1927

THE COLOMBO OBSERVATORY.

REPORT OF THE SUPERINTENDENT OF THE OBSERVATORY.

Staff.—There was no change in the scientific and technical staff.

In the clerical staff there were a few transfers between the Observatory and other offices of the Department, while three members left on appointments in the Government General Clerical Service and were replaced by newcomers to the Department.

Buildings.—The roof of the main building underwent extensive repairs in April. The construction of a new workshop and laboratory was commenced in December.

Astronomical Equipment and Work.

The main instruments have been unchanged.

The Cooke transit (4-inch object glass) and the Borrel chronograph have been in use for clock stars. A new spring was inserted in the travelling micrometer of the transit in February. The number of star transits observed was 1,548, an increase on the number in any preceding year owing to the examination of the fluctuations of the longitude determinations made by means of these observations and various European vernier time signals—notably the Bordeaux one.

Fournier sidereal clock No. 72 and the Cooke mean time clock have continued to be the main ratekeepers. Dent No. 45082 was dismounted for repairs on September 26. As it has had over eighteen years' use, repairs, as opposed to simple cleaning, are not unreasonable. Fournier No. 70 worked as a sidereal clock up to the same date. With the dismounting of Dent it became imperative that a second mean time clock should be available as an understudy to Cooke for such purposes as the wireless time signals, which necessitate electric contacts at each mean time second over a period of three minutes. The movement of No. 70 was therefore placed on the bracket of Dent with the help of a special adapting bedplate made by Mr. G. H. Tabor, and has been working quite satisfactorily since October 8 in conjunction with the Dent pendulum. This apparently rather drastic rearrangement was simpler than the alternative of converting No. 70 as it stood into a mean time clock suitable for sending time signals. The alteration of the pendulum length would have been easy, but the addition of a magnet to the pendulum of 70 to allow of solenoid adjustment would have been a bigger piece of work than what was actually done.

The Synchronome master clock continued to work well both for controlling the office clocks and calibrating the seismograph.

A number of chronometers were left at the Observatory for various periods, usually while the ship to which they belonged was in the graving dock. Under this head may be mentioned the chronometers from H.M.S. Cyclamen and H.M.S. Lupin.

Time Ball.—Time ball signals were given as before at 9 A.M., 1 P.M., and 4 P.M. Ceylon standard time (3.30, 7.30, and 10.30 Greenwich mean time) on ordinary week days, and at 9 A.M. only on Sundays and public holidays.

There were 950 successful signals and 6 failures in the year. None of the latter were from causes over which the Observatory had any control. Four appear to have been due to working parties on the line, and two to the ball dropping prematurely and so being unable to respond to the correct signal.

Synchronizing signals were sent at 7.55 A.M. and 3.55 P.M. on ordinary week days to the Central Telegraph Office, Surveyor-General's Office, Queen's House, and General Post Office. On Sundays they were replaced by a single signal at 8.54 A.M. A signal at 8.55 A.M. was sent daily to the Master Attendant's Office and lighthouse clock. The last named clock has had a distinctly better record than in any year before. Its chimes are broadcasted daily at noon, which gives a means of checking its error at the Observatory, and on only a dozen occasions did this exceed two seconds. Of these several occurred in a group due to the same cause as some of the time ball failures.

All the time signalling work is a matter of interactivity between the Observatory and the Telegraph Department—and in the case of the time ball and lighthouse clock with the Master Attendant's and Harbour Engineer's Departments as well, and I gratefully acknowledge the way in which all concerned have co-operated in keeping the proportion of failures so low.

Issue of Wireless Time Signals.—These have been sent out twice daily throughout the year on the International code. The morning signal is from 11.27–11.30 Ceylon standard time (5.57–6.0 Greenwich mean time) on 2,300 metres C. W., and the evening one at 10.27–10.30 (16.57–17.0 Greenwich mean time) on 600 metres.

The contacts for the actual dots and dashes of the wireless signal are made by metal pieces sunk in the rim of an ebonite drum at the Welikada Wireless Station. This drum is released at 11.27.00 or 10.27.00 by a signal from the Observatory, and during the three minutes it is in action is kept in beat with second by second signals from the Observatory mean time clock.

The outgoing wireless signal is listened to on the Observatory receiving set, so that any lag in the apparatus or failure of the drum to keep in step with the impulses from the Observatory is detected and reported to the Wireless Station by telephone, while in the case of any signal that does not pass this test satisfactorily the words "time signal failed" are transmitted in Morse after the conclusion of the signal.

In 1927 there were 710 successful signals out of a possible 730. It will be noticed that the service is not curtailed at all on public holidays. Of the twenty occasions on which a satisfactory signal was not passed, two were intentional omissions for non-technical reasons and four were in all probability correct, but the "wash out" was sent because of some failure in the receiving set at the Observatory preventing the signal being checked. In one case the signal was correct, but some

extra dashes went out just after it and the " wash out " was given as it was thought that someone might have mistaken them for the end of the signal. The remaining failures include cases in which the rate of the drum was for some reason too erratic or there was any other trouble either at the W/T station or on the line between it and the Observatory.

In the case of these signals, as in the case of the visual ones, a successful result can only be obtained by co-operation between the staffs of the Observatory and Telegraph Department, and I again wish to thank Mr. Harper, Mr. Kingston, and all others concerned for their help in this matter.

Longitude Determinations.—Comparisons between the time as determined by the transit instrument here and by European wireless vernier signals (chiefly Paris–Bordeaux) have been maintained throughout the year, and as a result the adopted longitude of the Observatory transit room is now taken as 5 hrs. 19 mins. 28.69 secs. E, a reduction of 0.49 secs. of time from the value previously accepted.

Detailed discussion of these results would be out of place here, and will be found in the Ceylon Journal of Science (Section E, Volume I., Part II.). However, it may not be out of place to mention that the investigation has provided considerable support for the idea of a correlation between the fluctuations of clock star observations and the meteorological conditions. Particular interest attaches to this point, as it is one on which most analyses elsewhere in the past have given negative results, but the position of the Colombo Observatory, both as regards its general geographical position in the monsoon area and its immediate local surroundings, is such as to make it a particularly suitable site for such an inquiry.

Meteorological Equipment and Work.

Meteorological sheds were maintained at the same sixteen outstations as in 1926. Several screens of the enlarged Stevenson type were taken into use, and it is hoped that the transfer from sheds to screens will be completed in 1928. At present duplicate readings are being maintained at several places, to supplement the comparisons already made at Colombo. The number of self-recording instruments was not changed.

Direct readings were taken at all stations at 9.30 A.M. and 3.30 P.M., Ceylon standard time, and the former wired to Colombo. Observations were taken at 7 A.M., at Colombo, Trincomalee, and Hambantota, in order to co-operate with the work of the Indian Meteorological Department, and observations were taken at 7 P.M., at these three stations, in connection with the evening wireless weather signals sent out from Colombo.

No fundamental change was made during the year, either in the main instruments or in the methods of checking and reduction of results that were employed at Colombo.

Nine clerks (eight Survey, one Public Works Department) and two lighthouse-keepers attended the Observatory during the year for training in meteorological observations before proceeding to outstations.

