ANNUAL REPORT

OF THE

DIRECTOR

KODAIKANAL AND MADRAS OBSERVATORIES

FOR 1918

MADRAS:
PRINTED BY THE SUPERINTENDENT, GOVERNMENT PRESS.

1919.

KODAIKANAL AND MADRAS OBSERVATORIES.

REPORT FOR THE YEAR 1918.

CONTENTS.

I.—KODAIKANAL OBSERVATORY.

II.—MADRAS OBSERVATORY.

KODAIKANAL AND MADRAS OBSERVATORIES.

I.—REPORT OF THE KODAIKANAL OBSERVATORY FOR THE YEAR 1918.

Staff.—The staff of the Observatory on December 31, 1918, was as follows:—

Director	J. Evershed, F.R.S.
Assistant Director	T. Royds, D.Sc. (on deputation). S. Sitarama Ayyar, acting sub. *pro tem.*
First Assistant	S. Sitarama Ayyar, B.A. A. A. Narayana Ayyar, acting sub. *pro tem.*
Second Assistant	A. A. Narayana Ayyar, B.A.
Third Assistant	S. Balasundaram Ayyar.
Fourth Assistant	Vacant.
Writer	L. N. Krishnaswami Ayyar.
Photographic Assistant	R. Krishna Ayyar.

MAGNETIC SECTION.

Magnetic Observer	S. S. Ramaswami Ayyangar, B.A.
Magnetic Recorder	S. S. Ranga Acharya.

The death occurred on October 14 of Second Assistant G. Nagaraja Ayyar after a partial recovery from a severe attack of influenza. He joined the staff of the Observatory in April 1, 1899, as writer and was promoted to Second Assistant on February 12, 1909. Mr. Nagaraja Ayyar was a good observer and was very skilful in the handling of instruments. He early succeeded in photographing an excellent series of spectra of large sunspots and was the author of a paper on the weakened lines in spot spectra published in the Astrophysical Journal in 1907, Vol. XXVI, p. 143.

The subordinate staff consists of a book-binder, an assistant book-binder, a mechanic, six peons, a boy peon for the dark room and two lascars.

2. *Instruments.*—With the exception of the new constructions and adaptations mentioned in paragraph 16 the instrumental equipment of the Observatory has remained the same. The 15-inch lens borrowed from the Nizamiah Observatory, Hyderabad, is still in use for photographing solar and Venus spectra. The Kullberg sidereal chronometer lent to the Nizamiah Observatory in 1917 remains at that Observatory.

3. *Weather conditions.*—The partial failure of the south-west monsoon in the months June to September inclusive resulted in less unfavourable conditions than is usual in those months. On the other hand the months of May and November were unusually cloudy and wet. The mean definition in the north dome between 8 and 10 a.m. was 2·9 on a scale in which 1 is the worst and 5 the best; the best monthly mean was 3·3 in April and in December. There were thirty-nine days in the year when the definition was 4 or over.

Photographic and visual observations.

4. *Photoheliograph.*—Photographs on a scale of 8 inches to the Sun's diameter were obtained on 303 days. In June the 6-inch photo-visual lens previously employed for this work was replaced by a visual

achromatic of the same diameter and focal length, and the daily photographs are now taken with a green colour screen limiting the effective light to the spectral region between F and G. Some experimental photographs have also been obtained in red light with lantern plates dyed with pinacyanol.

5. *Spectroheliographs.*—Monochromatic images of the disc in K light were obtained on 337 days, prominence plates on 249 days and Hα disc plates on 261 days.

6. *Six-inch Cooke equatorial and spectroscope.*—Work with this instrument has been continued on the same lines as formerly for visual observations of solar phenomena which cannot be readily photographed.

7. *Grating spectrograph.*—This was employed mainly in researches connected with displacements of the solar lines, the programme of work including photographs of the spectrum of Venus with Fe arc comparison lines, also control plates of sunlight and Fe arc. A good series of third and fourth order plates of the carbon arc and solar spectra was secured for measuring the displacements of the cyanogen band-lines near λ 3883. During a spell of exceptionally clear sky in February and March about fifty solar rotation plates were also obtained.

8. *The Venus spectra.*—In the six months April to September inclusive high-dispersion Venus spectra were obtained on twenty-seven mornings. These and 31 plates of sunlight spectra have all been measured by the positive on negative method, and yield results of great interest. The control plates taken under precisely the same conditions as the Venus plates give a mean shift of the more affected iron lines in the region 4337—4494 of + 0·010A, and of the less affected lines + 0·003A. The Venus plates taken near the western elongation of the planet, when the angle Venus-Sun-Earth was about 45°, yield slightly smaller values of the shifts, and there is a progressive diminution of wave-length as the angle at the Sun increases. When this angle exceeds 90° the displacements Sun — arc all have the minus sign, that is the solar lines reflected by Venus are shifted to violet instead of to red with reference to the iron arc.

This very striking result is shown in the following table:—

Month.	Mean angle. ♀—☉—⊕	Displacements in angstroms. More affected lines.	Displacements in angstroms. Less affected lines.
April and May	45°	+ 0·008	+ 0·002
June	75°	+ 0·002	− 0·002
July	95°	− 0·001	− 0·004
September	135°	− 0·006	− 0·010

It also appears that the more affected lines diminish in wave-length more than the less affected lines, so that when the light is derived from a hemisphere of the Sun turned about 90° to Earth, the Fe arc and solar lines nearly coincide.

The result of the Venus work seems to dispose finally of the possibility that the solar line-shifts are due to the gravitational effect resulting from Einstein's generalized relativity hypothesis. As the shift towards red of the solar lines, according to these observations, is only observed in the light derived from a hemisphere of the Sun facing towards Earth, it seems necessary to admit an earth effect whether the shift is interpreted as motion or otherwise. It is very desirable that confirmation of these results should be obtained independently by other observers.

The Venus spectra obtained in 1918 leave still undecided the question of the rotation period of the planet, although such evidence as has been obtained favours a short period. Four excellent plates obtained in November and December 1917 near the eastern elongation of the planet give consistently low values of the orbital velocity, but this may be interpreted in two ways: either the planet rotates in the same direction as the Earth and with approximately the same period, or the Sun—arc displacements are not constant but liable to considerable changes.

