THE COLOMBO OBSERVATORY. 1930

REPORT OF THE SUPERINTENDENT OF THE OBSERVATORY.

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ADMINISTRATION.

Staff.—There was no change in the senior staff. Mr. A. J. Bamford was in charge as Superintendent with Mr. H. Jameson as chief assistant. Mr. Jameson's official description as "Assistant Astronomer" is somewhat inadequate in view of the way in which the meteorological work has developed at the expense of the other activities of the Observatory. The other technical officers were Messrs. D. T. E. Dassanayake and A. P. Kandasamy (Senior), and Messrs. D. J. Jayasinghe, and R. D. Kreltsheim (Junior).

The normal clerical staff at Colombo now numbers fourteen, though extra assistance has to be obtained in January of each year to deal with the extra work involved in getting out the annual figures.

The staff also includes a mechanic, carpenter, binder, and coolies.

Buildings.—No additions were made, though the attacks of white ants necessitated some fairly drastic repairs in the balloon-filling shed.

TIME WORK.

The astronomical activities of this Observatory are mainly limited to time work, but include some investigations arising therefrom. At present these are chiefly in connection with atmospheric distortion of observations.

The Cooke micrometer transit (4-inch object glass) and Borrel chronograph continued to be in use, but it was found possible to make a considerable reduction in the number of clock stars observed, owing to the regular use of the Bordeaux and Rugby vernier signals.

Fournier sidereal clock No. 72 continued to be the best ratekeeper. It was stopped for a few minutes on September 11, when one of the hands was pressed back on its staff, but otherwise was in action throughout the year. Fournier sidereal No. 70 also worked well, though its rate was not quite so steady as that of No. 72. A new cord was inserted on June 12, which was the only occasion on which it was stopped.

The Cooke mean time clock gave trouble at the beginning of the year, which showed chiefly in the erratic way in which the amount of current varied when sending signals, although it was also apparent that the margin of power was very small. A new metal bracket for the contact was inserted on April 23, without producing much improvement.

The clock was removed by Mr. G. H. Tabor, Superintendent of Instruments, Survey Department, in May. As a result of his examination the holes in the plates were found to be worn and jewel holes were fitted, and in addition a general overhaul was given, which has produced very satisfactory results.

The clock has not the ratekeeping power of the sidereals, but is now working satisfactorily in its main duty, which is the sending out of the wireless time signals, for which purpose it is adjusted by solenoid after comparison with the sidereals.

Dent mean time clock No. 45082 worked continuously without incident and was used for time ball work and for receiving the vernier signals from March 5 to July 13 inclusive, *i.e.*, during the period when the Cooke clock was out of action.

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

Time Ball and Synchronization.—The time ball at the Master Attendant's Office was dropped 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 no failures during the year. The best previous records were in 1926, when there was only one failure, and in 1929, when there were three. The achievement in 1930 is therefore very satisfactory, especially when it is remembered that nearly a thousand signals are given per year, and that the successful working of the time ball involves co-operation between four departments (Survey, Telegraph, Harbour Engineer, and Master Attendant).

Synchronizing signals were sent daily to the Central Telegraph Office, whence a further distribution of time signals was made. These were sent at 7.55 and 15.55 on ordinary week days, and 8.54 on Sundays and public holidays. A test measurement was in all cases made immediately after the setting signals, and enabled the Observatory staff to verify that the setting signal had done its work satisfactorily, and if necessary to report any defect by telephone. The master clock at the Central Telegraph Office works in half-minute steps, and the method of testing is as follows:—When it indicates 58½ minutes past any hour a contact is made in it which short-circuits the relay. From a few seconds before 7.58½ (or 8·58½ or 15.58½) a contact is made at the Observatory, sending current in the reverse direction to that used for the setting signal. As the relay at the Central Telegraph Office is a polarized one, this has no effect on the relay, but the amount of the current in milliamperes can be read on the Observatory meter. The key is kept down, and when the Central Telegraph Office master clock shows 7.58½, the fact is shown at the Observatory by a sudden increase in current, due to the cutting out of the relay. A similar opportunity of noting change in current is provided, when the clock at the Central Telegraph Office shows half a minute past the hour, and the shunt goes out of action. This, as a "break", not a "make", is usually a more sharply defined change, and capable of being read more exactly.

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The clock in the lighthouse at the Chatham street-Queen street corner was synchronized daily at 9 A.M. by having its relay in series in the time ball circuit.

This clock has now had a certain amount of attention called to it, owing to the fact that at certain hours its strike is included in the broadcasting programme. The bells used for this are the original ones, and the original lettering on them is still quite clear, viz., "T. Meares of London fecit 1814". The support of the largest bell, which is used for the hour strike, had to be reinforced a few years ago, but otherwise the bells are an example of old craftmanship, unaltered by modern additions.

The noon broadcast of the strikes of this clock is checked by wireless, and the error noted. The great majority of these checks gave errors of less than 5 seconds. The clock stopped on 8 occasions during the year. On two of these occasions the cause was electrical, on one the stoppage was due to the carelessness of a workman attending to the electric lights of the clock, on another the clock was stopped by a cockroach getting between two of the toothed wheels, and on one occasion the reason for the stoppage could not be determined.

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 (5.57–6.00, Greenwich mean time) on 2,300 metres C.W., and the evening one at 22.27–22.30 (16.57–17.00, Greenwich mean time) on 600 metres, I.C.W. There is no curtailment on Sundays or public holidays.

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 22.27.00 by a signal from the Observatory, and during the 3 minutes it is in action is kept in beat with second-by-second signals from one of the Observatory mean time clocks.

A chronograph at the Wireless Station records both the impulses from the Observatory and the movements of the drum. This chronograph, though very useful, does not meet every contingency (*e.g.*, it would give no immediate warning if the drum dropped a second and went on exactly 1 second slow) and as a further safeguard, every outgoing signal is listened to, on the receiving set at the Observatory, by the officer who is responsible for sending the impulse that starts the signal. This officer is in direct telephonic communication with the Wireless Station, and the decision as to whether a signal may be passed as correct or not rests with him. In the case of a failure, the words "time signal failed" are sent out in Morse immediately afterwards.

In 1930 there were 722 successful signals out of a possible 730. Of the 8 unsuccessful cases, 3 were reported as due to trouble with the power or aerial at the Wireless Station, *i.e.*, troubles that affected all transmission, not only time signals. Two were reported as due to the motor at the Wireless Station, and 2 to trouble on the line. In 1 case the signal was not heard at the Observatory, so could not be checked, and the "washout" was sent. The fault was almost certainly in the receiving set at the Observatory alone, and the signal was probably correct. It was not, however, considered desirable to give it the benefit of the doubt, as that would have been a deviation from the principle that every signal, that is not cancelled, has been definitely audited at the Observatory as it goes out.

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

Meteorological Equipment and Work.

