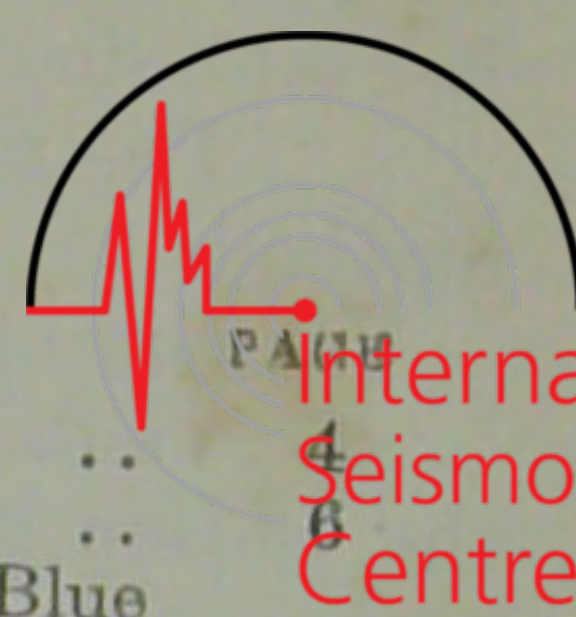


## REPORT OF THE SUPERINTENDENT OF THE OBSERVATORY.

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## ADMINISTRATION.

*Staff.*—On June 5 I returned from home leave, relieving Mr. D. T. E. Dassanayake, the Acting Superintendent, who reverted to his substantive post of Assistant Astronomer.

The vacancy in the Junior Technical Grade remained unfilled, while the two Third Grade Surveyors, who had been temporarily attached to the Observatory during the previous year, continued to work here throughout this year.

Owing to retrenchment, the strength of the clerical staff was reduced by one.

*Buildings.*—There were no extensions to the buildings during the year.

## TIME WORK.

The astronomical activities of the Observatory were mainly limited to time work.

The clocks were rated by regular observations of the Bordeaux and Rugby vernier time signals, and the Cooke micrometer transit was not used during the year.

The behaviour of the clocks continued to be satisfactory. The cord of Cooke mean-time clock snapped on January 7. A new cord was supplied, and the clock restarted the same day. Sidereal 72 was taken down on June 12 for cleaning, and restarted next day with a new cord. To reduce the time spent in taking clock comparisons, sidereal 70 was converted to a mean-time clock on June 26. An electric contact was fitted to this clock. Owing to the small margin of power available, this gave trouble for some time, but was finally made satisfactory. Dent mean-time clock was dismantled on December 5 for a general overhaul. It was set going again on December 20.

The Synchronome master clocks continued to be in use for calibrating the seismograph, and for dials in various parts of the building.

*Time Ball and Synchronization.*—The time ball at the Flagstaff Station was dropped at 09.00 Ceylon Standard Time (0330 G.M.T.) on all days, inclusive of Sundays and public holidays.

There were no failures during the year. The working of the time ball involves co-operation between four departments, Survey (Observatory), Telegraph, Harbour Engineer's, and Master Attendant's, and my thanks are due to those officers of the other departments concerned who have co-operated to obtain so satisfactory a result.

Synchronizing signals were sent daily to the Central Telegraph Office, whence a further distribution of time signals was made throughout the Island. These were sent from the Observatory at 07.55 and 15.55 on ordinary week-days, at 07.55 only on Saturdays and public holidays that are not post office holidays, and at 08.54 on Sundays and post office holidays. A test measurement is made immediately after the setting signal, which enables the officer on duty at the Observatory to verify that the setting signal has done its work satisfactorily, and if necessary to report any defect by telephone.

The clock in the lighthouse at the corner of Chatham street and Queen street was synchronized daily at 09.00, its relay being in series with the time ball circuit. At noon and at certain other times the strike of this clock is included in the broadcasting programme as a time signal.

The broadcast of the strike at noon is checked daily at the Observatory, and the error noted. The great majority of these checks gave errors of less than 4 seconds. The largest errors were 26½ seconds and 15 seconds. The clock stopped on one occasion, on the morning of December 21, after having been given a running overhaul during the previous two days. It was restarted the same morning, and gave no further trouble.

*Issue of Wireless Time Signals.*—These were sent out twice daily, in the old International or "Onogo" code, from the Welikada Wireless Station. The morning signal is from 11.27–11.30, Ceylon Standard Time, (0557–0600, G.M.T.), on 130 kc/s (2300 metres), C.W., and the evening one from 22.27–22.30 (1657–1700, G.M.T.) on 500 kc/s (600 metres), I.C.W. There is no curtailment on Sundays or public holidays.

In the case of a failure or erroneous signal, the words "time signal failed" are sent out in Morse immediately afterwards.

Details of the apparatus and procedure are given in the 1930 and previous reports.

In 1933 there were 727 successful signals out of a possible 730. Two failures were due to troubles developing in the transmitting gear at Welikada Wireless Station, and one to a failure of power at that station. The number of failures, 3, is the smallest recorded since these signals were started.

As in the case of the time ball work, the wireless signals involve close co-operation with the Telegraph Department, and I am glad to take this opportunity of expressing my thanks to all concerned for the way in which they have been maintained.