The chief daily weather report and forecast was prepared as before from the 9.30 A.M. readings, and broadcasted *en clair* at noon, *i.e.*, two and half hours after the readings on which it was based. It subsequently appeared in the " Post Office Daily List " and in the local newspapers.

The number of stations whose rainfall is telegraphed daily and whose figures appear in the " Post Office Daily List " was increased from October 1, by the addition of Avissawella, Deniyaya, Matale, Maskeliya, Neboda, Rangalla, and Watawala.

In the past, figures in the Daily List have all been taken from Government offices, but the new stations include three estates whose figures have been made available by the courtesy of Messrs. H. S. Hurst (St. Martin's, Rangalla), C. J. Hay (Panilkanda, Deniyaya), and H. A. McLaran (Gikiyanakanda, Neboda).

Weather reports prepared avowedly with a view to shipping, and hence omitting any discussion of rainfall over the Island, were sent out in Morse immediately after the time signals at 11.30 A.M. and 10.30 P.M. In these reports a certain amount of use was made of information kindly supplied by the Director-General of Observatories, India. They were, however, by no means restricted to the Indian messages, but included a certain amount of local detail, which would have been out of place in messages that avowedly summarized conditions over large areas.

The amount of information that can be given in these reports depends greatly on the number of weather messages received from ships, and I am glad to report a further increase in 1927 in the number of ship's telegrams and to take this opportunity of thanking the captains, and other officers, who have co-operated in this work. The ships from which such messages were received in 1927 include ss. Ahmedi, Ajax, Akbar, Alipore, Amur Maru, Anchoria, Anglo Indian, Anniston City, H.M.S. Argus, ss. Arracan, Artemisia, Astronomer, Atreus, Atsuta Maru, Auditor, Aungban, Badarpur, Bahadur, Barala, Batoe, Begum, H.M.S. Bellatrix, ss. Beme, Binfield, Blas de Lezo, British Peer, British Sailor, Calchas, Canara, H.M.S. Caradoc, Castor, ss. Cathay, Chakrata, Chambord, Chinkoa, Chyebassa, City of Athens, City of Baroda, City of Calcutta, City of Canterbury, City of Glasgow, City of London, Clausrickmers, J. P. Coen, Collegian, Comorin, Craftsman, Dalgoma, Dardanus, Defender, H.M.S. Despatch, ss. Diana, Diomed, Discoverer, Dogra, H.M.S. Durban, ss. Eclipse, H.M.S. Effingham, Enterprise, ss. Explorer, Fulda, Furstbulow, Gairsoppa, Gambhira, Garado, Garadana, Garmula, Gazana, Ghorinda, Gogra, Golconda, Hackola, Harrison, Haruna Maru, Hatarana, Hati Maru, Havildar, Hector, Herefordshire, H.M.S. Hermes, ss. Hobson's Bay, Holywell, Homefield, Hooft, Howra, Ikala, Iris, Ixion, Jalapalka, Jalarashmi, Jalatarang, Jalavihar, Janpieterszooncoen, Kangean, Karapara, Karoa, Kertosono, Kashmir, Khandalla, Khiya, Khosrou, Khyber, Kidderpore, Kohinur, Leicestershire, Lima Maru, Machaon, Macharda, Macedonia, Magdapur, Mahout, Maihar, Malakand, Malancha, Maloja, Mandala, Manipur, Margha, Mashobra, Masula, Matiana, Medon, Meerkerk, Memnon, Merkera, Moldavia, Morea, Morvada, Nagpore, Naldera, Nankin, Nawab, Nellore, Nerbuda, Nevasa, Nirpura, Nizam, Nowshera, Nurjehan, Nurmahal, Nyanza, Oldenburg, Orna, H.M.S. Ormonde, ss. Ormuz, Oronsay, Orsova, Orvieto, Osterley, Otranto, Onderkerk, Oxfordshire, Ozarda, Paduwa, Pasha, Peiho, Peleus, Peshawur, Perseus, Philoctetes, Portcurtis, President Garfield, President Harrison, President Monroe, Primauguet, Pundit, Pyrrhus, Queda, Radja, Rajput, Rondo, Rotti, Sachsen, Salabangka, Sarpedon, Schelde, Shwedagon, Sikh, Singu, Sirsa, Streefkerk, Sutlej, Talamba, Teiresias, Theseus, Titan, Torilla, H.M.S. Triad, ss. Trier, Vanburen, Venezia, Vondel, Wangaratta, Warina, Weissenfels, Wirebank, H.M.S. Woolston, and H.M.S. Yarmouth.

The number of telegrams received from various ships has of course varied considerably. H.M.S. Ormonde heads the list with 43, followed by ss. Badapur, ss. Aungban, and H.M.S. Hermes.

The number of rain gauge stations whose statistics are included in this report is 339, which is slightly less than the actual number of gauges on loan, as in a few cases it seemed undesirable to publish the figures received. The new stations started during the year include two under the Irrigation Department (Kanagarayankulam and Neethai), two under the Agricultural Department (Paranthan and Ambepussa), and four estate gauges, viz., Gendagala (Mr. H. V. Fonseka), Pottuville estate (Mr. T. S. Green, who was already sending from several gauges in that neighbourhood), Theydon Bois (Mr. H. F. Dalton), and Westward Ho ! (Mr. I. H. M. Clark).

Four stations were discontinued, at Iranaville, Manampitiya, Paranthan Railway Station, and Pattipola.

I am very glad of another opportunity of thanking the observers, both old and new, volunteer and official (and " official " observers are mostly " volunteer " so far as their rain gauge work is concerned) for all that they have done in keeping up these records.

Co-operation with Indian Meteorological Department.—In addition to the normal 7 A.M. telegrams to India from Colombo, Hambantota, and Trincomalee, extra telegrams were sent from these stations at various times, at the request of the Indian Meteorological Department. The numbers sent during 1927 were, Colombo 53, Hambantota 56, Trincomalee 67. In addition to these messages and the ships' telegrams referred to above, summaries of a certain proportion of the upper air flights were telegraphed and special telegrams were also sent quite apart from any application from India, at times when the general appearance of the 9.30 A.M. synoptic chart for Ceylon suggested anything worthy of special comment.

By the courtesy of the Director-General of Observatories, India, copies of all messages sent by him to the Navy wireless station at Matara were also delivered to the Observatory.

Upper Air Work.—The number of pilot balloons observed was 566, of which 541 were at Colombo and 25 at Diyatalawa, during the period of International co-operation from June 12 to 20. In addition to the theodolite observations a reward was offered for the return of balloon tails, and information regarding the total movement of the balloon was obtained by this means in 66 cases. During the north-east monsoon a flight from Colombo normally ends over the sea, so that the notice was not attached during these months, and the 66 above represents 17 per cent. of the flights concerned.

The balloon tails carry a notice (in English, Sinhalese, and Tamil) that a rupee will be paid to whoever returns it. On receipt of such a returned tail a money order for Re. 1 and a receipt form is sent to the finder. When the system was started a few years ago I had some misgivings as to whether the recipients, once they got their rupees would return the receipts, but experience has proved that there has been very little trouble on this account.

On the other hand, there have been several cases where the sender of a tail has not given his own address sufficiently accurately, and a money order, after having been despatched to the address given, has been returned by the postal authorities as " addressee not known."