The 16 climatological stations that were in action in 1929 were maintained, as were the 4 new stations established for aeronautical meteorology. The records obtained from the latter, particularly those from Chilaw, showed a marked improvement in the course of the year.

At the 16 main climatological stations observations were taken at 9.30 A.M. and 3.30 P.M. daily. In addition, observations were also taken at Colombo and Nuwara Eliya at 7 A.M. and at Trincomalee and Hambantota at both 7 A.M. and 7 P.M. The 7 A.M. observations are taken primarily for co-operation with India, while those at 7 P.M. are used, in conjunction with 7 P.M. values deduced from the Colombo autograms, in preparing the evening wireless weather report for issue from Colombo.

Mention may also be made of the climatological station maintained by the Rubber Research Institute at Culloden, Neboda, the records from which are sent regularly to the Observatory, the anemobiograph at Haputale, and the Robinson anemometer at the Little Basses lighthouse, which is maintained and read twice daily by the Lighthouse Service.

The chief changes in outstation observers during the year were at Nuwara Eliya and Kandy. At Nuwara Eliya, in 1929, owing to difficulty in finding suitable observers among the staff of Government offices, the work was kindly undertaken by the staff of the Tea Research Institute. Unfortunately it became necessary to make new arrangements from December, 1930, owing to the Institute being transferred to St. Coombs, Talawakele, and the observers are now drawn from the staff of the Nuwara Eliya Post Office.

I am glad to put on record my appreciation of the great help given by Mr. T. Eden of the Tea Research Institute, in connection with the Nuwara Eliya meteorological observations, and note with pleasure that observations are now being taken at the Institute's new premises at Talawakele.

At Kandy the observers have for some years been drawn from the Post Office staff, but at the request of that department this arrangement was terminated during the year, and observers are now selected from the Survey Office.

At the other main stations there were a few changes in personnel, but not in the departments from which they were drawn.

The pin diagrams and other systems of checking at Colombo were maintained without any great change in method.

Nine clerks of the Survey Department, and one from Puttalam Kachcheri, were given a course in meteorological work at the Observatory.

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

The chief material for this report was provided by the morning telegrams from 14 climatological outstations, the Colombo observations, including the morning pilot balloon flight, and such ships' messages as were available. Other sources of information were the telegram from Pamban and the figures from stations in Ceylon that are not fully equipped climatological stations, but from which the morning measurement of rainfall is wired. These stations now number 15, Topawewa and Vavuniya having been added during the year.

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. These messages deal with the immediate neighbourhood of Ceylon in considerably more detail than can be expected in the Indian messages, which avowedly have to summarize the outstanding features over big areas. By kind permission of the Director-General of Observatories, copies of the Indian messages are received at Colombo, and use is made of any relevant parts, but the main sources of information for the reports from Colombo are the Ceylon readings (both surface and upper air) and wireless messages received direct from ships.

The number of ships from which weather telegrams have been received (244) shows a gratifying increase over the corresponding figure for the previous year (210). I am glad to take this opportunity of expressing my thanks to the various Captains and other officers concerned.

The greatest number of telegrams received from any one vessel in 1930 was 54 from H.M.S. Effingham. As in 1929, the ss. Aungban and Badarpur have been two of the most regular suppliers of information, and others from which over 30 telegrams were received were H.M.S. Hermes and ss. Nawab and Blommersdijk.

The total number of ships' telegrams received was 1,399.

Acknowledgments have been sent in all cases, but inevitably not all of these have reached the addressee—some have been returned to me after redirection has failed to keep up with the continuous changes of the ship's address.

The full lists of ships from which messages were received in 1930 includes ss. Achilles, Agamemnon, Agapenor, Ahmedi, Akbar, Alderamin, Algerian Prince, André Lebon, Arracan, Athelprince, Athos II., Aungban, Autolycus, Azay-le-Rideau, Badarpur, Bahadur, Ballarat, Baloeran, Balranald. Banffshire, Bangkok, Baradine, Barrabool, Begum, Bellerophon, Bendigo, H.M.S. Berwick, ss. Binfield, Blitar, Blommersdijk, Boschdijk, Bovenkerk, British Colonel, Burgenland, Canara, H.M.S. Caradoc, Castor, ss. Cathay, Chakrata, Chantilly, Chenonceaux, Chitral, Christiaan Huygens, City of Bagdad, City of Baroda, City of Bath, City of Bombay, City of Calcutta, City of Cambridge, City of Carlisle, City of Chester, City of Delhi, City of Paris, City of Rangoon, City of Roubaix, City of Singapore, City of Sparta, Clan Murray, H.M.S. Clive, ss. Comorin, H.M.S. Cornwall, R.I.M.S. Cornwallis, ss. Cracovia, Cranfield, H.M.S. Cumberland, ss. Daga, Dana, Dara, D'Artagnan, Deebank, Derfflinger, Diomed, Director, Dogra, Durban, H.M.S. Effingham, ss. Egra, Ellora, Elpenor, Enggano, H.M.S. Enterprise, ss. Eridan, Esperance Bay, Eurybates, Forthbank, Franken, Fulda, Gamaria, Gambada, Gambhira, Gandara, Gange, Garheta, Garmula, Glenamoy, Glengarry, Gealpara, Gurna, Hakozaki Maru, Hakusan Maru, Hatipara, Havildar, Helenus, H.M.S. Hermes, ss. Hobsons Bay, Hoogkerk, Jalabala, Jaladuta, Jalajyoti, Jalapalaka, Jalatarang, Jalaveera, Jan Pieterszoon Coen, Janus, Johan De Witt, Johan van Oldenbarnevett, Kalyan, Karimata, Karmala, Kashgar, Kashmir, Kidderpore, Knight Companion, Kohinur, Koningin-der-Nederlanden, Kotu-Radja, Lahore, Lancashire, Laomédon, Largs Bay, Lossie Bank, Macedonia, Macharda, Magda, Magdapur, Mahronda, Maidan, Maihar, Malakand, Malakuta, Malancha, Maloja, Mandala, Manela, Mangalore, Manipur, Manora, Mantua, Mapia, Margha, Marnix van St. Aldegonde, Mashobra, Matheran, Matra, Meerkerk, Merkara, Mexico Maru, Moldavia, Mongolia, Montgomery City, Mooltan, Morea, Morvada, Mulbera, Nagina, Nagoya, Naldera, Nalgora, Nankin, Nanking, Narkunda, Nawab, Neuralia, Nevasa, Nirpura, Nirvana, Nizam, Northmoor, Novara, Nurjehan, Nurmahal, Orama, Orantes, H.M.S. Ormonde, ss. Ormonde, Orna, Oronsay, Orvieto, Osiris, Ostsee, Otranto, Oxfordshire, Pasha, Patria, Perseus, Peshawur, Piako, Poelambras, Port Dunedin, President Adams, President Garfield, President Harrison, President Polk, Quilca, Radja, Rajputana, Rajula, Rampura, Razmak, Ridderkerk, Risaldar, Rohna, Roseric, Rotti, Saarbrücken, Saleier, Sandown Castle, Schiekerk, Selandia, Shropshire, Shuja, Sikh, Silverbeech, Silver Palm, Singu, Soekaboemi, Stadsdijk, Staffordshire, Subadar, H.M.S. Suffolk, ss. Surada, Tairea, Tantalus, Tapanoeli, Telemachus, Trojanstar, Uckermark, Ursula Rickmers, Vechtdijk, Venezia L., H.M.S. Vindictive, ss. Vogtland, Waroonga, Yselkerk.