It was hoped to obtain confirmation of the low values of orbital velocity, implying a rapid and direct rotation, at the western elongation of the planet in April; but owing to the very bad definition prevalent in the spring months at Kodaikanal, it was found impossible in a long exposure to keep the planet in a fixed position on the spectrograph slit. The spectra therefore represent more or less the integrated light of the half disc, including rays from parts of the planet approaching the Earth, and from other parts receding from the Sun ; resulting in a partial compensation of the effect looked for. The mean of eight plates gives an orbital velocity only 0·7 per cent below that derived from Nautical Almanac data, whilst the plates taken at eastern elongation gave a value 3·5 per cent below the calculated velocity, a defect which is over ten times the probable error of a single plate.

The uncertainty as to the effect of the planet's rotation, and the possibility of variations in the wave-lengths of the solar lines, make it useless at present to derive a value of the solar parallax from the determinations of orbital velocity. Observations have been instituted however to test the constancy of the Sun—arc shift. Plates taken at weekly intervals in September, October and November indicate only very small changes when longitudes on the Sun differing by 90° are compared; but monthly tests will also be made, extending over a much longer period.

In photographing the spectrum of Venus with the grating spectrograph in the blue and violet regions, it was noticed that longer exposures were required than is necessary when the image of a brightly illuminated terrestrial cloud is brought on to the slit. Direct comparisons of the spectra in a low dispersion prism spectrograph, using a parabolic mirror to form the image of Venus, showed that with exposures regulated to give equal density in the green region the Venus spectra are much weaker in the violet than the cloud spectra, suggesting that the atmosphere of Venus is devoid of clouds, or if these are present the atmosphere above them must be strongly absorptive for the violet rays.

9. *The cyanogen bands.*—The measures of the cyanogen band-lines in the Sun and in the carbon arc have shown that most of the lines are shifted towards red, both at the centre of the disc and at the limb, and as in the case of iron the stronger lines give the larger shifts. The shift at the limb is on the average greater than at the centre of the disc, but is less than the theoretical gravitational shift equivalent to 0·634 km./sec. A systematic difference was found between north and south polar limbs, which requires further investigation.

10. *The solar rotation.*—Of the series of plates of the H*a* region obtained in the fine weather of March and April, 32 have been measured by the positive on negative method. The results show that despite the increased accuracy obtained in the measures large discordances in rotational velocity are still found in individual plates. In the equatorial regions, where spot disturbances are generally absent, plates taken on the same day will sometimes differ by as much as 3 per cent. The provisional mean value of the sidereal velocity at the equator from this series of plates is about 1·92 km./sec. but the extreme values differ by about 6 per cent in excess or defect of this. The average probable error of a plate from ten strong Ca and Fe lines of mean intensity 6 is ± 0·006 km./sec. In exceptionally good plates it is as low as ± 0·003 km./sec. The measuring errors are found to be smaller than the plate irregularities. Probably more uniform results might be obtained if the solar image were not well focussed on the slit, or were affected by astigmatism, so that the light forming the spectrum would be derived from a larger area of the Sun's

surface. The question of haze affecting the results is ruled out by the fact that photographs were obtained only on the clearest possible days.

In the case of the Hα line, which was also measured, the local distortions are nearly always present, and greatly interfere with the accuracy of the measures. The velocities obtained are generally but not always larger than for the iron lines. The mean equatorial velocity derived from Hα is 2·05 km./sec.

11. *Nova aquilæ.*—Two series of prismatic camera spectra of the Nova were obtained between June 12 and July 11, and the result of a study of these have been communicated to the Royal Astronomical Society. The changing wave-lengths of the double series of hydrogen absorption lines and of the enhanced lines of iron suggest an analogy with the solar eruptive prominences, for Kodaikanal photographs have proved these to move out from the Sun with accelerating velocity, indicating the action of a repulsive force, which is probably operative also in novæ. The hydrogen emission bands in the Nova are shown to have widths proportional to wave-length, which would not be the case if pressure or density were concerned in the widening; it is therefore considered to be a Doppler effect also, due to a vast explosion or expansion of the gases in all directions. The narrow absorption line H which is found superposed upon the broad emission band Hϵ is shown to have a displacement which is almost the same in amount and sign as that due to the solar motion in space, implying a stationary condition of the calcium vapour with reference to the sidereal system; it probably has no connexion with the star, and appears to be widely distributed in the milky way region.

12. *Conjunction of Venus and Sun.*—Arrangements were made with the 6-inch photoheliograph to obtain a series of photographs of Venus in red light, before, during, and after superior conjunction with the Sun, by the method proposed by Mr. Lindemann for photographing Regulus in conjunction with the Sun. On November 24 the planet was within 6′ of the Sun's limb and had it been possible to carry out the programme it would have been of great interest to ascertain whether the track of the planet was bent inwards towards the Sun (Einstein effect) or pursued a perfectly straight path past conjunction. On October 28 the sky was perfectly clear and it was found possible to photograph the planet, then only 7° west of the Sun, with a red filter and special arrangements for blocking out scattered sunlight. An exposure of 10 seconds was found sufficient to give a distinct image of the planet with plates dyed with pinacyanol. The scale is nearly 10″ to the millimeter, equivalent to a ratio F/A=140, enlarging lenses being used and a mirror to reflect the image to a convenient position. The red glass filter was placed near the focus of the 6-inch object glass; and in order to obtain photographs on the day of conjunction the filter was carefully silvered, the Sun's image could then be brought on to it without risk of fracturing the glass. At the same time, owing to the partial transparency of the silver film, sufficient red light was transmitted to give a distinct photograph of the Sun with a 10 seconds exposure. A small part of the film was removed to allow the light of Venus to be freely transmitted. It was hoped by this means to photograph both planet and Sun with a single exposure, but everything would depend on the purity of the sky near the Sun and the absence of scattered light in the instrument.

Experiments showed that there was considerable fogging of the plate through the opening in the silver film when the Sun was photographed in this way, but perhaps not enough to entirely block out the image of Venus. However after October 28 no clear skies occurred for about two months and the experiments were abandoned.

A more hopeful method would be to abolish the enlarging lenses and mirror and use a single object lens of at least 20 feet focus attached to a large equatorial. With a filter transmitting the extreme red and infra red, and plates sensitised with dicyanin Venus could probably be photographed in superior conjunction with the Sun ; but a non-diffusive sky and good definition would be essential conditions, and these could probably be found only on an oceanic island, or in Kashmir.

Summary of sunspot and prominence observations.

