

REPORT OF THE SUPERINTENDENT OF THE OBSERVATORY.

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ADMINISTRATION.

Staff.—I returned to Ceylon from home leave on July 11, relieving Dr. D. T. E. Dassanayake, who had acted as Superintendent in my absence. While in England, I spent a month on study leave at the London Meteorological Office.

I regret the death of Mr. J. R. R. Nathaniel, Clerk and Draughtsman, one of the meteorological observers at the Observatory, who was killed in a motor accident at Jaffna on July 28.

TIME WORK.

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

Observatory Clocks.—The clocks were rated by regular observations of the Bordeaux and Rugby vernier time signals. The Cooke micrometer transit was used only once during the year.

Mean time clock Fournier 70 stopped on June 21. It was given a complete overhaul and started again on the 24th. It gave trouble again both in August and September, requiring readjustments. The other clocks were satisfactory.

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

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 two failures during the year, the first, on March 22, due to a defect in the secondary circuit at Flagstaff, the second, on November 10, because of a mechanical defect at Flagstaff. The failure on March 22 was the first since January 31, 1937, a period of over two years.

At the request of the Master Attendant, Colombo, the time ball was discontinued from April 19 to May 2, inclusive, to enable certain necessary repairs to it to be effected.

The working of the time ball involves co-operation between four departments—Survey (Observatory), Telecommunication, Harbour Engineer's, and Master Attendant's—and my thanks are due to those officers of the other departments concerned, who have co-operated in this work.

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, when the chimes and strike of this clock are regularly included in the broadcasting programme as a time signal, the error of the clock is noted at the Observatory as a check. The chimes and strike are also included in the broadcasting programme at other times, chiefly at 11.00 and 20.00.

The error at noon was usually not more than one or two seconds. The largest noon errors were 9 seconds and 6 seconds. The wire ropes for the weights were replaced on November 21, and the clock was given a running overhaul next day.

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 18.57–19.00 (1327–1330, G. M. T.) on 500 kc/s (600 metres), C. W. There is no curtailment on Sundays and Public Holidays.

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

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

In 1938 there were 728 successful signals, out of a possible 730. On September 19 the morning signal was inadvertently missed by the officer on duty, and on September 23 the morning signal was cancelled because of a fault at the wireless station, which caused the emission to be irregular. The fault on September 19 was the first for over 15 months.

As in the case of the time ball work, the wireless signals involve close co-operation with the Telecommunication 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.—Colombo Observatory continued to function as the chronometer depot for the East Indies Squadron.

METEOROLOGICAL EQUIPMENT AND WORK.

The 16 main climatological stations and the 3 stations established for aeronautical meteorology continued to function throughout the year. All outstations, except Mannar (which, since 1937, has been staffed by whole-time observers, Surveyors seconded from the Survey Department), are staffed by part-time observers, usually Government clerks, who are paid an allowance for this work.

As a measure of retrenchment, the 3 stations for aeronautical meteorology, Tabbowa, Ridiyagama, and Chilaw, which were only established as temporary stations, were closed down at the end of the year. Tabbowa and Ridiyagama continued, however, as monthly reporting rainfall stations, while Chilaw continued to report current weather observations for the Colombo-Madras air-line, and daily rainfall to Colombo.

At the 16 main climatological stations maintained by the Observatory, observations were taken daily at 9½ and 15½ hours, the former observations being wired to Colombo by all the outstations except Hakgala. At four meteorological stations, maintained by the Rubber Research Scheme at Dartonfield, Agalawatta, by the Tea Research Institute at St. Coomb's, Talawakele, and at Passara, and by the Coconut Research Scheme at Bandirippuwa, observations are taken daily at the same hours, the Observatory receiving copies of the records at the end of each month, and exercising a general supervision over the work. From June 1, 1934, it was arranged that three of these stations, Dartonfield, St. Coomb's, and Bandirippuwa, should wire the morning observations to Colombo, for the morning weather report. I must express my indebtedness to the Directors of the Institute concerned, for their ready co-operation in this matter.

Observations were also 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.

In connection with the new Madras-Colombo air-mail service, the meteorological station at Mannar continued to supply pilot-balloon observations, usually twice a day. The pilot-balloon observations at Colombo continued to be taken, also generally twice a day. Current weather observations were made at Colombo, Chilaw, Puttalam, and Mannar, at 08.00 on days of northward mail-planes, and at 10.00 on days of southward flights.

An auxiliary meteorological station is maintained in the Fort area, Colombo, and a Dines pressure anemometer at the Pilot Station in Colombo Harbour. 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. There is a Dines pressure anemometer on Sober Island, in Trincomalee Harbour, in addition to the climatological station at Fort Frederick, Trincomalee.

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

A course of training in meteorological work was given to one clerk of the Survey Department, while an officer from the Rubber Research Scheme and three Minicoy lighthouse keepers also received short courses of instruction.

Raingauges and Volunteer Observers.—Rainfall figures appear in this report from 484 stations, a figure which includes the principal meteorological stations. This represents an increase of over 10 per cent. on the previous year. The greater part of this increase was due to new rainfall stations started at the request of the Medical Department. Forty-seven stations were started during the year, while 3 stations were discontinued, all unfortunately, with fairly long records; Kala-oya, 27 years; Diyatalawa, Public Works Department, 22 years; Bandaragama, 17 years.