The covering letter containing the tail frequently has a humorous aspect, chiefly in the nature of requests for an enhanced reward. On one occasion I received a letter stating that the writer had found a balloon but would not give it up for such a trifling sum as one rupee, but would do so if he received what he considered an adequate reward. The letter was not followed up, which possibly was just as well for the sender, since the balloon he claimed to be holding for ransom had already been returned by someone else, to whom the usual reward had already been paid.

A summary of the pilot balloon results is shown in plate 8, at the end of this report.

In it, wind observations are classified along the lines suggested by the International Commission for Air Navigation, so that wind velocities are grouped in steps as under :—

Metres/sec	..	1 or less	..	2–7	..	8–14	..	15–20	.. over 20
Miles/hour	..	3 or less	..	4–15	..	16–31	..	32–47	.. over 47
Kilometres/hour	..	5 or less	..	6–25	..	26–50	..	51–75	.. over 75

The number of observations from each direction are shown by the lengths of rays in the wind roses and the velocities by the thickness and darkness of the rays.

Pilot balloon results are shown up to 3 kilometres and are grouped by months and time of day, the morning flights being usually at about 9.30 A.M. and the afternoon ones at about 2.30 P.M.

A series of small circles of uniform diameter form the centre of the wind roses. These are inserted primarily to help the eye in separating rays in different directions which would not be long enough to emphasize themselves if they were brought in to the central point. The number of calms is shown by the radius of a second circle and the graph calls attention to the way in which during the intermonsoon periods calms occur at the surface in the mornings although the sea breeze limits their number in the afternoon.

In addition, a vertical arrow is shown between each pair of wind roses giving the average vertical velocity upwards or downwards for the altitude section in question. These velocities are obtained by comparing the observed heights, using the tail method, with those deduced from the theoretical velocities obtained from the free lift and weight of the balloons on the formula $81\ L^{\frac{1}{2}}/(L + W)^{\frac{1}{3}}$. Velocities within 1 metre/minute of theory are shown by circles and those from 1–5 metres per minute by arrows without feathers, velocities of 5 to 10 by arrows with one feather, and so on. The monthly means obviously do not give information as to how spread the individual variations are, but nevertheless bring out several points, notably the strong convection near the ground and its marked fall off above half a kilometre.

Above the pilot balloon observations wind roses are given, showing cloud observations of cirrus, cirro cumulus, and alto cumulus as observed with the rifle sights of the theodolite. To enable the velocity height ratios to be plotted as velocities, assumed heights of 15, 10, and 5 kilometres are adopted. It is of course not claimed that these values are precise, but the figures chosen may demand a reminder that the observations are in the tropics, and the cirrus correspondingly high.

A vertical arrow alongside the wind rose for alto cumulus gives the mean vertical velocity from 0 to 5 kilometres (not 3 to 5) but usually refers to only one or two observations. In some cases this arrow is missing, *i.e.*, if all pilot balloon tails were lost sight of below 5 kilometres in the month in question, a state of affairs that is usual in the south-west monsoon.

Aviation.—The members of the British Airship Mission, consisting of Group Captain P. F. M. Fellowes, Flight Lieutenant S. Nixon, and Mr. M. A. Giblett, visited Ceylon in October in connection with the possible development of an airship service between England and Australia, with Ceylon as one of the intermediate points of call.

In addition to the pleasure afforded by meeting the members of the Mission and discussing various points of meteorological interest with them, a very practical outcome of their visit has been that expenditure has been sanctioned for the purchase of new self-recording apparatus in order to give more information than is available at present on questions of wind and rainfall at outstations, and of temperatures at slightly above ground level at Colombo.

Weather Summary, 1927.

In January the rainfall was distinctly above average, particularly in the central areas. Such deficits as occurred were chiefly in the low country of the north-east and extreme south-west. Hendon's total of 61 inches is particularly worthy of note.

In February rain was again in excess, particularly in the eastern low country, while in March this excess was even more marked. The summary of the first three months was therefore an excess of rain at almost every station in the Island.

In April conditions were reversed and the greater part of the inland stations were below average. The most definite area above average for the month was near the centre of the west coast.

In May there was heavy rain, particularly in the south-west quadrant of the Island. There were areas in the north-west and south-east that were below, but most of the east coast was above.

June after starting as a wet continuation of May soon showed a decrease, and the total for the month was below average over more than half the Island.

In July the deficit was more marked, particularly in the western low country. However, the south-west face of the main hills continued to be an exception and to have more than its average. On August 1, Watagoda's total from January 1 up to date was 36 inches above its average for the period or over 50 per cent. in excess. Nuwara Eliya with 21 inches to spare was 44 per cent. above average.

In August the drier areas again predominated, the only stations above average being grouped in a strip that ran from the Jaffna Peninsula down the centre of the Island to include Anuradhapura and Dambulla, and thence on the eastern side of the centre to include most of a good deal of Uva and thence to south coast east of Hambantota.

September was a month of rather irregular distribution, the areas with more than average rainfall including most of the east coast, Uva, and the eastern half of the Southern Province, also the west coast between Chilaw and Kalutara inclusive. Deficits were common in the northern part of Sabaragamuwa, the Northern Province, and the western half of the Southern Province.

October was probably the most consistent month of the year, and the consistency was in the direction of drought.

In November deficits outnumbered excesses, though the latter occurred over the greater part of Uva and considerable sections of the Eastern and Southern Provinces, but in December the drought was still more marked. A few rather irregularly distributed stations passed their average, but the only appreciable area where the rainfall was consistently above average was a strip along the coast in the southern half of the Eastern Province.

It will be seen from the above that the Northern Province showed consistent deficit from September to the end of the year, while a similar cumulative drought effect from October to the end of the year was pronounced in Sabaragamuwa and quite appreciable over the greater part of the western half of the Island.

Publications.—Routine publications were 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 "Tropical Agriculturist."

A new manual of instructions for the use of meteorological observers in Ceylon and Part II. of Volume I. of Section E of the "Ceylon Journal of Science" were sent to press during the year but neither of them has yet been published.

A paper by Mr. H. Jameson was read before the Engineering Association in March on "Heavy Rainfall in Ceylon," and has been published in the Transactions of that Association while a note by him on his method for the reduction of direct comparisons of sidereal clocks with mean time verniers appeared in the "Observatory" of July.

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. The list is as follows :—

International.

League of Nations, Health Section, Eastern Bureau, Singapore :—
- Half-Yearly Bulletins, January to June, 1926, and July to December, 1926.
- Weekly Fascicule, December 18, 1926, tc December 10, 1927.

Commission Internationale de Longitudes par T. S. F. :—
- Operation Internationale des Longitudes.

Commission Internationale de la Haute Atmosphere :—
- Comptes Rendus des Jours Internationaux 1923, Parts I–IV.

International Geographical Union :—
- Report, 1925 and 1926.

International Meteorological Committee :—
- 12 Versammlung, in Wien, September, 1926.