13. *Sunspots.*— The following table shows the monthly numbers of new groups observed at Kodaikanal, and their distribution between the northern and southern hemispheres. The mean daily numbers of spots visible are also given :—

—	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Year.
New groups .	30	19	28	26	31	25	35	32	24	32	27	23	332
North	15	11	11	11	17	16	18	15	11	18	14	8	165
South ..	15	8	17	15	14	9	16	16	13	14	12	15	164
Equator	...	.	..	...		.	1	1	...	...	1		3
Daily numbers ...	6·8	4·4	5·0	5·7	5·1	3·9	6·7	5·2	4·1	5·8	5·1	4·2	5·2

The maximum spot activity of the present cycle took place during the second half of 1917 for both hemispheres when the mean monthly number of new groups reached 17 for the northern hemisphere, and 16 for the southern ; and the mean daily number rose to 7·1. The above table for 1918 shows a considerable reduction in these figures.

The number of new groups decreased more rapidly in the northern hemisphere than in the southern and in 1918 the spot activity was about equal in the two hemispheres.

The approximate mean latitude of the spots was 11°·8 in the northern hemisphere and 14°·6 in the southern, a decrease of over 2° in each hemisphere compared with 1917.

The number of bright reversals and of displacements of the Hα line fell from 483 and 133 respectively in 1917, to 422 and 108 in 1918. There were 44 observations of D_3 as a dark line in 1918, the great majority being recorded during the first half of the year.

14. *Prominences.* A rapid decline in prominence activity occurred during 1918. The mean daily areas in square minutes of arc, derived from the Kodaikanal photographic records, are as follows :—

	North.	South.	Total.
1918 January to June	2·28	2·72	5·00
July to December ..	1·24	1·99	3·23

The mean daily number recorded also fell from 18·2 for the first six months to 16·1 for the second half of the year.

The high latitude prominences reached their greatest development, in the southern hemisphere, and the closest approach to the poles during the early months of the year and then rapidly declined. After July there were no prominences of any magnitude recorded between latitude + 50 and the north pole. In the south the polar regions maintained some activity until the end of the year. This decline of the polar prominences is a well marked phase in the prominence cycle and occurred last in the year 1907.

Prominences generally attained a maximum development in the northern hemisphere early in 1917, whilst the southern maximum occurred during the first half of 1918. This delayed action of the south has caused a reversal of the relative activity of north and south as is seen on comparing the areas given above with those in the report for 1917.

Prominences projected on the disc as absorption markings attained their greatest development during the first six months of 1918 in both hemispheres, but there was a rapid decline during the latter half of the year in the northern hemisphere only.

Prominence areas east and west of the Sun's axis show a western excess during the first half of the year and an eastern excess during the second half. The denser prominences showing as absorption markings give the usual eastern excess throughout the year, the areas recorded east of the meridian being 52·4 per cent of the whole, derived from 5720 markings. Metallic prominences and prominences showing displaced lines were more frequent on the western limb than on the eastern.

The usual excess of displacements towards red is indicated for the hydrogen lines both at the limb and on the disc.

15. *Magnetic observations.*—Continuous magnetograph records are obtained of declination, vertical force, and horizontal force. Absolute observations for dip are made daily excepting Sundays, declination and horizontal force on three days per week alternately. All the records are made over to the Magnetic Survey Office, Dehra Dun, and the results are published by the Survey annually.

The vertical force magnetograph had occasionally to be readjusted during the year, and the earth inductor gave trouble owing to wear of the commutator, which was turned true in December.

Twenty-three "great" and 136 "moderate" magnetic storms were registered during the year. March, November, and December, were the most active months of the year, and January was the quietest month. There were nine "great" storms recorded in December.

16. *Workshop construction.*—The heavy equatorial mounting of the Poona 20-inch reflector was erected under the old sliding roof originally used for covering the siderostat of the spectroheliograph. This roof was mounted on rails and made more manageable by cutting off one-third of its length. The driving clock of the equatorial was repaired and put into working order.

A truck built of teakwood with flanged brass wheels was constructed and mounted on rails in the spectroheliograph building, about twelve feet from the siderostat mirror. On the truck an 18-inch parabolic mirror is mounted, and this can now be used alternatively with the spectroheliographs and other instruments depending on the 18-inch siderostat. A prism spectrograph was also arranged near the siderostat for use with the parabolic mirror for star or comet spectra.

A Hilger micrometer of old pattern but provided with a high quality screw was entirely reconstructed and converted into a positive on negative micrometer. The screw is mounted near the base plate of the machine and is connected with a carriage provided with accurately turned wheels running on straight gun-metal ways. The microscope is of novel design consisting of two opposed object lenses each of $9\frac{1}{2}$ inches focal length, and an eye-piece. The distance of about 20 inches separating the conjugate foci of the lenses is shortened by an arrangement analogous to that used in prism binoculars. The long focus solves the difficulty experienced with ordinary microscopes of focussing simultaneously the positive and negative films, which are necessarily separated by a small space.

17. *Time.*—The error of the standard clock is usually determined by reference to the 16-hour signal from the Madras Observatory. This is rendered possible by the courtesy of the Telegraph Department which permits the Madras wire to be joined through to this observatory. The signal is received with accuracy on most days and all failures are at once reported to the Postmaster-General, Madras.

18. *Meteorology.*—Eye observations are made at 8^h, 10^h and 16^h local mean time as in former years. The Richard thermograph (wet and dry bulb) and barograph, the Beckley anemograph, and the sunshine recorder also continue in use. Cloud observations with the nephoscope are made three times daily.

Pressure.—The mean annual pressure differed very little from the normal but there were large variations in the individual months. The pressure was in excess in the monsoon months June to October inclusive and largely in defect in January and May.

Temperature.—The mean annual temperature was slightly higher than the normal, the greatest excess was 3° in July. The grass minimum temperature for the whole year was 23°·0 recorded on the 3rd February.

Humidity.—The monsoon months June to October inclusive were drier than normal but the mean humidity for the year was only 1 cent below normal.

Rainfall.—The total annual rainfall was in defect by 2·18 inches only, but there was a defect of 11·26 inches in the months July to October inclusive. There was an excess of 2·86 inches in January and 7·95 inches in November.

Wind.—The mean daily wind movement was 276 miles, the normal being 306 miles. The defect occurred mainly in the months June to October. The greatest excess was in May. The mean direction in that month was S. by W., the normal direction being N.N.E.

Transparency of the atmosphere.—The transparency of the lower atmosphere as judged by the visibility of the Nilgiris, about 100 miles distant, was much below the average.

Cloud and sunshine.—The mean amount of cloud was in excess in January, May, November and December. The total number of hours of bright sunshine was 2399 which is 18 per cent above normal.