A large number of these stations are maintained voluntarily, by planters and other volunteer observers, while at most of the others, observations are taken by minor Government employees who receive no allowance for this work. I am glad to take this opportunity of thanking all who have co-operated in these observations.

While it is not possible to mention all the voluntary observers individually, I wish to put in a special word of thanks to some who have supplied other useful meteorological data. Among these may be mentioned:—Mr. R. G. Coombe (Poonagala) for his weekly barograms; Messrs. E. E. Meggett and K. Arden (Detanagalla) for sunshine charts and graphs, wind observations and anemograms, humidity and temperature graphs; Messrs. Ross Wyllie and R. H. Duncombe (Oakwell) and A. Pearson (Horakele) for sunshine charts; Mr. G. R. B. Williams (Hope) for wind observations; Messrs. G. Huntley (Vincit), J. M. Hodgson (Theydon Bois), G. P. Kelly (Nilloomally), and F. A. Bourke (Campion) for interesting notes.

The number of stations which report rainfall daily was increased to 42 during the year, by the addition of 3 of the 4 meteorological stations that are maintained by agricultural research institutes. Of the stations reporting rainfall daily, 9 are estate rain-gauges. I must express my great indebtedness to the Superintendents concerned, Mr. F. A. Bourke (Campion), Mr. B. Gordon Graham (Dunedin), Mr. W. S. Veitch (Eheliyagoda), Messrs. H. A. F. Mc Laren and H. A. Mc Laren (Geekiyanakande), Mr. A. J. Mc Kee (Maha Uva), Mr. R. Neville Rolfe (Maliboda), Messrs. M. H. Villiers and W. S. Roper (Panilkande), Messrs. A. B. Gault and R. C. Haworth Price (St. Martin's) and Messrs. H. C. Rodale and A. D. Dewar (Yataderiya), for their ready co-operation.

Weather Reports for Aviation.—On the mornings on which north-bound mail planes were due to leave Colombo Air-port (at 9 hours), reports of upper-winds at Colombo and Mannar, and current weather observations at 8 hours from Colombo, Chilaw, Puttalam, Mannar, and, between October and May, Pamban, were wired to Colombo Airport for the information of the pilots. The information from outstations was also wired to Poona and to Colombo Observatory. On days when south-bound mail planes were due at Colombo, reports of upper winds at Colombo and Mannar, and current weather reports at 10 A.M. at the same four Ceylon stations, were wired to Trichinopoly, the information from outstations being also wired to Poona and Colombo Observatory. From these observations, the 9½ hours observations from Ceylon stations, and upper wind observations from Indian stations, a route report and forecast for the Ceylon portion of the air-route was despatched to reach Trichinopoly before 11.50 A.M. On the nights before north-bound mail plane flights from Colombo, a forecast for the route Dhanushkodi-Madras, and a general inference for the route Colombo-Dhanushkodi, based on the Indian evening synoptic chart, were wired by the Indian Meteorological Office, Poona, to Colombo Observatory, and these were wired to Colombo Airport next morning. Upper wind reports from Madras and Trichinopoly, and current weather reports from Trichinopoly, were sent each morning to Colombo Observatory and to Colombo Airport.

This service of reports and forecasts for mail-planes started on January 29, with two planes each way a week. In February the number of planes was increased to four, and in August to five, a week.

Special reports and forecasts were given, on request, for occasional other flights. These included the flight of R.A.F. flying boats from Penang to Trincomalee in December, for which a temporary pilot balloon station was established at the latter place.

A short weather report and forecast for airmen was prepared daily, with the Daily Weather Report, and wired to Colombo Airport.

Other Weather Reports.—A Daily Weather Report, with a forecast, was prepared each morning in time to be broadcast *en clair* at noon. This subsequently appeared in the *Post Office Daily List* and in local newspapers.

The material for this report was mainly provided by the morning telegrams from 14 meteorological stations (increased in June to 17), the surface observations at Colombo, the morning pilot balloon observations from Colombo, Mannar, and certain Indian stations, and such ship's messages as were available. Other sources of information were a telegram from Pamban, and the figures from outstations in Ceylon that are not fully equipped climatological stations, but from which the morning measurement of rainfall was wired.

Weather reports for ships were sent out in Morse, from the Colombo Wireless Station, immediately after the time signals and on the same wave-lengths, at 11½ hours and 19 hours, while extra weather reports were occasionally sent out in Morse at 22½ hours, whenever the state of the weather made much reports desirable. These reports deal with the immediate neighbourhood of Ceylon in more detail than can be expected in the Indian inferences, which have to summarize the outstanding features over large areas. Copies of the Indian inferences were received at Colombo, and use was made of any relevant parts.

Observations from Ceylon meteorological stations at 8 hours and 17 hours were included in the Indian Fleet Synoptic Messages, which were broadcast from the Naval Wireless Station at Bombay at 11.30 and 21.40, I.S.T.

An inference for the Ceylon area was supplied to Matara Wireless Station, to be broadcast with the Indian inferences sent out from that station at 15.24. In October, Colombo Wireless Station took over these broadcasts from Matara.