Rain Gauges and Volunteer Observers.—Rainfall figures appear in this report from 378 stations. These include the stations that report daily, at which the observers receive an allowance, but the great majority of them are maintained voluntarily, and I am glad to take this opportuinty of thanking all who have co-operated in this work.

The new stations started during the year include seven under the Agricultural Department two under the Medical Department, six at schools, and four on estates, Gona-Penigala (Mr. H. V. Fonseka), Lemastota (Mr. B. Sortain), Lower St. Martin's (Mr. A. E. Butler), and Newfoundland. (Mr. C. H. Bevan). This last station is really the successor to Florindale.

While it is not possible to mention all the voluntary helpers individually, I wish to put in a special word of thanks to some of those who have done a great deal more than supply monthly summaries of their daily rainfall figures. Notable among these are Mr. J. A. Coombe (Poonagalla) for his barometer and temperature readings, besides special comments on unusual conditions; Mr. E. E. Megget (Detanagalla), Mr. Ross Wyllie (Oakwell), and Mr. A. Pearson (Horakelle) for sunshine records; Mr. A. C. Tutein-Nolthenius (West Haputale) for anemometer figures and charts; Messrs. H. Jones and H. A. B. Webb (Hope) for anemometer figures; and Mr. G. Huntley (Vincit), Mr. Innes Lillingston (Campion), and Mr. H. F. Dalton (Theydon Bois) whose climatological notes have been particularly interesting.

Daily figures have been received from three estates gauges and published in the daily reports in addition to those from observers in Government service. In this connection I am indebted to the various Superintendents concerned, namely, Mr. H. A. McLaren (Gikiyanakanda), Messrs. C. F. Hay, B. Sortain, and M. P. Fraser (Panilkande), and Messrs. D. C. Mortimer, A. E. Butler, and S. B. Dias (St. Martin's).

I also wish to make a special acknowledgment of the help given by a number of gentlemen in or near the Kelani Valley, who were kind enough to dispatch telegrams regarding heavy rain in connection with the question of flood warnings. Among the senders of such telegrams I may mention Messrs. W. W. Birtill and H. C. Rowbotham (Yataderiya), Mr. Allen Coombe (Rayigam), Mr. C. Pern (S. Wanarajah), Mr. J. A. Tate (Dunedin), Mr. R. A. Shaw (Ingoya), Mr. G. S. Hall (Kenilworth), Mr. N. Rolfe (Maliboda), and Mr. W. Hermon (Diwela).

Here again it is impossible to thank everyone by name, and in mentioning the above I emphasize the fact that the list is not exhaustive, and that I wish to express my thanks to all who have co-operated in this work.

Co-operation with Indian Meteorological Department.—Telegrams from Colombo, Trincomalee, Hambantota, and Nuwara Eliya are sent to India at 7 A.M. as a matter of routine, while extra storm-warning telegrams are also sent from the three coast stations at various times, when asked for by the

Indian Meteorological Department. The numbers of storm-warning telegrams sent in 1930 were: Colombo 138, Trincomalee 128, and Hambantota 108. These figures are considerably greater than any for the last few years. This increase was the natural result of the marked depressional activity during the year.

A considerable number of the results of pilot balloon flights were telegraphed to India, and the majority of the messages received from ships were also forwarded. In addition, telegrams were also sent whenever the general appearance of the 9.30 synoptic chart showed anything worthy of such treatment.

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

Conference on the Meteorological Requirements of the Royal Navy.—This conference was held at the Naval Office, Colombo, in March, under the Chairmanship of Captain Pridham-Whippell, H.M.S. Enterprise. Commander L. G. Garbett, R.N. (retired), Superintendent of the Navy Services Division of the London Meteorological Office, who had just come from a similar conference further East, was the principal speaker, and other members included Dr. C. W. B. Normand, Director-General of Observatories, India, besides various officers of the Royal Navy at present on the East Indies station. The Ceylon Meteorological Service was represented by Mr. Bamford.

Several recommendations were made regarding the co-ordination of meteorological activities between the Royal Navy and the Indian and Ceylon services. Several of these have already been put into action, while the arrangements for some of the more important, involving changes in the weather messages broadcast from the Matara Wireless Station, were not completed in 1930, but will probably take effect in 1931.

Among these may be mentioned the subdivision of the area covered by these broadcasts into three, viz., the Arabian Sea, the Bay of Bengal, and the Colombo area, reports for which will be prepared at Poona, Calcutta, and Colombo, respectively. The Colombo area is defined in longitude as from the Maldives to longitude 86°E. Its northern limit extends from the extreme north of Ceylon, eastward to longitude 86°, and westward to include the Gulf of Mannar and thence from Cape Comorin to Minicoy. Its southern limit is latitude 5°N.

Apart from its official aspects, the conference was of considerable value from the point of view of local meteorology, owing to the opportunity it gave of discussing local problems on the spot with such recognized authorities as Commander Garbett and Dr. Normand.

Upper Air Work.—Rubber pilot balloons were in use throughout the year, the tail method of observation being used. The balloons showed a marked improvement in quality over those received in the previous year, concerning which it had been necessary to make vigorous protests. During the first four months of 1930, flights were restricted to practically one a day, till a reserve against contingencies had again been formed, the former reserve stock having been dissipated.

It is interesting to note that during these four months the percentage of high flights was considerably more than usual, 47 per cent. of the flights reaching over 5 kilometres, and 32 per cent. over 7 kilometres.

The normal procedure of two flights a day was re-established in May. During periods of international co-operation an average of four flights a day was maintained as before. The total number of flights was 530, or 48 more than last year.

Requests, in English, Sinhalese, and Tamil, that the finder would return the tail, were attached during the south-west monsoon. Sixty-eight tails were returned, which represents just over 20 per cent. of the number of tails to which the request was attached. This is the same proportion as last year.

Two new upper-air theodolites, by Watts & Sons, were taken into regular use from February, 1930, replacing the Cooke theodolite in use before them. As the angular value of the grid in the new instruments was different to that in the old one, new computing graphs for the reduction of the observations had to be made out.

A point of increasing interest here is the importance of the vertical velocity as well as the horizontal. Various suggestions were made on this subject in a paper I read before the Royal Meteorological Society in 1929, and further development has been made since then. One particular point is the way in which cases occur in which the balloon after rising normally for a few minutes appears to meet a downward current that is strong enough to cancel the effect of its buoyancy during the next few minutes, after which it appears to rise with nearly its theoretical velocity.