*Naval Chronometers and Watches.*—At the request of the Naval authorities, Colombo Observatory took over the care of the chronometers and watches formerly kept at the Colaba Observatory, Bombay, and now functions as the chronometer depôt for the East Indies Squadron. The number of instruments normally maintained is 20.

## METEOROLOGICAL EQUIPMENT AND WORK.

The 16 main climatological stations and 3 stations established for aeronautical meteorology continued to function during the year.

At the 16 main climatological stations, observations were taken daily at 9½ hours and 15½ hours. In addition, observations were taken at 8 hours at Colombo and Nuwara Eliya and at 8 hours and 17 hours at Trincomalee, Batticaloa, and Hambantota, for transmission to India. The observations at 17 hours are used, in conjunction with values derived from the Colombo autograms, in preparing the evening wireless weather report for issue from Colombo.

Mention must also be made of the climatological stations maintained by the Rubber Research Institute at Culloden, Neboda, and by the Tea Research Institute at St. Coomb's, Talawakele, and at Passara, and the climatological station started in May at Bandirippuwa by the Coconut Research Institute. The records from these stations are sent regularly to the Observatory.



A pluviograph is maintained at Labugama by the Colombo Municipality, while the Observatory maintains another at Watawala, and a recording anemometer at Haputale, in addition to some pluviographs and recording anemometers at the main stations. There is a Robinson Anemometer at the Little Basses Lighthouse, which is maintained and read twice daily by the Lighthouse Service. A Dines pressure anemometer was installed in September on Sober Island, in Trincomalee Harbour.

The pin diagrams and other systems of checking at Colombo were continued without any marked change in methods.

One clerk of the Irrigation Department was given a course of training in meteorological work at the Observatory.

Visibility observations have been made for some time at 8 hours and 17 hours by the stations reporting to the Indian Meteorological Department. These observations are now being included in the climatological observations taken at 9½ hours and 15½ hours by all stations.

*Wireless Weather Reports.*—The chief daily weather report and forecast was prepared each morning in time to be broadcast *en clair* at noon. It subsequently appeared in the *Post Office Daily List* and in the local newspaper.

The chief material for this report was provided by the morning telegrams from 14 climatological outstations the observations at Colombo, including the morning pilot balloon flight, and such ships' messages as were available. Other sources of information were the telegram from Pamban, and the figures from stations in Ceylon that are not fully equipped climatological stations, but from which the morning measurement of rainfall is wired. These stations now number 22.

Weather reports, prepared avowedly with a view to shipping, were sent out in Morse immediately after the time signals at 11½ hours and 22½ hours. These messages deal with the immediate neighbourhood of Ceylon in more detail than can be expected in the Indian Messages, which avowedly have to summarize the outstanding features over big areas. By kind permission of the Director-General of Observatories, copies of the Indian messages are received at Colombo, and use is made of any relevant parts, but the main sources of information for the reports from Colombo are the Ceylon readings (both surface and upper air) and wireless messages received direct from ships.

The Fleet Synoptic Message continued to be sent out in the same form as in the latter part of the previous year.

The number of ships from which weather telegrams were received during the year was 400, which is slightly greater than the figure for last year (379). I am glad to take this opportunity of expressing my thanks to the various Captains and other officers concerned.

The greatest number of telegrams received from any one vessel was 103, from H. M. S. Investigator; 86 were received from ss. Badarpur, and others from which 40 and over were received included ss. Corfu, Masimpur, Rizwani, H. M. S. Enterprise, ss. Cathay, Strathaird, Marnix Van St. Aldegonde, Ormonde, and Oxfordshire.

The total number of ships' telegrams received was 3,781, a slight decrease on the number for last year (3,786). Acknowledgments were sent in all cases.

*Rain-gauges and Volunteer Observers.*—Rainfall figures appear in this report from 400 stations. These include the stations that report daily, at which the observers receive an allowance, but the great majority of them are maintained voluntarily, and I am glad to take this opportunity of thanking all who have co-operated in this work.

Seven rain-gauge stations were started during the year, and eleven were discontinued, while the rain-gauge at Kolonna was transferred to Eraporuwa. The only discontinued stations which had as many as 10 years of records were Nalanda, P. W. D. (27 years), Tonigala (21 years), and Vadamarachchi (12 years).

While it is not possible to mention all the voluntary helpers individually, I wish to put in a special word of thanks to some of those who have done a great deal more than supply monthly rainfall returns. Among these should be mentioned—Mr. R. G. Coombe (Poonagalla), for his weekly barograms and special messages on unusual weather conditions; Mr. E. E. Megget (Detanagalla), Mr. Ross Wyllie (Oakwell), Messrs. A. Pearson and O. B. Cheyne (Horakele), for sunshine charts; Mr. A. C. Tutein-Nolthenius (West Haputale), for anemometer figures and charts; Mr. C. K. Groves (Hope), for anemometer figures; Mr. E. H. Mellor (Norton Bridge and Donnybrooke), and Mr. C. Erskine (Ben Hope) for telegrams and post cards concerning heavy rain; Mr. G. Huntley (Vincit), Mr. J. A. Mudge (Theydon Bois), Mr. V. C. Baker (Keenagaha-ella), Mr. G. P. Kelly (Nilloomally), Mr. J. L. Innes-Lillington (Campion), for interesting climatological notes.