By courtesy of the Ceylon Telecommunication Department, copies of the morning Indian Fleet Synoptic Messages were supplied to the Observatory on week-days. These were not received in time to be used for the morning weather report, but were used for the evening report, together with the 17 hours observations from certain Ceylon stations, ship's telegrams, and the afternoon upper wind report from Mannar.

The monthly climatological broadcast was continued throughout the year.

The number of ships from which telegrams were received during the year was 314, which is appreciably lower than the figure for last year (372). The number of telegrams was also appreciably lower, 3,482 as against 3,929 in 1937. 122 telegrams were received from ss. Marnix van St. Aldegonde, and 113 from ss. Baloran, while other ships from which 40 or more telegrams were received were ss. Potsdam, Gneisenau, H.M.S. Investigator, ss. Jaladuta, Scharnhorst, Johan van Oldenbarnevelt, Jalaputra, and Shwedagon. Acknowledgments were sent in all cases.

A new departure was the institution of a system of weekly weather reports. The Medical Officer in charge of the Malaria Control Scheme of the Ceylon Estates Proprietary Association desired a greater amount of current rainfall information than was available in the daily weather reports. The matter was discussed with him, and it was agreed that weekly reports from a number of other stations would serve his purpose. Twenty-three stations were selected by him, and, since December, weekly reports of rainfall are now being received fairly regularly from these stations. Copies of these figures are also supplied to the Government Malariologist.

Co-operation with the Indian Meteorological Department.—Co-operation in connection with the Madras-Colombo air route has been described above. Weather telegrams from Colombo and Nuwara Eliya are sent to India at 8 hours and 15½ hours, and from Trincomalee, Hambantota, and, during certain seasons, from Batticaloa, at 8 hours and 17 hours, as a matter of daily routine, while extra storm warning telegrams are also sent at various times, when asked for by the Indian Meteorological Department. The number of storm warning telegrams sent in 1938 to Calcutta were:—from Colombo, 11; from Trincomalee, 27; from Hambantota, 11; and from Batticaloa, 10; while 7 telegrams were sent to Poona, all from Colombo.

The results of the morning pilot balloon flights at Colombo and Mannar, and, since February, of the afternoon flight at Mannar, are wired to Poona regularly. The morning flight at Colombo is wired to Rangoon regularly, and to Calcutta at certain seasons. In addition, afternoon flights at Colombo were wired to India on special request.

By arrangement with the Ceylon Telecommunication Department, all weather telegrams received by them from ships, whether addressed to Colombo, Poona, or Calcutta, are dealt with in the same way. At certain seasons of the year, they are forwarded direct to Poona, and copies are sent to the Observatory. For the rest of the year, they are forwarded to the Observatory, and from there sent to Calcutta or Poona, by letter or wire, at the discretion of the staff. During this latter period, selections of ship's telegrams from the Ceylon area, for the Fleet Synoptic Message, are made at Colombo, and transmitted to Bombay Naval Wireless Station twice a day.

By courtesy of the Director General of Observatories, India, copies of the daily morning telegram from Pamban are sent here, and are of considerable value, chiefly 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 generally indicated by Ceylon coastal observations. By courtesy of the same officer, upper wind telegrams have been received daily from Trivandrum since October, in addition to the upper wind telegrams from stations on the Madras-Colombo air route.

Special Warnings.—If the weather seems unsettled or suspicious, warnings by telegraph or telephone are given to the Royal Naval Dockyard, Trincomalee; the Naval Office, Colombo; the Master Attendant, Colombo, and the Assistant Master Attendant, Galle; the Urban District Council, Negombo; the Fisher Mudaliyar, Colombo; the Railway; and the Office of the Flood Scheme.

Information to Artillery.—Surface meteorological readings and information as to upper winds and temperatures at Colombo and Trincomalee were supplied to the Royal Artillery and the Ceylon Garrison Artillery, on request, for use during artillery practices.

Upper Air Work.—Observations of upper winds were made with pilot balloons, generally twice a day, at Colombo and Mannar. The tail method of observation was used. The quality of the balloons received was satisfactory. These balloons are kept in cold storage until required.

The morning flights, both at Colombo and Mannar, are generally limited, in order to allow the results to be computed in time for the mail-plane. At Colombo the total number of balloons observed was 719, the number of balloons reaching 5, 7, and 10 kilometres, respectively, being 105, 37, and 12, while the greatest altitude attained was 15.1 kilometres. At Mannar the total number of flights was 707, the number of balloons reaching 5 and 7 kilometres, respectively, being 35 and 6, while the greatest altitude attained was 8.6 kilometres.

Vertical Temperature Gradient.—The four thermographs at the Welikade Wireless Station were in continuous operation throughout the year.

Extension of the Ceylon Meteorological Service.—This matter is still under consideration.

Miscellaneous Inquiries.—As usual, a large number of inquiries were answered, personally, by telephone, or by letter, from other Government Departments, public institutions, and individuals. These dealt mainly with rainfall or other aspects of the climatology of Ceylon.

MISCELLANEOUS.

Kelani Flood Forecasts.—During 1938, there were no floods in this river reaching major or minor flood level at Colombo.

PUBLICATIONS.

The present report is on the same lines as last year. The average monthly totals of those rainfall stations whose records reached a length of 10 years in 1938 were reduced to the standard period, 1911–30, by comparison with neighbouring *réseau* stations.