Such an occurrence may now be accepted as a definite danger sign especially during the early stages of the monsoon. A particularly interesting case occurred on April 25 and 26, and was duly followed by a wind of 62 miles per hour on April 28.

Vertical Temperature Gradient.—Thanks to the kind co-operation of the Chief Engineer, Telegraphs, considerable progress has been made in this investigation.

Four thermographs were in continuous use at the Welikada Wireless Station. A Stevenson screen of the enlarged tropical type is in use near the base of the south mast, while small louvred screens are hoisted on that mast to heights that can be approximately described as 260, 130, and 50 feet above the base.

All the thermographs have weekly drums and are standardized by comparison with a psychrometer when the charts are changed. The instruments are interchanged each week in a regular rotation, so that the records from four consecutive weeks contain equal contributions from each instrument at each level.

Some sample curves are shown in the frontispiece, and exemplify both the inversions that are a marked feature of the inter-monsoon period, and the freedom from inversion that characterized the south-west monsoon.

Connected with the direct measurement by thermographs, a further analysis of the structure of the atmosphere near the surface has been made by a series of refraction observations. Readings of the apparent altitude of the top of the mast in question (and also of a reference point near the top), as seen from a fixed point in the Observatory compound, were made three times a day, by means of a telescope permanently fixed so that the top of the mast in question is near the centre of its field of view. The only readings necessary are those of the micrometer eyepiece of the telescope and of a spirit level that rests permanently on its tube. These supply a differential record of the variation in refraction, and are supplemented by periodic measurements by means of a theodolite placed alongside.

The permanently mounted telescope, which has a 4-inch object glass, gives differential values to a much higher degree of accuracy than can be obtained by the theodolite, but as its readings are only differential the periodic use of the theodolite as well is required.

It is quite clear that if the optical stratification of the atmosphere was in truly concentric layers over the earth's surface, we could calculate the refraction between the telescope and the summit of the wireless mast, by using the known linear dimensions and the thermograph readings, and assuming that the pressure falls off with altitude in accordance with the ordinary barometric-altitude formulae. This calculation has been made, and the difference between the observed refractions and the calculated ones give an indication of the way in which the actual atmospheric structure differs from the theoretical structure. It is a most interesting fact that this deviation changes sign with the transfer from inter-monsoon to monsoon conditions.

Seasonal Correlation.—In 1930 the rain that can be described as of purely south-west monsoon type was distinctly below average in amount. However, in a country like Ceylon, where rain due to different causes overlaps, it is desirable that anything of the nature of seasonal correlation should be for calendar periods since the interest of the public is in the incidence of rain, irrespective of what cause it may be due to. In the past some attempt has been made to find correlations with the rainfall for the period May to September inclusive which is roughly, but by no means exclusively, the rain of the south-west monsoon type, and the adopted criterion for this has been the percentage variation from average at 24 specified up-country stations on the south-west face of the hill-country. (*Vide* Observatory Report, 1929, page 5, and Ceylon Journal of Science, Section E, Volume 1, Part 3, page 233.)

In several past years it has been noticed that this rainfall variation showed an inverse correlation with the activity of the inter-monsoon thunderstorms, commonly described as the April thunderstoms. In 1930, up to the end of April these thunderstorms, though quite well in evidence. had been slightly below their normal activity, and as the other indicators showed little variation from normal the total information available on April 30 pointed to slight excess rather than deficit, the emphasis being more on the slightness of the variation from normal than on its direction.

As a matter of fact the numerical percentage rainfall in 1930 from the stations referred to above worked out to almost exactly its previous average, but this was largely due to heavy non-monsoonal rain in the early part of May, so that the numerical agreement in this year does not serve to strengthen the possibility of estimating ahead but rather calls attention to the complications.

In this case, up to April 30, the inter-monsoon thundershowers had not quite come up to average, but they were very active in the next few days, and were followed by heavy depressional rain on May 5–6, so that by the middle of May the future prospects of rain were distinctly reduced, although many stations had already made sure that their total for the month of May would be above, average.

In the map (No. IV.) at the end of this report variations from average are shown for the period May–September, 1930, inclusive.

Most of the 24 stations referred to above will be found in the unshaded area corresponding to variations within 5 inches from average.

In the lower slopes and the middle of the Kelani Valley the very low monsoonal rain of June and July was responsible for marked deficits in the totals for the five months, while near the west coast there was considerable excess, largely due to the depressional rain of early May.

On the lee side, where May–September are usually not months of heavy rain, averages were on the whole passed in 1930. This was in part due to the May storm, but also due in some measure to the shielding, that takes place under pure monsoonal conditions, being less marked than usual in the case of weak monsoonal rain on the windward side.

Publications.

The present report is on the same lines as its predecessors, and gives among other things the rain gauge figures from 378 stations. The latter part of it includes the tables that also appear in the Ceylon Blue Book. The chief change this year is a modification in the method of tabulating heavy wind at Colombo (Table XIV.).

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 Tropical Agriculturist.

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

A paper "On the Design of Rain Gauges for Tropical Use" was published by me in the Meteorological Magazine, and short notes on meteorological subjects were contributed to the same magazine by Mr. Jameson and myself.

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 :—

1930.

International.

League of Nations, Health Section, Eastern Bureau, Singapore :—

Weekly Fasciculus, 1929, December 14–1930, December 6.

Internationale Union Géodésique et Géophysique :—

Bulletins Géodésiques, July–September, 1929.

"Some results of Actinometric Observations at Sea", by L. Gorczynski.

Secrétariat du Comité Météorologique International :—

Publications No. 3, parts 1, 2 ; No. 5.
Correctif à la Publication No. 2.

Commission Internationale de La Haute Atmosphere :—

Results of Aerological Ascents 14. IV. 29, 15–16 IV. 29.

Africa.

Egypt.

Ministry of Public Works, Physical Department :—

Meteorological Report, 1923.
Upper Winds at Cairo and Khartoum.

Union of South Africa.

Royal Observatory, Cape of Good Hope :—

Cape Star-Correction Tables.

British East Africa.

British East African Meteorological Service, Nairobi :—

Summary of Rainfall in Kenya Colony, January–June, 1930.
Annual Report, 1929.

Mauritius.

Royal Alfred Observatory :—

Annual Reports, 1928, 1929.
Magnetical and Meteorological Observations, 1929, January–December ; 1930, January.
Miscellaneous Publications, Nos. 8, 9, 10.

AMERICA (NORTH).

Canada.

Toronto Observtaory :—

Meteorological and Magnetical Observations. 1928, 1929.

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Seismograph.

The Milne Shaw seismograph was in use throughout the year. A second clock that has been added outside the main casing was used to give the carriage of the recording drum its horizontal movement, while the inner clock was used for rotation only. There were a few stoppages on account of trouble with the clocks, but none of them were protracted.