The most striking features in the weather at Kodaikanal in 1918 were (1) the early arrival of the south-west monsoon, which set in three weeks before the normal date, (2) the partial failure of the monsoon in the months July to October inclusive and (3) the heavy rains in January and November.

19. *Seismology.*—The Milne horizontal pendulum recorded one hundred and twenty-seven earthquakes, an exceptionally large number. Details of the records are given in Appendix I.

20. *Library.*—One hundred and seven volumes were bound during the year.

21. *Publications.*—Bulletin Nos. 58 and 59, dealing with the prominences of the second half of 1917 and the first half of 1918, were issued during the year; but only a few copies were distributed privately outside India.

KODAIKANAL,
6th February 1919.

J. EVERSHED,
Director, Kodaikanal and Madras Observatories.

II.—REPORT OF THE MADRAS OBSERVATORY FOR THE YEAR 1918.

Staff.—The staff of the Observatory on 31st December 1918 was as follows :—

Deputy Director	R. Ll. Jones.
Computer	S. Solomon Pillai.
First Assistant	C. Chengalvaraya Mudaliyar.
Second Assistant	P. Jayaram.

I was on leave from the 1st May to 16th June 1918 and Mr. James Angus was in charge of the Observatory and the Meteorological office during my absence. Mr. Solomon Pillai was absent on privilege leave from 15th July to 3rd September. Mr. E. Ramanujam Pillai, the Second Assistant, was transferred to the Meteorological office on 16th March 1918.

2. *Time service.*—The time gun at Fort St. George failed on 27 occasions out of 730 giving a percentage of success of 96. Of these failures 3 were due to faults at the Observatory. The time ball at the Harbour failed altogether on eight days. On four of these days the releasing apparatus at the Harbour was out of order and on two other days the lines were interrupted. None of these failures were due to faults at the Observatory. On twelve other days the time ball failed at 1 p.m. but dropped correctly at 2 p.m. Most of these partial failures were found to be due to the fact that the line was interrupted at the Central Telegraph office at 1 p.m. by some one who did not know that it was required at that hour for another purpose. The 4 p.m. roll of signals was sent to the Central Telegraph office on every day and was received there correctly except on five occasions when the diffuser had not been joined on.

3. *Meteorological observations.*—Eye observations were made at 8^h, 10^h, 16^h, and 20^h, local mean time as in former years. The Richard thermograph and barograph, the Beckley anemograph, the sunshine recorder and self-registering rain-gauge also continue in use. Extra observations were taken for storm warning purposes and telegrams sent to Calcutta on 47 occasions and to Simla on one occasion.

4. *Buildings.*—The usual annual repairs to the office and quarters were carried out during the year.

5. *Instruments.*—The following is a list of the instruments at the Observatory on 31st December 1918 :—

(*a*) *Astronomical.*

Eight-inch Equatorial Telescope—Troughton and Simms.
Sidereal clock—Haswall.
Do. Dent, No. 1408.
Do. S. Riefler, No. 61.
Mean Time clock—J. H. Agar Baugh, No. 105.
Do. with galvanometer—Shepherd & Sons.
Meridian circle—Troughton and Simms.
Portable transit instrument—Dolland.
Portable telescope with stand.
Tape chronograph—R. Fuess.
Relay for use with the chronograph—Siemens.

(*b*) *Meteorological.*

Richard's barograph—No. 10, L. Casella.
Do. thermograph—No. 29637, L. Casella.
Peander's self-recording rain-gauge—No. 116, Lawrence and Mayo.
Beckley's anemograph—Adie.
Sunshine recorder—No. 149, L. Casella.
Nephoscope—Mons Jules Daboseq and Ph. Pellin.

Barometer, Fortins—No. 1771, L. Casella.
Do. do. No. 725, L. Casella (spare).
Do. do No. 1420, L. Casella (spare).
Dry bulb thermometer—No. 94221, L. Casella.
Do. do. No. 38037, Negretti and Zambra (spare).
Wet do. No. 94219, L. Casella.
Do. do. No. 38037, Negretti and Zambra (spare).
Dry maximum thermometer—No. 8581, Negretti and Zambra.
Dry minimum do. No. 69017, L. Casella.
Wet do. do. No. 91753, Negretti and Zambra.
Sun maximum thermometer—No. 127618, Negretti and Zambra.
Grass minimum thermometer—No. 3377, Negretti and Zambra.
Rain-gauge (8″ diameter)—No. 1042, Negretti and Zambra.
Measure glass for above.
Rain-gauge (5″ diameter).
Measure glass for above.
Stop watch—No. A-3.

The level error of the Transit Circle at the beginning of the year was $+ 0^{s}\cdot19$. Very little change occurred during the first three months. In April it began to change in the usual manner and reached its maximum negative value at the end of October, when the monsoon burst. In the course of a few days of heavy rain at the beginning of November it went through a rapid change in the reverse direction. The error had almost disappeared by the 21st November and at the beginning of this year its value was $+ 0^{s}\cdot25$. It is satisfactory to see that the variations though much larger than is desirable are no longer cumulative.

The rate of the Riefler clock has been very steady during the year. There was however a sudden change on the 9th July which is believed to have been due to the effect of the Calcutta earthquake of 8th July. A report on this matter was sent to Dr. Murray Stuart, who was deputed to investigate the earthquake, on the 11th September.

6. *Weather summary.*—The following is a summary of the meteorological conditions at Madras during 1918 :—

Pressure.—The mean monthly pressure was above normal in February, March, June, July, September, October and December and below normal in the remaining months, the greatest excess being 0·049 inch in October and the greatest defect 0·052 inch in January. The highest pressure was 30·119 inches on February 10 and the lowest 29·827 inches on May 1.

Temperature.—The mean temperature of the air was above normal in January, July, August, September, October, November and December and below normal in the remaining months. The maximum shade temperature was above normal in April, July, August, September and October and below normal during the rest of the year. The highest temperature recorded was 104°·1 F. on August 4. The minimum in shade was above normal in January, July, August, September, November and December and below normal in the remaining months. The lowest temperature recorded was 60°·8 F. on February 15. The highest sun maximum was 166°·9 F. on September 8 and the lowest on grass was 56°·6 F. on February 15.

Humidity.—The percentage of humidity was above normal throughout the year except in July, August and October. The driest day in the year was February 15, when the humidity was only 35.

Wind.—The wind velocity was in defect throughout the year except in January. The wind direction was normal in February, March, August and September.

Cloud.—The amount of cloud was normal in September and December. In January, May, August and November the sky was more cloudy than usual and less cloudy during the other months.