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*. Copies of the latter are also supplied to the newspapers. The usual astronomical ephemeris was prepared and published in the *Ceylon Almanac*, and a table of the dates of probable first visibility of the New Moon was prepared for the Ceylon Muslim League, to appear in the same publication. Occasional observations of the first visibility of the New Moon were made, for the purpose of this table. The times of rising and setting of the sun and moon at Colombo were supplied daily to local newspapers.

It must be remembered that 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 underground temperatures, evaporation, &c. Information on these points can be obtained on application to the Observatory.

A paper entitled "Thermal Diffusivity of the Soil at Colombo Observatory", by Dr. J. P. Andrews, formerly Professor of Physics at University College, was published in the Philosophical Magazine. This contained an analysis of the data contained in a paper by Mr. A. P. Kandasamy, "Underground Temperatures at Colombo Observatory" which appeared in the Ceylon Journal of Science in 1937.

As in previous years, publications have been received from a large 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 was some loss of record, mainly due to trouble with the clocks.

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.

With occasional adjustment the damping ratio remained generally in the neighbourhood of its mean value of 20 : 1; extreme values were 12 : 1 and 30 : 1.

The sensitivity was usually of the order of 60 mm. per second of arc, the extreme values during the year being 55 and 62.

The list below, of 108 earthquakes, is restricted to definite shocks, and does not contain a number of small traces that were also recorded. The regular diurnal movement of the pillar is still a definite feature of the records.

Slight earth-tremors are occasionally felt by people in Ceylon. A tremor felt on September 11 (No. 2146 in the list below) is of interest, as being probably the most severe experienced here for at least some decades. This is the only shock that has ever put the Colombo seismograph out of action.

The instrumental record commenced at 03.54.20 (Ceylon Standard Time), the coupling of the mirror being thrown out of action about half a minute later. The shock was felt over the greater part of Ceylon, particularly in the south-west, by ships at sea to the west of Ceylon, and at many places in South India. Only a few slight cases of structural damage were reported, cracks in walls or pillars (probably cracks in the plaster), plaster dislodged, tiles shifted or fallen.

All times in the table below are in Greenwich Mean Time.