International Meteorological Organization :—
- Report of the meetings, in Zurich, September, 1926, of the Commissions of Terrestial Magnetism and Atmospheric Electricity, and for the Reseau Mondial.
- Report of the meeting, in Zurich, September, 1926, of the Commission for Synoptic Weather Information.
- Report of the meeting of the International Commission of Solar Radiation, at Davos, August 31, 1925, and September 1 and 2, 1925.
- List of Directors of the International Commission for the Study of the Propagation of Sound of Great Explosions.

AFRICA.

Egypt.

Ministry of Public Works, Physical Department :—
Meteorological Report, 1921.

Mauritius.

Royal Alfred Observatory :—
Annual Report, 1925.
Monthly Magnetical and Meteorological Observations, June, 1925, to June, 1926.
Cyclone of February 24 to March 3, 1927.

Union of South Africa.

Irrigation Department :—
Monthly Weather Reports of the Meteorological Office, July to September, 1925.

AMERICA (NORTH).

Canada.

Toronto Observatory :—
Meteorological and Magnetical Observations, 1925.

Jamaica.

William H. Pickering, Esq., Mandeville :—
The Practical Use of Small Reflectors.
Report on Mars, Nos. 38 to 40.
Lunar Vegetation.

Mexico.

Geolcgical Institute :—
Catalogo de Los Temblores, 1923 to 1925.
Carta Sismica de Mexico, with Memoir.

United States of America.

Carnegie Institute of Washington :—
Annual Report, 1926.

Coast and Geodetic Survey :—
Manual of First-Order Triangulation, by C. V. Hodgson.
Report on the Readjustment of the First-Order Triangulation Net of the Western Part of the United States, by Oscar S. Adams.
Isostatic Conditions of the United States, as indicated by Groups of Gravity Stations, by William Bowie.
Geodetic Level and Rod, by D. L. Parkhurst.
Tables for Alber's Projection, by Oscar S. Adams.
World Longitude Signals by radio received at Niu (near Honolulu) and Fort Wm. Mackinly (near Manila).
Geodetic Operations in United States, from January 1, 1924, to December 31, 1926.

U. S. Naval Observatory :—
World Longitude Signals received at Washington and San Diego.

Department of Agriculture :—
Solarimeters and Solarigraphs, by Ladislaus Gorizynski, D.Sc.
Index to Monthly Weather Review, Volume 54 (1926).
Monthly Weather Review, September, 1926, to August, 1927.
Supplement to Weather Review, No. 28.

Department of Commerce, Bureau of Standards :—
A Fundamental Basis for Measurements of Length, by H. W. Bearce.
On Testing Measuring Tapes at the Bureau of Standards.

New York Meteorological Observatory :—
Annual Report, 1926.
Monthly Reports, September, 1926, to August, 1927.

University of California :—
Lick Observatory Bulletins, Nos. 382 to 391.
The Registration of Earthquakes at the Berkeley Station and at the Lick Observatory, from April 1, 1925, to March 31, 1927.

Central Station of the Jesuit Seismological Association, St. Louis, Missouri :—
Bulletins : Earthquakes of August 20–21, September 11, October 24, November 4, 6, 8, 14, and 16, 1927.
Seismological Records of St. Louis University, Missouri, July to October, 1927.
Bulletin of the Seismographic Station of Regis College, Denver, Colorado, January to June, 1927.
Bulletin of the Seismographic Station of Gonzaga University, Spokane, Washington, January to July, 1927.

AMERICA (SOUTH).

Bolivia.

Observatorio Del Colegio de San Calixto :—
Boletim Sismico, March to May, 1927.

Brazil.

Directoria de Meteorologia, Rio de Janeiro :—
Boletim Mensal, October, 1926, to April, 1927, and June to September, 1927.
Contribuicao ao Estudo Do Clima Do Brasil, by Dr. Henrique Morize.
Causas Provaveis Das Seccas do Nordeste Brasileiro, by Dr. J. de Sampaio Ferraz.
Wireless Telegraphy Meteorological Reports, No. 1.

Observatorio Nacional, Rio de Janeiro :—
Annuario, 1927.

Chile.

Observatorio Del Salto, Santiago :—
Boletin Mensual, October, 1926, to October, 1927.

Colombia.

Observatorio Nacional de San Bartolome, Bogota :—
Observaciones Meteorologicas, 1925.

ASIA.

China.

Freeman Meteorological Observatory, Canton :—
Daily Meteorological Record, from January to September, 1926.

Royal Observatory, Hong Kong :—
Annual Report, 1926.
Monthly Meteorological and Seismological Bulletins, November, 1926, to October, 1927.

Observatoire de Zi-Ka-Wei :—
Annales.

India.

Director of Agriculture, Bengal :—
Annual and Monthly Rainfall, 1926.
Daily Rainfall, November, 1926, to October, 1927.

Kodaikanal Observatory :—
Annual Report, 1926.
Bulletins, Nos. LXXX. and LXXXI.

Meteorolcgical Department :—
Administration Report, 1926–1927.
Monthly Rainfall of India, 1925.

Mysore University, Bangalore :—
Half-Yearly Journal, Volume I., Nos. I. and II.

Indo-China.

Central Observatcry, Phu-lien :—
Bulletin Pluviometrique, 1925.

Japan.

University Observatory, Kyoto :—
Bulletins, Sun-Spot Observations, Nos. 104 to 106, and Nos. 108 to 125.

Java.

Batavia Observatory :—

Rainfall Types in the Netherlands Indies.
Regenwaarnemingen in Nederlandsch-Indie, 1925.
Magnetical and Meteorological Observations, 1922.
Seismological Bulletins, October, 1926, tc July, 1927.
Monsoon Currents in the Java Sea and its Entrances.

Philippine Islands.

Central Observatory, Manila :—

Bulletins, May to August, 1925, and January to April, 1926.

Weather Bureau :—

Annual Report, 1921.

Syria.

Observatoire De Ksara, Saad-neil :—

Annuales, 1921, 1923, and 1924.

AUSTRALASIA.

Caroline Islands.

Meteorological Observatory, Nanyo :—

Monthly Reports, September to November, 1925.
Bulletins of Upper Air Observations, May to December, 1926.

Meteorological Observatory of South Seas Bureau, Palau :—

Annual Report, 1926.
Monthly Reports, January to May, 1926.
Bulletins of Upper Air Observations, January to April, 1927.

Commonwealth of Australia.

Commonwealth Meteorologist :—

Average Annual Rainfall Map, Review, 1924
Rainfall Map, 1926.
Abnormal Rates of Ascent of Pilot Balloons in the Lower Levels of the Atmosphere at Melbourne, by E. Kidson.

Fiji Islands.

Harbour Master, Suva :—

Annual Report, 1926.
Monthly Meteorological Observations, January to August, 1927.

New Zealand.

Dominion Observatory :—

Bulletins, Nos. 62, 64, 65, and 67.

Meteorological Observatory, Wellington :—

Monthly Meteorological Observations, October, 1926, to September, 1927.
Annual Report, 1926.

Survey Department, Wellington :—

Records of the Survey of New Zealand, Volume III.
Annual Report, 1926.

EUROPE.

Belgium.

Institut Royal Météorologique de Belgique :—

Memoires, Volume II. Sur la Distribution de la Pluie en Belgique.

Czecho-Slovakia.

Meteorological Institute, Prague :—

Résumé Mensuel, July, 1926, to June, 1927.