The number of daily reporting rain-gauge stations, which stood at 21 at the beginning of the year, was increased to 22 in November by the addition of Paranthan. Of these 22, 8 are estate gauges. In this connection I must express my deep regret at the death, during the year, of Mr. W. Carver, of Eheliyagoda, who co-operated by sending daily telegrams from that estate. I must express my great indebtedness to the other Superintendents concerned, Mr. W. S. Veitch (Eheliyagoda), Mr. H. A. McLaren (Geekyanakanda), Mr. R. C. H. Ellis (St. Martin's), Mr. W. S. Roper (Panilkande), Mr. J. L. Innes-Lillington (Campion), Messrs. J. A. Tate, F. L. Hemstock, and Guy M. Neave (Dunedin), Messrs. Neville Rolfe and D. H. C. Lewes (Maliboda), and Mr. H. C. Rowbotham (Yataderiya), for their ready co-operation.

An addition to the voluntary observations of special interest was the commencement, during the year, of wind observations at Horton Plains, by Mr. R. Mallaby, with a Robinson cup anemometer and wind-vane. Owing to the altitude (7,000 ft.) and position of this instrument, observations from it should be particularly interesting.

*Co-operation with the Indian Meteorological Department.*—Telegrams from Colombo and Nuwara Eliya are sent to India at 8 A.M., and from Trincomalee, Hambantota, and Batticaloa at 8 A.M. and 5 P.M. as a matter of daily routine, while extra storm warning telegrams are also sent from the four coast stations at various times, when asked for by the Indian Meteorological Department. The numbers of storm-warning telegrams sent in 1933 to Poona were:—Colombo, 18; Trincomalee, 4; Hambantota, 1; and to Calcutta;—Colombo, 48; Trincomalee, 81; Batticaloa, 93; and Hambantota, 72.

The results of the morning pilot balloon flight were telegraphed to Poona throughout the year, and to Calcutta at certain seasons. In addition, afternoon flights were wired when required, and telegrams were also sent whenever the general appearance of the morning synoptic chart showed anything worthy of such treatment.

The weather messages received from shipping were also forwarded to India, by wire if required, or if anything unusual was noted in them.

By the courtesy of the Director-General of Observatories, India, copies of all broadcasts sent by him to the Navy Wireless Station at Matara were also delivered to the Colombo Observatory. In addition copies of the daily morning telegram from Pamban were also sent here and proved of considerable value, owing to the way in which, during the north-east monsoon, strong wind often blows down the Gulf of Mannar, and so produces distinctly rougher weather between Colombo and Cape Comorin than is indicated by the shore readings at Colombo alone.

*Upper-Air Work.*—Rubber pilot balloons were in use throughout the year, the tail method of observation being used. The quality of the balloons received was satisfactory.

The total number of flights was 607 or 90 more than last year. The number reaching 5 kilometres was 58, of which 20 reached 7 kilometres. Only one balloon was followed as high as 10 kilometres, the highest altitude reached being 10.6 kilometres.



**Vertical Temperature Gradient.**—The four thermographs at the Welikada Wireless Station have been in continuous operation throughout the year, except for a week in March, while the wireless mast was being painted.

**Seasonal Correlation.**—The intermonsoon rains of March were below normal over the greater part of the Island, while in April, although excess and deficit nearly balanced, deficit on the whole predominated. Such conditions would suggest a monsoon rainfall rather above normal. Pre-monsoon temperatures were about normal. On the whole, therefore, conditions pointed to a monsoon rainfall somewhat above, or, at any rate, not appreciably below normal. The south-west monsoon rainfall was appreciably above normal.

**Kelani Flood Forecasts.**—After Dr. Bamford's retirement, in 1931, a Flood Forecasting Board was created by Government, to continue his method of forecasting heavy floods in the Colombo District from the preceding rainfall in the Kelani Valley, and to issue warnings, when necessary. This Board was composed of the Engineer or Engineers in charge of the Colombo Flood Protection Schemes, the Superintendent and the Assistant Superintendent of the Observatory.

The heavy south-west monsoon rains towards the end of May, 1933, caused a heavy flood at Colombo, of which the maximum height was successfully predicted, the computed and observed heights differing by only about  $2\frac{1}{2}$  inches.

The height of the river was also computed after various heavy rains later in the monsoon, none of which, however, were intense enough to cause even a minor flood. The maximum height recorded every time was appreciably below the computed figure. The difference can reasonably be explained by the scouring out of the bed of the river by the heavy May floods. It will be interesting to see how long it persists.

#### PUBLICATIONS.

The present report is on the same lines as its predecessors, and gives among other information rainfall figures from 400 stations. The latter part of it includes the tables that also appear in the Ceylon Blue Book. The chief change this year is the exclusion of the sun-shine figures. It is frequently difficult to get a satisfactory exposure for a sun-shine recorder, and the amount of sunshine cut off by obstructions when sun is low differs appreciably at different stations, and at different times of year. A further difficulty is the intensity of the sunshine usually experienced here, which makes the question of the interpretation of the traces given during intermittent sunshine a difficult one. Personal peculiarities of measurement among the computers have also been discovered to be appreciable. Table XX has therefore been discontinued, pending further consideration of the best method of reduction.