No.	Date	P									S									L									Maximum.			End.		Amplitude.		Remarks.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
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No.	Date 1938.		P			S			L			Maximum.			End. Amplitude.			Remarks.										
			H	M	S	H	M	S	H	M	S	H	M	S	H	M	MM											
May.—contd.																												
2123	..	12	..	15	50	06	..	15	59	24	..	16	09	48	..	16	16	51	..	19	45½	12.5	..	—				
2124	..	12	..	21	31	44	..	—	..	—	..	22	00	12	..	23	06½	..	..	23	06½	0.2	..	—		
2125	..	14	..	12	09	51	..	—	..	—	..	Not pro- nounced			..	13	22½	..	<0.5	..	S and L unreadable owing to overlapping trace.			International Seismological Centre				
2126	..	19	..	P	17	16	08	..	17	22	03	..	17	28	08	..	17	32	48	..	20	59½	..		about 105	M wave cut off on east side by lens frame.		
2127	..	23	..	(PR?)	17	18	15	..	07	37	28	..	07	49	51	..	07	58	51	..	—	..	29.0	..	E lost in the beginning following shock.			
2128	..	23	..	..	08	29	31	..	08	35	14	..	08	43	50	..	08	47	22	..	12	12	..	4.6	..	The P waves of this shock are superimposed on the diminishing end waves of preceding shock.
2129	..	30	..	..	14	42	57	..	14	53	32	..	15	10	—	..	15	21	51	..	17	28	..	0.8	..	L to the nearest minute only.
June																												
2130	..	9	..	eP	19	23	47	..	19	30	48	..	19	40	05	..	19	44	31	..	21	21	..	6.0	..	—		
			..	iP	19	23	49	..	(SR?)	19	34	24	..	..	..	..	..	..	..	..	..	..	..	..	..	—
2131	..	10	10	02	03	..	(S?)	10	09	08	..	(L?)	10	16	33	..	10	31	43	..	13	01½	..	5.9	..	—
2132	..	16	..	..	02	24	20	..	02	31	36	..	02	42	00	..	02	46	12	..	05	16½	..	10.0	..	—
2133	..	20-21	..	eP	23	57	37	..	00	03	04	..	00	10	49	..	00	12	34	..	02	03½	..	12.3	P uncertain owing to gradual emergence from micro-seisms.	
			..	(SR)	00	06	01	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	—
2134	..	23	..	..	13	19	04	..	—	..	—	..	Not pro- nounced			..	14	43	..	..	14	43	..	about 0.5	..	—
July																												
2135	..	12	..	..	08	56	28	..	—	..	—	..	—	..	..	09	15½	..	<1.0	..	S, L, M, not distinguishable.			..	—	
2136	..	29	..	..	13	11	10	..	(S?)	13	15	03	..	—	..	Not pro- nounced			..	14	43	..	about <0.5	..	..	—
August																												
2137	..	16	..	..	04	32	36	..	04	36	28	..	04	41	28	..	04	43	47	..	06	31	..	25.0	..	—
2138	..	18	..	..	09	35	26	..	?	..	?	..	?	..	?	..	10	53	..	?	..	Unclassifiable phases at 09h. 36m. 37s. 09h. 39m. 48s. with a recorded maximum wave of amplitude 5.8 mm. at 09h. 40m. 01s. The succeeding waves are more like S waves, and their amplitudes are of the order of 1 to 2 mm.			..	—
2139	..	25	..	..	01	33	26	..	01	37	56	..	01	40	00	..	01	45	46	..	03	40	..	12.1	..	—
2140	..	29	..	..	?	..	..	15	37	03	..	15	44	59	..	15	54	04	..	16	49	..	1.3	..	..	P between 15h. 29m. 59s. and 15h. 30m. 29s.
2141	..	30	..	..	12	00	23	..	12	09	04	..	12	35	45	..	12	40	02	..	13	29½	..	<0.5	..	Wave of longest period taken for M.
September																												
2142	..	7	..	..	02	02	57	..	02	09	47	..	Indefinite			..	02	19	30	..	02	40	..	<0.5	..	M not pronounced. Wave of longest period read.
2143	..	7	..	..	04	11	23	..	04	18	09	..	04	28	39	..	04	32	07	..	05	55½	..	4.0	..	—
2144	..	7	..	..	13	09	54	..	—	..	—	..	—	..	..	14	13	..	<0.3	..	S, L, M, indefinite.			..	—	
2145	..	9	—	—	..	09	34	46	..	09	37	18	..	09	55½	..	09	55½	..	1.0	A very unusual trace; P and S not discernible, but very well defined L waves commence abruptly.	
2146	..	10-11	..	..	22	24	10	..	—	..	—	..	—	..	—	..	00	23½	..	?	..	Thrown out of action at 22h. 24m. 30s. Set recording again at 22h. 51m. This earthquake was felt in Ceylon and in South India, and at sea to the west of Ceylon.			..	—
2147	..	21	..	..	19	02	23	..	19	10	50	..	19	23	05	..	19	32	20	..	20	10½	..	0.5	..	—
2148	..	23	..	(P?)	01	05	21	..	(iS?)	01	06	38	..	—	..	—	..	01	38½	..	?	..	The P waves are of small amplitude, and distinguishable from the micro-seisms only by their very small period. The iS waves commence abruptly with waves of very small period, and of amplitude about 1.5 mm. The period increases rapidly, and the amplitude dies away as fast.			..	—	
2149	..	27	..	..	02	39	06	..	02	45	27	..	02	50	07	..	02	53	32	..	03	40	..	0.5	..	—
October																												
2150	..	7	..	eP	00	56	53	..	—	..	—	..	01	20	04	..	01	34½	..	..	01	34½	..	0.3	..	—
2151	..	7	..	..	06	14	52	..	—	..	—	..	06	42	09	..	07	10½	..	..	07	10½	..	0.3	..	—
2152	..	7	..	..	16	27	03	..	—	..	—	..	16	55	14	..	18	12	..	..	18	12	..	0.7	..	—
			..	?	16	30	55	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	—
2153	..	10	..	..	20	56	38	..	21	03	21	..	21	13	48	..	21	15	11	..	23	04	..	12.0	..	—
2154	..	11	..	eP	00	20	20	..	—	..	—	..	00	34	50	..	—	—	0.3	eP possibly earlier. E lost while changing chart.	
2155	..	12	..	..	00	54	05	..	—	..	—	..	01	26	05	..	02	19½	..	..	02	19½	..	0.5	..	M not pronounced.
2156	..	13	..	..	15	34	22	..	—	..	—	..	—	..	..	16	30	..	<0.5	..	M not pronounced.			..	—	
2157	..	19	..	..	04	21	35	..	04	27	55	..	04	43	08	..	04	43	57	..	05	55	..	1.6	..	—
2158	..	20	..	..	02	27	42	..	02	34	16	..	02	45	38	..	02	47	04	..	05	39½	..	4.0	..	—
2159	..	21	..	..	20	27	30	..	—	..	20	31	01	..	20	32	07	..	22	18½	..	14.6	..	..	..	—
2160	..	23	..	..	02	32	50	..	02	42	23	..	02	47	50	..	02	55	55	..	03	36½	..	0.3	..	M not pronounced.
2161	..	23	..	..	15	09	39	..	15	16	13	..	15	23	06	..	15	29	51	..	16	22	..	0.3	..	M not pronounced.
November																												
2162	..	5	08	53	49	..	09	02	28	..	09	14	48	..	09	24	11	..	—	..	43.0	Merged into the beginning of the following shock.	
2163	..	5	..	..	11	00	43	..	11	09	39	..	11	22	04	..	11	31	41	..	14	40	..	44.6	..	—
2164	..	6	..	..	09	04	25	..	09	12	57	..	09	28	42	..	09	35	10	..	12	56½	..	11.0	..	—
2165	..	6	..	eP	17	35	50	..	—	..	—	..	18	00	35	..	18	37	..	<0.3	..	M not pronounced.			..	—		
2166	..	6	..	eP	21	13	20	..	—	..	21	42	50	..	21	44	35	..	—	..	<0.5	..	eP uncertain. M not pronounced, wave of longest period taken. End lost in the beginning of following shock.			..	—	