Sunshine.—The percentage of bright sunshine was normal in March, above normal in April, June, July, August and October and below in all other months. The total number of hours of bright sunshine during the year was 2331·6 against 2190·9 in the previous year.

Rainfall.—Rainfall was above the average in January, February, May, November and December and below in the remaining months, the greatest excess being 25·97 inches in November and the greatest defect 6·66 inches in October. The total rainfall for the year was 75·00 inches on 88 days. The monsoon rainfall from October 15 to the end of the year was 50·19 inches. The heaviest rainfall on one day was 6·33 inches on November 2.

Storm.—A depression formed in the south of the Bay on the 10th November. It developed into a severe storm and moved in a westerly direction and passed inland a little to the north of Madras shortly after 1 a.m. on the 11th. Between midnight and 1 a.m. the barometer fell about $\frac{1}{4}$ inch and the wind movement at the Observatory for that hour was 39 miles, though velocity in the fierce gusts just before 1 a.m. was much greater than 40 miles per hour. There was a lull between 1–5 a.m. and 1–25 a.m. when winds were very light. At 1–25 a.m. the gusts were renewed, accompanied by a change in wind direction from about N.N.W. to W.N.W. from 3 a.m. and the winds began moderating.

THE OBSERVATORY, MADRAS,
3rd February 1919.

R. LL. JONES,
Deputy Director, Madras Observatory.

APPENDIX I.

STATION—KODAIKANAL OBSERVATORY.

SEISMIC RECORDS.

$\phi = 10^\circ\ 13'\ 50''$ $\lambda = 77^\circ\ 28'\ 00''$ $h = 2343$ metres. *Subsoil*—Rock.
Apparatus—Milne's Horizontal Pendulum Seismograph.

1918.	T_o	$\frac{\tau}{T_o^2}$	1918.	T_o	$\frac{\tau}{T_o^2}$
January	17·3	2·5	July	17·6	2·6
February	17·4	2·4	August	17·7	2·6
March	17·3	2·6	September	17·7	2·6
April	17·4	2·5	October	17·9	2·8
May	17·5	2·5	November	18·1	2·6
June	17·4	2·7	December	17·8	2·8

No.	Date.	Phase.	Time G.M.T. H.	M.	S.	Period. (Sec.).	Amplitude (u). A$_N$.	A$_E$.	A$_Z$.	Distance Δ (Km.).	Remarks.
	1918.										
1	January 30 ...	eP	21	00	18	...	..	...	...	...	
		iL	21	35	54	...	...	..	...	...	
		M	21	37	24	...	...	180	...	...	
		F	22	34	06	...	...	...	...	...	
2	February 4 ...	eP	18	11	30	...	..	...	..	...	
		L		...		...	...	...	...	...	
		M	18	14	06	...	...	90	...	...	
		F	18	31	18	...		...	..	...	
3	7 ...	eP	5	32	06	...	...	...	...	...	
		iL	5	48	18	..	...	..	...	...	
		M	5	54	42	...	...	200	...		
		F	6	34	36	...	...	...	...	...	
4	13 ...	eP	2	43	36	...	...	...	...	...	
		iL	2	48	30	...	..		...	...	
		M	2	49	36	...	..	220	...	...	
		F	3	32	18	...	...	..	...	...	
5	13 ...	eP	6	14	36	...	...		...	...	
		iL	6	33	06	...	...	...	...	...	
		M	6	37	12	...	...	210	...	...	
		F	8	09	30	...	...	...	...	...	
6	13 ...	eP	20	50	12	..	...	...	...	...	Widening of line.
		F	21	00	36	...	...	...	...	.	
7	19 ...	eP	16	45	24	...	...	...	...	...	Widening of line.
		F	17	46	54	...	...	...	...	...	
8	March 7 ...	P		...			...	...	...	...	
		eL	9	10	12	...	...	..	...	...	
		M	9	10	42	...	...	60	...	...	
		F	9	16	36	...	...	...	.	...	
9	16 ...	eP	14	55	48	...	...	...	...	...	Widening of line.
		F	15	08	06	...	...	...	...	...	
10	17 ...	eP	14	22	06	...	...	...	...	...	Widening of line.
		F	14	25	12	...	...	...	...	...	
11	19 ...	eP	6	54	42	...	...	...	...	...	Widening of line.
		F	7	06	36	...	...	...	.	...	
12	20 ..	eP	0	56	24	...	...	...	...	...	Widening of line.
		F	1	01	30	...	...	...	...	...	
13	24 ...	eP	23	31	00	...	...	...	...	...	Widening of line.
		F	23	40	12	..	...	..	...	...	
14	27 ...	eP	4	20	00	...	...	...	...	...	Widening of line.
		F	4	33	18	...	...	...	...	...	
15	April 10 ...	eP	2	20	18	...	.	...	...	...	
		eL	2	23	30	...	...	...	...	...	
		M	2	23	48	..	...	50	...	...	
		F	2	51	00	...	...	...	...		
16	13 ...	P		..		...	...	...	...	...	
		iL	0	59	24	...	...	...	..	...	
		M	1	03	48	...	...	220	...	...	
		F	1	48	00	...	...	...	...	...	
17	16 ...	eP	11	53	00	...	...	...	...	...	Widening of line.
		F	12	01	00	...	...	...	...	...	
18	21 ...	eP	4	48	18	...	...	...	...	...	Widening of line.
		F	4	57	12	...	...	...	...	...	
19	21 ..	eP	8	54	00	...	...	...	..	...	Widening of line.
		F	8	55	00	...	..	...	...	...	