Routine publications have been similar to those of last year, and included daily reports in the *Post Office Daily List* and newspapers, and monthly summaries in the *Government Gazette* and the *Tropical Agriculturist*. The usual astronomical ephemeris was prepared and published in the *Ceylon Almanac*, while a new departure was the preparation of data regarding the probable first visibility of the New Moon, for a table supplied by the Ceylon Muslim League to the same publication. In this connection observations of the first visibility of the New Moon are made when the weather permits.

It must be remembered that a good many observations are made here which are not published in the report and Blue Book, owing to exigencies of space and the expense of printing. Among these may be mentioned measurements of amount of cloud, surface and under ground temperatures, evaporation, &c. Information on these points can be obtained on application to the Observatory.

A paper entitled "The Problem of River Floods and the Relation between River height and Rainfall," dealing with his investigations into flood forecasting at Colombo (see above), was read by Dr. Bamford, in December, 1933, before the Institute of Civil Engineers, and an abstract of this paper appeared as Sessional Paper 2., of December, 1933.

As in previous years, publications have been received from a number of observatories and other organizations. While their receipt has been acknowledged individually by letter, I am glad to take this opportunity of thanking the donors collectively.

#### SEISMOGRAPH.

The Milne Shaw seismograph was in use throughout the year. Only minor adjustments were needed. There were occasional losses of record, due to the cells running down, or to accidental tilting of the mirror, but loss of record this year was exceptionally small.

The coupling was maintained as before at the 250 magnification throughout, and measurements of period, damping ratio, and sensitivity were made about once a month.

The free period was maintained at 12 seconds by occasional adjustments.

The measurements of damping ratio varied usually from 1 in 14 to 1 in 22. On one occasion it was measured as 1 in 7, and on one occasion as 1 in 32. It was occasionally adjusted to a mean value of 1 in 20.

The sensitivity was usually of the order of 60 mm. per second of arc, the extreme values during the year being 33 and 88.


The list below, of 37 earthquakes, is restricted to definite shocks, and contains no reference to a number of small traces that were also recorded. The regular diurnal movement of the pillar is still a definite feature of the records.

All times are in Greenwich Mean Time.

No.	Date 1933.	P			S			L			Maximum.			End.		Amplitude.		Remarks.							
		H	M	S	H	M	S	H	M	S	H	M	S	H	M	..	MM								
January																									
690 ..	1	..	09	01	30	..	09	11	42	..	—	..	Not pronounced	10	13½	..	0.4	..	—						
691 ..	7	..	04	26	12	..	—	..	—	..	04	50	38	..	05	17½	..	1.0	..	—					
692 ..	9	..	P92	07	42	..	02	13	06	..	02	22	08	..	02	22	30	..	03	10½	..	2.5	..	—	
		PR	02	12	25																				
693 ..	15	..	18	13	29	..	—	..	—	..	18	23	11	..	18	49	..	1.0	..	—					
694 ..	21	..	19	29	36	..	19	36	20	..	19	42	35	..	19	44	10	..	21	32½	..	28.0	..	—	
February																									
695	13	..	02	56	56	..	03	05	49	..	03	14	01	..	03	14	50	..	03	40	..	1.1	..	—	
696 ..	23	eP	08	29	00	..	Elusive	..	09	12	15	..	09	30	56	..	—	..	2.4	..	—				
		iP	08	29	05																				
March																									
697 ..	2	..	17	41	55	..	17	51	—	..	18	06	—	..	18	08	—	..	22	54½	..	50.0	..	S, L, and M are given to the nearest minute as the trace is faint, due to the fast movement of the light spot	
698 ..	11	..	19	42	05	..	19	49	43	..	—	..	20	04	02	..	20	29½	..	0.5	..	—	..	—	
699 ..	17	..	16	07	35	..	16	17	30	..	16	32	26	..	16	42	43	..	17	27½	..	1.0	..	—	
700 ..	17	..	19	41	00	..	19	47	42	..	19	58	10	..	20	05	58	..	20	48½	..	2.5	..	—	
701 ..	18	..	03	22	35	..	—	..	—	..	03	47	34	..	—	..	—	..	1.0	..	—	..	—		
April																									
702 ..	19	..	06	52	48	..	06	59	08	..	07	12	46	..	07	13	30	..	—	..	1.0	..	—	..	—