No.	Date 1938.	P			S			L			Maximum.			End. Amplitude.			Remarks.				
		H	M	S	H	M	S	H	M	S	H	M	S	H	M	MM					
2167	6	..	21	49	20	..	21	58	03	..	22	13	40	M ₁ 22 23 05 .. M ₂ 22 25 29	—	..	4.8 .. 5.2	Two well defined maxima. This shock merged into following shock.			
2168	7	..	eP	00	57	50	..	—	..	—	..	01	29	05	..	—	..	0.3 ..	eP uncertain. M not pronounced, wave of longest period taken. End lost in the beginning of following shock.		
2169	7	..	eP	01	48	43	..	01	57	28	..	02	16	56	..	02	19	27	..	03 40½ .. 1.2 ..	
2170	7	..	eP	04	27	40	..	04	34	37	..	04	55	26	..	05	00	51	..	05 33 .. <0.3 ..	
2171	7	..	eP	19	31	48	..	19	43	55	..	20	11	51	..	20	14	51	..	21 03½ .. 0.3 ..	
2172	9	..	..	09	26	56	..	09	35	16	..	09	54	26	..	09	59	49	..	—
2173	10	..	..	11	05	30	..	—	..	11	27	33	..	11	30	54	..	12	06½ .. 0.6 ..	
2174	10	..	..	20	32	54	..	20	44	32	..	21	12	48	..	21	26	13	..	—
2175	11	..	..	01	22	17	..	—	..	01	48	20	..	02	03	24	..	02	44½ .. 0.7 ..	
2176	13	..	..	05	01	36	..	05	08	30	..	05	16	21	..	05	22	39	..	05 40 .. 0.5 ..
2177	13	..	..	13	33	59	..	—	..	13	52	57	..	13	58	21	..	14 18½ .. <0.3 ..		
2178	13-14	..	eP	22	42	04	..	22	50	57	..	23	10	27	..	23	15	14	..	00 48 .. 0.9 ..	
2179	14	..	eP	12	17	21	..	12	26	56	..	12	40	51	..	12	47	21	..	13 28 .. <0.3 ..	
2180	16	..	..	21	05	14	..	21	09	19	..	21	10	07	..	21	11	52	..	23 46 .. 23.3 ..
2181	16	..	..	11	27	10	..	—	..	11	44	22	..	11	52	04	..	12 11½ .. <0.3 ..		
2182	17	..	eP	04	08	35	..	04	19	08	..	04	50	46	..	05	02	33	..	07 03½ .. 7.2 ..	
2183	18	..	eP	14	26	34	(S?)	14	34	51	..	—	..	—	..	15	10	..	..	15 10 .. —
2184	21	..	eP	01	17	26	(S?)	01	27	02	..	01	34	33	..	—	..	02	18	..	(about 1)M not pronounced, and could not be picked out.
2185	22	..	(PR?)	01	21	53															
2185	22	..	..	01	24	38	..	01	33	14	..	01	52	49	..	02	00	51	..	03 07½ .. 1.2 ..
2186	29	..	..	13	50	05	..	13	58	43	..	14	18	27	..	14	26	24	..	16 18 .. 0.3 ..
2187	30	..	..	02	40	20	..	02	48	50	..	03	04	32	..	03	10	30	..	06 32½ .. 2.2 ..
December																					
2188	1	..	..	02	23	05	..	02	31	55	..	02	44	32	..	02	49	04	..	03 35½ .. 0.5 ..
2189	3	..	..	12	30	53	..	—	..	12	51	23	..	12	52	38	..	13	07½ .. <0.3 ..	
2190	6-7	..	..	23	08½	—	..	23	15	—	..	23	24½	—	..	23	28	—	..	00 42 .. 0.9 ..
				(SR?)	23	18½															
2191	7	..	..	13	35	36	..	13	45	11	..	14	01	10	..	14	05	51	..	—
2192	7	15	09	02	..	—	..	15	26	26	..	15	29	10	..	16	17	..	<0.3 ..
2193	16	..	..	17	32	50	..	17	45	04	..	18	04	26	..	18	10	16	..	20 54½ .. 1.7 ..
2194	16-17	..	..	23	28	21	..	23	38	23	..	23	58	56	..	00	04	41	..	01 57½ .. 0.8 ..
				? 23	52	17															
2195	17	..	..	16	39	20	..	16	49	38	..	17	01	05	..	17	03	02	..	17 58 .. 0.9 ..
2196	21	..	..	12	34	31	..	12	40	50	..	12	48	25	..	12	55	55	..	14 05 .. 0.4 ..

WEATHER SUMMARY, 1938.

January.—The rainfall was generally below normal south of the Batticaloa-Chilaw line, though occasional stations showed appreciable excess, and over a large area the deficit was only slight. The largest deficits were chiefly among the central hills, the rainfall being more than 10 inches below average at Ledgerwatta, St. Martin's, and Hendon.

North of that line, except in and near the Jaffna Peninsula, excess predominated, but was generally only slight.

From the 3rd to the 12th, rain was generally fairly widespread over the Island, but chiefly light. From the 13th to the 23rd, very little rain was reported, while during the next three days, rain was fairly general over the Island. On the 27th and 28th, there was but little rain, but on the 29th the weather became unsettled, and there was widespread appreciable rain on that and the following days, several stations in the north and east reporting heavy rain on the 30th.