Meteorologisch Observatorium auf dem Donnersberg :—

Jahrbuch, 1925.

Esthonia.

Meteorologische Observatorium Dorpat:—

Meteorologische Beobochtungen, 1925.
Merejaa Vaatlused, 1925/1926.

University of Tartu :—

On new Precision Seismographs, by J. Wilip.

France.

Commission de Météorologie des Bouches-du-Rhône :—

Bulletin Annuel, 1925.

University of Strasbourg :—

Annuaire de l'Institut de Physique du Globe, 1925.

Observatoire de Lyon :—

Climatologie du Department du Rhône.
Meteorologie Lyonnaise, 1921–1922.

Service Geographique de L'Armée :—

Rapport sur les Travaux Executes, 1920–1923.

Germany.

Haupstation fur Erdbebenforschung am Physikalischen Staatsinstitut :—

Monatliche Mitteilungen, October, 1926, to September, 1927.

Geophysikalischen Warte Gr. Raum der Universitat, Konisberg :—

Erdbebenregestrurungen, July to December, 1925.

Great Britain.

Fernley Observatory, Southport :—

Annual Report, 1925.

Meteorological Office, London :—

Annual Report of the Meteorological Committee to the Air Council, 1926–1927.
British Rainfall, 1926.
Geophysical Memoirs, Nos. 32 to 36.
Marine Observer, February, 1927, to January, 1928.
M. O. 252 (5th Edition).
Observatories' Year Book, 1924.
Professional Notes, No. 46.
Report on Atmospheric Pollution, 1925–1926.
Reseau Mondial, 1920.
Supplements, Nos. 6–9, to M. O. 252 (4th Edition), and Nos. 1–5, and 7 to M. O. 252 (5th Edition).

Royal Observatory, Edinburgh :—

Thirty-seventh Annual Report of the Astronomer Royal for Scotland.

Royal Observatory, Greenwich :—

Determinations of Time and Comparison with Wireless Time Signals, October 1, 1926, to November 30, 1926.

Sir Napier Shaw :—

The Physical Structure of the Atmosphere regarded from the Dynamical Point of View.

University Observatory, Oxford :—

The International Seismological Summary, April, 1923, to June, 1924.
On a Four-Year Periodicity in the Frequency of Earthquakes, by Professor H. H. Turner.
Seismological Tables and the Earth's Liquid Core, by Professor H. H. Turner.
30th and 31st Reports of the Committee of Seismological Investigation.

Holland.

Koninklijk Nederlandsch Meteorologisch Institut :—

Seismische Registrierungen in de Bilt, 1924.

Hungary.

Observatoire Sismologique de Budapest :—

Les Observations Sismologiques, July to December, 1926.

Reichsanstalt für Meteorologie und Erdmagnetismus :—

Jahrbuch, 1923.

Italy.

Osservatorio del Real Collegio Carlo Alberto, Moncalieri :—

Bollettino Meteorologico e Geodinamico, Osservazioni Sismiche, 1925 and 1926.

Osservatorio " Pio X.," Valle de Pompei :—

Bulletin, No. 157.

Osservatorio Ximeniano, Firenze :—

Bollettino Meteorologico, January to May, 1927.
Bollettino Sismologico, January to May, 1927.

Osservatorio Meteorologico e Geofisico de Taranto:—

Osservazioni Meteorologiche, July to December, 1926.

Societa Meteorologica Italiana :—

Bollettino Bimensuale, October to December, 1926.

Norway.

Det Norse Meteorologiske Institut :—

Arsberetning, July 1, 1925, to June 30, 1926.
Nedboriakttagelser I Norge, 1926.
Jahrbuch, 1926.
Publicationer, Volume IV., No. 1, and Volume V., Nos. 1 and 2.

Poland.

Institut de Geophysique et de Météorologie de l'Université de Lwow :—

Communications, 19–30.

Institut Météorologique de Pologne, Warsaw :—

Bulletin Météorologique, June to December, 1926.

Observatorie Astronomique, Wilno :—

Bulletins, Nos. 3 and 4.

Roumania.

Institul Meteorologic Central, Bucarest :—

Buletinul Lunar, July, 1926, to June, 1927.

Russia.

Russian Socie y of the Amateurs of the Universe's Knowledge, Oulitza, Leningrad :—

Astronomical Bulletin, No. 2 (in duplicate), No. 3 (in triplicate), No. 4 (in duplicate).

Geophysical Observatory, Odessa :—

Publications, January to December, 1926.

Spain.

Observatorio de Cartuja, Granada :—

Boletin Mensual, August, 1926, to May, 1927.

Sweden.

Observatoire Météorologique, Upsala :—

Bulletin Mensual, 1926.

Switzerland.

Observatoire Météorologique de Lausanne :—

Résumés Mensuels, 1926.
La Trombe de 24 Octobre, 1926, sur le Lac Leman.
L'Inversion de l'Inclinaison magnetique terrestre aux ages geologiques, par P. L. Mercanton.

Seismograph.

The old Milne instrument was in use up to May. A new Milne-Shaw instrument on loan from the British Association Seismological Committee was then set up, and I am glad to say this instrument has now been purchased by the Government of Ceylon.

When the new instrument was first set up, though the essentially seismological part of it worked excellently, a good deal of trouble was experienced with the driving clock, which had both to rotate the recording drum and draw its carriage along a rackway, which latter it only consented to do with extreme irregularity. With the assistance of Mr. G. H. Tabor, Superintendent of Instruments, the driving clock of the old instrument has now been fixed outside the recording box of the new one and is responsible for the horizontal movement of the drum carriage, while the rackway has been replaced by a spiral screw. The clock supplied with the new instrument rotates the drum but has no other duties.

Apart from the direct recording of shocks a marked diurnal movement of the pillar was observed here in the past (*vide* a paper " On the Slow Periodic Movements of the Colombo Seismograph Pillar." Gerlands Beitrage Zur Geophysik, 1912), but with the building of the new transit room in 1920 this variation practically disappeared so far as movements were concerned that could be measured by the instrument then in use. With the greater magnification of the new instrument they have become apparent again, though the clock drive on the original rackwork was too uneven to allow them to be analysed. With the new spiral drive it is hoped that this difficulty has disappeared.

In the following list of shocks the constants of the instrument from January–May can be taken as period 16.9–16.8 seconds, sensitivity 1 mm. = 0.53–0.54 seconds arc. Rate of film 4 mm. per minute and from then onwards with the Milne-Shaw instrument. Period 11.9–12.1 seconds, magnification 250, amplitude per 1 second arc tilt ·59–60 mm. Damping ratio 20 : 1 to 24 : 1.