The coupling was maintained at the 250 magnification throughout and measurements of period, damping ratio, and sensitivity were made at least once a month. The period remained in the neighbourhood of 12 seconds throughout the year without adjustment.

Measurements of the damping ratio varied from 1 in 14 to 1 in 27. The sensitivity was usually about 60 mm. per second of arc, the extreme measurements during the year being 66 and 57.

The list below is restricted to definite shocks and contains no reference to a great number of small traces that were also recorded. The regular diurnal movement of the pillar, which had not been very apparent on the old instrument since the new transit room was built, shows quite definitely on the new one, now that the clock drive is sufficiently regular to make this possible.

No.	Date. 1930.	P. H. M. S.	S. H. M. S.	L. H. M. S.	Maximum. H. M. S.	End. H. M.	Amplitude. MM.	Remarks.
	January							
1403	5	1 24 21	—	—	—	—	—	Focus too near and hence the phases could not be given. Amplitude is less than 2·5 mm. This was felt without instruments at several places in Ceylon
		1 40 41	—	—	—	—	—	
1404	12	11 19 50	—	—	11 26 50	11 56	0·9	—
1405	14–15	22 19 21	22 26 21	—	22 36 6	0 1	0·7	—
1406	18	7 15 39	7 25 4	7 41 9	7 44 19	8 40	1·4	—
1407	25	0 46 20	0 53 25	—	1 4 5	1 48	0·7	—
1408	28	6 31 25	6 43 7	—	7 12 24	—	0·5	—
	February							
409	2	A shock between 4h. 50m. and 23h. 30m.						Times of phases cannot be given, as the traces are overlapping owing to the driving clock having stopped
1410	7	16 39 21	16 43 26	16 46 9	16 53 51	18 30	1·9	—
1411	8	6 42 8	—	—	6 48 53	7 10	1·0	—
1412	12	—	—	—	*7 24 33	8 18	0·7	Record lost between 6 25 and 7 23, due to light failure, hence no P, S, and L
1413	14	18 47 50	18 55 50	19 6 50	19 17 15	19 46	0·9	* Time of Maximum wave recorded. True Maximum may have occurred earlier
1414	14	20 59 50	Elusive	21 40 5	21 49 26	23 25	0·8	—
1415	18	2 17 21	—	—	3 21 3	3 49	0·6	—
1416	23–24	23 54 19	—	—	23 56 4	0 27	1·1	—
1417	24	20 59 14	21 8 14	21 16 49	21 24 4	21 40	0·9	—
1418	27	2 18 50	—	2 23 20	2 25 12	2 56	0·7	—
	March							
1419	1	5 48 48	—	—	5 52 50	6 10	0·7	—
1420	6	15 53 35	15 59 52	16 24 20	16 36 5	17 13	1·2	—
1421	9	8 55 52	—	8 59 40	M_1 9 0 33	9 47	2·6	—
					M_2 9 1 10	—	2·6	—