No.	Date.		Phase	Time G.M.T.			Period. (Sec.)	Amplitude (μ).			Distance. Δ (Km.)	Remarks.
				H.	M.	S.		An.	Ae.	Az.		
	1918.											
20	April	21–22 ...	eP	23	31	00	...	...	...	...	...	
			eL	23	46	54	...	...	...	...	...	
			M	23	50	42	...	...	60	...	...	
			F	1	23	00	...	...	...	...	...	
21		23 ...	eP	15	55	54	...	...	...	...	...	Widening of line.
			F	16	04	06	...	...	...	...	...	
22	May	4 ...	eP	6	23	06	...	...	...	...	...	
			eL	6	30	48	...	...	...	...	...	
			M	6	35	54	...	...	80	...	...	
			F	6	53	42	...	...	...	...	...	
23		19 ...	P	......			...	...	...	...	...	
			iL	0	29	24	...	...	...	...	...	
			M	0	32	48	...	...	100	...	...	
			F	0	42	36	...	...	...	...	...	
24		20 ...	eP	15	04	30	...	...	...	...	...	
			eL	15	33	06	...	...	...	...	...	
			M	15	43	30	...	...	150	...	...	
			F	17	10	18	...	...	...	...	...	
25		20 ...	eP	18	14	24	...	...	...	...	...	
			eL	19	11	36	...	...	...	...	...	
			M	19	22	18	...	...	90	...	...	
			F	19	40	12	...	...	...	...	...	
26		21 ...	eP	0	49	24	...	...	...	...	...	Widening of line.
			F	0	50	24	...	...	...		...	
27		21 ...	eP	0	56	36	...	...	...	...	...	Widening of line.
			F	0	59	36	...	...	...	...	...	
28		21 ...	eP	1	13	54	...	...	...	...	...	Widening of line.
			F	1	16	30	...	...	...	...	...	
29		21 ...	eP	12	24	06	...	...	...	...	...	Widening of line.
			F	12	25	42	...	...	...	...	...	
30		21 ...	eP	13	36	06	...	...	...	...	...	Widening of line.
			F	13	38	12	...	...	...	...	...	
31		21 ...	eP	13	49	24	...	...	...	...	...	Widening of line.
			F	13	51	24	...	...	...	...	...	
32		21 ...	eP	14	33	06	...	...	...	...	...	Widening of line.
			F	14	35	06	...	...	...	...	...	
33		21 ...	eP	14	39	42	...	...	...	...	...	Widening of line.
			F	14	41	12	...	...	...	...	...	
34		21 ...	eP	15	04	42	...	...	...	...	...	Widening of line.
			F	15	05	42	...	...	...	...	...	
35		21 ...	eP	17	55	36		...	...	...	...	Widening of line.
			F	18	00	48	...	...	...	...	...	
36		21 ...	eP	20	20	00		...	...	...	...	Widening of line.
			F	20	22	06	...	...	...	...	...	
37		22 ..	eP	3	33	06	...	...	...	...	...	Widening of line.
			F	3	36	06	...	...	...	...	...	
38		22 ...	eP	6	55	12	...	...	...	...	...	Widening of line.
			F	6	57	30	...	...	...	...	...	
39		22 ...	eP	7	01	30	...	...	...	...	...	Widening of line.
			F	7	03	36		...	...	...	...	
40		22 ...	eP	7	38	06		...	...	...	...	Widening of line.
			F	7	42	12	...	...	...	...	...	
41		22 ...	eP	16	32	00	...	...	...	...	...	Widening of line.
			F	16	34	06	...	...	...	...	...	
42		22 ...	eP	23	36	36	...	...	...	...	...	Widening of line.
			F	23	39	12	...	...	...	...	...	
43		23 ...	eP	1	31	00	...	...	...	...	...	Widening of line.
			F	1	34	00	...	...	...	...	...	
44		23 ...	eP	2	47	18	...	...	...	...	...	Widening of line.
			F	2	50	18	...	...	...	...	...	
45		23 ...	eP	10	48	24	...	...	...	...	...	Widening of line.
			F	10	52	30	...	...	...	...	...	
46		23 ...	eP	13	18	00	...	...	...	...	...	
			eL	13	24	36	...	...	...		...	
			M	13	30	18	...	...	50	...	...	
			F	14	35	06	...		...	...	...	
47		24 ...	eP	2	47	24	...	...	...	...	...	Widening of line.
			F	2	55	30	...	...	...	...	...	
48		25 ..	eP	20	11	18	...	...	...	...	...	
			eL	20	54	48	...	...	...	...	...	
			M	20	56	48	...	...	40	...	...	
			F	21	34	48	...		...	...	...	
49		30 ...	eP	5	31	00	...	...	...	...	...	
			F	5	36	12	...	...	...	...	...	Widening of line.
50	June	1 ...	eP	15	22	06	...	...	...	...	...	Widening of line.
			F	15	35	24	...	...	...	...	...	
51		3 ...	P	......			...	...	...	...	...	
			eL	0	56	24	...	...	...	...	...	
			M	1	00	30	...	...	60	...	...	
			F	1	21	54		...	...	...	...	