Local tremors were chiefly noticeable in the mornings and are not given in detail in this list. During June–August the instrument was frequently out of action owing to trouble with the clock :—

No.	Date. 1927.	P. H. M. S.	S. H. M. S.	L. H. M. S.	Maximum. H. M. S.	End. H. M. S	Apli-tude. M.M.	Remarks.
	January							
1177	24	1 19 30..	1 30 5..	1 55 55..	2 9 55..	5 48	1·5	—
1178		6 56 5..	7 6 0..	—	7 46 30..	9 8	0·3	—
1179	26	15 58 5..	—	—	16 43 0..	17 42	0·2	—
1180	27	8 22 50(?)	—	—	8 24 20..	9 2	0·5	—
1181	30	9 4 20..	9 7 30..	9 10 0..	9 10 30..	9 57	0·5	—
	February							
1182	3	2 43 0..	—	—	4 25 30..	5 52	0·3	—
1183	4	2 50 50..	—	—	3 14 0..	5 7	0·3	—
1184	16	1 47 0..	1 57 25..	2 26 10..	2 30 40..	6 39	1·7	—
1185	21	12 33 25..	12 39 25..	—	12 55 20..	13 24	0·8	—
1186	28	14 27 40..	—	—	15 34 10..	17 4	1·0	—
	March							
1187	3	1 13 20..	1 19 50..	1 26 30..	1 32 50..	9 9	7·0	—
1188	7	9 37 40..	9 45 40..	9 56 0..	10 7 30..	14 0	11·5	—
1189	15	17 1 30..	—	—	17 6 0..	17 35	0·3	—
1190	15	22 1 30..	—	—	22 12 25..	22 32	0·2	—
1191	19	20 39 30..	—	—	20 43 35..	21 0	0·3	—
1192	21	15 20 35(S?)	—	15 27 40..	15 30 50..	16 56	0·7	—
1193	21	18 58 10..	—	—	18 59 30..	19 11	0·7	—
	April							
1194	13	13 51 40..	—	—	14 18 35..	15 58	0·2	—
1195	14	6 43 0..	7 4 35..	7 44 35..	7 51 0..	9 10	1·3	—
1196	16	8 30 0..	9 11 50..	9 34 0..	9 37 0..	11 27	0·5	—

No.	Date. 1927.	P. H. M. S.	S. H. M. S.	L. H. M. S.	Maximum. H. M. S.	End. H. M. S.	Aalitude. M.M.	Remarks.
1197 ..	April 19	.. 17 38 ..	— ..	— ..	17 55 ..	19 9 ..	0·5 ..	The usual time-marking stations having failed, these times are only approximate
1198 ..	20	.. 14 23 ..	— ..	— ..	14 25 ..	14 46 ..	0·5 ..	—
1199 ..	27	.. 19 35 0..	— ..	— ..	20 1 20..	20 55 ..	0·2 ..	—
	May	Old instrument						
1200 ..	9	.. 10 42 41..	10 49 50..	10 55 20..	10 56 5..	11 35 55..	0·3 ..	—
1201 ..	10 (1)	.. 6 10 27..	— ..	— ..	6 18 24..	6 50 40..	0·6 ..	—
1202 ..	(2)	.. 7 35 17..	— ..	— ..	7 42 24..	8 33 19..	0·4 ..	—
		New instrument						
1203 ..	22–23	.. 22 40 ..	22 46 ..	— ..	23 10 ..	2 8	Uncertain	—
	June							
1204 ..	3	.. 12 21 (?) .	12 29 ..	12 38 20..	12 39(30)?	About 15.7h	19·5 ..	—
	September							
1205 ..	11	.. 22 25 14..	22 32 51..	22 51 46..	22 52 57..	0 10 ..	1·5 ..	—
		22 28 24						
	October							
1206 ..	16	.. 12 26 20..	12 37 5..	12 42 5..	12 42 35..	— ..	0·75..	Gap between 13.00 and 13.30
1207 ..	17	.. 8 25 18..	— ..	— ..	14 56 32	16 26 0		—
1208 ..	19	.. 13 54 20..	14 03 50..	14 09 50..	14 13 20..	15 20 50..	0·65..	—
		13 57 05						
1209 ..	24	.. 16 13 50..	16 26 35..	16 44 50..	17 04 0..	20 52 20..	5·5 ..	—
	November							
1210 ..	2	.. 21 11 19..	21 16 19..	21 20 29..	21 25 39..	22 25 19..	0·85..	—
1211 ..	4	.. 13 58 01..	14 10 21..	15 05 51..	15 07 23..	17 34 51..	1·0 ..	—
1212 ..	6	.. 15 43 21..	15 50 21..	15 54 06..	15 56 31..	17 06 36..	0·65..	—
1213 ..	12	.. 14 53 ..	15 02 ..	15 08 5..	15 13 5..	16 0 ..	0·6 ..	—
1214 ..	14	.. — ..	— ..	— ..	— ..	2 20 ..	— ..	Record was lost up to 1h 05m. Hence no phases can be given
1215 ..		.. 5 16 58..	5 25 18..	5 31 33..	5 35 58..	7 04 48..	4·2 ..	—
1216 ..		.. 7 38 58..	Elusive or probably absent ..	8 28 18..	8 34 48..	9 48 48..	1·8 ..	—
1217 ..		.. 15 18 19..	15 26 29..	15 43 34..	15 49 49..	17 17 49..	0·8 ..	—
1218 ..	15	.. 22 08 34..	— ..	— ..	22 33 55..	23 02 19..	0·8 ..	—
1219 ..	16–17	.. 21 18 30..	21 18 50..	21 25 08..	21 25 14..	0 28 51..	12·7 ..	—
1220 ..	18	.. A shock between 2h 30m and 6h 30m. Trace undecipherable					1·3 ..	—
1221 ..		.. 11 09 32..	— ..	— ..	11 13 40..	11 21 37..	0·8 ..	—
1222 ..	21–22	.. 23 31 21..	Record lost			3 01 19..	— ..	—
	December							
1223 ..	28	.. 9 35 04..	— ..	— ..	9 41 39..	10 26 19..	0·6 ..	—
1224 ..	28	.. 18 32 35..	18 43 10..	18 57 20..	19 07 12..	21 54 20..	8·5 ..	—
1225 ..	December 31 to January 1, 1928	.. 23 35 12..	— ..	— ..	23 51 32..	0 34 22..	0·7 ..	—

Colombo: 1928. February 28.

A. J. BAMFORD, M.A., B.Sc., M.C.,
Superintendent.

APPENDIX.

Seasonal Correlation.—Reference was made in the 1926 report to the way in which a curve, compiled from two periods of 4.65 and 3.7 years respectively, gave a considerable degree of agreement with the south-west monsoon rainfall of a number of stations on the windward side of the hills, *i.e.*, stations where that rainfall is normally heavy. The continuation of this curve to 1927 indicated a slight excess for that year—to be precise 9 per cent. above average. However, another point where correlation has been observed is an inverse relationship between the intermonsoon thunderstorms of March and April and the rainfall of the ensuing monsoon. In 1927, March was exceptionally wet, and though the rainfall of April was below average, the intermonsoon thunderstorms as a whole were certainly above average, and suggested a deficient monsoon. Thus two main correlations pointed in opposite directions and lent peculiar interest to the ensuing season, which did its best to follow both leads.

The early part of the monsoon at the end of May and in early June was exceptionally wet, but was followed by a decidedly dry period from the middle of June to August (though even here there were exceptions, *e.g.*, Helbode).

The total offsets for May to September inclusive are shown in Plate IV., from which it will be seen that the excesses outnumbered the deficits, though not with the consistency with which they did in 1926, in which year both the indicators referred to above had pointed to excess rather than deficit.

