.8	12.7	1.5				1.3	2		1.3		9.7	87.1
Surigao	5.6				4.5	1.5		5.1	13.4	1.3	18.6	108	70.4		75.9
Maasin	7.6				11.4					18.3	7.6	32.3	310.9		400.9
Cebu	3.6	2		3.6	3	3.3							26.9	82.4	528.2
Iloilo	16	15.5			7.1							12.4	15.3	15.2	251.1
San Jose Buenavista	3.6	51.1			2.5	3	1.3			51.1	8.4	6.6			184.1
Cuyo	2.5	1.3	3.6	3.6	35.1	4.3		3.3		20.8			7.1	5.1	303
Ormoc		12.7		.5	10.9	9.4		.8		3	33.7	26.2	42.2		166.9
Guiuan		4.6	4.8	17.3	8.6	5.1	21.9	9.4			3	38.1	31.2	5.1	200
Tacloban	.2		44.2	.6		7.3		12.8	3	3.8	11.5	50	18.3	2	333.6
Capiz	73.2			49.3	44.9	2.4		5.4	1.8			27.1	4.9	1.5	286.8
Borongan			1.3	1.3	.5	13	8.4	32.5		1.8	14.5	74.9	16.5		309.6
Catbalogan		1.3			3.8	6.4		15.7		14	25.4	36.3	24.1	3	374.1
Calbayog		19.3			4.9	10.7		6.4			4.1	29.1	22.6	9.6	198.7
Masbate		9.7		5.1		39.2					6.1	18.5	5.8	1.3	191.4
Romblon	.3	10.7	4.8	6.4	25.1	4.1	3.4	5.1	1.8	1.5	1.3	.6		1.2	141.9
Batag		3.8		4.1	4.1	8.9	3	16.5	1.3	12.9	127	54.9	8.4	2.8	373.5
Sorsogon					26	26	80	24.7			38.7	98.6	10.9	27.1	417.6
Legaspi		3	1.5	37.8	.8	71.1		4.4		4	2.1	32	.8	1.8	268.5
Sumay, Guam		7.6	15.2	5		13.9	42	33	7.7		1.3	16.5	3.8	5.1	469.8
Calapan		45.7	47.8		12.7	8.6		5.1		14.5		7.4			252.7
Virac		.5	7.4	28.7	11.5	9.6	2.8	9.2	.5	4.1	12.9	29.5	1.1	2	264.6
Naga		.3		19	1.8	25.4		35.6	.5	14.2	63.2	54.6	8.1	5.5	274.3
Batangas			5.6	6.6	16.7	21.4	1.6		28.4	17.3		4.6			116.3
Lucena		11.9			3	8.9	13.8	1	5.3	6.6		.8			131.9
Atimonan		6.4	17	208.2	5.1	34.7		2.3	19.9	4.6		2.8		6.3	601
Ambulong, Tanauan		23.9	4.8	26.7	15.3	15		1	8			3.6			103.3
Canlubang, Calamba	14.2			1.5	.5	17.5	4.3	1	11.7	2.3	1	1.5			78.5
Paracale	.5		2.3	39.4	2	35.8	7.6	4.5	3.6	25.2	34.4	93.9	6.7	16	585.7
Santa Cruz, Laguna		11.9	4.8	1.5		48.3	1.5	2	1.3	2.3	1.5	2.8			120.5
Manila		17.3	16.6	.2	7.2	21.6	1	2.8	3.3	4.6	7.4	.3			106.5
Antipolo		17.3	8.9		22.4	28.7	3.3	2.8	2.3		4.3				127.9
Iba		7.1	1.8	4.8	11.4	28.4			.8						71.7
San Isidro		2.5			.3	19.8	3.5	.5	1.5	3.8	.5				49.5
Tarlac	3.6	25.4				5	5						1.8		33.6
Baler		8.9		23.4	21.6	83.8	98.3	1							255.1
Dagupan	11.7	5			6.1	4.3									24.9
Bolinao					2.5	5	4.8								10.6
Baguio		46.3	1.1	9.9	9.6	14	3		14.8	10.8	5.3	.5			117.2
San Fernando, Union					15.5	49.3	3				1				66.1
Echagüe	1	17.5	2.6	1.5	6.1	30.5	24.8	5.6	3.8	1.3	7.1				192.8
Candon	1.3			1.8	5.3	11.4									20.8
Vigan	1.3			33.4	3										36.6
Tuguegarao		4.6	9.1	5.9	8.7	43.4	24.4		24.6	2.6	37.5				304.7
Laog	.3	3.8			35	6									54.9
Aparri	7.7	21	19.8	45.6	5.1	30.8	24.4	4.9	4.3	7.4	13.3	9.6	2.5	5.6	391.9
Cape Bojeador	2.5	5.8		34.5	67.3	2.5				4.6	1.3	2.3		10.2	207.6
Santo Domingo, Batanes	5	22.4	42.4	4.1	38.2	71.4	14.9	63.1	.1	2.7	5.3	7.9	2.9	7.5	400.6

MAXIMUM AND MINIMUM TEMPERATURES AT THE STATIONS OF THE WEATHER BUREAU, NOVEMBER, 1916.

Day.	Jolo.		Isabela, Basilan.		Zamboanga.		Davao.		Cagayan, Misamis.		Butuan.		Dumaguete.		Tagbilaran.	
	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.
	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.
1	29.5	20.6	32.1	22.3	30.8	22.7	31.7	22	30.9	21.6	33.9	22.5	30.5	22.3	31.6	22.2
2	29.2	20.6	31.6	21.6	30.2	22.4	32.2	21.9	31	21.9	32.7	22.9	30.8	21.6	32.1	22.2
3	29.9	20.9	32	23.1	30.2	23.7	32.2	21.9	31.5	21.9	32.5	21.8	31.1	22.5	31.3	21.6
4	30.4	20.8	31.3	23.6	30.2?	23	33.2	21.5	31.2	22.6	31.5	22.7	31.1	24.3	31.3	22.7
5	29.7	21	31.6	23.1	30	23.8	32.2?	21.9	31.4	22.1	31	21.8	31	21.9	33.3	21.4
6	30.4	21.2	31.3	23.9	30.2	22.8	32.2	22.5	31.3	21.3	32.5	22.3	30.6	23.1	32.5	23.2
7	29.9	21.8	31.6	24.1	31.2	23.3	32.2	22	32	22.1	32.7	22.7	30.8	23.4	32.5	23.2
8	29.2	22.7	32.1	23.1	29.3	23.6	30.2	22	30.3	22.1	31.9	22.9	30.8	22.7	31.1	22.8
9	30.3	21.9	31.9	22.1	29.4	23	31.5	22.9	30.4	23.4	32.1	21.8	30.6	23	31.5	22.5
10	30.9	21.7	32.6	22.6	30.2	22.5	32.2	21	31.2	21.5	31.4	22.1	31	23.1	32.4	22.9
11	30	21.3	32.6	22.1	30.6	22.3	32.7	21.5	30.2	22.4	31.5	22.1	30.3	23.7	30.5	22.2
12	32.4	22.3	33.1	23.1	32.9	23	32.2	21.1	31.6	22.1	31.4	22.4	29.3	24	30.9	22.5
13	29.8	21.5	32.2	23.3	30.2	23.4	31.7	22	30.8	21.6	31.4	22.6	29.7	23	30.5	22.6
14	28.9	21.8	33.1	23.1	32.9	22.5	30.7	22	30.8	21.8	29.5	22.6	29.4	24.6	31.6	22
15	29.2	21.6	31.5	22.6	30.9	23.2	30.5	21	30.6	22.5	32.4	22.7	30.4	23.4	31.5	22.1
16	30.9	23.2	33.4	24.6	30.2	23.1	31.7	22	31.8	22.2	32.6	22.4	29.7	22.4	29.1	23.2
17	31.9	20.9	33.6	22.6	30.2	22.5	31.7	21.5	31.9	22.4	32.5	23.1	31.4	22.4	31.4	22.4
18	29.5	21.9	33.1	22.1	30.9	22.8	33.2	21.5	31.8	22.6	30.9	22.9	31.8	22.4	31.3	23.5
19	30.9	21.8	32.2	21.6	30.2	23.3	31.7	21.5	31	22.1	33.5	22.8	30.3	22	31.4	22.3
20	29.7	21.3	31.1	22.1	30.9	23.4	31.8	22.2	30.8	22.8	32.9	23.4	30.3	23.9	32.5	23.4
21	27.9	22	31.8	22	30?	22.5	32.7	21.5	30.5	22.4	32.1	22.6	29.3	23.5	31.1	23.2
22	29.9	20.1	32.6	21.6	30.8	22.7	31.2	21.7	31.5	22.5	31.1	22.2	28.5	23.3	29.6	22.5
23	30.4	20.8	32.4	22.1	30.2	22.9	32.7	21.3	30.8	21.6	32.4	21.8	29.4	24	31	21.4
24	30.5	21	32	23.1	30	23.5	32.2	22	30.4	22.1	31.5	22.6	30.4	23	32.3	21.9
25	30.7	22.6	32.1	22.6	30.2	22.4	31.8	21.5	30.4	20.9	30.9	22.4	30.5	23.3	32.3	21.7
26	30.6	23	30.6	22.6	30.9	22.1	32?	20.5	30.5	20.2	31.9	21.2	31	21.6	32	20.9
27	29.4	22.6	31.1	24.1	30.8	24.1	31.7	20	31	21	31.3	22.1	30.4	22	32.7	22.2
28	30.5	22.1	29.9	23.6	30.2	23.6	32.7	21.9	30.9	22	32.2	22.9	31.6	23	31.4	22.9
29	29.4	22.2	31.8	24.3	30.8	24.6	31.7	22.5	26	23	25.7	22.4	27.6	23.9	26.2	22.4
30	27.8	22.5	30.1	23.1	29.7	23.1	30.7	22.9	27.5	22.5	28.1	22.8	31.1	23.6	31.6	21.8
Mean	30	21.7	31.9	22.9	30.5	23.1	31.9	21.7	30.7	22	31.6	22.4	30.4	22.9	31.4	22.4

Day.	Iwahig.		Surigao.		Maasin.		Cebu.		Iloilo.		San Jose Buenavista.		Cuyo.		Ormoc.	
	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.
	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.
1	29.7	21	31.8	23.4	34.8	23	33	23.3	32	24.3	32.8	23.1	29.3	23.1	32.5	21.6
2	31.9	21.8	31.1	23.5	32	23	32.4	24	30.7	23.7	31.3	23	29.5	23.3	31.2	22.4
3	30.8	22.2	30.5	23.9	34.5	23.6	31.6	23.9	31.7	23.5	31.6	22.1	31.1	23	32.4	21.8
4	32.6	21.6	30.8	23	34.4	23.4	31.6	23.8	30	23.5	31.9	23	30.1	24.2	33.8	21.3
5	32.7	22.2	31.1	22.4	34.8	22.5	31.7	23.5	30.5	23.4	31.3	22.4	29.2	25	33.1	20.4
6	32.6	21.4	31.3	23.3	34.4	22.4	31	23.2	31.7	22.5	31.7	22.5	30.7?	25.2	33.4	19.9
7	32	21.4	31.6	22.9	32.5	21?	30.9	22.1	32.5	22.5	31.8	22.4	30.7	23.9	33.4	21.4
8	32	20.9	30.9	24.2	32	22.5	31.3	23.6	30.8	25	32.1	22.6	32	23.9	32.2	21.4
9	31.8	20.7	32.2	23.7	34.2	23	32.5	23.7	31.9	24.2	31.7	22.5	31.1	23	33	22.4
10	32.9	22.3	33	24.1	34	22.3	32	24.5	31.4	24.3	32.2	22.7	30.4	23.9	32.2	21.8
11	28.1	22.4	30.2	23.5	33	23	29.8	23.2	29.4	23.4	30.2	22.1	29.2	26.3	29.9	22.3
12	29.4	22.6	29	23.1	29.9	22.8	28.6	25	31.1	23.8	33.7	21.6	30.3	26.6	29.9	23.5
13	32	22.1	30.4	24	30	22.8	29.1	22	28.2	23.6	32.2	23	29.8	26.7	31.8	23.6
14	31.8	21.6	30.7	23.3	32	23	29.6	22.2	30.7	23.8	33.6	22.6	29.8	26	29.5	22.3
15	28.9	21.9	31.5	23	32	23.6	32.3	23	31.5	23.8	31.7	22.6	29.2	26.7	31.6	21.9
16	32.1	21.8	30	22.9	32.4	22.8	30	23.8	30.7	24.2	31.7	23.3	28.8	22.3	30.7	22.9
17	32.5	21.3	33	23.8	34	23.3	30.7	24.2	29	24.3	31.2	23.6	31.3	23.3	32	22.8
18	32.6	22.2	31.5	23.9	33.2	23.8	30.6	24.4	26.2	23.6	31.8	24	27.7	23.9	31.3	22.9
19	31	22.4	33	23.1	34.5	23.4	32	23.6	30	24	30.3	22.8	29.3	23.6	32.6	22.7
20	28.8	22.5	33.1	23.3	33.5	24	31.2	25.2	31	23.9	31.6	23	30	24.8	32.8	22.5
21	31.1	21.2	32	22.9	32.8	23.5	31.5	24.7	29.7	23.5	29.8	23.7	30.2	23.8	31.6	21.9
22	31.8	21.6	29.5	22.3	31.8	23.5	28.4	23.7	27.6	23.2	29.2	23.2	29.3	23.2	29.5	22.5
23	31.1	22	31	22.1	34	23	31.2	22.9	32	23	30.7	22.5	29.7	23.4	31.7	20.6
24	31.2	21.4	30.6	23.7	34.4	22.5	31.5	24.2	31.4	23	32.1	21.6	30.6	23.3	31.6	22.2
25	32.6	20.8	29.1	22.8	34	23.2	30.7	24	30.7	22.8	32.7	22.6	30.2	25.4	32.6	21.4
26	31.9	21.4	31.1	22.7	32.5	22.4	30.8	23.5	31.5	21.5	31.7	21.1	31.5	26.3	31.6	20.2
27	32	20.8	31.6	24.4	31.5	23.8	30.8	24	30.2	22.5	30.3	22.4	31.2	23.3	30.2	22.4
28	32.8	21.4	29.7	23.9	30	23.6	30.1	24.3	29.8	23	30.3	23.5	31.1	26	29.4	23.4
29	31.1	22.8	26	23.4	29.4?	22	26.8	23	28	23.9	28.7	24	28	24.5	26.5	23.6
30	29.3	21.2	29.5	23.5	31.4	22.2	29.8	24.5	29	22.7	30.9	22	27.7	24.5	30.7	21.2
Mean	31.4	21.7	30.9	23.3	32.8	23	30.8	23.7	30.4	23.5	31.4	22.7	30	24.4	31.5	22

Maximum and minimum temperatures at the stations of the Weather Bureau, November, 1916—Contd.

Day.	Guiuan.		Tacloban.		Capiz.		Borongan.		Catbalogan.		Calbayog.		Masbate.		Romblon.	
	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.
	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.
1	31.1	22.5	31.4	23.5	31.8	24.4	30.6	22.7	30	22.1	30	23.3	29.5	24.4	33.1	24.8
2	29.3	23.1	30.3	24	31.5	23.3	28.8	23.1	29.3	22.4	29.3	22.8	30	24.6	31.9	24.1
3	31.3	23.4	30.1	23.5	32	23.3	30.9	22.5	30.2	22.4	31.4	22.4	29.6	24.4	35.5	23.1
4	31.3	23.6	32.4	23.7	32.4	25.3	31.9	23.5	33	22.9	32.3	23	31.2	25	35.5	22.8
5	32.8	25	30.4	23.5	32.3	24.1	31.9	22.4	31.1	21.2	32.5	22.3	30.2	25.6	32.3	22.3
6	30.9	22.4	31.2	23	32	23.1	32.2	21.4	31	21.9	32.7	22.6	31	24.4	32.9	22.2
7	32	22.6	31	23.1	32.3	23.2	32.9	21.9	30.8	22	33.2	23	30.8	24.6	32.2	23.2
8	32.1	22.5	31.3	22.9	33.1	22.4	32.2	21.9	31.5	21.9	30.5	21.7	31.2	23.4	33.1	23.5
9	31	23.8	32.7	23.7	33.2	23.5	31.6	22.9	31.2	23.5	34.4	23.6	31	24.5	32.2	22.9
10	31.5	22.9	31.4	22.6	33	23.8	31.1	22.2	31	22.3	33.3	22.9	30.2	24.8	31.1	23.5
11	29.7	24.5	27.1	23.1	31.3	23.2	27.8	23.5	30.2	22.8	31.7	23.5	30.8	23.4	33.3	23.6
12	28	23.2	28.8	24	31.7	25	30.4	22.5	31.2	21.5	33.9	23.5	32	24	32.2	25.3
13	32.2	23.6	30.9	23	31.9	25.8	30.4	22.3	30.2	23	30.7	23.3	28.4	25	32.9	24.7
14	30.2	23.4	29.2	23	31.9	25.5	30.6	23.2	31.7	21.4	32.3	22.4	30.6	25.6	32.9	24.1
15	31.7	23.4	31	23	30.9	23.9	31.5	22	30.5	21.7	32.3	22.7	29.8	24.8	32.3	24.8
16	31.8	23.5	29.8	22.6	30.7	23.9	29.8	22	29.8	23.5	29.2	23.5	29.6	24.4	32.5	24.4
17	31.2	25	30.8	23.5	32	23.2	32	21.6	31.7	22.6	31.2	23.4	30.6	24.4	32.8	24.4
18	32.9	23.8	30.5	23.4	31.6	23.7	31.5	22	30.2	23.4	28.7	24.1	28.6	24	31.8	24.4
19	33	24.4	31.4	22.9	31.3	23.4	31	22.3	32	23.2	30.4	23.4	30	24.2	30.7	23.6
20	33	24.7	31.2	22.6	32.2	23.3	30.4	22.5	32	22.6	30.8	22.8	30	24.2	32.9	23.6
21	31.6	22.7	31.1	23.6	31.4	23.3	31.3	23	31.2	22.7	30.2	22.9	30.2	24.4	30.3	23.4
22	30.5	22.4	28	23	27.4	22.9	29.2	23.2	28	22.5	26.5	23.2	30	23.2	31	22.9
23	30.4	21.1	32.5	22.3	31.5	22	31.7	21.4	31	21.7	32.4	21.6	31	22.2	32	22.1
24	31.6	22.9	30	23.9	31.9	22.8	31	22.7	30.2	21.5	32.2	22.3	30.5	24.2	33	23.1
25	31.8	24.2	31.8	23.4	31.7	23.9	31.3	21.8	32.5	20	32.7	21.5	31.5	24.5	31.9	22.9
26	30	24.8	30.3	22.4	31.8	23.3	30	21.3	29	20.5	31.8	21.7	30.4	24.6	32.9	23.3
27	30.3	25.5	30	23.6	31.8	24.2	31.7	22.4	29.5	23.9	31	22.7	31.4	24	32	25.1
28	28.8	25	27.9	23.8	30.8	24.4	29.5	23.3	27	23.5	26.4	23.6	31.4	24.6	30.4	25.1
29	27.4	24	26.4	24	30.3	25	26.6	23.1	25.7	23.7	26.5	23.1	30.2	25	30.4	24.1
30	29.5	24.2	28.6	23.9	30.5	23.8	29.1	23.9	29.5	22.7	29.9	22.3	30.2	23.2	28.6	23.8
Mean	31	23.6	30.3	23.3	31.6	23.8	30.7	22.5	30.4	22.4	31	22.8	30.4	24.3	32.3	23.7

Day.	Batag.		Sorsogon.		Legaspi.		Sumay, Guam.		Calapan.		Virac.		Naga.		Batangas.	
	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.
	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.
1	29	23.2	29.9	22	27.2	23.6	29	24	32.4	25	29.6	22.2	30.1	21.1	32	22.8
2	28.3	23	30.5	22.1	29.7	23	26.4	21.2	32.6	23	31.3	22.5	30.5	21.5	31.7	22.7
3	29.8	22	30.1	22	29.7	22.5	26.8	21.8	32.8	22.8	31.7	21.4	30.8	20.2	32.8	22.6
4	30	24.4	30	21	31.7	24.4	29.6	25	33	23.5	32.4	22.4	31.3	21.8	33	23.3
5	29.9	24.4	31.6	22	32.6	21.5	29.6	23.4	32.7	21.5	31.7	21	30.5	20.1	31.8	20.9
6	30.6	24.4	32.2	21.6	31.3	22.4	29.8	23.8	33.5	21.7	31.5	21.4	31	21.4	32	20.7
7	30.5	24.8	31.4	20.5	31.7	20.4	30.2	24.2	34	22.1	32.2	20	31.4	18.6	32	20.6
8	30.5	22.5	31.1	19	33	22.4	30.2	23.2	31.7	22	31.9	20.8	32.7	21	32.1	21.5
9	31.8	23	31.9	20	32.9	22.8	30	24.2	32.8	21.9	31.4	22.1	31.4	20	32.2	21.3
10	31.5	23.6	31.9	19.8	31.2	22	29.8	22.4	31.1	22.5	29.6	21.1	26.1	19.4	32.4	21.1
11	29.4	23	30.5	22	31.1	24.5	29.2	23.6	32.7	23	31.9	22	30.4	21.3	32.4	21.1
12	29.3	24.3	30.8	22.7	31.1	25.7	28.6	24.8	34.1	21.6	31.4	22.3	30	20.5	29.6	22.8
13	29.4	23.3	29.9	22.9	30.3	23.9	29.4	22.8	32	21	31.6	22.2	29.5	21.7	28.6	23
14	29.3	24.2	30	21.5	30.9	24	29.6	25	31.3	23.5	32	22.3	30.6	21.1	31.6	21.1
15	30.8	23	30.5	21	30.1	23	29.8	24.8	31.5	22.8	30.6	22.6	29.3	21.6	30.6	22.3
16	30.9	22.8	30	22.5	30	23	29.2	23.6	31	22.5	29.9	23	31.4	20.9	29.9	21.8
17	31	22.5	30.7	22.4	30.7	24	30.4	24	33	22	32	22.9	32	21.7	31.7	23.4
18	30.6	23.4	30.5	22.3	31.4	23.1	29.4	24.8	31.5	22.5	31.2	21.9	31.5	21.6	32.1	23.2
19	30.4	23.2	30.4	22.5	31.4	23.4	27.8	22.8	32.5	22.9	31.3	22.5	31	20.4	32.2	23.1
20	29.9	23.8	30.4	22.4	30.9	23.3	29	22.2	31.1	23.4	31.1	22.7	32.7	21.1	30.2	24
21	29.8	23	32.5	23.9	29.4	24	29.8	22.2	31.5	23	29.1	22.8	29.5	20.8	31.1	22.5
22	27.8	23.1	32.5	23.4	29.8	23.5	28.6	22	31.5	23	29	22	30	20.8	30.3	22.5
23	29.5	23	31.5	21.5	30.3	22.1	27.8	21.8	30.6	22.3	30.5	23	31.4	20.6	31.1	21.5
24	30	22.6	30.1	22.6	31.9	24.3	26.4	24.2	32.2	22	30.4	21.9	31.4	20.5	32.1	22.5
25	28.8	23.3	30.1	21.6	31.1	24.5	27.8	23.6	31	23	31.3	20.4	31	19.6	29.7	22.8
26	29.2	24.2	30.5	21.4	31.7	21.9	29.6	24	30.8	22.5	31.4	20.4	30.5	19.8	29.8	21.3
27	27.8	23.3	30.5	23	30.8	22.9	29.6	26	32.8	22.1	29.2	22.4	27	21.6	31.2	21.6
28	26.2	22.9	30	22.9	27.3	23.9	28	23.8	31	22.5	26.5	22.5	25.8	21.7	30.7	22.3
29	27	23.4	27.5	20	28.8	24	29.8	23.4	34.9	22.5	29.8	22.6	27.5	21.6	31	21.4
30	27	23.2	30	22	28.3	22.3	30.6	23.6	35	21	28.9	20	27.6	21.3	30.5	22.1
Mean	29.5	23.4	30.6	21.8	30.6	23.2	29.1	23.5	32.3	22.5	30.7	21.9	30.2	20.8	31.2	22.2

Maximum and minimum temperatures at the stations of the Weather Bureau, November, 1916—Contd.