February.—This is usually the driest month of the year, but this year it was very wet, the rainfall being at least 5 to 10 inches above normal over nearly the whole Island. The total rainfall for the Island is perhaps the heaviest February rainfall on record. Excesses of over 10 inches were common among and around the central hills, and in the Eastern Province, where nearly every station in the coastal districts south of Vandeloo's Bay recorded totals more than 15 inches above normal. The greatest excess was 24.45 inches at Sakamam, and 8 other stations reported excesses of more than 20 inches. No station in the Island recorded a deficit. As many as 56 daily falls of over 5 inches were recorded, a large number of these falling on either the 8th or the 1st.

Rain was fairly heavy and widespread over the Island during the first 11 days of the month, because of a low pressure area over the Island. For the rest of the month rain was not appreciable, there being practically no rain from the 12th to the 17th, and from the 21st to the 23rd. Towards the end of the month, rain began to be fairly general.

March.—The rainfall for March was in excess nearly everywhere, only a few scattered stations reporting small deficits. The greatest excess was 13.40 inches, at Marambekande, seven other stations, scattered over the southern half of the Island, reporting excesses over 10 inches.

The rainfall was persistent throughout the month. During the first 11 days there was moderate but widespread rain. On the 12th the rainfall decreased. From the 14th there was widespread rain again, a number of moderately heavy falls being recorded in the south-west of the Island, from the 14th to the 16th. On the 20th a depression was identified to the east of the Island. This moved along the east coast, and was located on the morning of the 22nd off the South Indian Coromandel coast, where it slowly filled up. As a result of this depression, widespread heavy rain occurred on the 21st. Rain generally widespread, continued till the end of the month.

Thunderstorm activity was well in evidence throughout the month, and accounted for the greater part of the rain.

A fall of small hail during a thunderstorm was reported from near Negombo on the afternoon of the 30th.

April.—The rainfall was above normal over the greater part of Ceylon, deficits reported being generally only small. The highest excess reported was 17·95 inches at Nilloomally, while four other stations reported totals over 15 inches above the average. Generally speaking, the largest positive offsets were reported from the north-east of the hill country and in the Avissawella District.

The rainfall persisted throughout the month, an interesting feature being the unusually pronounced thunderstorm activity, which accounted for nearly the whole of the rainfall. The weather was distinctly of the inter-monsoon type, with weak barometric gradients, and there was no depressional activity.

May.—The rainfall for May was below normal, except in the Jaffna Peninsula, where slight excess was recorded, and at a few scattered stations. The greatest deficits occurred in the south-west, where May averages are high. Several stations, chiefly in the south-west of Ceylon, recorded their lowest May rainfall for over 40 years. As many as 49 stations, in the dry zone, sent in nil returns.

It is usual, during the early stages of the south-west monsoon, for fairly heavy rains to fall in the western and south-western low-country. This year, however, such rains were not particularly in evidence. It is possible that this may be explained by the fact that south-westerly pressure gradients and winds developed more rapidly this year than usual, and caused the rain to fall further inland. This view is supported by the fact that deficits were smaller on the western and south-western slopes of the hills than in the south-western coastal districts.

Barometric gradients were generally south-westerly throughout the month.

A hailstorm was reported from Diyatalawa on the afternoon of the 16th.

June.—The rainfall was below normal over the greater part of the Island. Twenty-two stations, nearly all in or near Sabaragamuwa, reported totals more than 10 inches below average, the greatest deficit being 16·99 inches at Maliboda. Eighty stations, chiefly in the North-Western and North-Central Provinces, and in the north of Uva, recorded no rain at all during June.

The rains this month were mainly concentrated on the south-west face of the central hills.

July.—The rainfall for July was generally a little below normal in the south-western low-country of Ceylon, along the greater part of the west coast, and along part of the east coast. Elsewhere it was generally in excess, most marked on the south-western slopes of the main hill masses, and in the low-country immediately to the east of the hills.

The tendency for the monsoon rains this year to miss the low-country districts, and to favour up-country, was again in evidence.

There was fairly heavy rainfall, mainly on the south-western slopes of the hills, but also to some extent on their eastern slopes, during the first five days of July. The rains then diminished, and only light falls were reported in general during the greater part of July. About the 25th the barometric gradient began to weaken, and a tendency to local thunderstorms, of the intermonsoonal type, set in. This was particularly marked on the 26th and 27th, after which days the rain fell off, and the weather reverted to the monsoonal type, with some local thunderstorms in the north of Ceylon. On the 31st the monsoon rain in the south-west of Ceylon was again fairly heavy.

Some hail was reported from Labookellie estate during the latter half of July.

August.—The rainfall of August was generally below normal on the southern and western slopes of the hills. It was appreciably above normal in the south-western low-country, and on the south-eastern slopes of the hills. Elsewhere it was, on the whole, about the average. A large number of stations in the dry zone reported totals of less than 2 inches, but few stations reported no rain at all.

On the 1st the monsoon rains in the south-west of Ceylon were fairly heavy. The rain then decreased, and generally only light or moderate rain was reported till the 21st. Between the 21st and the 26th there was fairly heavy monsoon rain, after which the rain again decreased, and not much fell for the rest of the month. There was appreciable thunderstorm activity, mainly in the north and east of Ceylon, during the first week in August, from the 14th to the 22nd, and on the last two days of the month.