A further item of interest in connection with this year's monsoon was the definite way in which south-west winds and gradient persisted into October. In fact, had this year been considered alone, the maps in Plates III. and IV. should have been for May–October, not May–September, although for the sake of comparison between one year and another the old classification by months is retained in this report.

In the frontispiece a smooth curve is shown which is identical with that exhibited at Kandy in 1926 and gives the effect of combining periods of 4.65 and 3.7 years, the amplitudes being in the proportion of 10 to 9. Below this is a curve showing the rainfall for May–September at a number

of stations at which the rainfall of that period is usually high. The actual stations used are Maskeliya Blair Athol, South Wanarajah, Norwood, Annfield, Hatton, Luccombe, Holmwood, Caledonia, Sandringham, Dunsinane, Labukele, Nuwara Eliya, which may be described as covering the main south-west face of the hills. To simplify the comparison between stations with different averages, all offsets are expressed as percentages, and in dealing with a number of stations the means of those percentages are used. The third curve, which shows a considerable similarity with the second, is compiled from stations rather further north, roughly describable as from Pussellawa to Matale inclusive. The actual stations are Helbode, Pussellawa, Sogama, Yarrow, New Forest, Peradeniya, Kandy, Katugastota, Vicarton, Delwita, and Matale.

At the extreme left both the rainfall curves depend on a few stations only, the number of stations used increasing from left to right as the dates are reached on which various gauges were started. From 1896 to the right all the stations are used. It is regretted that one or two typical stations, such as Carney, cannot be included owing to their records not going back far enough.

In view of the very great uncertainty that still surrounds the whole question of periodicities I may be criticised for publishing such curves now, instead of waiting for more complete analysis. My reason for so doing is that I wish to accelerate that analysis, and as I am aware that many planters and others are now keeping regular rainfall returns, and other climatic notes, in addition to those who report monthly to the Observatory, I should be glad to call the attention of anyone who is interested to the suggestions that have been made already, in the hope of getting information from them as to how far their experiences confirm or oppose the indications put forward.

It is of course well known that the tend of modern meteorology has been to emphasize its interdependence throughout the planet and thus in seasonal correlation one may look for parallelism with phenomena at the other side of the globe. This is so striking as to have had at times the effect of making one forget indications nearer home, and as some of the local phenomena appear to be closely connected, I am anxious that the records of them should not be lost.

A bird's eye glance at the curves in the frontispiece shows that there is an appreciable measure of agreement between them. However, more interest attaches to their points of disagreement.

It will be seen at once that the six highest peaks in the upper curve suggest high rainfall in 1882, 1886, 1900, 1904, 1919, 1923, and all are supported by distinct peaks on both the rainfall curves. The next three peaks on the upper smoothed curve are 1878, 1896, and 1915, the first of which alone is well supported, while the lower smoothed curve shows less of a peak in 1878 and 1896, but gives distinct peaks in 1890 and 1909, of which the former is in absolute disagreement with the rainfall curve and the latter receives moderate support.

As regards the dry years the agreement is good between all four curves in 1880, 1884, 1898, 1902, 1906, 1921, and 1925, but sharp drops also occur in the rainfall curves of 1887, in which case they are a year ahead of the theoretical curves, and in 1918, where they are a year late, while a dip in 1890 has nothing in the theoretical curves to explain it, and is followed by an equally unexplained rise in 1891. A somewhat similar dip occurred in 1908, while the dip in 1913 is unexpectedly large and possibly connected with the abnormally heavy rain of January of that year. Peaks in 1872 show considerable variation between the two rainfall groups, probably because the figures of only one or two stations are available, and may be connected with the peaks on the theoretical curves between 1871 and 1872.

The next step is to compare the discrepancies above with other points, and first among these is the question of intermonsoon thunderstorms. This cannot be done thoroughly because the majority of rainfall reports give cold figures of quantity alone, without much indication of the type of rain. However, it is interesting to note that in the case of 1890, which is perhaps the most glaring example of disagreement above, the April rainfall at Nuwara Eliya was the highest ever recorded in April at that station. I have no means of knowing at present whether this rain was accompanied by unusual thunderstorm activity (I suspect it was), and if anyone who reads this can give me any information on the point I should be very glad to have it.

1887 and 1893 (in both of which the monsoon rainfall was below the indications of the upper curve) were also years with a high rainfall in March–April to which the same applies.

The low rainfall of 1918 was mentioned above and certainly cannot be explained by high intermonsoon rain ahead of it, but is interesting in bringing out another point where some correlation has been found, viz., a direct relationship between the temperatures of February–April and the following rain. Parallelism between these two items was well marked in the decade 1880–1890, but February, 1918, stands out as the February with the lowest mean temperature on record, and it is interesting to find that the Meteorological Report for that month written by Mr. J. E. Evans (who was then Acting Superintendent of the Observatory) which appeared in the "Tropical Agriculturist" of March, 1918, including the following :—

> "The outstanding feature (of February) was its phenomenal coolness. . . . A February under conditions somewhat similar to that just experienced is found to be usually followed by a period rather deficient in rainfall, especially in the first half of the year."

I may conclude this section by pointing out that the periodicity curve above suggests a south-west rainfall for 1928 of rather less than last year. The indications of the February temperatures support this rather than oppose it and April thunderstorms are as yet unknown though I may be able to add a footnote regarding them by the time I receive the printer's proof.

1928. March 23. A. J. B.

Footnote referred to above.

The following list shows the offset from average of the rainfall from May 1 to July 20 and certainly shows that despite some heavy rain in early July the monsoon rainfall has so far followed the forecast and been below average :—

Nuwara Eliya	..	— 3.38	Kandy	..	+ 1.42	Colombo	..	— 3.94
Watagoda	..	— 0.26	Kurunegala	..	— 2.44	Neboda	..	— 8.95
Watawala	..	— 20.90	Kegalla	..	— 4.58	Deniyaya	..	— 8.08
Hatton	..	— 7.97	Balangoda	..	— 7.58	Kalutara	..	— 9.30
Maskeliya	..	— 8.53	Ratnapura	..	— 7.64	Galle	..	— 4.65
Matale	..	+ 4.76	Avissawella	..	— 0.03			

A. J. B.

1928. July 20.

12(19)28

Return of Rainfall in Ceylon during 1927, and the Means during different Periods.