Day.	Lucena.		Atimonan.		Ambulong, Tanauan.		Canlubang, Calamba.		Paracale.		Santa Cruz, Laguna.		Manila.		Antipolo.	
	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.
	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.
1	30	23	30.2	24.8	30.7	23.9	29.4	23	28.3	23.9	28.5	23.3	30.6	23.2	30.8	22
2	29.5	22.9	29.2	24.9	30	24.5	29.3	22.6	28.5	23.7	29.6	22.6	31	23.2	31.2	21.7
3	31	23	29.5	22.6	31.2	23	30.9	21.6	31.2	23	30.7	22.2	31.2	22.9	32.6	21.8
4	30.1	23.6	29.7	24.4	31.7	23.3	31.2	23.2	31	24.3	30.5	23.7	32	23.2	32.7	21.8
5	31.8	21.1	29.8	24.9	32.2	22.5	31.1	21.5	31.2	23.3	31.1	22.2	31.5	22	31.2	20.5
6	31.3	21.1	30.5	24.9	32.4	21.6	31.9	21	31	23.2	31.5	21.8	31.5	22.2	31.5	22.2
7	31.1	21.9	32.5	22.6	32.7	22.8	32.2	22.1	31.9	22.9	31.5	21.8	31.5	23.2	31.2	21.3
8	31.5	21.2	32.6	22.8	32.6	21.5	31.5	20.1	31.9	22.7	31	21.8	31.5	22.4	32.3	21.6
9	31.5	21.4	30.3	22.4	32	22.2	31.5	20.1	31	23.3	31.8	21.8	31.4	22	31.5	21.3
10	27.6	23	27.3	22.4	28.1	22.8	28.2	20.2	27.5	23	28	23.7	29.5	22.8	30.1	20.2
11	29.1	22.6	29.2	24.6	29.9	23.2	29.8	22.4	29.8	24.1	29.1	23.9	30.6	21.6	30.2	20.5
12	27	22.6	26.3	23.6	28.6	24.2	29.2	22.6	28	23.3	27.7	23.7	29.9	21.2	30.1	20.2
13	27.1	22.8	27.7	23.3	30.5	23.6	29.9	21.4	29.8	24.4	28	23.1	30.1	21	30.5	20.5
14	28.7	22.6	28.2	22.9	30.1	22.5	29.9	21.4	29.8	24.4	28.4	22.7	30.5	19.5	31.7	19.9
15	28.5	22	27.4	23.4	31.7	22.7	29.7	20.5	28	23.9	28.3	22.5	30.5	22.3	30.7	20.5
16	29.5	22	29.4	22	31.9	21.9	29.6	21.2	29.1	23.5	28.7	22.5	30.1	21.8	30.7	20.5
17	30.1	23	32.2	22.8	33.5	24.9	31.5	22.6	31.1	23.4	31.6	23.2	31.2	23	31.3	21.5
18	31.5	21.7	31.7	23	33.3	24.4	31.8	22.4	30.5	23.3	31.6	22.5	31.1	22.8	31.6	21.9
19	30.2	23	29.9	23.4	32	23.2	30.8	21.8	30.9	23.3	30.7	23.2	30.5	22.9	32.1	21.8
20	31	23.8	30.6	24	29.9	23.2	30	23.5	30.9	23.8	27.8	23.2	29.8	23.3	30.6	21.9
21	29.4	23.4	27.3	23.7	31	23.2	29.9	22.4	27.8	23.5	28.5	23.6	30.2	23.3	31.7	22.9
22	29.4	23	27.7	24.2	29.4	22.8	28.9	22	30.2	23.2	28	23	29	22.2	27.7	21.1
23	29	21.6	29.9	23.3	30	22.8	28.8	21.6	30	23.5	30.2	22.8	29.9	23	31	20.7
24	31	22.5	29.8	22.8	31.4	25	30.2	21.4	30	23.7	30.8	22.8	31.4	21.9	30.7	20.7
25	29.1	23.6	29.7	23.9	31.2	23.6	30.2	21.3	30.4	23.8	29.4	22.9	31	22.7	29.8	21.7
26	29.7	22.6	27.4	24	31.7	22.1	29.9	21.3	30.2	23.8	29.8	22.4	30.8	21.7	30.5	20.7
27	31.5	21.5	29	25	32.8	22	31.4	20.9	28.5	23.8	30	22	31.7	21.2	30.7	19.8
28	31.5	22.5	27.7	24.7	31.2	22.2	30.9	21.5	27.1	23.4	29.3	22.3	31	22.4	31.1	21.1
29	28.8	21.6	27.2	23.8	31.2	22.4	29.4	21	28.6	23.5	29.1	21.8	30.8	21.5	29.7	20.3
30	28.2	22.7	26.5	21.9	29.9	22.7	28.4	21.6	26.4	22.2	27.8	22.6	30.3	20	29.8	19.2
Mean	29.9	22.4	29.2	23.7	31.3	23	30.2	21.8	29.7	23.5	29.6	22.7	30.7	22.2	30.9	21

Day.	Iba.		San Isidro.		Tarlac.		Baler.		Dagupan.		Bolinao.		Baguio.		San Fernando, Union.	
	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.
	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.
1	32.1	23	30.2	23.1	33	22.2	31.1	23.5	33.1	23.1	32.4	24	24.4	15.7	32	22.8
2	32.2	23	31.4	23.3	34	22.6	31.3	23.1	34.8	23.6	33.3	23.1	24.8	14.9	31.8	22.5
3	33.8	23.5	31.4	22.4	33.9	22	31.4	22.4	34.5	23	33.3	22.3	25.2	15.4	32	22.7
4	32.7	21	32.1	22.3	35	21.8	31.9	23.9	35.3	22.6	32.5	23.8	26	14.4	33.1	22.3
5	32.4	21.9	31.8	22.1	34.8	21.4	35.6	21.9	33.8	23.1	32.5	24	23.5	15	32.6	23.5
6	31.7	21.5	31.6	23	35	21.5	31.7	21	33.1	23.2	32.2	23.6	23.8	15.4	32.1	22.6
7	31.7	21.4	31.7	23.8	35.5	21.2	31.9	22	31.6	23	31.4	26.9	23.3	14.4	31.8	22.5
8	31.4	19.7	31.9	22.4	35	21.5	32.4	21.2	33.2	22.9	32.3	25.7	23	14.4	32.5	21.6
9	31.6	20.4	31.5	22.6	36	21.8	33.5	22.8	33.8	23	32.9	24	23.3	15.2	32.6	22.6
10	31.7	23	30.4	23.5	34	23	30.2	22.3	33.7	24	31.8	25	23.3	15.5	32.7	24.7
11	32.6	21.8	30.4	21.4	33.2	21.2	30.6	22.2	33.7	23	31.7	24.5	22.3	13.2	31.8	22
12	31.9	19.5	30.9	20.5	33	20.4	30.7	21.5	33.2	21	31.7	22.4	23.5	13.9	31.5	21.3
13	31.8	19.5	30.8	20.5	33	20	31	23.2	32.7	21	31.9	20.9	24.2	13.1	31.2	21
14	31.4	20.5	31	19	34	18.5	30.8	19.3	31.7	20.1	31.6	21.4	24	12.4	32	20.6
15	32.7	19.6	31.6	20.7	34.3	20.4	30.9	22.1	31.6	21.5	30.1	26.4	24.5	14.4	33	20.5
16	32.2	20.5	31.4	21.5	34.2	21.3	31.9	22.2	31.8	23.2	29.1	25.9	23.3	15.4	30.3	22
17	31.1	21.2	31.9	23.8	34.4	21.1	32.5	21.6	31.6	23.8	30.1	25.8	22.6	14.9	31.3	22
18	31.8	22.3	32.7	23	34.5	22.5	32.7	22.8	31.8	23.9	30.5	25.8	23.5	16	31	24.2
19	31.8	22.3	31.6	22.9	35.6	22.4	30.7	22	32.8	23.4	32.5	23.9	22.8	15.9	32.3	23.5
20	31	22.5	29.3	22.8	33	21.7	30.9	23.2	33.3	23.5	32.5	23.9	23.2	16	32.5	23.1
21	30.7	21.9	31.5	22.2	33.3	22.5	29.9	22.3	33.9	23.5	30.6	24.6	23	15.6	32.1	24.4
22	31.4	21.2	30.4	22.5	28.6	22.5	28.6	23.1	32.1	22.9	31.8	24.1	23.3	15.8	30.6	25.9
23	30.1	22.3	29.1	23	29.5	21.4	26.5	22.8	30.1	23	31.3	23.7	19.2	15.9	29.1	22.9
24	32.8	21.1	30.5	23.1	32	21.7	29.8	22.9	34.2	23	31.7	22.2	23.8	15.8	31.5	23.2
25	31.4	21.7	30.6	22.9	31.7	22.4	30.6	23.5	32.6	23	32.3	23.8	22.5	14.9	31.5	22
26	31.2	21.3	31.5	21.3	34.2	21.5	30.8	21.9	32.9	22.6	31.9	23	23.7	14.5	31.5	22
27	31.4	20	31.4	20.6	34	21.3	32	21.5	31.2	22	30.7	22.1	21.8	14.5	31.5	22.5
28	32.8	21.2	31.9	22.7	34.3	22	31.1	22.9	32	23.4	29.5	25.8	21.3	15.5	30.7	23.5
29	30.7	22	30.6	20.9	34.5	22.4	30	20.5	30.4	22.6	28.3	25	20.9	12.4	29.5	21.9
30	29.4	19.7	28.6	19.4	34.8	18.5	28.6	18.4	30.1	19.8	28	22.9	20.5	11.2	29.8	19
Mean	31.7	21.3	31.1	22.1	33.7	21.5	31.1	22.1	32.7	22.7	31.4	24	23.2	14.7	31.6	22.4



Maximum and minimum temperatures at the stations of the Weather Bureau, November, 1916—Contd.

Day.	Echagüe.		Candon.		Vigan.		Tuguegarao.		Laoag.		Aparri.		Cape Bojeador.		Sto. Domingo, Batanes.	
	Maxi-mum.	Mini-mum.	Maxi-mum.	Mini-mum.	Maxi-mum.	Mini-mum.	Maxi-mum.	Mini-mum.	Maxi-mum.	Mini-mum.	Maxi-mum.	Mini-mum.	Maxi-mum.	Mini-mum.	Maxi-mum.	Mini-mum.
1	31.8	23	32.4	23	32.3	22.4	29.9	23.1	32.9	23	27.7	23.8	27.3	22.6	28.4	23.7
2	32.5	22.5	31.2	24.7	33	22.7	33.4	23.2	36.2	22.5	29.8	23.1	30.2	22.8	31	23.9
3	33	22.2	31.2	24	31.9	23.2	33.5	22.8	34.1	21	31.5	23.6	33.5	23.2	31.1	24.2
4	31.5	23	32.4	24.9	32.1	22.5	31.6	21.3	35.9	21.9	30.5	23.2	31	22.8	30.9	24.2
5	31	22.7	32.6	24.2	33.3	23	31	22.7	34.9	19.6	29.6	23.1	30	22.8	29.4	22.4
6	31.8	22.3	32	23.1	32.3	22.5	30.7	22	35.2	19.1	29.3	22.8	30.2	21.9	28.9	23.1
7	31.5	22.3	32	23.7	32	21	30.2	20.4	32.4	17.9	28.2	21.8	30.5	22.4	29.3	24.8
8	31.5	22.3	32	23.5	32.6	22.4	31.3	22.6	33.7	21.3	30.2	22.9	31	23	28.8	24.5
9	28	23.3	32.6	24.2	31.2	22.6	27.5	23.2	31.8	23	28.7	23.8	27.3	22.5	27	23.4
10	30	22.4	32.7	24.2	31.2	21	28.4	21.8	32.3	20.5	28.4	23.6	28.4	22.8	25.5	21.9
11	28	20.5	32.5	22.5	30.7	19.9	28.9	21	33.5	20.8	27.1	22.6	27.6	21.4	24.1	20.4
12	26	20.7	32.8	22.2	33.8	22	28	21.5	32.5	18.5	26.3	22.1	27.8	20.8	26.5	21
13	26	20.4	33	22	32.7	19.7	26.5	20.8	32.5	20.2	27	22.3	28.5	18.6	26.7	20.6
14	28.2	19	32.8	21.5	32.4	21.5	28.9	20.5	31.4	20	27.3	21.8	26.5	19.7	26	22
15	25.3	21.4	32.2	23.4	29	21.1	24.6	21.2	24.8	21.1	25.6	21.8	24.2	21.2	24.6	21.9
16	28	21.5	32	23	29.8	22	28	21.3	28.8	21.6	26.8	21.9	24.4	20.6	24	21.6
17	30.2	21.5	32.2	22.7	30.7	22	29.6	22.4	30.6	21.9	26.9	22.6	25.4	21.5	26.4	21.9
18	30.8	23	32.1	24.5	30	22	29.8	23.2	29.1	22.1	27.7	23.4	25.7	22.3	26.6	22.8
19	27.6	23	32	24.1	31.3	22.5	26.1	23	32.8	21.1	26.5	23	26.6	22	25.2	22.9
20	30	22.6	32.4	25	32.2	23	30	22.5	30.5	21.3	27.6	23	24.2	22.2	26.3	22.7
21	29.1	22.6	32.2	25	31.4	22.1	30.1	22.9	31	22.3	28	22.7	24.4	21.4	25.2	22.5
22	28.4	22.1	32	23.5	32.1	22.2	26.3	22.6	34.1	21.9	27.4	23.2	27.6	20.4	24.4	22.2
23	24.5	22.6	30.2	24.5	31.5	23.5	24.2	22.6	29.8	23.3	24.5	22.6	27.2	20.2	27.2	22.6
24	31.2	21.9	31.5	24.1	31.3	23.3	30.1	22.2	32.3	22.7	28.7	22.3	31	23	27.1	22.9
25	30	22.1	32.4	23	32.7	22.5	30.5	22.2	33.6	22	27.8	23	28.2	23.2	27.7	21.6
26	28.5	22.4	31.5	23.5	33.4	22.3	28	22.2	33.4	21	28.3	22.8	27.4	22.7	26.7	23
27	28	21.9	32.2	22.6	29.3	22.5	26	22.3	28.7	23.5	25.9	23.5	27.4	22.4	26.9	23.8
28	29	21.7	32.4	23.4	29.6	21.7	27	21.1	29.4	21.7	25.6	22.5	27.8	21.2	24.6	21
29	28	19.8	31	22	29.9	18.2	26.6	19.4	29.2	19.9	26	22.1	25.2	17.8	24.5	19.5
30	25	18.1	31	20	28.5	18	24.1	18.3	26.5	18.3	23	19.8	23.4	17.5	23.1	17.9
Mean	29.1	21.8	32	23.4	31.5	21.8	28.7	21.9	31.8	21.2	27.6	22.7	27.7	21.6	26.8	22.4



# SEISMOLOGICAL BULLETIN FOR NOVEMBER, 1916.

By Rev. MIGUEL SADERRA MASÓ, S. J.,  
Assistant Director of the Weather Bureau.

## EARTHQUAKES FELT IN THE PHILIPPINES.<sup>1</sup>

1, 20<sup>h</sup> 32<sup>m</sup> 27<sup>s</sup> \* [2, 4<sup>h</sup> 32<sup>m</sup> 27<sup>s</sup>]. **Bolinao** (W Luzon). Oscillatory earthquake of intensity III, duration 3 seconds. It originated in the China Sea.

12, 0<sup>h</sup> 36<sup>m</sup> 00<sup>s</sup> \* [13, 10<sup>h</sup> 15<sup>m</sup> 00<sup>s</sup>]. **Guam** (Mariana Islands). Earthquake of intensity III-IV. The records of Manila and Osaka, Japan, place the origin of this earthquake near the meridian 140° E and the parallel 13° N.

13, 11<sup>h</sup> 54<sup>m</sup> 31<sup>s</sup> \* [13, 19<sup>h</sup> 54<sup>m</sup> 31<sup>s</sup>]. **Calapan** (NE Mindoro). Earthquake of intensity IV, preceded by subterranean rumbling.

15, 18<sup>h</sup> 11<sup>m</sup> 09<sup>s</sup> \* [16, 2<sup>h</sup> 11<sup>m</sup> 09<sup>s</sup>]. **Samar and Leyte Islands**. Earthquake shocks of intensity IV-V, felt chiefly in the eastern part of Samar. The origin lay in the Pacific at about 126.4° E and 11.5° N.

17, 12<sup>h</sup> 10<sup>m</sup> [17, 20<sup>h</sup> 10<sup>m</sup>]. **Samar Island**. Earthquake of intensity III felt throughout the island. The origin probably was located within the island, in its NE part, and rather shallow.

23, 0<sup>h</sup> 02<sup>m</sup> [23, 8<sup>h</sup> 02<sup>m</sup>]. **Borongan** (E Samar). Earthquake of intensity II-III.

30, 11<sup>h</sup> 54<sup>m</sup> [30, 19<sup>h</sup> 54<sup>m</sup>]. **NE Mindanao**. Earthquake of intensity IV-V and long duration. It originated in the Butuan Bay. The greatest intensity was experienced by the towns placed on the eastern shore of the said bay, but it was distinctly felt throughout the whole province of Surigao and N part of the Agusan Valley. In spite of its relatively great intensity and extension none of the seismographs placed in Luzon at a distance of only about 750 kilometers registered it. This case confirms the statement made many times in this Bulletin about the volcanic or rockfall character of most of the shocks originated in the Butuan Bay.

## RECORDS OF THE MICROSEISMOGRAPH.

[Time: Greenwich mean. Midnight=0<sup>h</sup>. Instrument: Wiechert seismograph; 1,000 kilograms.  $A_N$ :  $T_0=6.19$ ,  $\epsilon=1.966$ ,  $\frac{r}{T_0^2}=0.068$ ;  
 $A_E$ :  $T_0=5.96$ ,  $\epsilon=2.267$ ,  $\frac{r}{T_0^2}=0.056$ . Alluvium. 2.40 meters above sea level].

No.	Date.	Character.	Phase.	Hour.	Period.	Amplitude.		Remarks.													
						$A_N$ $\mu$	$A_E$ $\mu$														
359	1	Iv	eP	20	32	27	-----	-----	Bolinao (W Luzon).												
			L							32	54	-----	-----								
			M <sub>E</sub>											32	58	1	47				
			M <sub>N</sub>															33	03	1	36
			F																		
F	-----	-----	-----																		
				9	25	24	-----	-----													
eP									27	-----	-----										
F												-----	-----	-----							
															0	59	22	-----	-----		
eP	1	02	-----																	-----	
F				-----	-----	-----															

<sup>1</sup>The intensity of earthquakes is given in the notation known as the Rossi-Forel scale. The time is that indicated by the seismographs at the Central Observatory whenever the disturbance has been registered by them. This fact is denoted by an asterisk (\*). Otherwise the time is that noted by the observer who sent the report. All time indications are in Greenwich mean time (midnight=0<sup>h</sup>), in-sular time being added in brackets for the convenience of Philippine readers.

## Records of the microseismograph—Continued.

No.	Date.	Character.	Phase.	Hour.	Period.	Amplitude.		Remarks.
						A <sub>N</sub> μ	A <sub>E</sub> μ	
362	11	I <sub>v</sub>	eP F	1 06 24 08				
363	13	I <sub>r</sub>	e L F	0 36 00 42 55 57				Guam (Mariana Islands).
364	13	I <sub>v</sub>	eP L F	11 54 31 54 47 59				Calapan (NE Mindoro).
365	13	I <sub>v</sub>	eP F	12 02 42 05				
366	14	I <sub>v</sub>	eP L F	9 53 04 55 46 10 04				
367	14	II <sub>r</sub>	eP S L M <sub>E</sub> M <sub>N</sub> F	22 34 06 36 02 38 00 38 25 39 07 23 26		9 7	38 60	Formosa.
368	14 15	I <sub>v</sub>	eP F	23 59 50 0 03				
369	15	I <sub>v</sub>	eP L M <sub>N</sub> F	18 11 09 12 26 12 38 17		2	6	Samar and Leyte Islands.
370	15	I <sub>v</sub>	eP L M <sub>E</sub> F	20 28 18 28 40 28 48 32		2	12	
371	18	I <sub>v</sub>	eP L F	11 48 19 48 31 52				
372	18	I	e F	11 56 19 12 25				
373	18	I <sub>v</sub>	eP F	14 11 55 14				
374	22	I <sub>v</sub>	eP F	9 27 19 30				
375	22	I <sub>v</sub>	eP F	16 32 05 34				
376	22	I <sub>v</sub>	eP F	18 12 41 15				
377	22	I <sub>v</sub>	eP L M <sub>N</sub> F	19 52 06 52 44 53 29 20 14		3	10	
378	24	I <sub>r</sub>	e L M <sub>N</sub> F	4 10 18 23 45 26 50 38		16	5	
379	27	I <sub>r</sub>	e L M <sub>N</sub> F	6 42 51 50 27 52 01 7 09		8	7	
380	29	I <sub>v</sub>	eP F	14 28 39 31				

TEMBLORES DE TIERRA SENTIDOS EN FILIPINAS.<sup>1</sup>

1, 20<sup>h</sup> 32<sup>m</sup> 27<sup>s</sup> \* [2, 4<sup>h</sup> 32<sup>m</sup> 27<sup>s</sup>]. Bolinao (W de Luzón). Temblor de tierra oscilatorio, intensidad III, duración 3 segundos. Originado en el Mar de la China.

12, 0<sup>h</sup> 36<sup>m</sup> 00<sup>s</sup> \* [13, 10<sup>h</sup> 15<sup>m</sup> 00<sup>s</sup>]. Guam (Islas Marianas). Temblor de tierra de intensidad III-IV. Los registros de Manila y de Osaka, Japón, colocan el origen de este temblor hacia el meridiano 140° E y el paralelo 13° N.

13, 11<sup>h</sup> 54<sup>m</sup> 31<sup>s</sup> \* [13, 19<sup>h</sup> 54<sup>m</sup> 31<sup>s</sup>]. Calapan (NE de Mindoro). Temblor de tierra de intensidad IV, precedido de ruido subterráneo.