No.	Date 1933.	P			S			L			Maximum.			End.	Amplitude.		Remarks.							
	April	H	M	S	H	M	S	H	M	S	H	M	S	H	M	MM.								
1703 ..	23	..	06	07	14	..	06	16	02	..	06	31	10	..	06	34	50	..	—	..	1.4	..	End lost in microseisms.	
1704 ..	27	..	02	50	09	..	Elusive	..	03	26	09	..	03	41	21	..	05	40½	..	5.2	..	—		
	May																							
1705 ..	8	..	10	54	56	..	—	..	—	..	12	12	34	..	12	46	..	0.5	..					
1706 ..	16	..	01	16	25	..	01	20	47	..	01	22	19	..	01	23	24	..	02	41½	..	5.0	..	
1707 ..	19	..	18	22	04	..	—	..	—	..	18	51	35	..	19	18½	..	0.5	..					
	June																							
1708 ..	6	..	02	36	02	..	—	..	—	..	02	56	32	..	03	15½	..	0.4	..					
1709 ..	7	..	11	52	04	..	—	..	—	..	12	11	46	..	12	32	..	0.5	..					
1710 ..	18	..	21	48	09	..	21	56	49	..	22	06	41	..	22	18	41	..	23	12	..	1.5	..	
1711 ..	24-25	..	22	00	33	..	22	05	21	..	—	..	22	14	—	..	00	46½	..	4	63	..	L could not be read, and M is only approximate, as the trace is indistinct owing to the fast movement of the light spot.	
	July																							
1712 ..	9	..	12	42	17	..	12	51	12	..	13	06	58	..	13	22	20	..	14	16	..	1.0	..	—
	August																							
1713 ..	11	..	08	59	36	..	09	04	08	..	—	..	Not pronounced	pro-	09	32½	..	<0.5	..					—
1714 ..	20	..	11	53	11	..	—	..	—	..	12	13	56	..	12	28½	..	0.5	..					—
1715 ..	25	..	07	57	09	..	08	02½	—	..	08	06	—	..	08	10	—	..	10	27	..	30.5	..	S, L, and M are given to the nearest half minute, as the time marks are indistinct owing to the overlapping of the traces.
1716 ..	28	eP	22	33	56	..	Elusive	..	23	11	45	..	23	28	13	..	—	..	4.0	..				—
	September	iP	22	38	01																			
1717 ..	6	eP	22	21	42	..	22	31	18	..	22	38	52	..	Not pronounced	pro-	23	52½	..	About				—
		iP	22	25	55																			—
1718 ..	25	..	18	59	08	..	19	09	14	..	19	21	48	..	19	25	58	..	20	31	..	1.3	..	—
1719 ..	30	..	14	31	23	..	—	..	—	..	14	56	32	..	16	23	..	0.3	..					—
	October																							
1720 ..	2	eP	15	49	29	..	Elusive	..	16	48	44	M <sub>1</sub>	17	03	51	..	18	26½	..	2.3	..			—
		iP	15	53	51	..	—	..	—	..	M <sub>2</sub>	17	14	51	..	—	..	2.5	..					—
1721 ..	5	..	13	36	35	..	13	42	01	..	13	48	12	..	13	53	59	..	14	30	..	1.5	..	—
1722 ..	23	..	13	48	23	..	—	..	—	..	13	59	44	..	14	28	..	0.4	..					—
1723 ..	25-26	..	23	47	30	..	—	..	—	..	00	50	50	..	01	22	..	0.5	..					—
	November																							
1724 ..	20-21	eP	23	35	15	..	23	46	12	..	00	09	42	..	00	15	34	..	02	22½	..	9.5	..	—
		iP	23	39	12																			
1725 ..	22	..	12	53	52	..	13	03	32	..	13	19	08	..	13	23	00	..	14	16½	..	1.0	..	—
1726 ..	28	..	11	15	59	..	11	24	05	..	11	32	05	..	11	35	21	..	12	12	..	1.3	..	—



International  
Seismological  
Centre



#### WEATHER SUMMARY, 1933.

*January.*—The rainfall was above average nearly everywhere, the excess being particularly marked on the eastern slopes of the hills, and in the districts east of these, to the coast. The rainfall of this month was comparable in intensity with that of the abnormal rainfall of January, 1913, while the geographical distribution of the precipitation was remarkably similar in the two months, in each case being definitely orographical.

The highest monthly totals recorded were 123.09 inches at Upper St. Martin's estate, and 122.20 inches on a neighbouring estate, Hendon. These are the highest monthly rainfall totals to be found in the official records of the Observatory, which, for a number of stations, go back for over 60 years. Other rainfall stations also broke their previous records for any month. The excesses above average at Upper St. Martin's and Hendon, respectively, were 87 and 86 inches, while several other stations, mainly on the north-eastern slopes of the hills, were over 40 inches above normal.

The highest daily rainfall reported was 12.50 inches, at Maha-oya, on the 6-7th. There were 19 falls of 8 inches or over in a day, and 180 of 5 inches or over, during the month.

The mean pressure for the month was below normal, while the usual pressure gradient from the north was steeper than usual, and the winds above average strength, particularly in the north and east of the Island.

Humidity and amount of cloud were both appreciably above normal, while the range of temperature was distinctly smaller than usual, day temperatures being below, and night temperatures above, their average.

*February.*—The rainfall was generally in excess in the southern half of the Island, and generally in deficit in the northern half, where several stations reported no rain at all. The January rains continued into February, but conditions became more settled towards the end of the first week, and the weather was fairly fine till about the 18th. Thunderstorms were in evidence during the last ten days of the month.

*March.*—The rainfall this month was generally in deficit in the low-country, while, up-country, excess predominated on the whole, though even in the hills a large number of stations reported deficit. Most of the rain fell during the second half of the month, and was chiefly the result of local thunderstorm activity.

*April.*—Thunderstorm activity was fairly well marked this month. Excess and deficit of rain were somewhat irregularly distributed, but deficits predominated in the north and west of the Island, and in the central hill country, while excess was the rule in the south and east.

There was a fall of hail at Ratnapura on the afternoon of the 26th.