Three hailstorms were reported, two at Diyatalawa, on the 1st and 4th, and one at Bandarawela, on the 19th.

September.—The rainfall was generally above normal in the hills, and particularly on their western slopes. The extreme south-west of the Island was also above normal. Elsewhere, except in the immediate neighbourhood of the hills, rainfall was generally below normal.

Most of the stations in the northern half of Ceylon recorded totals of less than 2 inches, but only a few, chiefly in the districts south-east of Mannar, reported no rain at all.

The rain in the south-west of Ceylon was generally fairly light up to the 12th, but was appreciably heavier during the remainder of the month, particularly up-country. Thunder was frequently reported, mainly from the dry zone, from the 1st to the 9th, and again from the 17th to the 23rd.

October.—The rainfall was nearly everywhere below normal, the only appreciable areas showing excess being the Jaffna Peninsula and a small area round Trincomalee. The greatest deficits were found in the south-west of Ceylon, and particularly in or near the Ginigathena Pass, where the rainfall at several stations was over 15 inches below normal.

The highest monthly totals reported were between 10 and 15 inches. These were chiefly in the Jaffna Peninsula and near Trincomalee, while a few stations on the western slopes of the hills also reported totals of over 10 inches. Several monthly totals of less than 2 inches were reported, chiefly in the south-east of Ceylon.

For many stations with long rainfall records, this month's rainfall must have been the lowest October rainfall on record.

During the first ten days of the month, the barometric gradient remained of the usual south-west monsoon type, and there was light to moderate rain in the south-west of Ceylon, and not much rain elsewhere. The gradient then became more irregular, and from the 13th to the 15th a few local thunderstorms were reported, in various parts of the Island. From the 16th to the 23rd, very little rain was reported, except occasional local thunderstorms. About the 22nd, conditions became markedly unsettled in the Bay of Bengal, and about the 24th, probably as a result of this, the rainfall over Ceylon increased. Rain and thunder became widespread over the Island, precipitation that was both heavy and widespread being reported between the 28th and 31st.

November.—The rainfall for November was consistently below normal everywhere, more than 70 stations, distributed practically throughout the Island, recording deficits of more than 10 inches. The greatest deficits were 14·74 inches at Ambepussa, 14·69 inches at Labugama, and 14·57 inches at Mullaittivu, while several other stations recorded deficits of over 13 inches. The smallest deficits were found in the central hill-country and in the south of the Island, while the greatest deficits were generally reported from the low country to the west and north of the hills, and in the north of Ceylon. The only station to report no rain was Pottuvil, but an appreciable number reported less than 2 inches for the month.

For many stations with long rainfall records, this month's rainfall must be the lowest November rainfall on record. Labugama Reservoir, with an average for November of over 17 inches, reported a monthly total of only 2·83 inches, or 16 per cent. of average, the lowest November total on record.

Widespread rain occurred during the first three days of the month, on the 2nd of which the rainfall was fairly heavy. After that it decreased, and only occasional light rain was experienced till the 15th. On the 16th the rainfall increased, and moderate but widespread rain persisted up to the 19th. From the 20th to the end of the month, the weather was again generally dry, except from the 25th to the 28th, when fairly heavy falls were reported from many stations. Thunderstorm activity was only moderately in evidence this month.

December.—The rainfall for December was below normal over the greater part of Ceylon, the principal districts showing excess being among the hills, particularly on their north-eastern slopes, while there was also excess in the Jaffna Peninsula, and in the Galle District. The greatest excesses above normal were 25.81 inches at Hendon Estate, and 18.60 inches at Lower St. Martin's Estate, while excesses between 10 and 15 inches were reported from five other stations on the eastern slopes of the hills. The greatest deficits below normal were 11.28 inches at Kirimutti, and 10.18 inches at Vakaneri, north of Batticaloa, while there were many deficits of 5 to 10 inches along the east coast, and a few in the south-west of Ceylon, including Labugama.

The highest monthly totals reported were 63.03 inches at Hendon, 52.94 at Upper St. Martin's, and 52.31 at Lower St. Martin's all in the Nitre Cave district. A number of totals between 30 and 40 inches were reported from several other stations on the eastern slopes of the hills. A few stations reported less than 2 inches for the month, chiefly between Colombo and the neighbourhood of Negombo.

For the first half of the month, weather conditions continued fairly settled over Ceylon, with monsoon rain, generally light or moderate, in the north and east, and local afternoon or evening thunderstorms in the lee of the hills. About the middle of the month the tendency to rain, particularly of the windward slopes of the hills, increased. Some very heavy falls were recorded in these districts, especially on the 17th and between the 21st and 24th, between which two days winds near Ceylon were fairly strong. After the 24th, the winds fell off in strength, but rain continued widespread, and heavy in places, till the 27th. For the last few days of the month, very little rain was recorded.

Year.—The rainfall for the year was generally below normal, except in part of the hill country, particularly the eastern slopes of the main hill masses, and in the low-country directly between the hills and the east coast, where it was in excess. Generally speaking, the rainfall was in excess for the first third, and in deficit for the last two-thirds, of the year.

Colombo, July 18, 1939.

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