15, 18<sup>h</sup> 11<sup>m</sup> 09<sup>s</sup> \* [16, 2<sup>h</sup> 11<sup>m</sup> 09<sup>s</sup>]. Sámar y Leyte. Temblor de tierra de intensidad IV-V sentido principalmente en la parte oriental de Sámar. El origen se hallaba en el Mar Pacífico cerca de los 126.4° E y 11.5° N.

17, 12<sup>h</sup> 10<sup>m</sup> [17, 20<sup>h</sup> 10<sup>m</sup>]. Isla de Sámar. Temblor de tierra de intensidad III, sentido, en toda la isla. Parece que el origen era muy superficial y se hallaba dentro de la isla hacia el NE de ella.

23, 0<sup>h</sup> 02<sup>m</sup> [23, 8<sup>h</sup> 02<sup>m</sup>]. Borongan (E de Sámar). Temblor de tierra de intensidad II-III.

30, 11<sup>h</sup> 54<sup>m</sup> [30, 19<sup>h</sup> 54<sup>m</sup>]. NE de Mindanao. Temblor de tierra de intensidad IV-V y de larga duración. El origen se hallaba en la bahía de Butúan. Tuvo su máxima intensidad en los pueblos de la costa oriental de dicha bahía, pero fué bien perceptible en toda la Provincia de Surigao y en la parte N del Agusan. A pesar de su intensidad y relativa extensión no fué registrado ni por los sismógrafos de Manila ni de otras estaciones de Luzón a solos 750 kilómetros de distancia. Este caso confirma la aserción hecha repetidas veces de que los más de los terremotos originados en la bahía de Butúan son de carácter volcánico o de hundimiento, es decir, superficial.

---

<sup>1</sup> La intensidad de los terremotos se indica conforme a la conocida escala de Rossi-Forel. Cuanto a la hora de su ocurrencia, adoptamos la indicada por los sismógrafos de este Observatorio siempre que los hayan registrado, distinguiéndola por medio de un asterisco (\*). En caso contrario copiamos la apuntada por los observadores que nos envían las notas. Todas las indicaciones del tiempo se refieren al tiempo medio de Greenwich (medianoche=0<sup>h</sup>). Para conveniencia de los lectores de Filipinas se añade también el tiempo insular.









15919  
P556

OCT 1 1917

THE GOVERNMENT OF THE PHILIPPINE ISLANDS

# WEATHER BUREAU

MANILA CENTRAL OBSERVATORY

---

BULLETIN FOR DECEMBER, 1916

---

PREPARED UNDER THE DIRECTION OF  
REV. JOSÉ ALGUÉ, S. J.  
DIRECTOR OF THE WEATHER BUREAU

MANILA  
BUREAU OF PRINTING  
1917



---

---

**BULLETIN FOR DECEMBER, 1916.**



# METEOROLOGICAL BULLETIN FOR DECEMBER, 1916.

By Rev. JOSÉ CORONAS, S. J.,  
Chief, Meteorological Division of the Weather Bureau.

## GENERAL WEATHER NOTES.

Pressure and temperature.—The mean atmospheric pressure of this month is lower than that of the preceding year and than the December's normal, in spite of having been but one depression or typhoon near the Philippines. That of Manila differs from the normal by  $-2.56$  mm., and from the monthly mean of December, 1915, by  $-0.60$  mm.

The mean monthly temperature is, with very few exceptions, either almost identical with that of the preceding year or somewhat lower. The extreme temperatures of the month for Manila were  $32.2^{\circ}$  C. on the 18th and  $17.4^{\circ}$  C. on the 1st. The absolute maximum and minimum temperatures for Baguio were  $25.0^{\circ}$  C.,  $10.7^{\circ}$  C. on the top of Mirador, and  $25.8^{\circ}$  C.,  $8.5^{\circ}$  C. in the valley.

PRESSURE AND TEMPERATURE AT THE FIRST AND SECOND CLASS STATIONS FOR DECEMBER, 1916.

Station.	Pressure.						Temperature.					
	Mean.	Departure from Dec., 1915.	Highest mean.	Day.	Lowest mean.	Day.	Mean.	Departure from Dec., 1915.	Highest.	Day.	Lowest.	Day.
	mm.	mm.	mm.		mm.		°C.	°C.	°C.		°C.	
Zamboanga	756.05		757.15	3	754.74	27	25.8		33	8, 9, 16	21.9	2, 23
Tagbilaran <sup>a</sup>	56.46		57.68	31			25.6				18.8	24
Surigao	56.48	-0.87	57.79	31	55.28	1	25.5	-0.6	32.7	3	22	26
Cebu	56.51	-1.09	57.49	31	55.49	2	26.6	-0.8	31.6	5	22.8	24
Iloilo	56.40	-1.18	57.32	25	55.42	16	26.2	-0.2	31.3	19	21.4	27
Ormoc	56.68	-1.08	57.82	31	55.70	2	25.7	-0.3	32.7	4	19.4	23
Tacloban	56.73	-0.72	57.94	31	54.91	1	25.5	-0.4	32.5	5	21.4	2
Capiz	57.15	-1.01	57.95	4	56.22	2	26.5	-0.9	31.8	5	22.2	24
Calbayog	56.98	-0.67	57.99	31	55.28	1	25.4	-0.1	32.3	18	20.5	23
Legaspi	57.27	-0.37	58.20	28	55.75	1	26.3	-0.1	30.9	4	21.1	3
Atimonan	57.73	-0.64	59.38	28	56.70	17	26.1	+0.4	30.8	9	22	28
Ambulong, Tanauan	57.06	-0.56	58.13	28	56.02	2	26	+0.5	32	11, 21	18.7	1
Paracale	57.97	-0.57	59.63	28	56.68	2	26	0	30.4	13, 19	22.2	1, 2, 3
Manila	57.79	-0.60	58.75	28	56.64	18	24.9	-0.5	32.2	18	17.4	1
San Isidro	58.07	-0.69	59.15	28	57.11	18	25.4	+0.1	32.5	8	18	1
Dagupan	57.18	-0.65	58.06	25	55.95	18	26.4	-0.1	35.3	5	17.1	1
Bolinao	57.48	-0.64	58.41	25	56.26	18	27	+0.7	33.1	19	20.7	25
Baguio <sup>b</sup>	635.66	-0.54	636.37	4	635	16	17.5	0	25	20	10.7	1
Vigan	757.52	-0.73	759	1	756.27	18	26.3	-0.2	32.8	9	16.8	1
Tuguegarao	59.51	-0.82	61.88	28	57.47	19	23.9	-0.2	31.2	5	17.3	1
Laoag	57.83		59.85	1	56.23	18	25.6			6	17	29
Aparri	59.84	-0.93	62.59	28	57.87	19	23.7	-0.1	28.7	19	20.2	29

<sup>a</sup> 20 days of observation.

<sup>b</sup> The barometric readings of this station are not reduced to sea level.

<sup>c</sup> 28 days of observation.

<sup>d</sup> 29 days of observation.

Rainfall.—There is nothing very particular to be remarked in regard to the rainfall of this month except that very heavy rains were observed on the 28th and 29th in the Penal Colony of Iwahig, Palawan Island, 279.4 mm. of water having fallen from 6 a. m. of the 28th to 6 a. m. of the 29th. Hence extraordinary floods occurred in that place, which did considerable damage to the Colony.

The following is an extract from report of the Superintendent of the Iwahig Penal Colony, to the Director of Prisons, concerning the flood on December 29, 1916.

During the whole of the month of December there were heavy rains daily, which culminated on the early morning of the 29th, in excessive floods, in which the waters reached a level of from 3 to 4 feet above previous recorded high water marks. Many buildings, improvements and permanent plantings were destroyed, roads washed away and considerable loss in live stock and other equipment. The loss in permanent planting amounted to about one thousand of the matured coconut palms. The waters rose from a normal stage to the highest mark within two hours between 4 and 6 o'clock in the morning, a rise of as much as 3 feet being recorded within five minutes, the highest mark being reached shortly before day break. The darkness and sudden rise of the water was the cause for the greater part of the loss in live stock and other equipment, although much of it could not have been prevented even had the flood occurred during the day. Many narrow scapes from drowning are recorded among the colonists, some having to be rescued from their quarters on banana rafts, while other had to remain in the branches of the trees from four to six hours until the waters subsided. At the ice plant the waters came up high enough to put out the fires in the boilers, and washed away many of the heavy squared timbers which had been prepared for the erection of the new warehouse building. There is no record of the water ever having been over the ground where the sawmill is located before.

RAINFALL AT VARIOUS STATIONS OF THE WEATHER BUREAU DURING THE MONTH OF DECEMBER, 1916.

Station.	Total.	Departure from Dec., 1915.		Departure from normal.	Rainy days.	Departure from Dec., 1915.	Greatest rainfall in a single day.	Day.	Station.	Total.	Departure from Dec., 1915.		Departure from normal.	Rainy days.	Departure from Dec., 1915.	Greatest rainfall in a single day.	Day.
		mm.	mm.								mm.	mm.					
Jolo	297.1	+109.8	+134.1	25	+2	44.7	17	Virac	481.7	-347.3	+38.2	28	+6	80.8	30		
Isabela, Basilan	311.2	-9.6	+153.6	20	+2	72.1	28	Naga	209.6	-781.1	-85.8	21	-3	75.6	2		
Zamboanga	279.6	+136.2	+168.3	18	+5	53.7	28	Batangas	65.2	+30.7	-48.2	13	-2	16.5	27		
Davao	183.2	-120.4	-21.4	13	-1	44.2	8	Lucena	297.9			23		79.7	27		
Cagayan, Misamis	71.7	-114.9		10	-10	18	24	Atimonan	422.6	-503.6	+30.4	23	-4	110.5	27		
Butuan	295.8	+44.6	-3	26	+7	65.8	15	Ambulong, Tanauan	67.5	-197.3		11	+2	23.9	27		
Dumaguete	337.5	-32.7		19	0	83.3	26	Canlubang, Calamba	126			16		35.8	27		
Iwahig	809.1	+161		21	-1	279.4	28	Paracale	795.7	-202.6		28	+1	157.5	27		
Surigao	617.2	+283	+83.4	29	+8	91.8	13	Santa Cruz, Laguna	170.3	-207		23	+1	44.7	15		
Maasin	395.6	+48.8	+85.4	16	+4	63.2	24	Manila	76	-106.3	+13.6	13	0	16.2	26		
Cebu	136.5	+44.4	-11.3	19	-2	60.3	17	Antipolo	87.6	-231		14	-5	15.7	29		
Iloilo	86.8	-18.9	-28.9	14	-2	15.2	19	Iba	28	-64.1	+1	8	+1	11.7	24		
San Jose Buenavista	54.1	-68.4	-5.7	16	-2	9.9	25	San Isidro	36.6	-87.1	-11.5	12	0	12.4	21		
Cuyo	61.4	+11.1	+9.4	8	-2	18.5	18	Tarlac	10.3	-69.6	-29.8	5	-3	5.6	29		
Ormoc	391.6	+64.4	+191.5	25	+2	252.2	1	Baler	430.1	+198.9	+67.8	25	+6	134.1	30		
Guiuan	516.5	-216.9		29	+4	75.7	25	Dagupan	30.5	+10.4	+15.1	4	-4	23.4	24		
Tacloban	519.1	-33.4	+151.1	29	+4	86.2	1	Bolinao	8.1	-21	-4.8	7	-3	3.1	30		
Capiz	165.8	-2.1	-67.8	24	0	36	17	Baguio	24.6	-68.4	-27.2	8	-4	11.7	11		
Borongan	552.7	-259.6	-57.1	30	+5	75.7	29	San Fernando, Union	11.4	+9	+3	2	0	8.9	24		
Catbalogan	413.3	-336.8		26	-1	142.2	1	Echague	227.8	-20.1	+70.2	28	+4	32.8	30		
Calbayog	227.9	-488.8	-48.5	25	0	54.9	1	Candon	9.9	+6.1	-1.7	5	+4	4.1	9		
Masbate	213.2	-309.1	+8.9	22	+1	64.5	4	Vigan	7.3	-37.6	-1	3	-2	6.7	24		
Romblon	289.7	-17.4	+64.1	30	+8	36.7	29	Tuguegarao	335.9	+186.3	+179.1	20	+12	58	11		
Batag	329.3	-276.2		25		77.2	28	Laoag	49.9	+12.6	+22.3	7	+5	13.8	8		
Sorsogon	1,539			27		109.2	12	Aparri	479.9	+177	+219.8	28	+4	63.3	11		
Legaspi	474.9	-312	-7.5	27	+6	61	28	Cape Bojeador	89.1			12		14.7	9		
Sumay, Guam	56	-109.1	-97.5	10	-10	12.7	4,5	Santo Domingo, Bata-									
Calapan	304.1	+46.1		27	+2	79.5	18	nes	739.1	+491.6	+357.9	30	+9	127.9	30		

DEPRESSIONS AND TYPHOONS.

Only one typhoon was observed during the month in the Far East. Its track was published in the Bulletin for November, Plate X, together with the tracks of the depressions and typhoons for October and November.

This typhoon appeared on November 29 over the Pacific to the east of the southern part of the Philippines near 10° latitude N and 131° longitude E; it moved WNW on the 29th and 30th, but recurved northeastward on the 1st, thus disappearing any danger for the Archipelago.

## NOTAS GENERALES DEL TIEMPO.

**Presión y temperatura.**—La presión atmosférica media de este mes es menor que la del año pasado y que la normal de diciembre, a pesar de no haber habido más que una depresión o tifón cerca de Filipinas. La de Manila difiere de la normal en  $-2.56$  mm., y de la media mensual de diciembre, 1915, en  $-0.60$  mm.

La temperatura media mensual es, con muy pocas excepciones, casi igual o algo menor que la del año pasado. Las temperaturas extremas de este mes en Manila fueron  $32.2^{\circ}$  C. y  $17.4^{\circ}$  C. observadas respectivamente los días 18 y 1. Las temperaturas máximas y mínimas absolutas de Baguio fueron  $25.0^{\circ}$  C.,  $10.7^{\circ}$  C. en la cumbre del Mirador, y  $25.8^{\circ}$  C.,  $8.5^{\circ}$  C. en el valle.

**Precipitación acuosa.**—Nada particular ocurre mencionar sobre la lluvia de este mes, si no es las copiosas lluvias que se observaron los días 28 y 29 en la Colonia Penal de Iwahig, Isla de Palawan, habiendo caído 279.4 mm. de agua desde 6 a. m. del 28 hasta 6 a. m. del 29. De ahí las extraordinarias inundaciones que ocurrieron en aquel lugar y que causaron considerables daños a la colonia.

El siguiente es un extracto del report del Superintendente de aquella Colonia al Director de Prisiones, referente a estas inundaciones del 29 de diciembre:

Durante todo el mes de diciembre hubo diariamente abundantes lluvias que culminaron en la madrugada del 29 en grandes inundaciones, alcanzando las aguas una altura de 3 o 4 pies sobre las registradas anteriormente. Muchos edificios, mejoras y plantas permanentes quedaron destruidos, los caminos arrasados, y hubo considerable pérdida de ganados y otros enseres. La pérdida de plantas permanentes asciende a cerca de mil cocos. Las aguas subieron del estado normal a lo más alto en menos de dos horas, entre 4 y 6 de la mañana, habiéndose registrado una subida de tres pies en cinco minutos, y alcanzando su mayor altura poco antes del amanecer. La oscuridad y la repentina crecida del agua fueron la principal causa de tantas pérdidas en ganados y otros enseres, aunque mucho se hubiese perdido también aún cuando la inundación hubiese ocurrido durante el día. Muchos colonos lograron con dificultad salvarse, habiendo algunos sido rescatados de sus habitaciones por medio de balsas de troncos de plátano, al paso que otros permanecieron en las ramas de los árboles de cuatro a seis horas hasta que las aguas se hubieron retirado. En la fábrica de hielo las aguas subieron lo bastante para apagar el fuego de las calderas y arrastrar muchas de las pesadas vigas que habían sido preparadas para la construcción del nuevo edificio-almacén. No hay memoria de haber llegado nunca el agua a cubrir el terreno en que está instalada la máquina de aserrar.

## DEPRESIONES Y TIFONES.

Un solo tifón se observó durante el mes en el Extremo Oriente. Su trayectoria se publicó en el Boletín de noviembre, Lámina X, juntamente con las trayectorias de las depresiones y tifones de octubre y noviembre.

Este tifón apareció el 29 de noviembre en el Pacífico al E de la parte meridional de Filipinas en los alrededores de  $10^{\circ}$  latitud N y  $131^{\circ}$  longitud E; se movió al WNW los días 29 y 30, pero recurvió al NE el 1.º, desapareciendo así todo peligro para el Archipiélago.

METEOROLOGICAL DATA FOR MANILA CENTRAL OBSERVATORY.\*

[ $\phi=14^{\circ} 34' 41''$  N;  $\lambda=120^{\circ} 58' 33''$  E; barometer above sea, 14.2 meters; gravity correction not applied,  $-1.72$  mm.]

Day.	Air temperature. <sup>b</sup>				Underground temperature.						Relative humidity (mean)	Vapor pressure (mean)	Radiation.			Evaporation. <sup>b</sup>	
	Press-ure (mean)	Mean.	Maxi-mum.	Mini-mum.	0.25 meter.		0.50 meter.		1.50 meters.				2.50 meters.	Mini-mum on grass	Maxi-mum in sun. Black bulb in vacuo.	Free exposure (total)	Shelter (total).
					8 a.m.	2 p.m.	8 a.m.	2 p.m.	8 a.m.	8 a.m.							
1.	758.01	23.6	29.8	17.4	26.4	27.7	28.1	28.3	28.5	28.2	67.8	14.5	14.8	51.2	6.5	5.2	
2.	57.24	25.1	29.7	21.2	26.5	27.5	27.8	28.1	28.6	28.2	69.1	16.2	19.9	49.6	4.5	3.8	
3.	58.24	25	29.2	22.5	26.6	27.7	27.8	28.1	28.8	28.2	83.6	19.6	20.8	49.8	2.1	1.6	
4.	58.44	25.3	30.6	22.1	26.8	27.5	27.8	28.1	28.6	28.2	86.1	20.4	20.2	52.3	2.4	1.9	
5.	57.68	25.2	30.8	21.3	26.8	27.9	27.9	28.2	28.5	28.2	86.4	20.3	19.4	55	1.9	1.5	
6.	57.49	25.4	31.1	21.3	26.8	28	27.8	28.1	28.5	28.2	82.7	19.6	19.1	52.6	2.3	1.9	
7.	57.68	25.3	31.3	20.7	27.1	28.2	27.9	28.2	28.5	28.2	81.1	19.7	18.2	53	3.6	2.7	
8.	57.45	24.6	29.3	21.6	26.9	27.7	27.9	28	28.5	28.2	90.6	20.7	19.2	42.7	5	7	
9.	57.57	25.4	31.3	21.6	27.1	28.2	27.9	28.4	28.5	28.2	84.3	20.1	19.5	53	2.4	1.9	
10.	58.18	24.9	31	20.7	27	28.1	28.1	28.6	28.2	28.2	85.3	20.1	18.8	49.5	1.7	1.5	
11.	58.18	25.3	30.2	22.2	27.3	28.2	27.9	28.2	28.5	28.2	88.4	21	20.6	54	1.4	1.4	
12.	58.02	25.2	31.3	21	27.1	28	27.9	28.2	28.4	28.2	82.9	19.4	19	54	2.7	2.1	
13.	58.35	25.4	31.8	21.5	27.2	28.1	27.9	28.2	28.4	28.2	80.3	19.1	19.8	48	2.4	2	
14.	57.88	25.4	31.8	21.3	26.9	28	27.9	28.1	28.3	28.2	89.3	20	19.2	51.5	2.5	1.9	
15.	57.41	24.8	30.5	21.3	26.9	27.6	27.9	28.1	28.3	28.2	85.6	19.9	19.1	45	1.3	1.8	
16.	56.82	25.6	30.9	22	26.8	27.9	27.8	28.1	28.3	28.1	85.2	20.5	21	56.5	2.3	1.8	
17.	56.83	25.4	29.9	22.7	27.3	28.1	28.1	28	28.5	28.2	89.9	21.6	21.3	52.2	1.1	1.1	
18.	56.64	26.1	32.2	21.7	27.2	28.2	27.9	28.1	28.3	28.1	84.5	19.6	18.2	55.4	2.7	2.1	
19.	56.87	26	31.9	22.7	27.4	28.2	28	28.2	28.3	28.1	84.3	20.8	20.6	51.3	3.3	2.6	
20.	57.53	25.2	31.6	21.2	27.3	28.3	28	28.3	28.3	28.1	81.2	19	18.7	49.7	2.9	2.4	
21.	58.13	25.3	31.4	20.9	26.8	28.1	28	28.2	28.3	28.1	82.8	19.6	18.2	58.8	2.1	1.6	
22.	57.75	25.2	30.5	22.1	27.3	28.2	27.9	28.1	28.3	28.1	86.7	20.5	19.9	48.3	2.9	2.4	
23.	57.56	24.8	30.5	21	27.1	27.9	28	28.2	28.4	28.1	85.9	19.7	18.7	49	2.2	1.6	
24.	57.90	24.8	29.5	22.5	27	27.9	28	28.1	28.4	28.1	88.5	20.5	20.4	44	1.4	1.5	
25.	58.45	24.8	31	20	26.9	28.2	27.9	28.3	28.3	28.1	82.3	18.9	17.6	55.5	2.7	2.1	
26.	58.06	24.2	29.2	21.2	27.1	27.7	28	28.4	28.1	28.1	87.3	19.5	18.9	51.8	1.8	1.8	
27.	58.22	23.7	27.4	21.7	26.8	27.9	27.9	28.3	28	28	88.8	19.1	19.4	37.3	1.2	1.1	
28.	58.75	23.6	27.8	21.2	26.5	26.9	27.6	27.6	28.4	28	84.8	18.3	19.5	41.5	1.9	1.6	
29.	58.21	23.7	28.5	21.2	26.5	26.9	27.6	27.6	28.3	27.9	86.4	18.7	19.5	49	1.6	1.7	
30.	57.95	23.5	26.8	21.2	26.2	26.6	27.3	27.4	28.2	28	90.1	19.4	19.8	50.5	5	3	
31.	57.99	25.5	31.3	21.3	26.3	27.4	27.3	27.6	28.3	28.1	85.2	20.5	19.4	51.5	2.1	1.5	
Mean Total	757.79	24.9	30.3	21.4	26.9	27.8	27.9	28.1	28.4	28.1	84.3	19.6	19.3	50.7	2.3	1.9	
Departure from normal	-2.56	-0.3	+0.4	+0.2							+3	+0.4			70.4	58.4	