No.	Date.		Phase.	Time G.M.T.			Period. (Sec.).	Amplitude (μ).			Distance Δ (Km.).	Remarks.
								An.	Ae.	Az.		
	1918.			H.	M.	S.						
52	June	4 ...	eP	4	55	36	...	...	...	...	...	Widening of line.
			F	4	59	42	...	...	...	...	...	
53		4 ...	eP	18	09	30	...	...	...	...	...	
			eL	18	16	06	...	...	...	...	...	
			M	18	23	30	...	...	40	...	...	
			F	18	39	42	...	...	...	...	...	
54		8 ...	eP	20	33	06	...	...	...	...	...	Widening of line.
			F	20	41	12	...	...	...	...	...	
55		26 ...	P	22	31	00?	...	...	...	...	...	Widening of line. In continuation of hour mark.
			F	22	35	06	...	...	...	...	...	
56	July	1 ...	eP	6	17	42	...	...	...	...	...	
			eL	6	28	30	...	...	...	...	...	
			M	6	44	24	...	...	100		...	
			F	7	59	42	...	...	...	...	...	
57		3 ...	eP	7	02	48	...	...	...	...	...	
			eL	7	08	00	...	...		...	...	
			M	7	37	42	...	...	350	...	...	
			F	9	21	18	...	...	...	...	...	
58		8 ...	P		...		...	...	...	...	...	Very destructive in Assam
			iL	10	26	24	...	...	...	...	...	
			M	10	31	30	...	...	1400	...	...	
			F	12	02	48	...	...	...	...	...	
59		15 ...	eP	20	24	54	...	...	...	...	...	Widening of line.
			F	20	41	12	...	...			...	
60		21 ...	eP	6	29	30	...	...	...	...		
			eL	6	32	00	...	...	...	...	...	
			M	7	02	48	...	...	40	...	...	
			F	8	58	42	...	...	...	...	...	
61		24 ...	P		...		...	...	...	...	...	
			eL	11	57	42	...	...	...	...	...	
			M	12	01	48	...	...	70	...	...	
			F	12	17	12	...	...	...	...	...	
62		29 ...	eP	12	12	00	...		...	...	...	Widening of line.
			F	12	21	18	...	...	...	...	...	
63		29 ...	eP	12	36	12	...	...	...	...	...	Widening of line.
			F	12	44	24	...	...	...	...	...	
64		29 ...	eP	12	59	42	...	...	...	...	...	Widening of line.
			F	13	01	48	...	...	...	...	...	
65		29 ...	eP	15	09	48	...	...	...	...	...	Widening of line.
			F	15	11	54	...	...	...	...	...	
66		29 ...	eP	16	46	18	...	...	...	...	...	Widening of line.
			F	18	07	30		...	...	...	...	
67		29 ...	eP	22	57	30	...	...	...	...	...	Widening of line.
			F	23	01	30	...		...	...	...	
68		31 ...	eP	16	09	30	...	...	...	...	...	Widening of line.
			F	16	28	30	...	...	...	...	...	
69	August	5 ...	eP	2	38	06	...	...		...	...	Widening of line.
			F	2	54	24		...		...	...	
70		8 ...	eP	10	38	12	...	...	...	...	...	Widening of line.
			F	10	59	36			...	...	...	
71		12 ...	eP	5	16	48	...	...	...	...	...	Widening of line.
			F	5	20	54	...	...	...	...	...	
72		14 ...	eP	14	44	24	...	...	...	...	...	Widening of line.
			F	14	56	42	...	...	...	...	...	
73		14 ...	eP	17	25	42	...	...	...	...	...	Widening of line.
			F	17	28	12	...	...	...	...	...	
74		14 ...	eP	18	35	06	...	...	...	...	...	Widening of line.
			F	18	54	42	...	...	...	...	...	
75		15* ...	iP	12	26	00	...	...	...	...	...	
			eL	12	32	18	...	...	...	...	...	
			M	12	53	00	...	...	1300±	...	...	
			F	18	56	36	...	...	...	...	...	
76		16 ...	eP	3	41	12	...	...	...	...	...	
			eL	3	55	30	...	...	...	...	...	
			M	3	58	24	...	...	60	...	...	
			F	4	13	06	...	...	...	...	...	
77		16 ...	eP	8	51	24	...	...	...	...	...	
			eL	8	55	18	...	...	...	...	...	
			M	9	11	54	...	...	30	...	...	
			F	9	16	30	...	...	...	...	...	
78		17 ...	eP	8	18	00	...	...	...	...	...	Widening of line.
			F	8	27	12	...	...	...	...	...	
79		23 ...	eP	6	25	36	...	...	...	...	...	Widening of line.
			F	6	33	18	...	...	...	...	...	
80		23 ...	eP	6	59	24	...	...	...	...	...	A single bead-like record.
			F	7	01	24	...	...	50	...	...	
81		23 ...	eP	7	32	00	...	...	...	...	...	
			eL	7	38	42	...	...	...	...	...	

* There was a lull between $16^{h}\frac{1}{2}$ and $17^{h}\frac{1}{2}$.

At $12^{h}\,56^{m}\!\cdot\!3$ the boom had moved east $8\cdot5^{mm}$ but instead of oscillating in the usual way moved westwards very slowly 2^{mm} in a minute and a half The usual oscillations were resumed at $12^{h}\,57^{m}\!\cdot\!8$

No.	Date.	Phase.	Time G.M.T. H.	M.	S.	Period. (Sec.).	Amplitude (μ). An.	Ae.	Az.	Distance Δ (Km.).	Remarks.
	1918.										
81—cont.	August 23—cont. ...	M	7	44	18	...	...	50	.	...	
		F	8	00	24	..	...	...	...	...	
82	31 ...	eP	22	14	42	...	...		...	...	Widening of line.
		F	22	27	12	...	..	...	...	...	
83	September 2 ...	eP	14	54	36	...	...	..	...	...	Widening of line.
		F	15	11	30	...	...	...	...	...	
84	5 ...	eP	7	31	00	...	...	..		..	Widening of line.
		F	7	43	18	...	...	...	...	...	
85	7 ...	iP	17	29	30	...	...	..	...	...	
		iL	17	37	42	...	...	...	.	...	
		M	18	07	12	...	...	1420	...	...	
		F	22	08	00	...	..	...	..	...	
86	8 ...	eP	0	35	06	..	...	...	...	...	Widening of line.
		F	1	06	54	...	...	...	..	...	
87	8 ...	eP	6	31	00	...	...	...	...	...	Widening of line.
		F	6	45	18	...	..	...	...	...	
88	11 ...	eP	4	24	54		...	...	...	...	Widening of line.
		F	4	44	24	..	...	..	..	...	
89	13 ...	eP	2	56	48	...	...	...	...	...	Widening of line.
		F	2	59	36	...	...	...	..	...	
90	16 ...	eP	6	22	54	...	...	..	...	...	Widening of line.
		F	6	27	00	...	...	...	...	...	
91	22 ..	iP	10	05	24	...	...	...	...	...	
		eL	10	09	00	...	...	...	...	...	
		M	10	11	00	.	...	250	...	...	
		F	10	33	36	...	..	...	...	...	
92	28 ...	eP	11	51	24	...	...	..	..	...	Widening of line.
		F	11	55	30	...	...	..	..	...	
93	29 ..	eP	12	26	54	...	...	...	...	...	
		eL	12	35	54		...	...	..	...	
		M	12	38	42	..	...	160	...	...	
		F	12	54	36	...	...	...	...	...	
94	30 ...	eP	18	41	48		..	...	...	...	
		eL	18	48	12	...	...	...	...	...	
		M	18	54	06	...	...	110	...	...	
		F	19	45	54	...	...	...	...	...	
95	October 1 ...	eP	1	15	54	...	.	...	..	...	
		iL	1	30	12	...	..	...	...	...	
		M	1	30	12	...	...	80	...	...	
		F	2	19	42	...	...	...	...	...	
96	1 ...	eP	8	06	18	..	...	..	.	...	Widening of line.
		F	8	09	18	..	...	...	...	...	
97	9 ...	eP	9	32	00	...	...	...	...	..	Widening of line.
		F	9	55	06	...	...	...	...	...	
98	11 ...	eP	14	38	00	..	...	..*	...	...	
		eL	15	36	42	..	...	...	..	...	
		M	15	42	48	..	...	130	..	...	
		F	16	45	54	...	..	...	..	...	
99	16 ...	eP	20	25	54	.	...		...	...	Widening of line.
		F	20	43	06	...	...	...	...	...	
100	25 ...	eP	5	10	30	...	...	..	...	...	Widening of line.
		F	5	26	42	..	.	...	...	...	
101	27 ..	eP	15	49	48	...	...	...	..	.	
		eL	16	24	42	...	...	...	...	...	
		M	16	27	42	...	...	40	...	...	
		F	16	39	00	...	..	..	...	.	
102	27 ...	iP	17	27	00	...	...	...	...	...	
		iL	17	41	00	...	..	...	..	...	
		M	18	01	54	...	..	100	...	...	
		F	18	34	42	...	...	...	..	...	
103	November 3 ..	eP	11	32	00	...	...	...	...	...	Widening of line.
		F	12	25	06	...	..	...	...	...	
104	8 ...	eP	4	50	00	...	...	...	...	.	
		iL	4	59	06	...	...	..	..	...	
		M	5	28	48	...	...	840	...	...	
		F	8	23	06	...	...	...	...	...	
105	10 ..	eP	17	41	42	...	...			...	Widening of line.
			17	43	48	..		...	..	..	
106	10 ...	eP	18	26	24	..	...	..	...	...	Widening of line.
			18	28	24	...	...	..	...	...	
107	10 ..	eP	18	49	24	...	...	...	...	...	Widening of line.
			18	50	54	..	..	...	...	...	
108	11 ...	eP	7	44	18	..	...	...	..	...	Widening of line.
			7	52	00	..	...	...	...	...	
109	12 ..	eP	23	08	18	...	...	...	..	...	Widening of line.
			23	25	06	...	...	...	...	...	
110	18 ...	iP	18	50	36	...	...	...	...	...	
		iL	18	58	36	...		...	...	...	
		M	19	14	00	...	...	650	...	...	
		F	22	17	00	...	...	...	...	...	