No.	Date. 1930.	P. H. M. S.	S. H. M. S.	L. H. M. S.	Maximum. H. M. S.	End. H. M.	Amplitude. MM.	Remarks.
	March							
1422 ..	10	.. 16 38 20..	16 46 50..	17 0 50..	17 3 2..	17 30..	0·5..	Maximum not pronounced
1423 ..	15	.. 6 50 35..	— ..	7 8 50..	7 13 38..	9 0..	1·5..	—
1424 ..	26	.. 7 20 40..	7 22 50..	7 31 25..	7 42 38..	10 54..	14·5..	Times were interpolated as time marking device was not working
1425 ..	26	.. 11 40 49..	— ..	— ..	11 52 9..	13 18..	1·0..	do.
1426 ..	30	.. 8 53 14..	— ..	9 19 51..	9 22 33..	10 28..	0·9..	—
1427 ..	30	.. 15 28 9..	15 39 12..	15 44 54..	15 50 39..	17 28..	4·4..	—
1428 ..	31	.. 12 49 17..	— ..	— ..	13 11 17..	13 35..	0·7..	—
	April							
1429 ..	2	.. 19 58 33..	— ..	— ..	20 10 33..	20 54..	0·6..	—
1430 ..	15	.. 10 48 38..	— ..	— ..	11 8 33..	11 30..	0·8..	—
1431 ..	20	.. 16 35 25..	— ..	— ..	16 46 0..	17 25..	0·9..	—
1432 ..	21	..eP12 8 54.. iP12 15 39	Elusive ..	12 34 4..	12 44 34..	15 32..	1·5..	—
1433 ..	23	.. 22 9 41..	— ..	— ..	22 35 36..	23 23..	1·3..	—
1434 ..	26	.. 16 41 49..	— ..	— ..	17 15 29..	17 45..	0·3.	—
1435 ..	27	.. 14 41 29..	— ..	— ..	14 49 9..	15 13..	0·5 .	—
1436 ..	28	.. 18 40 11..	18 44 41..	18 50 19..	18 51 46..	19 29..	0·9..	—
	May							
1437 ..	5	.. 13 50 20..	— ..	— ..	— ..	— ..	— ..	Owing to the fast and wide movements of the boom the trace is not distinct enough to render it possible to read off the times of the subsequent phases with any certainty. Maximum may have occurred between 13h. 55m. and 14h. 19m. The amplitude is probably greater than 55 mm. First movement was to the west
1438 ..	6–7	.. 22 42 35..	22 49 5..	23 0 50..	23 7 45..	— ..	22.0..	End masked in tremors due to local heavy rain
1439 ..	8	.. 12 54 51..	13 0 39..	13 7 51..	13 16 21..	14 12..	0·5..	—
1440 ..	8	.. 14 14 21..	— ..	— ..	14 35 36..	15 11..	0·4..	—
1441 ..	8	.. 15 43 41..	15 50 21..	16 5 51..	16 9 51..	17 14½.	1·0..	—
1442 ..	11	.. 22 47 15..	— ..	— ..	22 56 5..	23 33..	1·1..	—
1443 ..	19	.. 15 11 49..	15 18 9..	15 25 49..	15 30 59..	15 53..	0·9..	—
1444 ..	20	.. 11 29 13..	11 38 48..	11 53 8..	12 17 18..	13 9½.	1·5..	—
1445 ..	29	.. 17 32 19..	— ..	— ..	17 42 9..	18 22..	0·5..	—
1446 ..	31	.. 18 17 5..	— ..	— ..	18 38 8..	18 58½.	0·4..	—
	June							
1447 ..	1	.. 13 23 51..	— ..	14 7 15..	14 20 31..	15 35½.	0·8..	—
1448 ..	4	.. 9 58 49..	10 1 59..	10 8 19..	10 12 4..	11 4..	1·0..	—
1449 ..	5	..eP12 1 17.. iP12 6 49	— ..	12 24 59..	12 41 25..	13 7½.	0·7..	—
1450 ..	16	.. 13 40 50..	— ..	— ..	13 46 3..	13 55..	0·5..	—
1451 ..	19	..eP13 13 20 iP 13 18 10	13 22 30..	13 40 0..	13 43 5..	15 17..	1·6..	—
1452 ..	25	.. 11 35 19..	— ..	— ..	11 49 1..	12 15..	0·7..	—
1453 ..	25	.. 21 41 50..	21 56 5..	— ..	22 50 50..	23 29..	1·3..	—
	July							
1454 ..	2	.. 21 8 32..	21 12 38..	21 26 7..	21 28 2..	23 30..	22·0..	—
1455 ..	11	.. 7 10 19..	— ..	7 15 14..	7 15 49..	7 31½.	1·3..	—
1456 ..	13	.. 19 39 49..	19 42 34..	19 47 49..	19 52 9..	— ..	2·1..	End lost in the beginning of the following shock
1457 ..	13	.. — ..	— ..	— ..	21 1 24..	21 19½.	0·7..	P is lost in the end of the previous shock
1458 ..	14–15	.. 22 51 —..	— ..	23 38 —..	23 57 —..	1 47..	1·6..	Times are given to the nearest minute, owing to the failure of the time marking device
1459 ..	17	.. 14 38 30..	— ..	— ..	14 43 30..	— ..	0·7..	End is lost
1460 ..	22	.. 19 36 50..	19 45 45..	19 56 50..	20 3 0..	20 32½.	0·5..	—
1461 ..	23	.. 0 19 5..	0 28 32..	0 43 50..	0 52 34..	1 58..	0·7..	—
	August							
1462 ..	2	.. 16 58 20..	— ..	— ..	17 9 10..	18 5½.	0·5..	—
1463 ..	17	.. 12 40 50..	— ..	— ..	12 50 35..	13 27..	0·5..	
1464 ..	18	.. 10 4 4..	10 19 45..	10 37 10..	10 37 58..	12 26..	2·0..	—
1465 ..	20	.. 21 2 19..	21 8 49..	21 20 57..	21 22 24..	23 4½.	1·7..	—
1466 ..	23	.. 10 59 36..	11 4 41..	11 14 1..	11 19 17..	12 49..	1·8..	—
1467 ..	23	.. 15 11 6..	— ..	— ..	15 18 56..	15 52..	0·5..	—
1468 ..	30	.. 10 8 19..	— ..	10 12 14..	10 15 34..	11 4..	1·9..	—
	September							
1469 ..	1	.. 17 49 11..	17 55 19..	17 58 5..	18 2 31..	18 38..	1·7..	—
1470 ..	2	.. 19 11 18..	— ..	— ..	19 22 33..	19 51..	0·5..	—
1471 ..	11	.. 12 45 20..	— ..	— ..	13 14 35..	14 1..	0·7..	—
1472 ..	14	.. 3 33 46..	— ..	— ..	3 47 13..	4 58½.	0·7..	—
1473 ..	14	.. 17 36 6..	— ..	— ..	17 42 28..	18 10..	0·8..	—
1474 ..	22	.. 5 1 35..	5 4 50..	5 9 15..	5 12 0..	5 32½.	0·5..	—
1475 ..	22	.. 14 24 10..	14 28 10..	14 31 50..	14 36 27..	15 25..	2·0..	—
1476 ..	22	.. 16 39 49..	— ..	— ..	16 47 56..	17 8..	0·7..	—
1477 ..	24	.. 12 15 5..	12 22 2..	12 32 20..	12 37 28..	13 18½.	1·3..	—
1478 ..	25	.. 18 39 6..	18 43 48..	18 47 36..	18 52 53..	19 38½.	1·0..	P might have been earlier. It is masked in microseisms
1479 ..	29	.. 13 38 32..	— ..	— ..	13 44 38..	14 7..	0·6..	—
1480 ..	30	.. 21 31 49..	21 40 29..	21 53 49..	22 1 34..	23 25..	0·8..	—
	October							
1481 ..	2	.. 15 48 50..	— ..	— ..	15 57 20..	16 10½.	0·7..	—
1482 ..	8	.. 10 31 49..	10 42 49..	10 58 34..	11 13 13..	13 16..	1·5..	—
1483 ..	17	.. 8 58 51..	— ..	— ..	10 3 59..	11 5..	0·8..	—
1484 ..	23	.. 9 17 34..	— ..	— ..	10 0 1..	10 52½.	0·5..	—

No.	Date. 1930.	P. H. M. S.	S. H. M. S.	L. H. M. S.	Maximum. H. M. S.	End. M. M.	Amplitude. MM.	Remarks.
	October.							
1485 ..	24	.. 20 25 49..	20 34 35..	20 42 49..	20 49 21..	23 20½.	4·5..	—
1486 ..	25	.. 12 52 19..	— ..	— ..	12 59 49..	13 21½.	0·6..	—
1487 ..	28	.. 21 19 50..	21 29 50..	21 43 6..	21 48 8..	22 51½.	1·2..	—
1488 ..	31	.. 10 37 41..	10 46 51..	11 5 9..	11 11 51..	12 17½.	1·0..	—
	November							
1489 ..	4	.. 15 48 5..	— ..	— ..	16 3 20..	16 22½.	0·9..	—
1490 ..	8	.. 3 29 40..	3 35 10..	3 42 22..	3 48 37..	4 20½.	0·5..	—
1491 ..	9	.. 19 17 50..	19 24 50..	19 37 40..	19 38 38..	22 18½.	10·0..	—
1492 ..	12	.. 20 5 51..	— ..	— ..	20 16 6..	20 49½.	0·5..	—
1493 ..	22	.. 14 21 48..	— ..	— ..	14 59 18..	15 36½.	0·7..	—
1494 ..	23	.. 15 58 49..	— ..	— ..	Not pronounced	16 51..	0·5..	—
1495 ..	24	.. 3 41 19..	— ..	— ..	3 54 49..	4 24½.	0·4..	—
1496 ..	26	.. 19 12 20..	19 21 20..	19 34 50	M¹ 19 37 2	22 46½.	10·0..	—
					M² 19 38 50	— ..	10·0..	—
	December							
1497 ..	2	.. 7 6 50..	7 11 35..	7 22 26..	7 26 38..	8 27..	1·5..	—
1498 ..	3	.. 16 44 3..	— ..	— ..	16 51 11..	17 19½.	0·5..	—
1499 ..	3	.. 18 56 11..	18 59 51..	— ..	— ..	22 47½.	(35) ?	Phases L and M are difficult to be read, the trace being faint due to fast movement of light spot. The amplitude is of the order of 35 mm.
1500 ..	8	.. 8 15 18..	— ..	— ..	8 30 38..	8 59..	0.5..	—
1501 ..	8	.. 17 45 33..	— ..	— ..	17 55 38..	— ..	0.7..	—
1502 ..	8	.. — ..	— ..	— ..	18 29 56..	19 12½.	0.5..	P is probably lost in the end of the previous shock
1503 ..	10	.. 10 51 20..	— ..	— ..	11 3 32..	11 34½.	1·0..	—
1504 ..	13	.. 16 31 4..	— ..	16 35 24..	16 36 4..	17 23..	0·9..	—
1505 ..	21	.. 15 0 40..	15 5 25..	15 13 40..	15 19 20..	15 49½.	0·5..	—
1506 ..	22	.. 0 6 5..	— ..	— ..	0 37 50..	1 12½.	0·8..	—
1507 ..	25	.. 13 32 3..	— ..	— ..	13 59 19..	14 45..	1·0..	—

Weather Summary, 1930.