Day.	Wind.				Clouds.		Sun-shine.	Rain, 24 hrs. beginning 6 a. m.		Miscellaneous.		
	Prevailing direction.	Total movement.	Maximum hourly velocity.	Direction at the time of the maximum velocity.	Amount (mean).	Form and direction.		On the tower.	In the park.			
						Upper.					Lower.	
1.	NNE, NNW	306	20.5	NNE	3.5	Ci.	Cu.	E	8 15		☉ p.	
2.	NNW	333	19	WNW	8.2	Ci.-S.	Cu. ENE, NE		1 05		☉ a.	
3.	SW, W	118	11	WSW	8.8	Ci.-Cu. SSW	N.-cf. SW		0 55		☉ a.	
4.	W quad.	137.5	15	NW	6.8	A.-Cu. NNE	Cu. E		7 15	6.9	7.4	☉ p
5.	Variable	92.5	10	SW	5.8	A.-Cu.	Cu. ENE		4 45			☉ a.
6.	N quad.	90	13.5	NE	4.6		Cu. NE		5 20			☉ a.
7.	NE	202	23	NNE	3.8	Ci.	Cu. ENE		7 30			☉ a.
8.	Variable	98	11.5	WNW	8.6	A.-Cu. NE	Cu.-N. ENE		2 45	10.9	10.9	d° ☉ a. ● p.
9.	NE quad.	129	14	W	3.8	Ci.	Cu. E		7 15			☉ a.
10.	NE quad.	135	17.5	N	6.4	Ci.	Cu. E		5 40	6.7	6.9	☉ ☉ a. p.
11.	NE quad.	109	11	WNW	6.5	A.-Cu. E	Cu. ENE		4 50	6.9	6.1	☉ p.
12.	NNE, NE	129	16.5	NNE	4.2	Ci.	Cu. E		6 05			☉ a.
13.	NE	147	13	ENE	5.4	Ci.	Cu. E		6 05			☉ a.
14.	NE	141.5	13.5	NNW	6.3	Ci.	Cu. E		6 40		.2	☉ a.
15.	N quad.	150.5	19	N	7.1	Ci., Ci.-S.	Cu. ENE		4 25	4.8	4.7	d° ☉ p.
16.	E quad.	131	12.5	E	7.8	Ci.-S. W	Cu. ESE		4 45	2.3	2.3	☉ a. p.
17.	NW	96.5	12	NW	8.7	A.-Cu. NE	N.-cf. EbyN		2 45	.5	.5	☉ ☉ a. p. ☉ p.
18.	E	121	19	E	5.8	Ci. ESE	Cu. E		5 10			☉ p.
19.	Variable	116.5	17	SE	7.2	Ci. ENE, E	Cu. E		5 45			☉ p.
20.	NE	146.5	12	SW	3.8	Ci.	Cu. E		8 35			☉ p.
21.	NE quad.	157.5	15	W	3.8	Ci.	Cu. E		7 50	.5	.5	☉ a.
22.	N quad.	130	14	WNW	7.3	A.-Cu. SEbyE	Cu. E		5 20	.1	.1	p° a. ● ☉ p.
23.	E quad.	102	8	SE	5.5	A.-Cu. ENE, SE	Cu. E		3 45	3	3.3	☉ a.
24.	N	144	17	ESE	8.2	A.-Cu. ENE	Cu. E		3 20			☉ a. ☉ a. p.
25.	NE	124	13	WSW	5	Ci.	Cu. E		8 05		.1	☉ p.
26.	NNE, ENE	187	23.5	NE	8.3	A.-Cu. E	s.-cu., n.-cf. ENE		2 35	16.2	16.6	☉ p.
27.	NNE, NE	168	19	NNE	8.8	A.-Cu. ENE	N.-cf. E		0 55	6.6	6.1	☉ p.
28.	NNE, NE	127	15	NE	9.9	A.-Cu.	S.-Cu. E		0 10			☉ p.
29.	N quad.	103	9	W	9.2	A.-Cu. S, SE	Cu. E		0 40	10.6	10.7	☉ a.
30.	NNW	210	15	NNW	9.9	Ci.-S.	s.-cu., cu.-n. SSE		0 00			☉ a.
31.	NNE	114	9	W, ESE	6.3	Ci.-S.	Cu. E		6 20			☉ d° a. ☉ p.
Mean Total		145	14.8		6.6				4 40			
Departure from normal		4,496							144 50	76	76.4	
		-212.5			+0.4				-11 41	+13.6		

\* All the mean values given in this table are deduced from hourly observations.

<sup>b</sup> These values are taken from instruments mounted in the Observatory Park, 1.5 meters above ground.



METEOROLOGICAL DATA FOR MIRADOR OBSERVATORY, BAGUIO.\*

[φ = 16° 25' N; λ = 120° 36' E; barometer above sea, 1,512.5 meters; gravity correction not applied, -1.65 mm.]

Day.	Pressure <sup>b</sup> (mean)	Air temperature at Mirador (on the top of the mountain).				Air temperature in the valley (near the city hall).				Relative humidity (mean).	Vapor pressure (mean).	Radiation.		Evaporation.		
		Mean.	Maximum.	Hour.	Minimum.	Hour.	Maximum.	Hour.	Minimum.			Hour.	Minimum on grass.	Maximum in sun. Black bulb in vacuo. <sup>c</sup>	Free exposure (total)	Shelter (total)
	mm.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	Per ct.	mm.	°C.	°C.	mm.	mm.	
1	635.01	14.8	20.5	0.40p.	10.7	4.30a.	21.7	1.15p.	8.5	6.20a.	73	9.2	7.8	51.4	3.8	3
2	35.03	16.6	23.5	11.00a.	12.2	0.05a.	24.3	0.35p.	11.5	3.35a.	76.8	10.8	9	54.1	4.3	2.4
3	35.75	17.2	20.3	9.20a.	15.6	2.35a.	23.6	10.10a.	15	0.15a.	84.7	12.4	9.9	49.5	3.6	2.3
4	36.37	18	23.8	11.10a.	15.8	12m. n.	25.6	11.45a.	16	12m. n.	84.5	12.9	15	59.3	4	2.4
5	35.68	18.2	23.9	11.25a.	15	2.00a.	25	10.40a.	13.7	3.30a.	80.8	12.4	12.4	55.1	4.1	3.3
6	35.51	18.4	24.4	10.40a.	15	2.20a.	25.8	11.50a.	13.7	5.55a.	75.5	11.7	10.8	52.9	3.8	2.4
7	35.66	18	23.3	10.20a.	14.7	5.35a.	25	11.35a.	12.7	5.40a.	80.7	12.3	10.2	52.3	1.7	1.4
8	35.60	18.3	24.4	11.40a.	15.7	1.00a.	24.5	11.25a.	13.6	1.25a.	83.7	13.1	13.1	58.1	1.9	1.4
9	35.68	18	24	1.25p.	15.6	5.00a.	25	0.40p.	14.9	6.40a.	81	12.4	14.1	55.2	2.2	2.3
10	36.17	17.7	23.7	10.30a.	14.3	5.05a.	24.5	11.15a.	13.7	6.35a.	85.7	12.9	13.5	55.9	2.2	1.4
11	35.98	18.2	23.7	10.25a.	15.2	5.10a.	24	10.10a.	13.6	5.10a.	84.2	13	12.1	58.6	1.5	1.4
12	35.90	18.5	24.5	1.50p.	15.2	2.30a.	24.4	2.00p.	13.2	5.10a.	75.5	11.8	12.4	54	5.7	3.2
13	36.26	17.6	23.8	10.25a.	13.6	3.05a.	25.3	11.50a.	12.7	6.20a.	77.7	11.6	11.7	56.6	3.5	2
14	36.09	18	23.3	Noon	14.7	3.00a.	24.5	0.40p.	12.2	5.25a.	72.8	11	11.8	53.8	5.8	3.2
15	35.56	17.9	24.3	0.05p.	14.6	4.00a.	25.3	1.40p.	13.5	6.20a.	80.5	12.3	12.5	53.5	4	2.4
16	35	18	22.6	1.05p.	14.8	4.00a.	24.3	0.40p.	14.5	3.50a.	76	11.6	14	49.3	4.8	2.6
17	35.18	18.4	24.6	0.20p.	15.5	5.20a.	24.6	0.30p.	14.3	5.35a.	81.8	12.8	13.3	53.6	7.2	3.9
18	35.06	18.7	23.2	0.25p.	15.6	5.10a.	24.5	0.40p.	14.6	6.00a.	73.2	11.6	14.2	55.3	4	1.5
19	35.30	18.6	24.3	10.30a.	16	2.10a.	25.5	11.40a.	15.1	6.10a.	82.3	13	14.5	53.3	2	1.5
20	35.63	18.8	25	11.00a.	15.4	11.00p.	25.5	11.30a.	14.6	6.10a.	87	13.8	14.4	54.7	2.3	1.4
21	36.06	18.1	23	11.00a.	15	3.15a.	23.5	11.55a.	14.1	5.10a.	84.7	13	13.1	53.4	1.9	1.1
22	35.67	17.1	22.6	0.10p.	14.9	5.00a.	23	Noon	14.2	5.20a.	88.3	12.7	14.8	52	1.7	1.3
23	35.46	17.3	23.1	9.55a.	14.4	4.50a.	23.6	1.20p.	13.8	4.50a.	89.7	13.2	12.4	62.2	1.8	1.3
24	35.57	16.8	21.3	0.20p.	14.8	12m. n.	23.7	1.25p.	13.7	4.40a.	89	12.8	13.9	49.8	1.8	1.2
25	36.36	17.4	22	1.25p.	14.3	2.00a.	23.4	Noon	13.4	6.00a.	83.3	12.2	13	52.3	2.3	1.5
26	35.78	16.6	22.8	9.55a.	13.9	5.15a.	23.4	10.40a.	13.4	7.00a.	86.7	12.2	14	55.9	5.3	2.4
27	35.55	17	23.8	2.25p.	14.2	9.50p.	24	0.20p.	13.4	5.20a.	74.5	10.7	12.7	55.2	5.2	3.2
28	35.90	16	22.4	0.40p.	13.4	12m. n.	23.1	0.20p.	13	5.50a.	77.7	10.4	13.8	52.7	6.3	3.6
29	35.39	15.8	21.4	0.15p.	13.4	4.45a.	22.2	11.45a.	13.1	2.40a.	76.3	10.1	12.6	52.5	5.4	2.8
30	35.42	15.8	17.4	Noon	14	3.00a.	18.2	11.20a.	14.4	4.55a.	90.8	12.1	13.7	52.7	0	.5
31	35.81	17.6	22.2	10.50a.	15	4.45a.	23.3	0.45p.	14.9	6.20a.	89	13.4	14.1	58.9	2	1.4
Mean	635.66	17.5	23		14.6		24		13.6		81.5	12.1	12.7	54.3	3.5	2.2
Total															108.9	66.9

Day.	Wind.				Amount (mean). 0-10.	Clouds.			Sunshine. h. m.	Rain, 24 hours beginning 6 a. m. mm.	Miscellaneous.	
	Prevailing direction. <sup>d</sup>	Total movement. Km.	Maximum hourly velocity. Km.	Direction at the time of the maximum velocity.		Form and direction.		Upper.				Lower.
1	E	332.8	22.8	E	3	Ci.	NE	Cu.	ENE	4 30		≡° p.
2	E quad.	246.8	18.5	SE	5.7	Ci.	S	Cu.	ENE	3 20		
3	E	420.6	41.2	E	9.6	Ci.-S.		Cu.-N.	E	0 05	1.4	d a. d° p.
4	E	516.2	43.5	E	6.7	A.-Cu.	ESE	Cu.	E	2 55		∩° a. d° ≡° p.
5	E quad.	284.4	18.5	SE	1.7	Ci.		Cu.	ESE, E	4 00		∩° a. ≡° p.
6	Variable	231.7	16.3	SW	2.6	Ci.		Cu.		6 25		∩° a. ≡° p.
7	SW quad.	186.3	19.8	E	3.4	Ci.		Cu.		3 40		∩° a. ≡° p.
8	Variable	155.7	12.6	SW	E			Cu.-N. E quad.		1 35	.5	∩° a. ≡° ≡° p.
9	E	315.4	24.9	E	5.9	Ci., A.-Cu.		Cu.-N. E, Ebys		2 00		∩° a. d° ≡° ≡° p.
10	E	306.6	20.7	SW	5.1	Ci.		Cu.-N.		2 50		d ≡° p.
11	E quad.	197.3	19.6	E	6.3	A.-Cu.	NW	Cu.-N.	ENE	4 45	11.7	≡° ≡° ≡° p.
12	E	287.2	22	E	1.4	A.-Cu.		Cu.	E	6 15		
13	E	306.1	19.3	E	5.7	Ci.		Cu.	ENE, ESE	3 15		∩° a. ≡° p.
14	E	328.4	22.3	E	1.3	Ci.		Cu.	SE, E	3 30		
15	E quad.	278.1	21.5	E	3.3	Ci.		Cu.-N.	NE	5 05		∩° a. ≡° p.
16	E	477.3	34.6	E	5.7	A.-Cu.	SE	Cu.-N.	SE	1 00		∩° a. ≡° p.
17	E	343	22.7	E	5.1	A.-Cu.	SSE	Cu.-N.	SE	3 10		∩° a. d° p.
18	E	430.4	27.2	SE	4.4	A.-Cu.	N	Cu.	ENE	4 35		
19	E	339.8	23.9	E	6.7	Ci.-S.		Cu., S.		1 15	1.5	∩° ≡° a. ≡° ≡° ≡° p.
20	E	242	18.7	E	3.7	Ci.		Cu.	ENE	2 45		∩° p.
21	E quad.	218.4	14.8	E	7	Ci.-S.		Cu.	ENE	2 30		∩° a. ≡° a. p.
22	E quad.	245	15.3	E	7.7	A.-Cu.	SE	Cu.-N.		0 25	.5	∩° a. d ≡° ≡° p.
23	E, SW	252.2	17.7	W	5.1	Ci.		Cu., Cu.-N.		3 10	1.3	∩° a. p. ●° p.
24	E	306.3	32.5	E	7.9	A.-Cu.	EbyN	Cu.	NE	0 25	1.8	∩° ≡° ≡° p.
25	E quad.	292.8	30.8	SE	3.7	Ci.-S.		Cu.-N.	ENE	3 30		∩° p.
26	E quad.	332.5	27.6	E	3.3	Ci.		Cu.		3 05		∩° a.
27	E	425.9	27.7	E	4.4	A.-Cu.	ENE	Cu.	E	3 05		
28	E	595.7	33.6	SE	4.6	Ci.-S.		Cu.		2 20		∩° a.
29	E	580.9	31.9	E	8.1	Ci.-S.		Cu.-N.		0 45		d p.
30	E	337.3	36	E	10			N.		0 00	5.9	d a. ●° ≡° p.
31	E	272.6	24.4	E	8.7	A.-Cu.		Cu.-N.	SE	0 50		≡° d° ≡° p.
Mean		325.3	24.6		5.3					2 48		
Total		10,085.7								87 00	24.6	

\* All the mean values given in this table are deduced from six daily observations taken at 2, 6, 10 a. m. and 2, 6, 10 p. m.  
 b The barometric readings of this station are not reduced to sea level.  
 c Maximum of hourly observations taken from 6 a. m. to 6 p. m.  
 d This element is based on hourly observations, taken from a quadruple register, which gives only eight possible directions of the wind.

DAILY RAINFALL AT THE STATIONS OF THE WEATHER BUREAU, DECEMBER, 1916.

Station.	Day of month.																
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	
Jolo	mm.	mm.	0.5	4.8	0.5	0.5	mm.	mm.	7.9	0.3	5.1	1	mm.	16.8	0.8	8.4	
Isabela, Basilan			1.3									1		21.3	33.5	.5	
Zamboanga			2.3					3				5.3	4.5	21.3	8.2	.5	
Davao	20.3		19.3	12.7				44.2				8.9	6.4	13.2			
Cagayan, Misamis													2.8		4.8		
Butuan	13.5		27.2	2.5	5.6			8.1	37.3	2.5		10.4	38.6	.8	2	3.6	
Dumaguete		8.9	19.6					.5			1	14.9	35.3	3.6	83.3	*	
Tagbilaran					2.6	25.1		.8	9.2	*						*	
Iwahig	.5		9.3	47.7					52.6	4.1		7.1		7.4	41.9	36.6	
Surigao	1.1	.5	3	3.1	8.8	4	9.9	4.5	69.5	9.4	61.9	41.9	91.8	28	8.9	11.1	
Maasin	52.3				13.5	4.6			21.6	10.2	13.2	29.2	42.4	31.5	24.9		
Cebu	.8			.6				.3		5.3	.8		15.7	4.7	8.9	2.8	
Hoilo		4.4				8		1.3				3.6	4.6	3.1	5.6		
San Jose Buenavista	2	2	2.3	.5				3.3			.8	2.8	.5	.3	5.6		
Cuyo		3.5															
Ormoc	252.2	.5		2.1	1.3	2.1	.8	7.9	.5		8.7	6.6	26.6	10.5	12.8	.5	
Guiuan	20.6		2	52.8	2.8	.5	5.9	.6	6.9	3	21.8	28.7	55.9	20.8	38.3	2.8	
Tacloban	86.2	1.3	.7	7.4	4.6	27.1	16.1	4.7	.6	.3	9.1	36.6	49.4	49.3	15.7	1.8	
Capiz	3.4	1.1		3	11.8		1.3	.8	8.4	11.5	14.2	15.7	.6	2.6	6.5	.5	
Borongan	34.6	7.4	14.5	11.4	4.1	16.8	1.8	12.2	6.9	7.4	20.9	50	26.4	11.5	20.9	2.1	
Catbalogan	142.2		2.5	37.8	3.6	5.1	7.4	.3			6.9	3.6	32.3	24.4	12	4.6	
Calbayog	54.9	2	11.4	2.3	7.1	3.3	2.5	6.4	1.3	5.1	7.9	14.2	6.1	25.2	25.9	3	
Masbate	17	1.3		64.5	2.6	2.3	4.1				8.4	2.8	4.3	9.4	37.6	.3	
Romblon	1.7	3.3	28.5	6.5	1.3	12.7	5.8	15.7	8.7	.1	.3	24.4	6.7	5.6	24.9	.3	
Batag	41.7			37.1	6.4	7.7	3	4.1	6.4	6.4	7.6	23.8	13.2	6.6	19.8	8.1	
Sorsogon	52.6	57.9	28	38.6	4.7	31.8	30.5	37.2	34.8	72.1	79.7	109.2	92.7	63.4	87	32.5	
Legaspi	25.2	16.5	11.9	5.6	6.1	11.2	4.6	7.4		11.2	17.2	52.4	11	2.8	33.3	11.9	
Sumay, Guam		1.3		12.7	12.7		7.6	1.3	1.3		3.8		10.2		3.8		
Calapan	.5	.8	11.9	4.1	18.6	.6	1.8	.3	26.2	5.8	1	38.6		.5	5.6	36.8	
Virac	60.2	3.8		26.7	1.8	.5	2	1.5	4.8	6.9	5.3	35.5	6.9	.5	22.9	11.7	
Naga	14.3	75.6	12.5	2.3	.5	6.4	2	6.1		20.8		3.8	.5		13.7	.5	
Batangas			4.3				6.8	2.8				4.8		1.5	9.2	1.5	
Lucena		3.8			.5	.5	7.9	6.6	3.6	.3	.5	30.7	24.1	.5	36.3		
Atimonan	14.2	17	6.1	6.4		12.7	19			19.4		36.8	13		52.7	2	
Ambulong, Tanauan						1.3		6.9					.8		6.2		
Canlubang, Calamba					1		2.3	11.1				1.8	2	3.3	25.7	4.8	
Paracale	18.5	77.4	34.8	31.3	8.6	16.3	4.9	3.8	11.2	27	.5	23.1	18.8	16	60.9	58.5	
Santa Cruz, Laguna		1.5	4.1		.8	.8	.5	10.4			6.4			.8	44.7	6.4	
Manila				6.9				10.9			6.7	6.9			4.8	2.3	
Antipolo			.8		.8			12.7			6.4				12.7	6.4	
Iba			2.1					.8	1.5		8.4	.3			.8	.8	
San Isidro		2	1.3						2	2.3							
Tarlac								.8	.3								
Baler		42.4	21.1	1		8		2	27.9			9.7	1.5	.5	1	.8	
Dagupan			.5													10.5	
Bolinao			.3					2.5				.3					
Baguio			1.4					.5			11.7						
San Fernando, Union																	
Echague		21.9	2.6	1.8	1.8	3.3	3.8	7.4	24.9	.3	32	17.2	.3	1.3	.5	12.7	
Candon									4.1								
Vigan			.1														
Tuguegarao		24.6	1.5				7.6	16.7	10.4		58	42.1	5.3	5.3	23.7	19.3	
Laoag			4.1					13.8	3.8		5.4	11.7					
Aparri	7.3	23.9	19.7	25.9		1.6	23.6	53	18.3	30	63.3	34.8	.3	2	17.3	48.2	
Cape Bojeador	5.8	10.6	6.9	14				14	14.7		2.8	3.3		4.3	5.1	2.8	
Santo Domingo, Batanes	13.6	26.7	47.5	30.6	2.6	2.8	1.7	7.6	37	44.9	3.2	2.6	39.6	14.2	21.2	64.8	

\* No observation.

Daily rainfall at the stations of the Weather Bureau, December, 1916—Continued.