*May.*—The rainfall was above average nearly everywhere in Ceylon, deficits being reported from only a few stations, mainly in the Eastern Province. Excess of rain was particularly well marked on the western slopes of the hills, where offsets above normal up to 40 inches and over were recorded. Padupola reported not only the greatest excess above average, 48 inches, but also the greatest total for the month, 72.18 inches. This figure has only once been exceeded at Padupola (October, 1913, 74.97 inches), during the 62 years of rainfall observations at that station, while at many stations on the lower western slopes of the hills the rainfall this month was substantially above the highest total recorded for any previous May. Other stations reporting over 60 inches were Kenilworth estate, Watawala, Theydon Bois, and Blackwater estates.

187 reports of rainfall of 5 inches or over in a day were received, of which 37 were 8 inches or over. The greatest daily fall reported was 14.45 inches, at Norton Bridge on the 21st-22nd. The great majority of these heavy falls occurred between the 21st and the 25th, when unusually intense south-west monsoon conditions prevailed over Ceylon.

The weather during the first half of the month was of the intermonsoon type, with fairly heavy local afternoon or evening rains. About the 17th, however, a definite south-westerly gradient set in across the Island. Until the 21st this gave only moderately heavy rain, but for a week after that date, and particularly up to the 25th, the south-west of Ceylon experienced exceptionally heavy falls. Watawala, near the head of the Ginigathena Pass, reported over 46 inches of rain in these 7 days, of which over 35 inches fell in the first 4 days, 21st-25th.



As a result of the heavy rains in the Kelani Valley, there were severe floods, a major flood, of practically 10 feet, being measured at Nagalagam street. For several days there were also unusually high winds and stormy conditions at sea. About the 28th, weather conditions commenced to moderate again, though there was still appreciable rain, mainly in the south-west of the Island.

Temperatures, particularly during the day, were below normal, though not usually by large amounts. Humidity and cloud were both above average. Barometric pressure was above average, while wind strength was generally below average. Wind directions were, on the whole, south-westerly.

*June.*—The rainfall of June was below normal over the greater part of Ceylon, the chief exceptions being the low-country districts to the west of the hills, while districts to the south of Batticaloa also showed slight excess. Most of the rainfall stations in the north of the Island reported no rain at all during the month.

The weather during the greater part of June was of the usual south-west monsoon type. The last few days saw the commencement of a fairly severe wet spell in the south-west of the Island.

*July.*—The rainfall this month was, on the whole, above normal. Excess was most marked in the neighbourhood of the hills, while deficits were mainly reported from the Southern and Eastern Provinces, from the Jaffna peninsula, and from the districts south and south-east of Puttalam.

Hail was reported from Mahadova on the 18th.

*August.*—The rainfall was in excess over almost the whole of Ceylon. The stations showing greatest excess were somewhat irregularly distributed over the Island, but a large number lay in the low-country to the west of the main hill-country, as far as the coast, while the southern and eastern slopes of the hills also showed some cases of marked excess. Deficit was most marked on the upper western slopes of the main hills, and was also reported from several districts of the Southern Province.

Ordinary monsoon conditions prevailed during the first half of August. From about the middle of the month, however, the monsoon winds frequently weakened, and local afternoon and evening thunderstorms developed, particularly in the dry zone, which, as a consequence, showed excess of rainfall nearly everywhere.

A hailstorm was reported at Bandarawela on the 10th, and others were reported at Haputale and Mirahawatta (near Bandarawela) during the month.

The barometric pressure was above normal in the north and east, and slightly above normal in the south and west, the usual pressure gradient from the south-west being consequently weaker than usual. Winds at the coast were appreciably below normal, except at Batticaloa, where the winds at this season are mainly local sea-breezes, and were better developed than usual.

*September.*—The rainfall for September was appreciably above normal on the western slopes of the main hill-country, and along the east coast south of Batticaloa. In the low-country in the south-west of Ceylon, it was appreciably below normal. Elsewhere offsets above and below normal were irregular, without any marked preponderance of either.

The monsoon, which had weakened during the latter half of August, with a development of local rains, began to strengthen again at the beginning of September, and heavy rain, of the south-west monsoon type, fell in the south-west of the Island. By the 6th the monsoon currents had reached some stability, and the rain fell off, being now generally light, and still confined to the south-west of the Island. These conditions continued till the last week in September, when the south-westerly gradient again weakened, and local thunderstorms gave widespread rain.

A violent local squall, or whirlwind, passed over the compound of Colombo Observatory on the night of the 11th, doing some damage to one of the buildings in the compound. The path of the disturbance must have been only a few yards in diameter, and it moved in a straight line, from W.S.W. to E.N.E., for at least  $1\frac{1}{2}$  miles.

A hailstorm was reported from Campion estate, Bogawantalawa, on the 26th.

*October.*—The rainfall of October was, on the whole, above normal in the south-west of the Island and on the western slopes of the hills, and below normal elsewhere. Appreciable deficits, however, appeared along the west coast, from Kalutara northwards, while a similar coastal strip along the east coast, from Trincomalee southwards, and districts on the north-west of the Island, were above normal. Excess of rain was particularly well marked on the western slopes of the hills. Padupola, which reported the greatest monthly total, 60.59 inches, had also the greatest excess above average, 31.92 inches, while other stations in and south of the Ginigathena Pass reported totals for the month of over 40 inches, and offsets above average of over 20 inches.