January.—There was considerable rain during the first half of the month and very little in the second half, when conditions were of the type more often experienced in February than January. Rainfall totals for the month were well above average in the extreme north and along the north-east coast, while the areas most consistently in deficit were the North-Central Province and southern half of the Eastern Province. The highest total for the month was 36·1 inches at St. Martin's, a figure which is not quite up to the January average at that station.

February.—This is a month of low averages and at three-quarters of the stations the rainfall of February, 1930, was within a couple of inches of the corresponding average. Temperatures and duration of sunshine were both above their averages, on the whole.

March.—As in February the rainfall did not show very great deviations from average, while temperatures, duration of sunshine, and pressure can all be described by saying that the season was ahead of, rather than behind, its normal time table.

April.—Thunderstorm activity, though well marked, was below rather than above its normal amount, and the rainfall was below average at more than half the stations. Deficits in rainfall were, however, not very great, while totals appreciably in excess of average were not uncommon, particularly in the west and south.

The highest total for the month was Hiniduma's 28·30 inches. The general description of conditions as ahead of the time table again received some justification, the first occasion on which the wind at Colombo remained in the south-west quadrant throughout the night being April 27/28, or about ten days earlier than the corresponding occurrence in 1929.

May.—The chief meteorological feature of May was a depressional storm, whose centre was first apparent off Hambantota on the morning of the 5th, and subsequently moved northward off the east coast, and crossed the Indian coast south of Nagapatam on the 7th. A detailed account of this storm will be found below (see Appendix).

Its after-effects continued to give considerable rain on the west side up to May 14, after which there was a week of exceptionally fine weather throughout the Island. However, the activities of the 5th, 6th, and subsequent days were sufficient to ensure that the rainfall totals for May were above average at all stations.

From the middle of May to the middle of June rainfall was, on the whole, distinctly in deficit, despite a few vigorous falls in the western low country.

June.—The totals for June were above average in the Western Province, but below average in most of the up-country areas on the western face of the hills, where June averages are high. Thus Kenilworth, with 31·13 inches, had the highest total, but was about 6 inches below its previous June averages. Averages were passed at most of the stations on the lee side—a fact that does not rest on particularly heavy rain, but rather on the lowness of the averages. In the north, rainfall was on the whole deficient.

July.—Rainfall was scanty throughout, the amounts of the deficits being greatest in those areas, where high averages gave most scope. A great number of the northern and eastern stations reported no rain at all.

August.—The first week of August was one of vigorous monsoon, which gave heavy rain over the south-west faces of the main hill-country. From the 7th to the 16th there was very little rain anywhere, and though rain of the thunderstorm type was fairly widespread during the second half of the month, it was insufficient to bring the totals for the month up to average, except in the case of lee-side stations (*e.g.*, Uva and Eastern Province) where the passing of the average was not a great achievement. As in July, the stations with highest totals were well below their own averages.

September.—There was a moderate amount of rain during the first half of the month, and from the 16th to the 23rd consistent heavy rain over the western side, after which the last few days were almost rainless.

The totals for the month were well above average on the main western slopes of the hill-country, but below average on the lee side and in most of the coastal areas.

October.—The total rainfall of the month was in excess at practically all stations, and heavily in excess over a large portion of the Island.

During the first few days it was particularly heavy near the west coast, including a fall of over 10 inches at Colombo on the 3rd.

From the 5th to the 21st (and particularly on the 14th) considerable rain occurred in the form of irregularly distributed thunderstorms, but the rain of this period was greatly exceeded by what followed. On the 20th there was heavy rain in the north, which proved to be due to a depression forming north-east of the Island.

This depression moved in an almost westerly direction, and though its actual centre passed just north of Ceylon, its effect on Ceylon weather was pronounced, both rainfall and wind being markedly affected. Its worst effects were on the 23rd, squally weather being reported all round the Island, but it continued to give heavy rain up to the 29th, after which the last two days of the month were almost rainless.

During the passage of this depression over 50 stations recorded more than 5 inches in a day, while several recorded over 10 inches. Further details will be found in the Appendix.

November.—Rainfall was largely of the thunderstorm type and was distributed erratically. In every Province there were some stations below average and others above. The former predominated, but some of the latter had a good deal to spare, and included such figures as Udahena (Poonagalla), 36·39 inches, which is nearly double its November average, and Blackwood, 33·93, which is the highest total recorded during the month of November at that station.

A small but severe storm formed at sea about 300 miles east of Trincomalee on the 26th. Fortunately it kept to a rather more northerly course than its predecessor, and the threat of a repetition of the October floods did not materialize. It did, however, cause some damage at Trincomalee, Mullaittivu, and the neighbouring coast, not by excessive rain, but owing to the way in which the sea was driven considerably further up the shore than usual. A feature of this storm was the unusually high winds reported from shipping near the north of Ceylon, notably Beaufort 10 to 11 from the *ss. Mulbera*.

December was as abnormal a month as May or October, but for the opposite reason. Less than half a dozen stations (out of over 360) reached their average rainfall, and about half the stations in the Island recorded the lowest total for the month of December on record. When it is remembered that at some of these stations figures are available for 60 years, it will be realized that this is a very striking fact.

The best thing that can be said in mitigation of this drought was that it was not cumulative, and its results were not so bad as they would have been had it followed a drier period than was the case.

The totals for the year do not lend themselves to simple classification. This is only natural considering that it contained both months that were abnormally wet (May, October) and others that were unusually dry (June, December).

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Superintendent.

Colombo, March 28, 1931.

Return of Rainfall in Ceylon during 1930, and the Means during different Periods. (See note at end of table.)