Station.	Day of month.														Total.			
	17.	18.	19.	20.	21.	22.	23.	24.	25.	26.	27.	28.	29.	30.		31.		
Jolo	mm. 44.7	mm. 5.1	mm. 1.1	mm. 9.4	mm. 37.1	mm. 34.8	mm. 0.3	mm. 6.4	mm. 0.5	mm. 51.6	mm. 8.9	mm. 65.3	mm. 72.1	mm. 8.9	mm. 5	mm. 3	mm. 311.2	
Isabela, Basilan	5.6	4.3	8.6	14.8	2.3					18.6	10.9	50.1	53.7	8.2	4.6	2.5	279.6	
Zamboanga	19.9	20.3	1			44.7				13.7	10.2	7.6	12.2				183.2	
Davao				9.9	4.6					18	1.3	12.5		1.5			71.7	
Cagayan, Misamis	5.9	7.1		3.6	14.7					11.7	11.7	65.8	5.1	4.9	10.2	.8	295.8	
Butuan	9.7	3.3	.8	15.8	6	5				10.2	3	20.8		1	35.1	2.8	337.5	
Dumaguete	32.5		2.5	20.8	35.6	3.8											44.6*	
Tagbilaran	*	*	*	*	5	2.5				9.4	3.4			279.4	146	33.4	11	809.1
Iwahig	30	34.8	5.6	34.3	2.5	12.1				46.7	44.4	51.5	19.3	1.3	3.6	18	617.2	
Surigao	17.7		1.5	33.5	22.9	1.8	.3	46.7	33	63.2	33	15.2	7.1				395.6	
Maasin	19				14.7					1.4	4.8	1.1		1		.5	136.5	
Cebu	60.3			1.3	20.5	1.3				11.6	13.2	11.9					86.8	
Iloilo	.8		15.2		10.2					9.9	4.6	3		.5			54.1	
San Jose Buenavista		9.1	7.1		1					17		8.4			3		61.4	
Cuyo	1	18.5								11.9	11.4	12.3	1.6		3	1.3	391.6	
Ormoc	15.5	6		2.1		5				21.1	75.7	19.1	10.9	3	31	26.2	516.5	
Guiuan	37.5	14.7		4.1	2.5	3	8.4			25	56.8	12.5	18.7	19.5	16.3	5.3	519.1	
Tacloban	27.6	12.1	.6	9.8	2.5	1.5				5.6	21.8	5.3	1.1	2.4			165.8	
Capiz	36	3.8	.3		.8	2.8				7.9	5.1	40.9	5.9	17.8	21.1	2	552.7	
Borongan	63.3	6.6	8.2	13	2.1		1.3	31.7	17.3	42.7	7.9	26.4	75.7	5.1	2.5		418.3	
Catbalogan	6.1	2.8			1	5.3		7.9	5.1	40.9	5.9	17.8	21.1	2	13.2	1	227.9	
Calbayog	2.3					3.3		2.5	2.8	17.8		4.8	13.5	.8	1.5		213.2	
Masbate	6.4	3.6		3.6				.5	3.1	15.2	5.1	16	4.1	1			289.7	
Romblon	7.7	28.7	.4		6.7		3.6	1.3	22.9	4.4	13.2	15	36.7	1	.8		329.3	
Batag	9.2	6.6		3.8			6.6	2.3	5.1	3.3		77.2	22	1.3	1		1,539	
Sorsogon	51.4	76.7		50.8	58.4			29.2		100.2	53.1	104	101.5	59.7	1.3	1	474.9	
Legaspi	16.5	11.5		18.6			1	13.4	1.8	9.2	7.4	61	49.8	53.4	3		56	
Sumay, Guam			1.3					1.8	2		5	19.6	1.5	9.9	2	9.9	304.1	
Calapan	11.4	79.5	8.6	.8	4			2.6	1	2	13.5	7.4	21.1	68.6	80.8	8.1	481.7	
Virac	16.5	62.5	5.3	2.8				3.8			1.3	7.4	2.9	25.1	8.1	1.5	209.6	
Naga		.5						2.3			8.2	16.5		2.5	1.8		65.2	
Batangas	3							2.3			8.2	16.5		2.5	1.8		297.9	
Lucena	24.6		9.7	.5	6.4		12.7		3	30	79.7	11.7	1.8	2.5		4.8	422.6	
Atimonan	8.9		2.5		3.6	7.9	39.9	2	8.4	22.7	110.5	7.5	4.6			4.8	67.5	
Ambulong, Tanauan	1						1.8		.8	8.3	29.9	3.1	7.4				126	
Canlubang, Calamba	2.5	5					2.5	1.5	19	35.8	5	11.7					795.7	
Paracale	2.5	8.6				1.3	8.9	4.8	4.3	20.5	157.5	10.6	103.9	4.8	56.4		170.3	
Santa Cruz, Laguna	12.2	1.5		1.3			3.6	2.3	.5	21.3	32.3	.6		9.9			76	
Manila	.5				.5	1	3			16.2	6.6			10.6	6.6		87.6	
Antipolo		1			.5		7.9		.8	8.4	6.6			15.7	6.9		28	
Iba								11.7						2.6	.6	1.3	36.6	
San Isidro	5.3				12.4	1		.5						8.4			10.3	
Tarlac														5.6	1.3		30.5	
Baler	22.4	10.4	5.1	.5	64.8	18.6	4.3	26.6	8.1	3.8				10.9	134.1	1.3	430.1	
Dagupan						6.1		23.4							5		8.1	
Bolinao	.3		1.3					.3							3.1		24.6	
Baguio			1.5				5	1.8							5.9		11.4	
San Fernando, Union							1.3	8.9							2.5		227.8	
Echague	12.7			11.4	9.7	.8	3.8	10.5	.5	5.4	.5	.3	3.8	32.8	3.8		9.9	
Candon				1.5		1.5		1.8						1			7.3	
Vigan								6.7							1.5		335.9	
Tuguegarao		3.3		19.5	50.6	6.6	.8	1.8	11.7					2.5	24.6		49.9	
Laosg														.3	10.8		479.9	
Aparrí	1.3	.5	28.7	13	22.6			.5	24.9	5.9	.3	6.3	.5	3.8	2.4		89.1	
Cape Bojeador														4.8			479.9	
Santo Domingo, Batanes	92.2	72.2	23.9	6.4	.1	.4		.3	4.1	.6	3.2	.5	11.2	127.9	35.5		739.1	

\* No observation.

\* 20 days of observation.

MAXIMUM AND MINIMUM TEMPERATURES AT THE STATIONS OF THE WEATHER BUREAU, DECEMBER, 1916.

Day.	Jolo.		Isabela, Basilan.		Zamboanga.		Davao.		Cagayan, Misamis.		Butuan.		Dumaguete.		Tagbilaran.	
	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.
	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.
1	29.5	23.5	32.4	22.1	30.8	22.4	31.7	21.3	28.9	21.5	28.4	21.4	30.1	23.9	31.1	20.5
2	29.9	24.4	32.6	21.6	29.8	21.9	31.7	20.6	31.2	22	32.4	22.8	30.4	24	29.8	23.7
3	30.2	21.2	32.6	22.1	30.2	22.8	32.7	21	30.9	21.6	31.5	23.5	29.6	23.4	31.5	23.1
4	29.3	21.9	32.1	22.6	31.1	23	33.7	21.1	30.6	21.9	32.2	22.4	29.4	23.5	32.3	22.4
5	30.3	21	33.4	23.1	30.2	23	33.2	22.3	30.7	22.1	31.2	22.9	30.6	24.6	32.4	22.5
6	30.1	22.4	33.1	22.9	30.2	22.5	32.7	22	30.6	23.1	31.9	22.9	30.6	24.2	31.4	22.8
7	30.2	23.7	33.8	22.5	32.9	22.7	32.7	22.5	30.9	22.3	32.6	22.5	29.9	24	31.3	22.2
8	30.5	21.7	31.6	23.1	33	23.5	31.7	21.8	30.5	21.8	33.4	22.3	29.9	23.8	30.7	22.2
9	30	21.7	32.2	22.1	33	22.8	31.7	21.3	30.9	21.8	31.7	22.6	29.5	25.5	31	21.9
10	30.2	21.3	32.6	22.6	30.4	23.1	32.2	21.9	30.5	21.2	31.3	22.1	30.1	24.5		
11	29.8	21.3	32.8	22.7	30.2	23	32.2	20.9	30.4	21.8	30.9	22	30.6	23.8		
12	30.7	20.9	33.1	23.1	31.3	22.3	31.7	21.9	31.5	22.9	28.9	23	29.4	23.5		
13	29.1	22.3	33.6	23	32.9	23.2	32.2	21.9	30.6	22.5	29.5	22.4	30.2	23.6		
14	30.2	22.6	30.6	23.6	31.7	22.7	30.2	22.9	30.5	23.2	27.4	22.8	28.1	22.8		
15	29.2	21.8	30.6	22.6	28.5	23.2	30.7	22.4	30.8	22	27	22.4	30.1	23.8		
16	29	21.6	32.1	23.1	33	22.7	31.2	22.9	31.2	22.8	31.3	22.5	29.4	22.8		
17	27.1	22.1	31.6	23.3	29	23.1	29.7	22.5	29.4	23.2	27.6	23.4	29.8	25.7		
18	30.4	20.9	32.5	23.1	31	22.7	31.7	22.5	29.9	23.6	32.2	23.4	29.7	23.6		
19	29.5	21.4	31.6	22.3	30.8	22.7	31.2	22	30.5	21.6	31.7	22.7	29.1	24		
20	28.5	19.9	29.2	21.6	30.2	22.2	31.7	22	30.9	21.9	31.2	22.1	29.4	24.2	29.9	22.6
21	30.2	20.9	27.1	22.6	30.2	23.5	31.2	22.1	30.4	22.5	29.7	22.5	29.6	23.7	28.4	21.4
22	28.4	21.4	31.6	23.1	31	23.1	28.7	22	29.1	22.2	30.1	22.1	29.6	22	28.4	21.1
23	28.6	21.1	29.8	22	29.3	21.9	30.7	21.5	30.5	21.6	30.9	21.9	29.8	22.3	30.6	21.1
24	29	21.2	31.8	21.9	30.2	22.1	30.7	20.5	29	21	28.6	20.8	29.7	21	30.5	18.8
25	27.8	23.9	29.6	22.6	30.2	22.6	30.7	22	29.5	22.1	24.9	22.3	28.8	22.4	27.6	21.6
26	27.2	21.5	29.9	22.1	29.1	22	24.2	21.9	25.3	22.8	23.6	22.2	28.4	23.2	27.6	22.2
27	26.6	21.1	29.6	22.3	26	22.5	27.2	21.8	29.3	21.9	24.1	21.4	28.4	22.2	30.6	20.9
28	28.2	21.3	28.2	22.6	26.6	23	29.7	21.9	30.9	22.5	29.7	22	28.6	24.3	31.4	23.2
29	30.2	21.9	31.6	22.9	30.8	22.7	30.7	21.4	30.5	22.5	30.9	22.4	29.3	24.3	30.5	22.4
30	30.4	22.2	32.6	21.6	32.5	23	29.7	21.9	29.9	22	27.8	22.5	29.3	23.6	30.7	22.4
31	29.6	21	32.4	21.6	32	22.6	29.3	22	30.4	23.7	29.2	23	29.4	23.2	30.9	22.5
Mean	29.4	21.8	31.6	22.5	30.6	22.7	30.9	21.8	30.2	22.2	29.8	22.4	29.6	23.6	30.5	22

Day.	Iwahig.		Surigao.		Maasin.		Cebu.		Iloilo.		San Jose Buenavista.		Cuyo.		Ormoc.	
	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.
	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.
1	30	21.5	28.5	24.4	27	20.8	29.2	23.5	29.5	22	30.2	20	27.9	24.8	27.4	20.8
2	31.3	20.2	28.5	24.4	33	23.6	28.5	24	28.8	23.6	29	23.5	30	24.9	28.3	22.2
3	29.1	21.5	32.7	23.3	32.8	23.4	30.6	24.7	30.7	23.6	31.8	23	29.1	24.6	32.4	21.7
4	30.4	23.5	32.5	23.9	33.5	23.4	30.6	25.1	31	24.4	31.5	23	29.6	26.1	32.7	22.8
5	30.9	22.5	30.3	24	30	23.2	31.6	24.8	30.4	24	32.2	21.6	29	26.4	31.3	23.4
6	31.4	22	31.3	23	32.6	20.9	31	24.7	30.7	23.8	31.7	22.1	29.2	26.2	31.1	21.5
7	31.7	22.1	30.4	23	32.8	22.5	31.3	23.8	30.5	23.5	32.6	22.4	29.3	25.6	31.8	21.4
8	31.4	21.8	31.7	22.9	34.4	22	30.5	24.6	30	23.6	32.3	22.2	29.5	26	31.1	21.4
9	31.8	21.6	29.1	23.4	34.1	23	29.7	24.5	30.5	23.5	31.8	21.6	30	25.8	31.2	21.8
10	30.6	22.5	32.6	23.7	33.6	22.4	30.2	24.6	31.1	24	32.2	22.1	29.9	26	31.9	22.2
11	31.6	21.8	30.5	23.8	32	22.8	31	24	31.2	24	33.2	22	29.6	26.3	31.6	21.5
12	32	21.4	26.7	22.7	33	23	30.1	24.2	30.2	23.8	32.8	21.5	29.6	25.3	29.3	23
13	31.4	22.2	29.6	22.8	31	22.5	30	24.2	30.1	23.5	32.2	23.2	29.8	24.8	31.4	22.8
14	32.5	22.1	26	23.2	28	23	27.9	23.9	26.6	23.7	29.1	22.8	28.7	26.4	28.1	23.7
15	28	22.9	27.8	23.2	30.1	22.8	27.9	23.9	27.6	24.4	31	22.9	28.6	26.5	27.3	23.4
16	30.2	23.3	29.9	23.4	30	22.5	29.6	24.6	29.6	24.2	32.6	23.5	30.1	25.7	30.7	22.5
17	27.2	23.4	27.5	24.2	30.8	22.4	28.7	23.6	29.1	24.8	32.9	22.7	29.6	25.5	27.7	23.4
18	29.9	22.7	31	23.7	31	23.6	29.4	24.5	30.5	24.4	32.3	24.8	31.5	24.3	31.1	23.6
19	28	23.3	31.9	23.3	32	23.6	31	24.6	31.3	23.6	32.2	23	30.2	23.5	32.4	22.6
20	29.4	21.8	30.8	23.1	32.6	22.5	29.8	25	29.6	23.6	31.8	22.6	29.7	24.9	32	20.4
21	31.2	22.1	27.8	22.3	30.9	22.8	29.6	23.6	30.2	23.6	32.1	21.6	29.1	24.1	31.2	23.4
22	30.9	23.4	28.8	22.9	32.4	23	28	23.2	30	23.8	31.7	23.1	29.1	24	30.1	22.6
23	29.3	22.4	30.4	22.4	32	21	30	23.9	29.5	23.2	32.2	21.1	28.8	25.7	31.3	19.4
24	31.4	20.5	27.5	22.4	30.2	22	31	22.8	29.7	21.5	31.8	20.5	29.3	25.4	29.4	19.8
25	28.5	21.1	25.9	22.4	27	20.9	28.2	23.6	29.7	22	31.7	22.5	28.5	25.9	26.7	22.4
26	29.8	22.3	25.4	22	27.6	21	27.6	23.6	28.5	21.5	30.4	22	27.5	22.4	27.7	22.4
27	30.3	22.2	27.9	22.2	29.4	20.6	28.9	23.7	27.6	21.4	29.2	22.8	27.8	24.6	29.8	22.8
28	27.2	22.3	30.1	24.4	31.4	23	29.4	23.9	28.7	24	32.2	22.2	27.5	22	30.8	25
29	24.9	19.4	31.5	23.9	31.5	23.5	29.8	24.9	29.6	23.7	32.7	23.5	28.5	25.5	30.8	23.2
30	25.3	22.9	29	23.7	31.6	23.5	30	24.5	30.9	24	33.3	23.2	29.6	23.6	31.5	21.8
31	27.8	22.1	28.3	22.4	30.6	24	28.7	24.6	30.7	24.2	32.2	22.6	29.5	23.9	31.3	22.3
Mean	29.9	22.1	29.4	23.2	31.3	22.6	29.7	24.2	29.8	23.5	31.7	22.4	29.2	25.1	30.4	22.3

Maximum and minimum temperatures at the stations of the Weather Bureau, December, 1916—Continued.

Day.	Guiuan.		Tacloban.		Capiz.		Borongan.		Catbalogan.		Calbayog.		Masbate.		Romblon.	
	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.
	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.
1	27.9	23.1	26.7	22.1	29.9	24.7	27.2	23.2	26.4	20.5	26.3	22	29	24.4	30.9	21.8
2	29.9	23	27.5	21.4	28.2	24.3	30.1	21.9	26.7	22	25.9	22.7	28.4	22.2	29.4	22.3
3	32	23.4	30.7	22	31.3	24	30.9	22.9	29.2	21.2	29.8	22.5	30	23	31.7	22
4	31.4	25.8	31	23	31.5	25.1	31	23.7	30	21.8	32.1	22.2	30.6	25.8	32.3	23.6
5	31.1	23.8	32.5	23.4	31.8	24.9	30.8	23.8	30.5	22.2	31.8	22.5	30	23	31.1	23.6
6	31.2	24.3	28.9	23.5	30.8	24.7	31.1	22.7	28.9	20.9	29.8	22.4	28.2	24.6	29.9	24.3
7	31.4	23.4	30.4	23.1	31.3	24.4	31.2	22.3	29.6	21	31.8	21.6	29.8	25.2	31.5	22.1
8	30.9	24.4	30.5	22.7	31.3	24.7	31.2	22.7	31	21.2	29.8	22.4	30.2	24.6	32	23.8
9	30.1	25.5	31.5	22.9	31.7	24.5	30.9	22.6	31.9	21.4	32.2	22.4	30	24.5	31.4	23.5
10	31.5	23.5	32	23.4	31.6	23.7	31	22.9	30.8	21.5	30.2	22.3	30	24.8	32.4	23.5
11	32	23.4	30.4	23.5	31.3	24.3	30.2	22.9	30.1	21.6	32.2	22.7	30.4	25	31.6	24.3
12	29.4	23.4	28	23	31.3	23.9	29	22	29	22.6	31.2	22.2	30.6	23.8	32.6	24.3
13	30	23.3	27.5	23.4	30.9	24.9	30	23.1	28.1	22.4	31.9	23	29.8	24.4	32.9	23.9
14	28.6	23.4	26.3	22.8	28.7	24.3	29.9	22.9	27	23.8	28.3	23.6	30	24.8	30.1	24.5
15	30.1	24.2	30	23.3	30.9	24.6	29.6	24.8	29.4	23.2	31	24	29.6	23	29.7	24.8
16	29.2	22.6	30	22.8	31.1	24.3	30.2	22	30.4	22	30.6	22.9	29.5	24.8	31.5	23.7
17	29.7	23.8	27	23.4	31.4	24.3	28.4	24.1	28	23	28.8	23.9	29	24	32.5	25.4
18	30.9	23.5	30.6	23.3	31.2	23.4	30.6	22.9	32	23.2	32.8	23.3	30	25	31.7	24.3
19	31.6	24.2	30.5	23.5	31.7	24.1	31.5	23.4	31.7	23.2	32.2	23.1	30.7	25	31	23.3
20	31.6	21.3	31.2	22.4	31.3	24.4	30.4	21.9	31.4	20.4	32.7	21.3	30.6	24.6	32.5	24.2
21	29.9	23.8	29.5	23.7	30.4	25.4	30.4	23.4	30	22.5	31.8	24	30	24.2	31.9	23.9
22	31.6	24.2	29.5	23.6	30.6	24.2	30.6	24.4	28.8	22.2	29.2	22.4	29.6	24.6	31.9	23
23	30.5	23.9	31.7	22.4	30.9	23.2	30.6	20.7	30	19	31.7	20.5	29.8	23.5	32	24.2
24	29.1	22.4	26.7	22.4	30.9	22.2	29.1	21.1	29.5	20.1	32.2	21.5	28.6	23.4	32	23.1
25	27.9	22.4	25.9	22.2	30.7	23.5	28.2	21.9	27.6	21.4	28.8	23.3	29.6	24	31.2	23.2
26	28.7	22.4	25.9	22.4	29.6	23.5	28.3	24.2	27.4	22.5	28.8	22.5	28.8	24.5	30.9	22.9
27	29.8	23.6	28	21.9	29.5	24.8	28.1	20.4	27.5	19.7	28.4	22.6	29	22.4	30.4	23.9
28	30.3	23.5	28	22.9	30.2	24.4	26.9	23	26.2	21.8	26.2	22.8	30.4	23.8	28.6	22.2
29	30.4	25.1	28.8	22.3	30.2	24.5	29	23.5	28.1	22.8	28.3	22.8	28.6	23.4	28.9	22.8
30	28.1	23.5	28.8	22.2	31.2	24.2	29	21.5	29	21.7	29.7	21.8	29.6	23.6	30.6	23.3
31	31.6	23.5	30	22.8	30.9	24	30.1	22.2	30.7	21.6	30.7	22.1	29.6	23.6	32.2	23
Mean	30.3	23.6	29.2	22.8	30.8	24.2	29.9	22.7	29.3	21.8	30.2	22.6	29.7	24.1	31.3	23.5

Day.	Batag.		Sorsogon.		Legaspi.		Sumay, Guam.		Calapan.		Virac.		Naga.		Batangas.	
	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.	Maxi- mum.	Mini- mum.
	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.
1	28.5	22	28.5	20.5	28.6	23.2	29.2	24	30	21	28	20.8	27.6	20	28.8	18.3
2	27.3	22.5	28.2	20	25.9	22.1	28.6	23.8	29.1	22	26.6	21.1	23.3	20	28.8	22
3	30.1	23.9	30	21	30	21.1	27.6	23.4	30.6	22.6	31	21	29.8	19	31.4	22.3
4	30.1	24.6	30.5	22.6	30.9	25.1	30.2	21.2	31.1	22.8	31.8	21.4	30	19.8	32.4	22.2
5	29.1	23.3	30	22	29.2	24.5	28.4	21	31.5	23.5	31.4	22.6	30	21.5	32.5	21.3
6	28.8	23.9	30	23	29.8	24.8	29.2	24	31.5	22.5	31.5	20	30	21.5	31.2	21.3
7	29.8	24.5	30.2	22.9	30.4	22.2	29.2	23.8	31.9	22.4	31.1	21	29.8	21.5	30.2	19.9
8	29	23.5	29.9	22	30.6	24.2	29.2	24.4	32.3	23.3	31.2	20.9	30.8	20.6	31.7	21.6
9	29	23.4	30.7	23	30.7	25	29	24.8	31	24	32.2	21	31.2	20.1	32	22.3
10	29.6	24	30.7	22	29	25	29.4	25.4	32.5	22	30.5	21.5	31	20	32.5	22.3
11	29.5	24.4	29.9	22.1	30.8	23.3	29.8	24.6	31.5	24	31.8	20.3	30.9	18.5	32.7	21.9
12	27.9	23.5	30	21	29.3	23.1	29.4	24.6	33	22.5	30	21.9	29.8	20.8	31.7	20.8
13	29.3	23.2	29.9	21	29.7	24.1	28.2	24.6	31	22.1	31.2	22	30.8	19.9	31.8	21.6
14	29.5	23.8	30	21.5	30.2	23.7	29.2	26	32	24.4	31.4	23.8	31.3	20.3	32	22.5
15	29.2	23	30	22	28.9	24.1	29.8	26	32.5	25.5	30.5	23.9	30	22.2	30.7	22.6
16	29	23.8	30.5	22.2	27.9	23.9	29.4	24.8	31.5	24.5	29.5	22.6	31.5	20.9	31.8	22.4
17	28.6	23.3	30	23	30.5	24.5	28.8	24.6	31.3	24.1	31	23.9	32.2	20.6	33.3	23
18	29.3	23.5	30.1	22	28.8	24.6	29.2	24.6	33.4	23.8	29	22	29.4	21.4	32.7	23
19	28.8	24	30.5	22.4	30.3	24.6	29.8	25	33.5	23.2	31	23.1	32	21.6	33.2	23.4
20	29.5	23.6	31	23.2	30.7	24.9	29.6	24.6	32.5	23.7	31.4	20.6	31.4	18	32.9	22
21	29.5	24	30	21.8	30.4	24	29.2	24.4	31.8	23.4	32.2	21	29.5	18.3	32.6	21.6
22	29.5	24	30.5	22.4	30.3	25.3	28.6	24.2	30.8	23	31.9	21.1	30.5	18.7	32.3	20.7
23	29.6	23	31.5	21.2	30.6	22.1	28.8	24.2	30.6	24	30.3	19.6	30.3	19	31.7	22
24	28.8	22.7	30.5	22	29.5	23.4	29	24	31.4	23	31.7	19.4	30.4	18.5	32.1	21.7
25	28.8	24.2	30.8	21.2	30	25.3	28.2	24.6	31.6	22.4	31.6	21.5	30	19.1?	32.3	20.8
26	27.9	23.8	30	20.5	28.4	23.8	29.8	24.8	33.5	22.6	29.7	22.3	30.2	20.9	31.5	21.4
27	28.3	23.5	29.9	21	29.4	24.4	29.6	21.4	33.5	22	30.3	22	29.6	21.6	25.6	22.4
28	27.3	23	29.2	22.6	26.3	23.3	29.8	21.4	33	22	27	22.5	25.2	21	27	21.6
29	27.4	22.7	29	21	25.9	23	29.2	23.6	33.5	22	27.5	22	26	21.1	29.7	22
30	28.3	22.6	28	22	28.7	22.8	27.4	24	32	21.5	27.3	21.6	29.5	20.4	29.8	22.5
31	29	23.7	30	22.1	29.5	23.6	28	23.4	31.1	22.4	29.2	22.4	30.2	19.5	31.4	22.9
Mean	28.9	23.5	30	21.8	29.4	23.8	29.1	24	31.8	23.1	30.3	21.6	29.8	20.2	31.4	21.8

Maximum and minimum temperatures at the stations of the Weather Bureau, December, 1916—Continued.