During the first half of the month, the barometric gradient was flat or weak south-westerly. The weather was generally unsettled, with widespread rain. About the 13th, under the influence of a storm in the Bay of Bengal, the south-westerly gradient strengthened, and south-west monsoon conditions temporarily reappeared, with, generally, moderate westerly or south-westerly winds, and occasional squalls. The rain was now chiefly confined to the south-west of the Island. As the storm passed out of the Bay, these conditions disappeared, and by the 23rd, weaker gradients had reappeared. These were accompanied by local afternoon or evening thunderstorms and sometimes widespread rain, conditions which continued till the end of the month.

*November.*—The rainfall this month was, on the whole, below normal. There was well marked excess on the north-eastern slopes of the hills, and in the southern districts of the Eastern Province, while deficits were most marked in the south-west of the Island, and north of the line Mannar-Anuradhapura-Kalmunai.

During the first half of the month, conditions were intermonsoonal, with weak gradients, and, generally, light winds, and thunderstorms in the afternoons or evenings. About the middle of the month, a depression in the Bay of Bengal brought dry air from the Indian mainland over Ceylon, and there was practically no rain from the 15th to the 18th, after which intermonsoonal conditions reappeared. About the 22nd, northerly barometric gradients appeared, and continued till the end of the month, while north-easterly monsoon conditions gradually set in over the Island.

A slight hailstorm was reported about midday on the 6th, at Campion estate.

*December.*—The rainfall this month was below normal nearly everywhere in Ceylon. Deficits were greatest on the north-eastern slopes of the hill-country, where the rainfall at this season is usually heaviest, but were well marked over the greater part of the Island.

Until the 11th north-east monsoon conditions prevailed, with, in general, moderate rain, which was heaviest and most widespread between the 6th and the 9th. About the 12th, a marked steepening of the barometric gradient suggested the possibility of a depression forming in the Bay of Bengal. This soon materialized, giving a steep westerly or south-westerly gradient. The storm passed out of the Bay to the Indian coast well north of the Island, but caused some fairly heavy rain and strong winds in the north and north-east of Ceylon. By the 16th, it had ceased to affect the Island, and a period of fairly dry weather set in, which lasted till almost the end of the month.

*Year.*—The rainfall for the year was nearly everywhere above normal, except in the north of the Island, and along the west coast.

H. JAMESON, D.Sc., F.Inst.P.,  
Superintendent.

Colombo, April 24, 1934.



Return of Rainfall in Ceylon during 1933, and the Means during different Periods up to 1932.