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.	Dates.
	Feet.																													
Alagalla (Al.) ..	1,062	1927 ..	12·55	13	1·73	5	6·61	10	5·35	10	27·45	20	12·87	23	4·93	12	1·27	5	10·14	14	16·06	19	5·92	12	7·07	6	111·95	149	7·65	May 1 to 2.
		means during 16–17 years	6·17	9	1·77	2	6·10	7	8·51	11	9·70	10	11·70	17	7·37	12	5·35	9	8·36	10	15·67	15	12·81	13	9·77	9	103·28	124	9·82	June 24 to 25, 1911.
Allai Tank ..	20	1927 ..	6·08	12	4·37	10	11·39	13	2·28	5	6·79	7	3·13	2	0·00	0	1·63	2	4·72	6	3·36	6	14·93	19	7·25	13	65·93	95	2·70	May 1 to 2.
		means during 52 years ..	8·62	9	2·42	3	2·30	3	1·91	4	2·81	4	1·43	1	1·69	2	4·16	4	4·67	5	8·92	11	15·69	15	18·60	15	73·22	76	9·11	Nov. 17 to 18, 1906.
Alutnuwara ..	300	1927 ..	23·95	16	8·19	12	15·97	15	2·04	8	3·52	9	0·21	2	0·81	1	2·57	5	5·02	9	5·21	13	16·45	14	16·57	19	100·51	123	5·75	Dec. 22 to 23.
		means during 28 years ..	15·78	14	4·97	7	5·30	8	4·56	8	2·66	5	0·62	2	1·21	2	2·12	4	2·77	5	12·19	15	13·74	15	16·83	17	82·75	103	9·92	Jan. 17 to 18, 1913.
Ambalantota ..	15	1927 ..	4·81	10	2·50	6	12·15	16	1·47	4	4·85	7	5·90	8	0·32	3	1·00	1	4·31	12	1·14	7	5·75	11	4·58	12	48·78	97	3·75	Mar. 15 to 16.
		means during 6 years ..	4·59	6	1·58	3	5·38	9	1·76	3	3·65	6	3·36	8	2·45	6	0·94	5	3·70	8	4·89	9	6·21	11	4·84	8	43·35	82	5·20	Nov. 14 to 15, 1923.
Ambanpitiya (Am.) ..	663	1927 ..	7·31	14	4·81	7	12·99	15	5·59	15	19·01	25	8·79	28	4·58	16	2·01	14	12·55	19	12·58	20	8·52	18	6·38	7	105·12	198	3·50	May 1 to 2.
		means during 56 years ..	3·35	6	2·61	4	6·85	10	10·25	15	10·86	15	12·79	20	8·30	17	6·55	16	8·64	16	17·33	20	13·75	16	7·34	11	108·62	166	16·65	Aug. 7 to 8, 1886.
Ambepussa ..	—	1927 ..	Started in May				—	—	—	—	16·21	24	8·80	26	1·76	11	0·43	5	9·83	18	14·59	20	8·36	16	2·18	4	—	—	4·33	Oct. 23 to 24.
Amparai Tank ..	90	1927 ..	17·59	16	8·08	13	13·54	12	1·71	9	9·91	8	1·28	4	0·00	0	0·42	2	5·18	9	2·01	7	9·99	18	14·10	14	83·81	112	7·20	May 3 to 4.
		means during 52 years ..	14·84	12	4·84	5	3·46	5	3·15	5	3·72	5	2·18	3	1·87	3	2·90	5	4·36	6	8·86	6	12·34	13	18·22	15	80·74	90	19·20	Dec. 7 to 8, 1881.
Andankulam Tank, Trincomalee	40	1927 ..	4·47	11	5·12	8	7·63	13	2·87	5	5·15	7	2·28	2	0·70	1	2·18	3	6·99	7	1·33	5	9·26	19	7·49	14	55·47	95	2·73	Dec. 20 to 21.
		means during 37 years ..	7·83	10	1·56	3	1·73	3	1·48	4	2·09	3	0·86	1	1·58	3	2·86	5	3·41	6	6·65	11	13·83	15	15·15	15	59·03	79	9·70	Dec. 27 to 28, 1921.
Annfield Estate, Dikoya (An.) .	4,300	1927 ..	6·66	15	3·85	10	9·39	17	4·84	8	21·62	18	19·41	27	17·10	27	3·29	14	13·32	22	7·08	15	5·03	13	3·17	7	114·76	193	4·62	May 1 to 2.
		means during 40 years ..	4·01	10	2·23	6	6·35	12	9·21	17	8·91	17	16·34	25	15·53	26	11·35	23	10·80	21	12·68	22	9·52	18	6·15	13	113·08	211	8·79	Oct. 4 to 5, 1913.
Anningkanda Estate, Deniyaya	1,550	1927 ..	11·85	21	9·12	11	18·42	21	6·25	14	19·21	24	13·38	27	10·47	23	4·14	18	11·42	20	17·43	18	15·70	22	9·23	23	146·62	242	4·78	Nov. 30 to Dec. 1.
		means during 50 years ..	8·93	14	7·37	11	10·58	15	12·86	18	12·78	17	13·28	21	9·30	18	7·88	17	10·99	17	16·05	21	17·37	21	13·48	19	140·87	208	7·98	Oct. 27 to 28, 1906.
Anuradhapura — Survey Office	295	1927 ..	2·63	15	3·38	12	6·71	14	8·84	12	3·03	9	0·42	5	0·64	1	2·74	3	3·55	8	4·67	10	6·03	18	4·33	11	46·97	118	2·42	Aug. 1 to 2.
		means during 58 years ..	3·98	9	1·54	4	2·86	7	6·71	13	3·36	7	1·30	4	1·27	3	1·74	4	3·04	6	9·61	16	10·59	18	8·70	16	54·70	106	9·32	May 20 to 21, 1891.
Anuradhapura — Experiment Station	295	1927 ..	3·27	8	2·98	10	5·08	8	3·65	7	2·85	5	0·00	0	0·08	1	4·31	5	5·46	4	8·48	9	7·08	10	3·52	6	46·76	73	2·78	Oct. 28 to 29.
		means during 4–5 years..	8·87	10	0·78	3	4·68	8	4·78	7	3·76	7	0·17	1	0·70	2	1·10	2	5·91	6	7·82	12	10·47	13	7·66	12	56·70	83	4·59	Nov. 20 to 21, 1926.
Arachchi Amuna (A. A.) .	135	1927 ..	6·21	12	2·37	8	10·89	17	4·60	10	8·56	15	8·09	17	3·76	13	3·20	8	4·50	12	8·59	13	15·47	15	9·03	16	85·27	156	3·99	Mar. 14 to 15.
		means during 11 years ..	4·22	11	2·43	6	8·03	12	5·07	9	6·08	12	5·68	16	4·63	14	3·62	13	5·87	13	5·96	13	9·61	15	9·42	14	70·62	148	7·40	Dec. 6 to 7, 1919.
Aranayaka (Ar.) ..	1,000	1927 ..	9·14	14	3·34	5	9·21	14	7·09	10	16·30	21	12·18	26	6·64	17	1·77	11	7·56	18	11·00	18	6·92	15	5·01	7	96·16	176	4·08	April 30 to May 1.
		means during 22 years ..	4·20	8	1·84	3	6·53	10	7·20	12	7·34	11	13·75	20	11·10	18	8·11	15	8·67	14	14·06	18	11·04	17	7·36	12	101·20	157	9·30	Oct. 4 to 5, 1911.
Arawa Estate ..	600	1927 ..	41·74	18	6·83	13	21·06	17	1·59	6	3·02	6	0.73	1	0·49	1	2·98	6	3·47	11	4·74	14	24·87	21	23·36	19	134·88	133	6·80	Nov. 27 to 28, 1927
		means during 2 years ..	27·31	16	4·04	8	12·25	12	1·80	6	6·16	8	0·36	1	0·24	1	2·68	4	2·12	8	4·73	11	18·77	20	20·81	17	101·27	112	6·80	Nov. 27 to 28, 1927