Day.	Lucena.		Atimonan.		Ambulong, Tanauan.		Canlubang, Calamba.		Paracale.		Santa Cruz, Laguna.		Manila.		Antipolo.	
	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.
	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.
1	27.4	21.3	26.2	23	29	18.7	28.2	16.8?	27	22.2	27.7	19	29.8	17.4	30.7	15.9
2	22.4	26.6	23.1	29.9	21	29.2	21	26	22.2	28.1	22.9	29.7	21	29.8	19.8	19.8
3	28.1	22.4	25.9	22.9	29	23	28.8	21.4	27.8	22.2	27.5	22.2	29.2	22.5	29.6	21.3
4	30	23.4	28.9	23.6	31.8	24	30.8	22.4	30	25.3	30.1	23.3	30.6	22.1	32.7	20.8
5	29	23.8	28.7	24.3	30.3	22.9	29.8?	22.6	29.8	24.2	29.3	22.6	30.8	21.3	30.6	20.5
6	29.5	23.9	27.2	24.2	30.1	23.6	30.2	22.5	29.4	24.5	28.5	23.3	31.1	21.3	31.5	20.2
7	30.2	22.6	27.5	24.2	29.5	22.8	28.9	21.8	29.8	24.9	27.7	22.1	31.3	20.7	30.7	19.7
8	30.9	23.5	29.4	24	30	23.6	29	21.6	29.6	24.8	28.8	23	29.3	21.6	30	20.6
9	33.2	21.3	30.8	24.7	31	23.9	30.1	21.4	29.2	23.8	29.6	21.9	31.3	21.6	31.9	20
10	30.4	23.2	28.5	24.2	31	24	30.2	20.1?	29.4	23.9	28.3	23.1	31	20.7	29.8	20.5
11	31.2	23.4	29.2	24.7	32	24	30.4	21.8	30.2	24	29.8	22.9	30.2	22.2	31	21
12	30.5	22.7	28.2	23.4	30.7	23.9	30.4	21.8	29	24.1	29.2	21.6	31.3	21	31.2	20
13	30.5	22.2	29.4	24.1	31.2	24	30	22.4	30.4	24.4	29.7	22.9	31.8	21.5	31.7	20.1
14	30.2	23	29.9	24.6	30.8	23.5	30.2	22.6	29.6	24.3	29.3	23.2	31.8	21.3	31.7	20.8
15	27.5	24.4	27	23.5	30.7	23.3	29.4	22.6	27.7	24.2	29.1	23.7	30.5	21.3	31.7	20.3
16	30.4	23	28.7	24	29.9	23	29.3	22.4	29.2	23.8	28.7	23.2	30.9	22	31.8	21.3
17	32.3	23.4	30.5	24	30.1	24.1	29.8	22.6	30	24.4	29.4	23.4	29.9	22.7	30.7	21.8
18	32.5	23.6	29.6	23.9	30.8	24.6	30.4	22.6	28.8	24.8	29.4	23.2	32.2	21.7	32.1	21.3
19	32.4	23.6	30.7	24.4	31.7	24	30.6	23	30.4	23.2	30.3	23.7	31.9	22.7	32.2	21.7
20	30.5	22.7	29.7	23.9	31.4	23.5	30.4	22.8	30.1	22.8	29.9	21.5	31.6	21.2	31.8	19.3
21	30.7	21.6	29.3	23.9	32	23.5	30.4	21.4	30.2	24.8	29.8	22.8	31.4	20.9	32.5	20.8
22	30.5	20.9	28.3	23.4	31.3	22	30.1	20.6	30	22.8	29.3	21.7	30.5	22.1	31.3	21.1
23	30.2	22.5	28.3	23.8	30	22.5	29.4	22.6	27.9	23.9	28.8	23	30.5	21	31.7	20
24	30.9	22.2	29	24.1	31.7	22.5	29.4	22.4	29.4	22.3	29	23	29.5	22.5	29.8	21.1
25	30.5	22.5	28.6	24.7	31.3	22.9	30.4	22.7	29.8	25.3	29.5	20.9	31	20	31.5	18.6
26	29.4	22.5	27.7	23.5	30	22.8	28	19.9?	29.9	25	28.2	22.2	29.2	21.2	29.2	20.2
27	27.5	21	27.6	23	25	21.9	25	19.8	26.2	23.1	25.5	22.8	27.4	21.7	25.7	20.4
28	27.8	21	25.2	22	25.7	22.3	25	21.2	25.2	23	24.7	21.8	27.8	21.2	28.6	20.3
29	28	21.6	25.6	22.4	26.2	22	26.8	21.2	26.3	22.8	26	22.1	28.5	21.2	27.7	21.5
30	30.2	22.3	27.9	23.5	27.5	22	26.8	20.6	26	22.8	27.3	22.1	26.8	21.2	25.9	20.2
31	31	22.6	28	22.9	31.9	22.5	29.9	22.3	28.3	23	29.6	21.5	31.3	21.3	31.5	20.9
Mean	30	22.6	28.3	23.7	30.1	23	29.3	21.6	28.8	23.8	28.6	22.4	30.3	21.4	30.6	20.4

Day.	Iba.		San Isidro.		Tarlac.		Baler.		Dagupan.		Bolinao.		Baguio.		San Fernando, Union.	
	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.
	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.
1	29.7	16.2	29.4	18	33.5	15.6	29.4	17.9	29	17.1	28.5	20.5	10.7	29.1	17.9	17.9
2	30.7	17.2	30.4	19.4	32.4	18.5	29.6	20.6	29.8	19.4	28.6	24.4	23.5	12.2	30.2	18.3
3	29.6	20	27.6	21	32	19.6	27.2	21	26.6	22	27.6	23.9	20.3	15.6	28.9	21.8
4	31.4	20.7	31.2	22	32.5	19.3	30	22.1	31.2	21.6	31.5	23	23.8	15.8	29.9	21.2
5	31.7	20.7	31.3	21.5	31	20	30.1	21.7	35.3	22	31.8	22.2	23.9	15	31	22
6	31.4	20.3	32	20.3	34.6	20.2	31.1	20.6	32.3	21.6	31.8	21.9	24.4	15	31	22
7	31.5	19.5	32	20.3	34.2	20.4	30.9	20.5	32.2	22.4	31.9	22.9	23.3	14.7	30.6	22
8	31.5	20.5	32.5	21.5	34.5	21	31.9	22.5	32.7	22.4	32.1	23.9	24.4	15.7	31.2	22
9	31.4	22	30.6	22.4	33.2	21.2	29.7	23.9	34.8	23.5	32.9	25.3	24	15.6	31.3	24
10	31.4	21	31.2	21	34	22.2	29.9	22.8	32.2	22.1	32.3	23.8	23.7	14.3	31.2	22.2
11	31.4	21	31	21.6	34	21	30.6	22.4	32.7	22.5	32.3	22.8	23.7	15.2	30.8	22
12	31.6	20.9	32.4	21.4	34.9	21.5	31.3	21.8	34.3	22.4	32.5	23.1	24.5	15.2	31	22.2
13	31.4	20.2	31	21.4	33.5	20.4	30.6	21.1	31.8	21.1	31.7	21	23.8	13.6	31.5	22.7
14	31.4	20.2	32.1	21.2	34.5	20.6	30.6	22.6	32.3	21.6	32.1	22.1	23.3	14.7	30.9	21.7
15	31.4	20.5	32	22.5	34.6	21.4	32.3	22.3	32.8	22	32.4	22.5	24.3	14.6	31.9	21.5
16	32.3	23.5	31.1	22.3	32.5	22	29	22.5	32.2	22.6	32	22.9	22.6	14.8	30.3	22.5
17	32.1	21.9	29.2	22.1	33.6	22.3	28.4	23.1	32.7	22.9	32.5	23.6	24.6	15.5	30.9	22.7
18	31.6	23.4	31.8	22.2	34.5	22.4	30.9	23.7	34.4	22.9	32.8	23.6	23.2	15.6	31.7	22.7
19	31.2	22.2	30.9	22.6	34.5	22	29.2	23.5	33.7	23.5	33.1	23.6	24.3	16	32	23.2
20	31.8	21.5	32	21.9	33.9	22.5	30.4	23	34.7	23	32.9	23.5	25	15.4	31.7	23
21	31.5	20.6	31.9	20.6	33.4	22.3	32.2	23.7	32.9	22.9	31.8	22.6	23	15	31	23
22	31.5	21.5	28.5	22.6	33.8	22.6	25.4	20.9	32.9	23	32.5	23.1	22.6	14.9	31.2	22
23	31	19.8	31.5	20.6	35.2	22.4	31.1	21.3	32.3	21.9	32	23.5	23.1	14.4	31	22
24	30.1	20.6	29.2	22.1	33.3	22	26	23.1	32.2	22.2	31.7	22.3	21.3	14.8	31	22.5
25	30.5	20.2	31.4	20.6	34	22	30.2	20.2	30.2	21.5	31.8	20.7	22	14.3	30.5	22
26	30.9	20.4	31	21.5	33	21	28.3	21.5	32.2	22.1	31.9	23.5	22.8	13.9	30.5	22
27	30.9	22.4	30.3	20.7	33.2	20.5	27.7	21.6	31.7	22	31.8	20.8	23.8	14.2	30.5	22
28	30.9	23.5	28.5	21.8	30	21.4	27.2	23.1	31.4	21.8	31.8	23.3	22.4	13.4	30	21.6
29	30	22.7	28.3	21.4	28.4	21.5	25.6	22.4	31.6	22.3	29.6	22.6	21.4	13.4	29	22.5
30	28.2	21.2	26.2	21	26.2	20.5	24.5	20.7	26.8	21.5	26.5	23	17.4	14	27.8	22.7
31	31.6	21.7	30.2	21.9	32.2	21	27.9	21.5	34.7	22.2	31	23.3	22.2	15	31	22.2
Mean	31.1	20.9	30.6	21.3	33.1	21	29.3	21.9	32.1	22	31.5	23	23	14.6	30.7	22

Maximum and minimum temperatures at the stations of the Weather Bureau, December, 1916—Continued.

Day.	Echague.		Candon.		Vigan.		Tuguegarao.		Laoag. <sup>a</sup>		Aparri.		Cape Bojeador.		Santo Domingo, Batanes.	
	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.
	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.
1	24.5	17.9	32	21	28.1	16.8	25.2	17.3	28.6	17.7	25.3	20.5	23.4	16.2	22.6	17.8
2	24.6	19.7	32.2	19	28.2	18.6	24.2	19.4	27.6	20.2	23.5	20.3	23.2	18.4	22.5	19
3	26.8	20.8	30.5	24	29.4	21	29.6	21.5	29.9	22	25	22.3	23.2	18.8	23.4	19.9
4	30.5	21.7	31.5	22.6	31.6	20.2	28.8	21.6	33.2	20.5	27.1	22.8	26.5	20.4	24.6	21.4
5	29.5	22	31.5	22.2	31.8	21.5	31.2	21.8	35.4	20	27.9	21.8	26.5	20	26.5	22.4
6	29.4	21.5	32	22.5	31.7	21.3	29.4	21	36	19	27.2	22	27.3	21.4	28.7	23
7	30.5	21.6	32	22.5	32.4	22.5	30	21.4	34.9	19	28.2	22.5	27.8	22.4	26.9	23.8
8	29.5	22.7	33.2	22.8	32.1	22.5	29	22.6	32.6	23.3	27.5	23.3	27.5	22.4	24.7	23
9	28.5	22.8	31.6	24	32.8	22.5	24.5	22.3	33	22.8	24.5	22.5	25.2	21.6	23.4	21.4
10	31	21.9	31.5	23.7	32.4	22.5	30	21.8	33.1	22.9	27.6	22.6	26	21.7	22.9 <sup>?</sup>	21.4
11	29.2	22.3	31.5	23.1	31.5	21.6	26.5	21.8	33.1	23.3	25.2	22.8	26.5	21.1	23.5	20
12	27.5	20.5	32	24	31.5	22.5	25.1	20.5	30.4	22	25.6	22.3	24.8	20.4	23.4	21.3
13	29.5	21.7	32	23.5	32.1	22.6	27.8	21.7	33.9	22	27	22.2	27.8	19.7	25.1	21.4
14	30	21.6	32.4	23	31.2	22	28.6	21.6	-----	-----	28.1	21.7	28.8	21.6	28.8	22.9
15	29.5	22.7	31.2	22.6	32.6	22	30.2	22.6	-----	-----	26.3	22.5	25.3	21.2	23	20.5
16	27.5	21.5	32.2	22.5	32.1	22	25.7	22.2	31.1	23.5	24.6	22.3	24.8	16.4 <sup>?</sup>	22.5	19.5
17	29.5	21.3	32.2	24.2	31.8	21.4	30.2	22.4	35.4	22.5	28.1	22.7	26.6	20.8	23	21
18	31.6	21.3	32.5	24.2	31.3	23	30.5	23.3	33.3	22.8	28	23.3	27	22.2	24	21
19	31.5	22.4	32.4	24	31.1	22.6	30.6	21.7	34.4	21.3	28.7	22	28.2	22	25	21.4
20	30.1	22.5	32.2	24.4	32.1	22.2	29.3	22.8	31.4	21.8	25.6	22.8	26.8	20.9	24.4	21.3
21	28	22	32.2	25	30.3	22.6	23.8	21.6	32.1	21.3	24.8	22.4	25.6	20.5	24.8	21.4
22	25.8	21.6	31	23	31	22	25.1	21.6	35.9	19.5	26.9	22.3	27.2	21.4	25.9	21.5
23	29.8	20.7	31.7	22.9	30.4	22.3	27.7	21	33.9	19.4	27	21.5	27.7	21.2	26.7	21.7
24	27.6	21.9	32.2	23	31.2	21.5	28.2	21.7	34.8	20.8	27.2	22.3	29.5	21.4	28.8	22.5
25	29	21.3	32	24.2	29.4	22.5	29.6	21.5	31.7	23	26.9	21.7	29.2	23.2	27.4	20.2
26	25.6	21.4	33	22	29.9	21.5	25.7	21	31.7	22.4	24.5	21.3	26.4	18.8	23.6	20.6
27	24.9	19.9	32	23	32.6	21.5	25.8	20.6	33.1	18.5	25.5	22.2	26.4	18.6	23	20.5
28	24.5	19.5	32	22.9	31.9	24.4	25.3	20	33.6	19.7	23.3	20.8	24.6	-----	22.5	20.2
29	24.6	19.3	32	22	31.6	23.3	25.6	19.6	32.4	17	24.8	20.2	27.8	19.2	24.6	19.7
30	23.8	20.3	30.5	23.5	28.6	21.6	26.2	21.1	29.1	21.9	25.2	20.5	27.6	18.6	23.6	20.5
31	27.5	20.7	32	23.4	31.6	21.7	28.2	21.1	31.3	22.3	25.4	20.8	25.6	21.4	22.8	20.6
Mean	28.1	21.3	31.9	23.1	31.2	21.8	27.7	21.4	32.7	21.1	26.2	22	26.5	20.4	24.6	21.1

<sup>a</sup> The maximum temperatures of this station are not reliable; they seem to be too high.





## SEISMOLOGICAL BULLETIN FOR DECEMBER, 1916.

By Rev. MIGUEL SADERRA MASÓ, S. J.,  
Assistant Director of the Weather Bureau.

### EARTHQUAKES FELT IN THE PHILIPPINES.<sup>1</sup>

5, 15<sup>h</sup> 21<sup>m</sup> 54<sup>s\*</sup> [5, 23<sup>h</sup> 21<sup>m</sup> 54<sup>s</sup>]. Cape Bojeador (NW Luzon). Earthquake of intensity III, duration 4 seconds. Origin in the China Sea.

6, 18<sup>h</sup> 35<sup>m</sup> 38<sup>s\*</sup> [7, 2<sup>h</sup> 35<sup>m</sup> 38<sup>s</sup>]. Butuan (N Mindanao). Oscillatory earthquake, intensity II-III. It originated in the Pacific at a distance of about 800 kilometers from Manila and 140 kilometers from Butuan; it was recorded in all the observatories of the Far East.

10, 13<sup>h</sup> 48<sup>m</sup> [10, 21<sup>h</sup> 48<sup>m</sup>]. Guiuan (SE Samar). Earthquake of intensity III. Origin in the Pacific, it was registered at the station of Butuan.

12, 14<sup>h</sup> 26<sup>m</sup> 30<sup>s\*</sup> [12, 22<sup>h</sup> 26<sup>m</sup> 30<sup>s</sup>]. Butuan (N Mindanao). Earthquake of intensity II-III. Origin in the Pacific, but further S than the one occurred on the 6th.

24, 13<sup>h</sup> 37<sup>m</sup> 18<sup>s\*</sup> [24, 21<sup>h</sup> 37<sup>m</sup> 18<sup>s</sup>]. Butuan (N Mindanao). Earthquake shock of the same character and intensity of the preceding one; it originated also in the Pacific.

### RECORDS OF THE MICROSEISMOGRAPH.

[Time: Greenwich mean. Midnight=0<sup>h</sup>. Instrument: Wiechert seismograph; 1,000 kilograms.  $A_N$ :  $T_0=5.1$ ,  $\epsilon=2.634$ ,  $\frac{r}{T_0^2}=0.048$ ;  
 $A_E$ :  $T_0=5.2$ ,  $\epsilon=1.968$ ,  $\frac{r}{T_0^2}=0.048$ . Alluvium. 2.40 meters above sea level.]

No.	Date.	Character.	Phase.	Hour.	Period.	Amplitude.		Remarks.
						$A_N$ $\mu$	$A_E$ $\mu$	
381	3	I <sub>r</sub>	eP	19 26 12	7	35		
			L	30 15				
			M <sub>N</sub>	31 02				
			F	42				
382	5	I <sub>v</sub>	eP	15 21 54				Cape Bojeador (NW Luzon).
			L	22 37				
			F	26				
383	6	I <sub>v</sub>	eP	18 35 38	4	146		Butuan (N Mindanao).
			L	37 19				
			M <sub>N</sub>	37 29				
			M <sub>F</sub>	35 38				
				19 08				
				6				
384	9	I <sub>v</sub>		23 39 54				
				43				

<sup>1</sup> The intensity of earthquakes is given in the notation known as the Rossi-Forel scale. The time is that indicated by the seismographs at the Central Observatory whenever the disturbance has been registered by them. This fact is denoted by an asterick (\*). Otherwise the time is that noted by the observer who sent the report. All time indications are in Greenwich mean time (midnight=0<sup>h</sup>), insular time being added in brackets for the convenience of Philippine readers.

## Records of the microseismograph—Continued.

No.	Date.	Character.	Phase.	Hour.			Period.	Amplitude.		Remarks.
								A <sub>N</sub> μ	A <sub>E</sub> μ	
385	12	I <sub>r</sub>	eP	h.	m.	s.			Butuan (N Mindanao).	
			L	14	26	30				
			M <sub>N</sub>	28	44					
			F	29	08		4	9		
				38						
386	13	I <sub>r</sub>	eP	21	31	31				
			L	39	11					
			M <sub>E</sub>	41	02		8	7		
			M <sub>N</sub>	41	22		8	5		
			F	22	06					
387	14	I <sub>r</sub>	e	17	02	33				
			F	26						
388	20	I <sub>r</sub>	eP	18	53	51				
			L	19	01	13				
			M <sub>E</sub>	01	27		9	9		
			F	36						
389	23	I <sub>v</sub>	eP	9	01	03				
			L	01	11					
			F	04						
390	23	I <sub>r</sub>	e	9	44	42				
			L	54	46					
			M <sub>E</sub>	56	11		5	8		
			M <sub>N</sub>	56	38		6	8		
			F	10	30					
391	24	I <sub>v</sub>	eP	13	37	18			Butuan (N Mindanao).	
			L	40	19					
			M <sub>N</sub>	40	33		6	10		
			F	49						
392	25	I <sub>v</sub>	eP	2	01	41				
			L	02	12					
			F	05						
393	26	I <sub>r</sub>	e	3	43	14				
			F	4	12					
394	26	I <sub>r</sub>	eP	20	15	50				
			S	17	47					
			L	19	42					
			M <sub>N</sub>	22	27		8	51		
			M <sub>E</sub>	22	43		7	65		
			F	21	21					
395	27	I <sub>v</sub>	eP	7	49	41				
			L	50	18					
			M <sub>E</sub>	50	26		3	44		
			F	54						
396	27	I <sub>r</sub>	eP	21	46	42				
			S	48	12					
			L	49	42					
			M <sub>N</sub>	53	49		7	18		
			M <sub>E</sub>	22	37					
			F	22	37					
397	29	I <sub>v</sub>	eP	8	35	10				
			L	36	05					
			M <sub>E</sub>	36	14		3	17		
			M <sub>N</sub>	36	37		3	24		
			F	41						

TEMBLORES DE TIERRA SENTIDOS EN FILIPINAS.<sup>1</sup>

5, 15<sup>h</sup> 21<sup>m</sup> 54<sup>s\*</sup> [5, 23<sup>h</sup> 21<sup>m</sup> 24<sup>s</sup>]. Cabo Bojeador (NW de Luzón). Temblor de tierra de intensidad III, duración 4 segundos. Origen en el Mar de la China.

6, 18<sup>h</sup> 35<sup>m</sup> 38<sup>s\*</sup> [7, 2<sup>h</sup> 35<sup>m</sup> 38<sup>s</sup>]. Butúan (N de Mindanao). Temblor oscilatorio de intensidad II-III. Este temblor se originó en el Pacífico a unos 800 kilómetros de distancia de Manila y 140 de Butúan; registráronlo todos los observatorios del Extremo Oriente.

10, 13<sup>h</sup> 48<sup>m</sup> [10, 21<sup>h</sup> 48<sup>m</sup>]. Guiuan (SE de Sámar). Temblor de tierra de intensidad III. Epicentro en el Pacífico; registrado en la estación de Butúan.

12, 14<sup>h</sup> 26<sup>m</sup> 30<sup>s\*</sup> [12, 22<sup>h</sup> 26<sup>m</sup> 30<sup>s</sup>]. Butúan (N de Mindanao). Temblor de tierra de intensidad II-III. Originado en el Pacífico mucho más al S que el del día 6.

24, 13<sup>h</sup> 37<sup>m</sup> 18<sup>s\*</sup> [24, 21<sup>h</sup> 37<sup>m</sup> 18<sup>s</sup>]. Butúan (N de Mindanao). Temblor de tierra del mismo carácter e intensidad que el precedente y originado también en el Pacífico.

<sup>1</sup> La intensidad de los terremotos se indica conforme a la conocida escala de Rossi-Forel. Cuanto a la hora de su ocurrencia, adoptamos la indicada por los sismógrafos de este Observatorio siempre que los hayan registrado, distinguiéndola por medio de un asterisco (\*). En caso contrario copiamos la apuntada por los observadores que nos envían las notas. Todas las indicaciones del tiempo se refieren al tiempo medio de Greenwich (medianoche=0<sup>h</sup>). Para conveniencia de los lectores de Filipinas se añade también el tiempo insular.