Station and Abbreviation used on Maps.	Height above Mean Sea Level.	Year.	Jan.		Feb.		March.		April.		May.		June.		July.		August.		Sept.		Oct.		Nov.		Dec.		Total for the Year		Greatest Quantity registered in any 24 hours.		
			Inches.	Days.	Inches.	Days.	Inches.	Days.	Inches.	Days.	Inches.	Days.	Inches.	Days.	Inches.	Days.	Inches.	Days.	Inches.	Days.	Inches.	Days.	Inches.	Days.	Inches.	Days.	Inches.	Days.	Inches.	Days.	
Alagalla (Al.)	1,062	1933 ( means during 22 years ..	13.96	15	4.75	6	3.23	8	7.54	8	31.25	24	10.54	26	9.56	19	8.76	17	6.70	19	24.59	20	14.29	14	2.28	6	137.45	182	6.44	May 21 to 22	
Allai Tank	20	1933 ( means during 57 years ..	5.76	8	2.23	3	5.87	7	9.66	12	9.50	10	11.00	17	7.29	12	6.03	10	7.88	11	16.32	16	13.13	15	8.98	10	103.64	131	9.82	June 24 to 25, 1911	
Alutnuwara	300	1933 ( means during 33 years ..	15.73	17	1.44	4	1.01	2	2.63	4	4.26	8	0.00	0	0.04	1	5.72	13	2.38	2	9.23	14	12.86	13	16.86	12	72.16	90	4.70	Nov. 7 to 8	
Ambalantota	15	1933 ( means during 11 years ..	8.82	9	2.46	3	2.26	3	1.99	4	2.93	4	1.36	1	1.75	2	4.18	4	4.39	5	9.12	11	15.65	15	17.98	15	72.90	77	9.11	Nov. 17 to 18, 1906	
Ambanpitiya (Am.)	663	1933 ( means during 61 years ..	38.73	25	10.10	6	7.10	5	3.30	4	9.20	9	0.00	0	2.70	4	2.51	7	2.80	3	9.62	4	18.95	17	7.96	11	112.97	95	5.60	Jan. 3 to 4	
Ambepussa (Amb.)	—	1933 ( means during 5 years ..	15.44	14	5.25	7	5.23	7	5.11	9	2.83	5	0.60	2	1.13	2	1.98	3	2.79	4	11.68	15	13.93	16	16.44	17	82.41	102	9.92	Jan. 17 to 18, 1913	
Amparai Tank	90	1933 ( means during 57 years ..	10.47	20	2.45	6	2.79	5	4.51	7	13.38	19	2.91	9	1.59	4	1.29	3	2.02	3	3.81	9	8.28	9	1.00	5	54.50	99	4.51	Nov. 26 to 27	
Anamaduwa	258	1933 ( means during 42 years ..	3.57	6	1.34	3	4.12	7	3.88	7	4.33	8	2.87	8	1.98	5	1.78	7	3.47	9	4.54	9	8.15	13	5.46	9	45.47	88	5.27	Nov. 4 to 5, 1929	
Andankulam Tank, Trincomalee	40	1933 ( means during 57 years ..	9.19	17	2.16	6	9.71	12	7.93	10	23.59	28	12.74	24	9.82	24	10.50	23	8.30	22	21.80	25	9.02	14	1.89	7	126.65	212	4.48	April 5 to 6	
Angoda Lunatic Asylum	—	1933 ( means during 2-3 years ..	3.44	6	2.04	4	6.84	10	10.81	15	10.78	16	12.75	21	8.18	17	6.77	16	8.60	16	17.48	21	13.77	17	7.19	11	109.23	169	16.65	Aug. 7 to 8, 1886	
Annfield Estate, Dikoya (An.)	4,300	1933 ( means during 45 years ..	8.83	12	3.37	5	3.40	9	7.81	10	29.28	13	6.02	28	9.21	19	9.94	15	6.24	22	21.34	25	8.80	15	1.19	7	123.02	195	4.61	Oct. 28 to 29	
Anningkanda Estate, Deniyaya	1,550	1933 ( means during 55 years ..	5.60	7	2.80	5	6.24	8	14.32	19	12.25	19	8.86	24	6.41	19	7.81	18	6.38	19	19.14	23	15.16	23	5.43	11	110.40	195	5.87	May 6 to 7, 1930	
Anuradhapura	295	1933 ( means during 63 years ..	43.46	30	6.49	10	0.49	3	6.70	7	2.90	10	4.05	5	0.90	1	7.12	13	6.37	7	4.77	18	13.79	18	10.23	17	107.27	139	6.52	Jan. 6 to 7	
Experiment	295	1933 ( means during 55 years ..	14.28	12	4.85	5	3.45	5	3.18	6	3.86	5	2.08	3	1.86	3	2.91	5	4.11	6	8.74	12	12.41	14	17.71	15	79.42	92	19.20	Dec. 7 to 8, 1881	
		1933 ( means during 63 years ..	Started in June												0.80	12	5.51	10	2.78	16	10.86	19	16.01	19	3.27	11	—	—	5.74	Nov. 10 to 11	
		1933 ( means during 42 years ..	10.50	19	0.90	6	1.05	3	4.00	8	6.13	10	0.00	0	0.09	2	4.61	12	6.42	5	10.68	13	14.17	14	7.70	10	66.25	102	5.58	Nov. 7 to 8	
		1933 ( means during 2-3 years ..	8.58	10	1.87	3	1.72	3	1.88	4	2.57	4	0.83	1	1.90	3	3.31	5	3.67	6	7.73	12	15.23	16	15.54	15	64.82	80	13.30	Nov. 18 to 19, 1904	
		1933 ( means during 45 years ..	4.61	11	1.09	4	2.48	3	2.16	5	19.72	23	10.33	16	4.91	13	12.92	16	2.17	11	—	—	—	—	—	—	—	—	—	4.61	Aug. 20 to 21
		1933 ( means during 55 years ..	2.87	4	3.82	5	2.45	7	9.14	12	25.93	21	9.11	18	5.72	11	11.38	16	5.76	16	21.49	20	14.73	18	4.58	8	116.97	157	9.69	May 3 to 4, 1931	
		1933 ( means during 45 years ..	9.67	18	1.15	8	7.00	13	5.21	12	38.55	29	11.56	26	18.18	29	11.48	25	14.07	24	16.38	23	6.92	19	1.78	10	141.95	236	6.61	May 21 to 22	
		1933 ( means during 55 years ..	3.92	10	2.23	6	6.26	12	9.31	17	9.10	17	16.17	25	15.02	26	11.50	23	10.65	21	12.59	22	9.71	18	6.04	13	112.49	211	8.79	Oct. 4 to 5, 1913	
		1933 ( means during 55 years ..	8.00	21	10.80	15	11.42	20	15.65	19	42.55	29	10.06	25	6.17	22	8.21	18	9.47	21	20.04	22	15.01	19	8.81	18	166.19	249	4.63	May 21 to 22	
		1933 ( means during 63 years ..	8.80	13	7.35	11	10.74	16	12.81	18	12.77	18	13.13	22	8.94	18	8.02	17	10.83	17	15.82	21	17.60	21	13.57	19	140.37	211	7.98	Oct. 27 to 28, 1906	
		1933 ( means during 63 years ..	10.18	17	0.69	5	1.58	4	5.12	11	10.12	22	0.61	7	1.69	6	6.54	16	4.47	9	3.89	14	9.33	17	3.19	8	57.41	136	2.74	Aug. 30 to 31	
		1933 ( means during 63 years ..	3.97	9	1.58	4	2.91	7	6.87	13	3.57	7	1.22	4	1.25	3	1.74	4	3.11	6	9.72	16	10.70	18	8.62	16	55.28	106	9.32	May 20 to 21, 1891	
		1933 ( means during 63 years ..	10.20	18	0.36	3	1.79	3	6.42	8	10.27	19	0.10	2	9.57	3	7.87	6	5.81	7	10.81	17	10.70	18	8.62	16	55.28	106	9.32	May 20 to 21, 1891	