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	1930 ..	9·04	13	7·21	5	3·84	6	5·85	7	20·06	14	5·64	15	0·38	3	6·59	8	7·90	11	23·49	23	6·90	17	2·52	5	99·42	127	7·20	May 5 to 6.
		means during 20 years ..	5·96	9	2·11	2	5·99	7	8·92	12	9·47	10	11·21	16	7·43	12	5·37	9	8·19	11	15·89	16	12·73	15	9·01	9	102·27	128	9·82	June 24 to 25, 1911.
Allai Tank ..	20	1930 ..	20·01	14	2·10	4	1·15	4	2·78	8	10·26	4	0·20	2	1·02	4	4·21	8	0·42	2	19·27	22	10·81	14	2·31	8	74·54	94	5·46	May 5 to 6.
		means during 55 years ..	8·70	9	2·48	3	2·31	3	1·99	4	2·98	4	1·35	1	1·73	2	4·24	4	4·52	5	9·06	11	15·80	15	18·11	15	73·27	77	9·11	Nov. 17 to 18, 1906.
Alutnuwara ..	300	1930 ..	18·04	16	12·59	8	1·65	4	3·41	8	4·96	7	0·42	2	0·00	0	2·34	3	2·62	3	18·60	21	10·02	12	4·44	11	79·09	95	7·50	Feb. 8 to 9.
		means during 31 years ..	15·48	14	5·20	7	5·22	8	4·97	9	2·87	6	0·58	2	1·20	2	2·01	3	2·87	5	11·88	15	13·85	16	16·43	17	82·57	104	9·92	Jan. 17 to 18, 1913.
Ambalantota ..	15	1930 ..	2·49	6	2·32	3	5·01	9	7·15	9	13·30	15	1·86	6	0·65	1	0·38	6	4·05	10	7·78	14	6·93	9	5·67	5	57·59	93	4·05	May 5 to 6.
		means during 5 years ..	3·72	6	1·46	3	4·88	8	3·04	5	4·52	7	2·84	7	2·22	5	0·80	5	3·56	8	4·70	9	8·72	13	5·47	8	45·93	83	5·27	Nov. 4 to 5, 1929.
Ambanpitiya (Am.) ..	663	1930 ..	7·35	12	1·36	3	7·51	8	13·25	12	20·31	18	12·41	26	0·71	10	4·74	15	10·44	22	33·68	28	7·64	21	0·45	3	119·85	178	4·50	May 5 to 6.
		means during 59 years ..	3·45	6	2·64	4	6·83	10	10·71	15	10·79	15	12·83	20	8·21	17	6·53	16	8·62	16	17·64	21	13·72	17	7·19	11	109·15	167	16·65	Aug. 7 to 8, 1886.
Ambepussa ..	—	1930 ..	7·34	11	4·97	5	7·43	8	13·08	14	24·14	19	8·66	23	0·84	13	3·20	9	8·63	23	27·60	28	14·82	20	1·32	6	122·03	179	5·87	May 6 to 7.
		means during 3 years ..	6·40	9	3·09	6	7·09	8	17·58	19	13·50	18	9·37	23	5·67	17	3·17	13	6·97	19	21·20	24	16·28	23	5·20	10	115·52	188	5·87	May 6 to 7, 1930.
Amparai Tank ..	90	1930 ..	7·63	14	3·40	5	2·33	6	3·73	8	11·56	8	2·54	7	1·34	1	4·22	8	1·80	4	8·29	17	14·39	20	3·26	8	64·49	106	6·00	May 5 to 6.
		means during 55 years ..	14·42	12	4·74	5	3·45	5	3·20	6	3·81	5	2·11	3	1·87	3	2·88	5	4·20	6	8·72	12	12·42	14	17·84	15	79·66	91	19·20	Dec. 7 to 8, 1881.
Andankulam Tank, Trincomalee	40	1930 ..	15·40	13	4·65	2	0·94	2	3·12	4	13·30	4	0·80	4	2·32	3	6·00	9	1·50	3	17·64	20	12·67	16	2·39	3	80·73	83	9·42	May 5 to 6.
		means during 40 years* ..	8·40	10	1·89	3	1·74	3	1·87	4	2·55	3	0·85	1	1·87	3	3·31	5	3·77	6	7·53	12	15·29	15	15·52	15	64·59	80	13·30	Nov. 18 to 19, 1904.
Angoda Lunatic Asylum	—	1930 ..	Sta	rt	ed in	A	pril	—	13·12	14	30·58	24	15·91	22	0·76	8	3·23	10	7·04	19	35·10	26	16·25	15	0·43	2	—	—	8·38	Oct. 3 to 4.
Annfield Estate, Dikoya (An.)	4,300	1930 ..	4·96	11	2·13	6	6·44	12	6·95	18	20·58	17	13·41	23	7·62	16	11·32	19	14·75	20	19·26	25	7·91	17	0·95	8	116·28	192	5·90	May 5 to 6.
		means during 43 years ..	3·99	10	2·22	6	6·27	12	9·33	17	9·00	17	16·21	25	15·26	26	11·23	23	10·72	21	12·73	22	9·58	18	6·05	13	112·58	210	8·79	Oct. 4 to 5, 1913.
Anningkanda Estate, Deniyaya	1,550	1930 ..	11·50	13	8·06	11	20·59	26	10·84	23	17·93	24	9·18	26	2·62	13	5·07	15	14·41	22	22·07	25	14·23	17	12·03	17	148·53	232	4·15	March 25 to 26.
		means during 53 years ..	8·90	13	7·29	11	10·87	16	12·75	18	12·65	17	13·02	22	9·07	18	7·79	17	10·88	17	16·14	21	17·42	21	13·51	19	140·29	210	7·98	Oct. 27 to 28, 1906.
Anuradhapura — Survey Office	295	1930 ..	3·08	15	3·37	6	7·79	7	6·68	14	8·29	10	0·16	2	0·00	0	1·14	2	4·17	7	15·46	22	6·70	11	3·77	5	60·61	101	4·80	Oct. 20 to 21.
		means during 61 years ..	3·95	9	1·55	4	2·96	7	6·76	13	3·43	7	1·26	4	1·29	3	1·68	4	3·18	6	9·60	16	10 68	18	8·51	16	54·86	106	[illegible]	May 20 to 21, 1891.
Anuradhapura — Experiment Station	295	1930 ..	3·74	10	3·26	6	13·52	7	4·52	11	9·00	8	0·08	1	0·00	0	0·36	3	3·00	4	14·35	22	7·35	8	2·96	3	62·14	83	[illegible]	May 6 to 7.
		means during 7–8 years ..	6·55	9	1·51	3	5·20	8	5·36	9	3·93	6	0·19	1	1·07	2	0·92	2	5·58	5	8·00	13	10·89	14	7·00	11	56·19	83	7·5[illegible]	Dec. 27 to 28, 1928.
Arachchi Amuna ..	135	1930 ..	3·14	6	4·20	8	10·64	18	8·01	17	11·33	18	4·81	20	1·78	7	3·71	13	6·69	17	7·59	18	5·06	13	1·41	7	68·37	162	2·1[illegible]	Feb. 8 to 9.
		means during 14 years ..	3·88	10	2·55	6	7·84	12	5·50	11	6·16	12	5·46	17	4·35	13	3·86	13	5·44	13	6·29	14	9·96	16	8·94	14	70·24	151	7·4[illegible]	[illegible] 6 to 7, 1919