## VOLCANIC NOTES, 1916.

**Bulusan Volcano.**—On the 20th of January the Observatory received a telegram from the municipal president of Irosin, Sorsogon, stating that the Bulusan Volcano, situated some 20 kilometers NE of the town, was in eruption since the 18th, and that the inhabitants, fearing some great outburst, were fleeing from the town.

The Bulusan Volcano is the most oriental of the Luzon Island; it rises on its SE end, close to the "San Bernardino Strait," which separates Luzon from Samar Island. The approximate geographical position of the volcano is  $12^{\circ} 47' N$ ,  $124^{\circ} 1' E$ , and its height about 1,400 meters.

No historic records are to be found of any important eruption of this volcano; for centuries it has been seen issuing forth small jets of white steam though different crevasses around its deformed crater. Some small outbursts are mentioned as occurred during the years 1852, 1886, and 1894, but the reports are so meagre and vague that they leave ample room for a reasonable doubt lest some outbursts of the Mayon Volcano have been mistaken as eruptions of the Bulusan. If such eruptions really occurred they must have been of very small importance or at least did not make great impression compared with other bigger outbursts of the Mayon Volcano occurring at the same time.

The first explosion of this year began at about 2<sup>h</sup> a. m. of the above said 18th: a little later a light earthquake shock was felt: some persons awakened by the shock and a faint noise saw that the volcano was throwing out a great quantity of smoke, which the prevailing fresh northeasters carried downwards to the southwestern valleys, with a subsequent fall of ashes or dust and very small stones.

Similar ejecta continued to fall now and then during the following three days, but due to cloudy and rainy weather it was impossible to see if new outbursts occurred. Between 7<sup>h</sup> and 8<sup>h</sup> a. m. of the 22d rumblings were heard in the volcano, which repeated at intervals during about three hours, at the same time some darker smoke was observed. Since this disturbance the volcano has remained quiet.

Neither before nor during these two small eruptions frequent earth tremors or shocks of local origin occurred: from the different telegrams received in the Observatory about the Bulusan disturbances, it may be inferred that during the whole disturbed period but four or five local shocks were felt.

The inhabitants of the towns situated around the volcano did not consider themselves safe, notwithstanding the volcanic calm and the assurances given from Manila. At any perceptible shock felt in the region urgent telegrams for instructions were sent to Manila, so the Director of the Weather Bureau considered it expedient to set up a seismograph in the town of Irosin. This was the most affected by the eruption, on account of its location SW of the volcano, the ejecta being carried towards this direction by the prevailing northeasters. The intention of the Director was to find out if there existed interior strain revealed by light and frequent earth tremors. During about three months the instrument remained in operation without revealing any activity.

With the same purpose of appeasing the startled inhabitants of that region the Bureau of Science had also sent a geologist, Mr. J. P. Goldsberry, to make an examination of the volcano and its ejecta. His opinion of the remoteness of a big eruption agreed with the assurances given by the Observatory. He considered the dust and lapilli thrown by the volcano, of exterior origin, that is, from the walls and bottom of the crevisses but not "from molten lava by the explosion of inclosed gases," and that the greater tension of the gases just at such period might be attributed to a rainy season of exceptionally heavy and long downpours.<sup>1</sup>

<sup>1</sup>"The Philippine Journal of Science." Section A, Vol. XI, No. 5, pp. 251-256.

Ragang Volcano, Mindanao.—In the month of July, 1916, during a Constabulary patrol through the region situated between Lake Lanao and Cotabato, Lieut. W. F. Donnelly, P. C., came in sight of an active volcano which from all indications had recently erupted a discharge of volcanic ash and vapors capable of partially destroying the vegetation for 3.5 kilometers around. But because neither the state of the weather, rainy and foggy, nor the object of the patrol, which was to look after some bands of Moros remontados, permitted a closer examination, it was resolved to make a second expedition to locate the crater and examine its actual state of activity.

Consequently in September, Col. P. E. Traub, U. S. Cavalry, chief of the district, greatly interested in the discovery of Lieut. Donnelly, undertook the expedition in company with Capt. G. O. Fort, P. C., and the said lieutenant. Arrived at the spot, met with some difficulty in discovering the volcano, on account of the fog. When the fog lifted they saw a group of three peaks or cones with a deep hollow in the center between them. Such irregular cones seemed to be the remnants of a greater cone. From the hollow or crater, apparently extinct at present, radiates toward the SE a current of broken and jagged lava extending about 3 kilometers. In some places the lava not so broken presents the slaggy and corded type so characteristic of some recent vesuvian flows. All around the cones and crater the products of former eruptions are scattered in the order of their size, boulders and bombs, pedregal, lapilli and ashes, to a great distance. The actual activity is shown by numerous jets of sulphurous vapor issuing from vents distributed in the interior faces of the cones, forming the broken crater, and in the current of lava. At present the most active center is a great fissure about 30 meters long and 5 wide and deep opened across one of the cones. This crater seems to have been the origin of the last and very recent outburst; it is steaming energetically but filling up with the loose material carried down its walls by the rains. There are all around the principal cones other extinct vents, some in the shape of small cones and some of cracks and crevases. The shagged state of vegetation principally toward the NE is an evidence of some very recent eruption of fine material and sulphurous vapors.

Captain Fort in his report, from which we extracted all the data, advances the opinion that formerly there existed four peaks around the crater, but the one in the SE was blown up by violent explosions, the open breach giving an outlet to the molten lava.

The position of the new volcano is approximately  $124^{\circ} 29' E$ , and  $7^{\circ} 40' N$ ; it occupies the north end of a line of extinct but relatively modern volcanic cones which in a ENE-WSW direction extends to the old Makaturing. This volcano, according to the last map of the Bureau of Constabulary, is situated at about  $124^{\circ} 19' E$  and  $7^{\circ} 36' N$ .

This volcanic line seems recent comparatively with other cones of the country and specially with the powerful currents and layers of bassalt found in the Lanao Section. All this zone occupies the heart of the part of Mindanao occupied and exclusively controlled until quite recently by the moros. For this reason it remained for centuries unexplored by outsiders. Hence the scanty particulars about the known Makaturing Volcano, only some 25 kilometers inland from the coast, and hence also that many great eruptions, which very probably occurred in the "Ragang" and other cones during the last three centuries, are unknown to the world. That the Ragang Volcano has been constantly more or less active it is evident from the meaning of the name "Palao Ragang", "the mountain where smoke or fire rises" by which it is known among the Moros. There exist moreover some historic but vague reports which persuade the occurrence of recent volcanic eruptions in this section. Such reports refer to occasional falls of ashes in different towns of the coasts north and south of Mindanao. The last fall was reported from the District of Dapitan where in April of 1873 appeared a big black cloud with a consequent rain of ashes, coming from the interior, SE or S.

The present state of the slaggy lava flow from the Ragang Volcano and of the ashes, lapilli and volcanic blocks scattered all along the coast of the Illana Bay seem to suggest the occurrence of tremendous and relatively recent eruptions; may be shortly before and perhaps even after the discovery of the Islands. Undoubtedly the whole narrow neck or isthmus laying between the Iligan and Illana bays and which unites the Zamboanga Peninsula to the main body of Mindanao island, has been in preceding epochs the field of great volcanic activity, owing to volcanic action its present relief and perhaps its upbuilding.

## NOTAS VOLCANICAS, 1916.

**Volcán Bulusan.**—El 20 de enero se recibió un telegrama del presidente municipal de Irosin, Provincia de Sorsogón, en el cual notificaba que el volcán Bulusan, situado a unos 20 kilómetros al NE, estaba en erupción desde el día 18, y que la gente, temiendo alguna grande explosión, abandonaba el pueblo.

El volcán Bulusan es el más oriental de la Isla de Luzón, situado en su extremo SE, junto al llamado "Estrecho de San Bernardino" que la separa de la Isla de Sámar. Sus coordenadas geográficas aproximadas son:  $12^{\circ} 47' N$ ,  $124^{\circ} 1' E$  y su altura de unos 1,400 metros.

No hay memoria de que haya ocurrido erupción alguna de importancia; se le ha visto emitir casi constantemente vapores por diferentes grietas situadas en los bordes de su ya muy deformado cráter. Cítanse pequeñas explosiones en 1852, 1886, y 1894, pero en términos vagos y confusos, de tal manera que hay lugar a dudar si se confunden con erupciones del volcán Mayón. De todos modos, si realmente ocurrieron las mencionadas erupciones debieron ser de poquísima importancia, o teniendo alguna no llamaron mucho la atención por coincidir con erupciones de aquel volcán.

La primera explosión de este año tuvo lugar hacia las 2 a. m. del citado día 18; poco después se sintió un ligero temblor de tierra. Algunas personas, despertadas por éste y por algún ruido sordo, vieron que salía del volcán mucho humo, el cual era arrastrado por los vientos hacia los valles del SW donde comenzó a caer ceniza.

Sin que conste hubiera otras explosiones cayó sin embargo algo de ceniza los tres días siguientes. De 7 a 8 de la mañana del día 22 oyéronse retumbos en el volcán, a los que siguió la emisión de humo algo oscuro; los ruidos y emisión de humo se repitieron a intervalos durante unas tres horas. Después de esta perturbación, el volcán ha permanecido tranquilo.

Ni antes ni durante estas dos insignificantes erupciones se experimentaron frecuentes movimientos sísmicos locales. De los varios telegramas recibidos en el Observatorio se deduce que durante todo el período de erupción no se sintieron más de cuatro temblorcillos.

En vista con todo de que los habitantes de los pueblos vecinos al volcán no se tranquilizaban y en repetidos telegramas, pedían instrucciones al Observatorio, éste resolvió montar un sismógrafo en el pueblo de Irosin, el más importante y el que por estar situado al SW recibía principalmente los productos de las explosiones a causa de los constantes nordestes; el objeto era conocer si existía tensión interior. Tres meses estuvo funcionando allí el aparato sin que revelase actividad ninguna.

Con el mismo fin de tranquilizar a la gente y prevenir alguna catástrofe la Oficina de Ciencias envió también al geólogo, Mr. J. P. Goldsberry, para examinar el volcán; su opinión sobre el muy remoto peligro de una grande erupción coincidió con la del Observatorio. Además examinada la naturaleza de los productos de las explosiones cree que éstos procedían solamente de las paredes y del fondo de las grietas, empujados por una extraordinaria tensión y formación de vapores, a que dió probablemente lugar un período anual de lluvias mucho más abundante y largo que otros años.<sup>1</sup>

**Volcán Ragang, Mindanao.**—En julio de 1916 una patrulla de constables que recorría la región situada entre la laguna de Lanao y Cotabato, al mando del Teniente W. F. Donnelly, P. C., divisó un cono volcánico, el cual según todas las señas había recientemente arrojado cenizas y vapores con destrucción parcial de la vegetación en un radio de unos 3.5 kilómetros. Mas como ni el mal estado del tiempo, con lluvia y niebla, ni el objeto de la excursión, que era perseguir unas bandas de moros remontados, permitían un

<sup>1</sup>"The Philippine Journal of Science." Section A, Vol. XI, No. 5, págs. 251-256.

reconocimiento detenido, se resolvió que en una segunda visita se procuraría dar con el cráter y examinar su actual actividad.

Grandemente interesado en este descubrimiento el Coronel P. E. Traub, U. S. Cavalry, jefe del distrito, planeó para el mes de septiembre un viaje de exploración en el que le acompañaron el Capitán G. O. Fort, P. C., y el teniente antes mencionado. Llegados al sitio devastado tuvieron al principio alguna dificultad en descubrir el volcán a causa de la niebla. En cuanto ésta se levantó vieron a poca distancia un grupo de tres picos o conos con una profunda hoya entre ellos y casi en el centro. Al llegarse cerca encontraron que del fondo de la hoya o cráter, al parecer extinto, arrancaba en dirección al SE una corriente de lava solidificada y muy resquebrajada, la cual se extendía a una distancia de unos 3 kilómetros. En algunos sitios donde la corriente lávica estaba menos resquebrajada presentaba los caracteres de los vertederos de escorias siderúrgicas, con formas onduladas y retorcidas, muy semejantes a algunos derrames lávicos recientes del Vesuvio. Al rededor de los conos hasta una gran distancia se extienden los productos de antiguas erupciones, según el orden de su peso y tamaño, grandes piedras y bombas, pedregal, grava, arena y cenizas. La actividad actual se manifiesta por multitud de chorros de vapor, los cuales se abren paso por muchas grietas tanto en las vertientes interiores de los conos que rodean el cráter como en la misma corriente de lava. El centro más activo se halla en una hendidura de unos 30 metros de largo por 5 de ancho y otros tantos de profundidad, abierta a través de uno de los conos. Parece ser éste el cráter que erupció más recientemente. Salen aún por todas partes chorros de vapor, pero se está rellenando rápidamente con el material suelto de sus bordes que las lluvias arrastran hacia el interior. Existen al rededor de los tres conos principales otras muchas bocas extintas representadas por grietas y pequeños montículos. El estado de la vegetación, principalmente hacia el NE evidencia que muy recientemente ocurrió una erupción de gases y tal vez de cenizas.

El Capitán Fort, de cuyo precioso *report* se extractaron todos los datos, opina que antiguamente serían cuatro los montículos o conos que encerraban el cráter principal del Ragang y que uno de ellos, el del SE, después de haber sido destruido por grandes explosiones dejó paso libre a la corriente de lava.

La posición geográfica del Ragang es  $124^{\circ} 29' E$  y  $7^{\circ} 40' N$ ; ocupa el extremo septentrional de una serie de conos volcánicos extintos, pero aparentemente modernos, la cual se prolonga en dirección WSW hacia el volcán Makaturing. Este, según el último mapa trazado en la Oficina de la Constabularia se halla a los  $124^{\circ} 19' E$  y  $7^{\circ} 36' N$ .

La línea volcánica Ragang-Makaturing parece ser moderna, comparada con otros conos de la misma región, y sobre todo con las grandes corrientes y capas de basalto de la sección de Lanao. Toda esta zona está situada, puede decirse, en el centro de la parte de Mindanao dominada y casi exclusivamente habitada por moros hasta hace pocos años. Por esta razón ha permanecido durante muchos siglos inexplorada por personas de diferente raza; con esto se explica la escasez de pormenores acerca del conocido volcán Makaturing, con distar sólo unos 25 kilómetros de la costa, y el que no se hayan divulgado al exterior erupciones importantes del Ragang y tal vez de otros conos volcánicos vecinos, ocurridas durante los tres últimos siglos. No parece pueda dudarse de que el Ragang ha estado constantemente en mayor o menor actividad, en tiempos modernos, pues lo pone en evidencia el nombre de "Palao Ragang" "montaña que echa fuego o humo" con que es conocido entre los moros. El estado actual de la corriente de lava escoriácea del Ragang, así como las cenizas, gravas, bloques y bombas volcánicas que se encuentran a lo largo de la costa de la bahía Illana, sugieren la idea de grandes erupciones volcánicas recientes, posiblemente poco antes del descubrimiento de las Islas y aún quizá después. Corroboran estas ideas algunas noticias históricas acerca de lluvias



de cenizas ocurridas en diferentes pueblos cristianos de las costas de esta parte de Mindanao; el último caso que se cita tuvo lugar en el Distrito de Dapitan en abril de 1873, donde se vió aparecer hacia el SE una nube negra que se resolvió en lluvia de ceniza.

Todo lo que se conoce del estrecho cuello o istmo situado entre las bahías de Iligan e Illana y que une la península de Zamboanga al resto de Mindanao, induce a creer que ha sido en épocas precedentes el teatro de grandísima actividad volcánica, debiendo a ella no sólo su actual configuración sino tal vez su existencia o formación.



---

**APPENDIX TO THE MONTHLY BULLETINS  
FOR 1916.**

---



## ANNUAL SUMMARY OF METEOROLOGICAL DATA FOR MANILA DEDUCED FROM TWENTY-FOUR DAILY OBSERVATIONS DURING THE YEAR 1916.

Month.	Pressure.				Air temperature.							
	Mean.	Departure from normal.	Mean.	Departure from normal.	Mean maximum.	Departure from normal.	Mean minimum.	Departure from normal.	Absolute maximum.	Day.	Absolute minimum.	Day.
	<i>mm.</i>	<i>mm.</i>	<i>°C.</i>	<i>°C.</i>	<i>°C.</i>	<i>°C.</i>	<i>°C.</i>	<i>°C.</i>	<i>°C.</i>		<i>°C.</i>	
January	759.64	-1.51	24.8	-0.1	30.1	0	21.2	+0.8	32.8	9	17.4	18
February	58.82	-2.43	25.3	0	30.8		21.1	+ .8	33.2	23	16.9	8
March	59.80	-.74	26.4	-.2	32.7	+ .2	21.5	+ .2	34.9	29	20	3
April	58.88	-.54	27.3	-.8	33.4	-.5	22.7	-.1	35	24, 28	20.4	16
May	57.88	-.47	27.4	-1	33.4	-.2	23.3	-.6	35.5	21	22	23
June	56.77	-1.15	27.1	-.8	32.4	-.1	23.8	-.1	35.1	5	22.3	23, 24
July	57.63	+ .39	26.9	-.1	32.1	+1.1	23.6	-.1	34.1	9	22.4	2
August	57.76	+ .43	27.2	+ .2	31.4	+ .7	24	+ .3	33.5	25	22	22
September	56.68	-.74	26	-.8	30.6	-.1	23.3	-.3	33.3	7	22.3	9, 18, 30
October	58.33	-.32	25.9	-.8	30.5	-.6	23	-.1	33.8	1	21.6	28
November	57.71	-1.65	25.7	-.2	30.7	+ .3	22.2	0	32	4	19.5	14
December	57.79	-2.56	24.9	-.3	30.3	+ .4	21.4	+ .2	32.2	18	17.4	1
Annual	758.14	-0.94	26.2	-0.4	31.5	+0.1	22.6	+0.1	35.5	V, 21	16.9	II, 8

Month.	Wind.				Relative humidity.		Vapor pressure.		Cloudiness.			
	Prevailing direction.	Velocity.			Direction at the time of the maximum velocity.	Mean.	Departure from normal.	Mean.	Departure from normal.	Mean.	Departure from normal.	
		Total.	Departure from normal.	Hourly maximum.								
		<i>Km.</i>	<i>Km.</i>	<i>Km.</i>			<i>P. ct.</i>	<i>P. ct.</i>	<i>mm.</i>	<i>mm.</i>	<i>0-10.</i>	<i>0-10.</i>
January	N quadrant.	6,637.5	+1,509.2	36	NNE	77.9	-0.2	18	-0.1	7.4	+2.0	
February	E quadrant.	4,814	-541.4	25.5	SW	78.1	+4.2	18.5	+1	6	+1.1	
March	E quadrant.	5,853.5	-1,008.6	24	WSW	73.4	+1.9	18.5	+ .4	4.6	+ .2	
April	E quadrant.	5,592	-1,308.4	26	SW	75	+5.3	20	+ .6	4.8	+ .7	
May	E quadrant.	5,601	-1,237.5	31	NNE	77.8	+1.8	20.8	-.8	6.8	+1.1	
June	SW	5,561.5	-1,159.7	39.5	SW	83.5	+2.7	22	-.3	8.2	+1.2	
July	SW	5,248	-3,202.4	32.5	SW	85	+ .2	22.3	-.1	7.6	-.2	
August	SW	10,167.5	+1,116.4	42	WSW	84	-1	22.4	0	7.9	0	
September	SW quadrant.	5,583.5	-2,440.2	42	SW	88.4	+2.6	22	-.4	8.5	+ .8	
October	NE quadrant.	3,434	-1,824.4	22	WNW	87.6	+3.9	21.5	-.1	8.1	+1.4	
November	NE quadrant.	4,190.5	-577.6	25	NNE	83.9	+1.4	20.4	+ .1	6.4	+ .1	
December	NE quadrant.	4,496	-212.5	23.5	NE	84.3	+3	19.6	+ .4	6.6	+ .4	
Annual		67,179.0	-10,882.1	42.0		81.6	+2.2	20.5	+0.1	6.9	+0.7	

Month.	Evaporation.		Sunshine.		Rainfall.					
	Free exposure, total.	Under shelter, total.	Total.	Departure from normal.	Total.	Departure from normal.	Greatest in a single day.	Day.	Rainy days.	Departure from normal.
	<i>mm.</i>	<i>mm.</i>	<i>h. m.</i>	<i>h. m.</i>	<i>mm.</i>	<i>mm.</i>	<i>mm.</i>			
January	114	89.9	117 50	- 70 16	38.2	+ 11.1	20.8	2	7	+ 2
February	111.1	82.7	180 40	- 18 15	23.6	+ 13	20.7	15	3	0
March	169.8	123.7	222	- 16 18	29.1	+ 11	16.8	18	5	+ 2
April	156.5	115.4	224 20	- 37 34	46.2	+ 12.1	33.8	18	5	+ 1
May	132.7	100.5	171 20	- 59 01	39.8	- 66.5	9.3	7	15	+ 5
June	93.6	71	127 35	- 44 17	224.6	- 9	72.9	14	17	+ 1
July	78.1	61.5	153 55	+ 8 13	179.9	-215.4	46	14	25	+ 4
August	90.8	74	163 05	+ 22 15	282.3	- 78.8	43.7	22	24	+ 2
September	50.2	46.2	92 10	- 43 15	372.6	+ .1	74.2	4	25	+ 4
October	50.9	45.7	97 35	- 69 44	223.6	+ 39	43	21	25	+ 9
November	75.9	59.6	170 05	+ 6 19	106.5	- 21.8	21.6	22	15	+ 3
December	70.4	58.4	144 50	- 11 41	76	+ 13.6	16.2	26	13	+ 4
Annual	1,194.0	928.6	1,865 25	-333 34	1,642.4	-291.6	72.9	VI, 14	179	+37

## CATALOGUE OF PHILIPPINE EARTHQUAKES, 1916.<sup>a</sup>

Date.	Time of occurrence (Greenwich mean time).		Place.	Probable origin or epicenter.		Approximate extension of the shaken area.		Intensity (Rossi-Forel).	Remarks.
				$\phi$	$\lambda$	Longer axis.	Shorter axis.		
Jan.	1	7 25	Batangas (S Luzon)	o	o	Km.	Km.	III	Registered at Manila.
	3	19 12	Guam (Mariana Islands)					II-III	
	4	3 13	Panay Island	10.8 N	122.4 E	600	450	VIII	Do.
	6	4 30	Panay Island					IV	Aftershock.
	6	17 54	Camarines (SE Luzon)					III	
	7	17 38	Western Luzon					III	Registered at Manila.
	9	22 16	Samar and Leyte Islands	11.6 N	124.5 E			IV	
	10	7 30	Camarines (SE Luzon)					III-IV	Epicenter near the Isarog Volcano. Several light shocks during the month.
	13	6 23	Eastern Mindanao and Samar					II-III	Repetitions at 8 <sup>h</sup> 26 <sup>m</sup> and 10 <sup>h</sup> 56 <sup>m</sup> . Registered all over the world. Origin in the Pacific.
	16	9 59	Butuan (N Mindanao)					IV	
	21	19 25	Camarines (SE Luzon)					III	
	27	17 24	Camarines (SE Luzon)					IV	Registered at Manila.
	29	16 55	Samar Island					IV	
Feb.	1	6 53	Samar and Leyte Islands					IV	
	1	17 51	Camarines (SE Luzon)					III	
	2	13 43	Butuan (N Mindanao)					III-IV	
	4	8 09	Ormoc (W Leyte)					III	
	4	19 04	Eastern Mindanao			380	200	IV-V	Origin off southeast coast. Registered in the Far East.
	5	8 10	Aparri (NE Luzon)					III	Origin far off the NE coast of Luzon. Registered in the Far East.
	6	16 58	Camarines (SE Luzon)					III	
	11	9 17	W Samar					IV	
	14	10 05	Butuan (N Mindanao)					II-III	Origin off the SE coast of Mindanao. Registered in the Far East.
	16	3 56	Samar Island					III-IV	Origin in the Philippine Deep. Registered at Manila.
	18	1 15	Ormoc (W Leyte)					III	
	18	7 16	Laoag (NW Luzon)					II-III	
	21	10 10	Camarines (SE Luzon)					III	
26	2 14	W Luzon					III-IV	Registered at Manila.	
26	23 35	Guam (Mariana Islands)					III-IV		
Mar.	5	15 06	W Luzon					III	Do.
	8	23 27	Eastern Mindanao	8.0 N	125.7 E	400	180	V	Do.
	10	21 45	N Luzon	18.4 N	121.2 E	200	110	IV-V	Do.
	12	7 47	Aparri (NE Luzon)					III	Do.
	12	21 48	Naga (SE Luzon)					II-III	
	20	11 30	Butuan (N Mindanao)					III	
	25	20 07	Iloos Sur (NW Luzon)					III	
	27	14 09	Albay (SE Luzon)					III-IV	
	28	9 47	Guam (Mariana Islands)					IV-V	
	28	16 25	Laoag (NW Luzon)					IV	Registered at Manila.
	28	1 50	Butuan (N Mindanao)					II-III	Origin in the Philippine Deep, off the Pacific.
	30	21 49	Samar and NE Mindanao	10.9 N	126.8 E	450	100	III-IV	Registered at Manila.
	Apr.	1	22 53	Ormoc (W Leyte)					V
8		15 15	Tagbilaran (SW Bohol)					III	
14		12 17	Central Luzon	16.0 N	120.8 E	200	100	IV	Do.
23		13 35	Butuan (N Mindanao)					III	
25		23 34	Northern Luzon	18.4 N	121.2 E			IV-V	Do.
28		10 13	Camarines (SE Luzon)					III	Do.
28		20 21	NW Luzon			180	100	IV	Repeated at 21 <sup>h</sup> 46 <sup>m</sup> . Registered at Manila. Origin in the China Sea.
May	6	11 19	Surigao (NE Mindanao)					III	
	7	11 15	Aparri (NE Luzon)					III-IV	Origin off the NE coast of Luzon. Registered in the Far East.
	8	12 56	S Luzon and Mindoro					III-IV	Registered at Manila.
	16	5 00	Surigao (NE Mindanao)					II-III	
	21	13 47	Sorsogon (SE Luzon)					III	
	23	22 10	Butuan (N Mindanao)					III	Do.
	26	20 23	Cuyo Islands					IV	Do.
29	12 52	Agusan Valley (E Mindanao)					III-IV	Origin near the eastern coast of Mindanao.	
June	5	3 06	Samar Island					III	Origin near the eastern coast of Mindanao.
	9	21 27	SE Mindanao	6.0 N	128.0 E	450	200	IV-V	Registered in the Far East.
	10	21 21	SE Mindanao	6.0 N	128.0 E	450	200	III-IV	Aftershock at 0 <sup>h</sup> 25 <sup>m</sup> on the 11th. Registered at Manila.

<sup>a</sup> See explanation in Monthly Bulletin of the Weather Bureau for December, 1910, page 445.

## Catalogue of Philippine earthquakes, 1916—Continued.

Date.	Time of occurrence (Greenwich mean time).	Place.	Probable origin or epicenter.		Approximate extension of the shaken area.		Intensity (Rossi-Forel).	Remarks.
			$\phi$	$\lambda$	Longer axis.	Shorter axis.		
June 10	22 31	Guam (Mariana Islands)	o	o	Km.	Km.	III-IV	Registered at Manila. Origin in the Pacific.
	23 48	Butuan (N Mindanao)					II-III	
	16 2 51	Laoag (NW Luzon)					III	
	27 1 38	Aparri (NE Luzon)					III-IV	
June 29	10 50	SE Mindanao	6.0 N	128.0 E	450	200	IV-V	Registered in the Far East.
	July 2 22 53	Eastern Mindanao					III	Origin in the Philippine Deep. Registered at Manila.
July 5	8 39	SE Luzon	14.2 N	124.5 E	200	200	IV-V	Registered at Manila.
	8 16	SE Luzon	13.5 N	124.7 E	300	200	V	Registered at Manila and Zikawei. Aftershocks at 9 <sup>h</sup> 42 <sup>m</sup> and 10 <sup>h</sup> 01 <sup>m</sup> . Repeated at 9 <sup>h</sup> 55 <sup>m</sup> .
July 7	7 09	Sorsogon (SE Luzon)					III	Registered at Manila.
	9 2 32	Baguio (W Luzon)					II-III	
July 10	1 04	S Luzon					III-IV	
July 12	0 54	Tacloban (NE Leyte)					III	
July 13	14 13	Legaspi (SE Luzon)					III	
July 13	15 01	Western Mindanao and Visayas Islands	9.4 N	122.0 E	300	400	VI-VII	Registered in the Far East. Aftershocks at 15 <sup>h</sup> 22 <sup>m</sup> and 17 <sup>h</sup> 02 <sup>m</sup> .
	July 14 14 47	Western Mindanao and Visayas Islands	9.4 N	122.0 E	500	300	IV	Registered in the Far East. Registered at Manila. Origin in the China Sea.
July 17	8 40	NW Luzon			250	100	III-IV	
July 17	15 14	Guam (Mariana Islands)					III	
July 21	5 38	Surigao (NE Mindanao)					III	
July 25	3 40	Samar and Leyte Islands	11.8 N	125.5 E			III-IV	
July 26	12 02	Butuan (N Mindanao)					III	
Aug. 3	9 55	Cape Bojeador (NW Luzon)					III	Repeated at 17 <sup>h</sup> 45 <sup>m</sup> .
	4 16 27	Romblon Island					II-III	
Aug. 5	3 55	Eastern Mindanao					III	Origin off the eastern coast. e-Registered in the Far East.
Aug. 7	7 09	Samar and Leyte Islands	11.2 N	127.0 E	450	300	V-VI	Repeated at 11 <sup>h</sup> 23 <sup>m</sup> . Registered at Manila.
Aug. 8	14 40	Cape Bojeador (NW Luzon)					II-III	Registered in the Far East. Aftershock at 21 <sup>h</sup> 32 <sup>m</sup> . Repeated at 8 <sup>h</sup> 19 <sup>m</sup> on the 9th.
	18 54	N Luzon	19.0 N	121.0 E	200	100	VI-VII	
Aug. 8	21 26	Batangas (S Luzon)					III	
Aug. 11	5 50	Batangas (S Luzon)					II-III	
Aug. 14	23 39	SE Luzon	12.7 N	123.5 E	400	300	V-VI	Aftershock at 23 <sup>h</sup> 51 <sup>m</sup> . Registered at Manila.
Aug. 15	3 06	Butuan (N Mindanao)					II-III	
Aug. 15	17 31	SE Luzon	12.7 N	123.5 E			III-IV	
Aug. 15	21 32	Guam (Mariana Islands)					II-III	
Aug. 16	11 40	Aparri (NE Luzon)					IV	Registered at Manila.
Aug. 17	1 48	NW Luzon					III-IV	Do.
Aug. 17	1 59	Masbate Island					III	
Aug. 18	2 45	Cape Bojeador (NW Luzon)					II-III	
Aug. 26	23 43	N Luzon					V	Origin near the NE coast. Registered in the Far East.
Aug. 29	17 31	Butuan (N Mindanao)					III	
Sept. 1	3 38	N Agusan Valley (Mindanao)					III-IV	Registered at Manila.
	2 7 41	Naga (SE Luzon)					III	
Sept. 3	7 55	Guam (Mariana Islands)					III	
Sept. 3	10 17	Laoag (NW Luzon)					III	
Sept. 7	11 09	S Luzon and Mindoro					III-IV	Repeated at 11 <sup>h</sup> 10 <sup>m</sup> . Registered at Manila.
Sept. 8	16 07	SE Luzon			250	180	III-IV	Registered at Manila.
	19 10	W Luzon					III-IV	Repeated at 19 <sup>h</sup> 20 <sup>m</sup> . Origin in the China Sea. Registered at Manila.
Sept. 9	8 22	S Luzon and Mindoro					IV	Registered at Manila.
Sept. 9	13 17	Iba (W Luzon)					II-III	
Sept. 9	16 43	Eastern Mindanao					II-III	Origin off the eastern coast. Registered at Manila.
Sept. 11	5 38	S Luzon and Mindoro					III	Registered at Manila.
	17 12	N Luzon	17.5 N	121.0 E	300	250	VI-VII	Aftershock at 19 <sup>h</sup> 44 <sup>m</sup> . Registered in the Far East.
Sept. 13	1 50	Agusan Valley (Mindanao)	8.0 N	125.6 E			V	
Sept. 13	8 05	Ormoc (W Leyte)					III	
Sept. 13	19 33	W Luzon					III	Origin in the China Sea. Registered at Manila.
Sept. 14	1 37	W Luzon	14.5 N	119.6 E	350	140	IV	Registered at Manila.
Sept. 16	6 52	Laoag (NW Luzon)					III	Do.
Sept. 18	17 06	W Luzon	14.5 N	119.6 E			III	Repeated at 20 <sup>h</sup> 47 <sup>m</sup> . Registered at Manila.
Sept. 24	16 36	Butuan (N Mindanao)					IV	
Sept. 30	9 12	Guam (Mariana Islands)					II-III	
Oct. 1	7 36	Baguio (W Luzon)					II-III	Origin in the Philippine Deep.
	2 6 00	Guam (Mariana Islands)					IV-V	
Oct. 4	11 51	Eastern Mindanao					III-IV	
Oct. 5	3 23	Cape Bojeador (NW Luzon)					III	
Oct. 5	16 38	Baguio (W Luzon)					II-III	Origin in Nueva Vizcaya. Registered at Manila.

## Catalogue of Philippine earthquakes, 1916—Continued.

Date.	Time of occurrence (Greenwich mean time).	Place.	Probable origin or epicenter.		Approximate extension of the shaken area.		Intensity (Rossi-Forel).	Remarks.
			$\phi$	$\lambda$	Longer axis.	Shorter axis.		
	<i>h. m.</i>		$^{\circ}$	$^{\circ}$	<i>Km.</i>	<i>Km.</i>		
Oct. 5	21 18	Butuan (N Mindanao) .....					III	
9	4 49	Butuan (N Mindanao) .....					III	
10	14 32	Panay Island .....					III-IV	Registered at Manila.
10	17 40	Cuyo Islands .....					IV	
17	21 37	Capiz (N Panay) .....					III	
19	17 08	NW Luzon .....					II-IV	Do.
21	17 32	S Luzon .....					IV	Repeated at 18 <sup>h</sup> 28 <sup>m</sup> . Origin near the Taal Volcano. Registered at Manila.
26	1 38	NE Mindanao .....	9.8 N	126.8 E			IV	Registered at Manila.
26	18 20	Guam (Mariana Islands) .....	13.0 N	139.7 E			II-III	Registered in the Far East.
28	3 30	NE Mindanao .....	9.8 N	126.8 E			III-IV	Registered at Manila.
Nov. 1	20 32	Bolinao (W Luzon) .....					III	Origin in the China Sea. Registered at Manila.
12	0 36	Guam (Mariana Islands) .....	13.0 N	140.0 E			III-IV	Registered in the Far East.
13	11 54	Calapan (NE Mindoro) .....					IV	Registered at Manila.
15	18 11	Samar and Leyte Islands .....	11.5 N	126.4 E			IV-V	Do.
17	12 10	Samar Island .....					III	
23	0 02	Borongon (E Samar) .....					II-III	
30	11 54	NE Mindanao .....			150	100	IV-V	Origin Butuan Bay.
Dec. 5	15 22	Cape Bojeador (NW Luzon) .....					III	Registered at Manila. Origin in the China Sea.
6	18 36	Eastern Mindanao .....					II-III	Origin off the eastern coast. Registered in the Far East.
10	13 48	Guiuan (SE Samar) .....					III	
12	14 26	E Mindanao .....					II-III	Origin off the eastern coast. Registered at Manila.
24	13 37	E Mindanao .....					II-III	Origin off the eastern coast. Registered at Manila.



## TABLE OF CONTENTS.

[Numbers refer to page.]

Introduction .....	Page. 3
Introducción .....	5

	Jan- uary.	Feb- ruary.	March	April.	May.	June.	July.	Aug- ust.	Sep- tember.	Octo- ber.	Novem- ber.	Decem- ber.
Meteorological Bulletin by Rev. José Coronas, S. J.:												
General weather notes.....	9	45	65	85	107	135	153	173	195	219	237	259
Depressions and typhoons.....	10	46	66	86	108	136	154	174	196	220	238	260
Notas generales del tiempo.....	20	47	67	90	113	137	156	177	200	222	242	261
Depresiones y tifones.....	20	47	67	90	113	137	156	177	200	222	242	261
Meteorological data for Manila.....	28	48	68	92	116	138	157	179	202	223	244	262
Meteorological data for Baguio.....	29	49	69	93	117	139	158	180	203	224	245	263
Daily rainfall at the sta- tions of the Weather Bureau.....	30	50	70	94	118	140	159	181	204	225	246	264
Maximum and minimum temperatures at the sta- tions of the Weather Bureau.....	32	52	72	96	120	142	161	183	206	227	248	266
Seismological Bulletin by Rev. Miguel Saderra Masó, S. J.:												
Earthquakes felt in the Philippines.....	37	57	77	101	125	147	165	187	211	231	253	271
Records of the microseis- mographs.....	39	58	78	102	126	148	166	188	212	232	253	271
Temblores de tierra sen- tidos en Filipinas.....	41	61	81	104	128	150	168	190	215	234	255	273

Appendix to the Monthly Bulletin for 1916.....	Page. 281
Annual Summary of meteorological data for Manila.....	283
Catalogue of the Philippine earthquakes, 1916.....	284

### SPECIAL DISCUSSIONS.

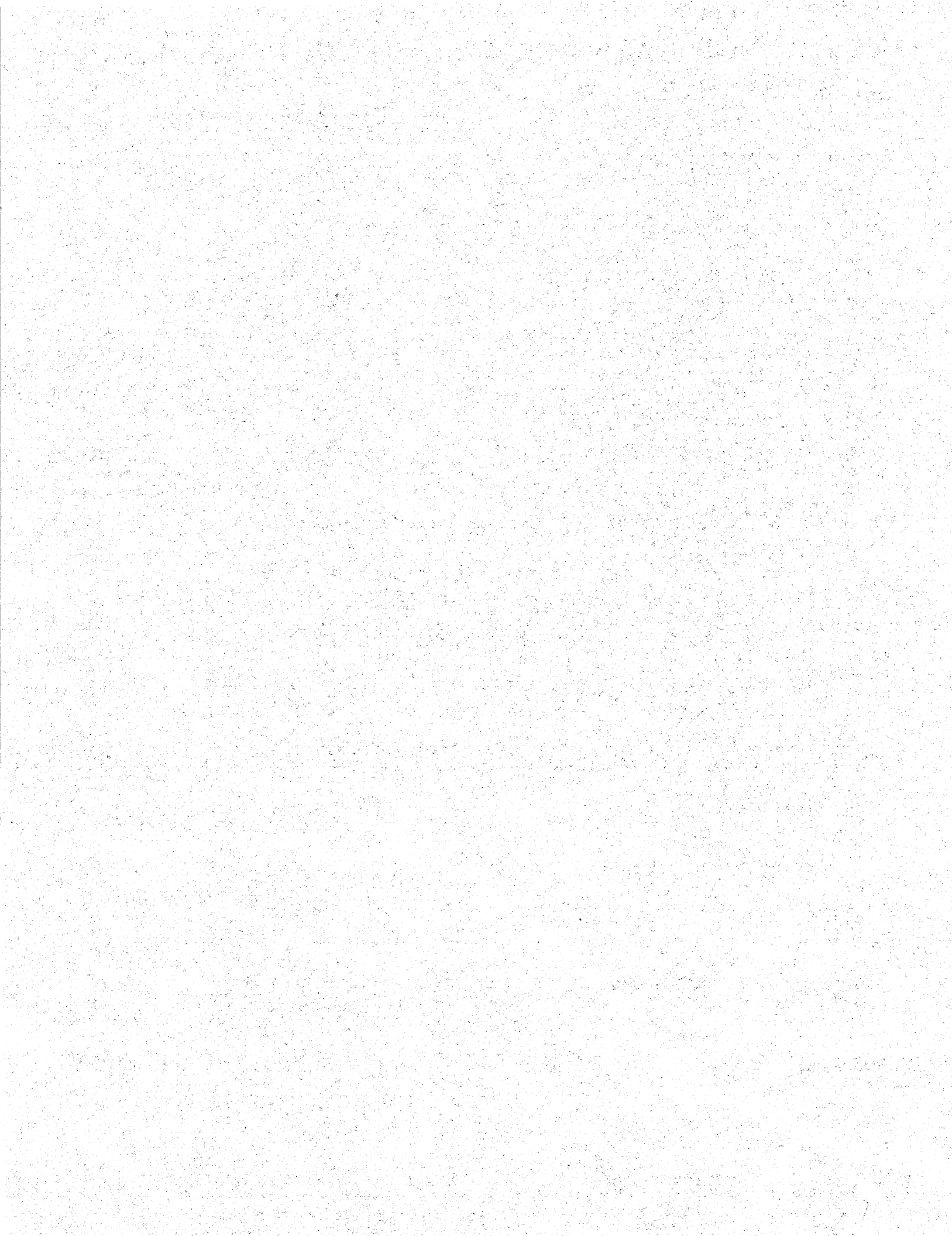
The typhoon of Biliran and northern Leyte; January 10 to 16, 1916, by Rev. José Coronas, S. J..	11
El tifón de Biliran y N de Leyte; 10 a 16 de enero, 1916 .....	20
Extraordinary floods in Mindanao, January, 1916, by Rev. José Coronas, S. J.....	15
Extraordinarias inundaciones en Mindanao, enero, 1916 .....	23
Seismographic records of Butuan, Mindanao, by Rev. Miguel Saderra Masó, S. J.....	129
Registros seismográficos de Butuan, Mindanao .....	131
Volcanic Notes, 1916, by Rev. Miguel Saderra Masó, S. J.....	274
Notas volcánicas, 1916 .....	277

## LIST OF ILLUSTRATIONS.

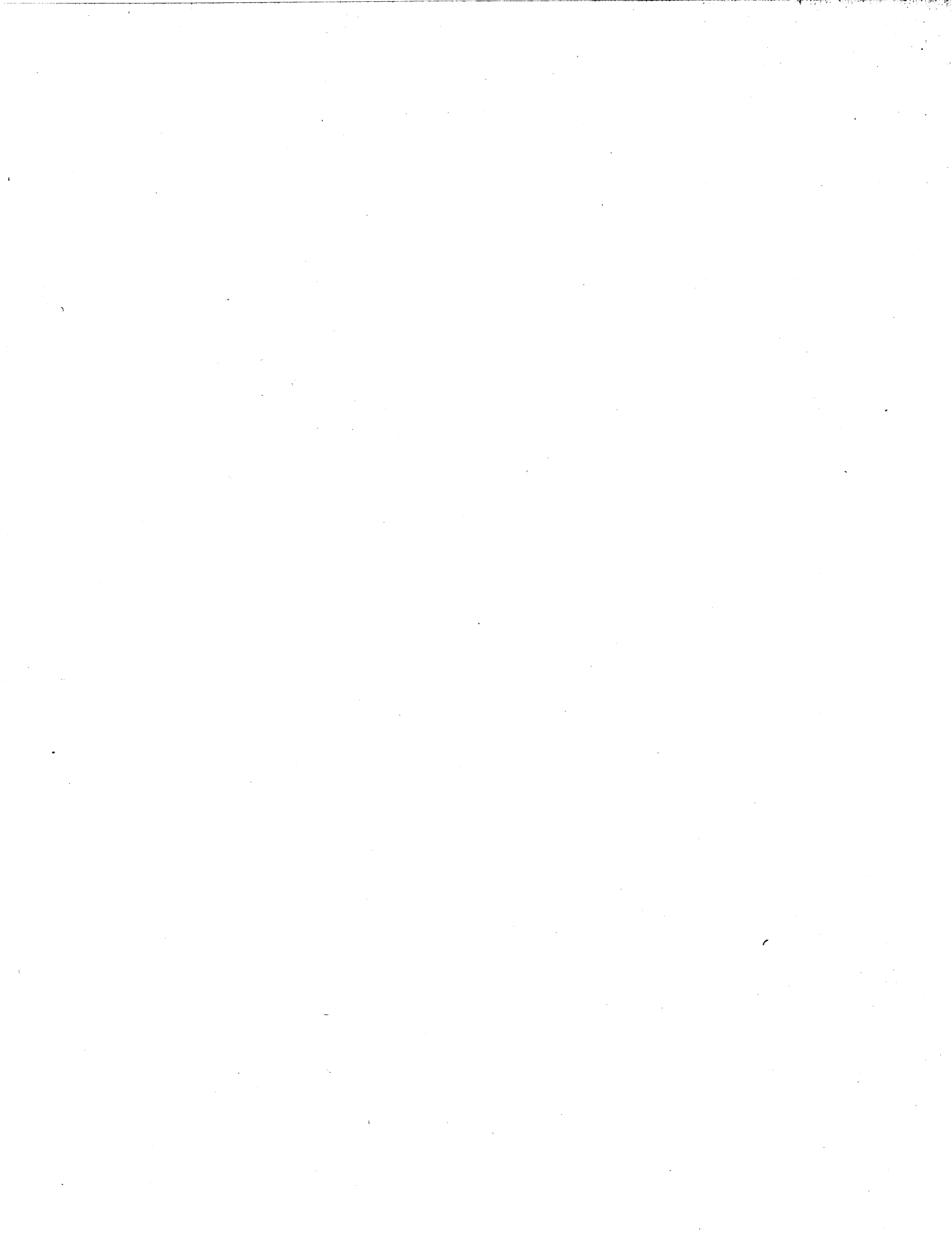
---

	Page.
Approximate tracks of the typhoons and depressions, January, 1916 .....	12
Isobars for the typhoons of January 14 to 16, 1916 .....	14
Approximate tracks of the typhoons and depressions, February and April, 1916.....	88
Isobars for the typhoon of April 17 and 18, 1916 .....	89
Approximate tracks of the typhoons and depressions, May, 1916 .....	110
Approximate tracks of the typhoons and depressions, June and July, 1916.....	155
Approximate tracks of the typhoons and depressions, August, 1916 .....	175
Approximate tracks of the typhoons and depressions, September, 1916 .....	197
Isobars for the typhoon of September 4 to 7, 1916 .....	198
Approximate tracks of the typhoons and depressions, October to December, 1916 .....	239

















**BOUND**

**AUG 25 1949**

**UNIV. OF MICH.  
LIBRARY**