* The amplitude was comparatively large, namely 0·6mm, from 14h 38m·5 to 14h 40m·5.

No	Date.	Phase	Time G.M.T. H.	M.	S.	Period. (Sec.).	Amplitude (u). AN	AE	AZ	Distance Δ (Km.)	Remarks
	1918.										
111	November 22 ...	eP	16	36	06	...	...	...	...	...	Widening of line.
		F	16	42	48		...	...		...	
112	23–24 ...	eP	23	06	36	...	...		...	...	
		eL	23	10	00	...	...	80	...	...	
		M	23	35	06	...	...	...	...	...	
		F	0	13	54	...	...	...		...	
113	28 ...	eP	9	58	42	...		...	...	...	Widening of line.
		F	10	00	36	...	...	...	...	...	
114	29 ...	eP	10	54	06	...		...	...	...	Widening of line.
		F	11	02	42	...	...	...	...	...	
115	30 ...	P		...		...	...	...	...	...	No P.Ts.
		iL	7	26	12	...	...	...	...	...	
		M	7	26	24	...		60	...	...	
		F	7	41	12	...	...	...	...	...	
116	December 1 ...	eP	2	46	06	...	...		...	...	
		iL	2	50	12	...		...	...	...	
		M	2	51	06	...	...	480	...	...	
		F	3	32	00	...	...	...	...	...	
117	2 ...	eP	10	18	42	...	...	...	...	...	
		eL	10	48	24		...	...	...	...	
		M	10	59	00	...	...	400	...		
		F	11	57	48	...	...	...	...	...	
118	4 ...	e	7	43	18	...	...	...	...	...	Widening of line.
		F	7	47	24	...	...	...	...	...	
119	4 ...	eP	12	08	18		...	...	...	...	
		iL	13	00	42	...	...		...	...	
		M	13	18	06	...	...	760	...	...	
		F	15	27	12	...	...	...	...	...	
120	4 ...	eP	19	04	42	...	...	...	...	...	Widening of line.
		F	19	12	54	...	...	...	...	...	
121	6 ...	eP	8	43	18	...	...	...	...	...	Widening of line.
		F	10	42	48	...	...	...	...	...	
122	9 ...	eP	18	52	30	...	...	...	...	...	Widening of line.
		F	20	06	48	...	...	...	...	...	
123	18 ...	eP	21	44	06	...	...	...	...	...	A single shock.
		F	21	50	24	...	...	50	...	...	
124	19 ...	eP	20	30	00 ?	...	...	...	...	...	Widening of line. Beginning lost in hour mark.
		F	20	38	12	...	...	...	...	...	
125	20 ...	eP	6	55	36		...	...	...	...	Widening of line.
		F	6	56	42	...	...	...	...	...	
126	25 ...	eP	10	42	06	...	...	...	...	...	Widening of line. Amplitude was $0 \cdot 3^{mm}$ at 10^h $42 \cdot 5^m$
		F	11	21	18	...	...	...	...	...	
127	31 ...	eP	8	34	06	...	...	...	...	...	Widening of line.
		F	8	37	12	...	...	...	...	...	

APPENDIX II.

Latitude 10° 13′ 50″ N.

Longitude 5ʰ 9ᵐ 52ˢ E.

Height of Barometer cistern above mean sea level 7688 feet.

MEAN Monthly and Annual Meteorological Results at the Kodaikanal Observatory in 1918.

Month.	Barometer.		Dry Bulb Thermometer.				Wet Bulb.		Tension. of Vapour.	Relative Humidity.	Sun Max. in Vac.	Min. on Grass.	Wind.			Rain.		Clear Sky.	Bright Sun-shine.
	Reduced to 32°.	Daily Range.	Mean.	Max.	Min.	Range.	Mean.	Min.	By Simpson's Tables.				Daily Velocity	Mean Direction.		Amount.	Days.		
	Inches.	Inches.	°	°	°	°	°	°	Inches.	Cents.	°	°	Miles.	Points	Points.	Inches.	No.	Cents.	Hours.
January	22·805	0·065	53·1	61·0	45·2	15·8	48·3	42·1	0·303	76	115·9	38·0	289	3	N. E. by N.	6·08	8	44	210·1
February	·860	·060	54·1	64·8	43·5	21·3	44·9	38·1	·219	54	125·7	33·8	316	1	N. by E.	0·57	1	83	283·5
March	·847	·056	58·2	68·5	47·9	20·6	48·0	41·3	·243	52	132·2	39·7	308	5	N. E. by E.	1·02	5	79	297·5
April	·841	·058	62·2	72·4	52·0	20·4	51·9	46·4	·292	56	135·2	43·6	269	7	E. by N.	2·12	3	74	282·6
May	·755	·063	60·0	66·7	53·4	13·3	55·1	50·5	·396	80	125·9	49·0	329	17	S. by W.	5·14	11	25	141·4
June	·775	·057	58·9	66·1	51·7	14·4	53·7	47·8	·370	76	127·3	45·8	253	24	West	5·90	10	41	198·3
July	·797	·043	59·3	66·8	51·7	15·1	53·1	47·5	·355	73	129·6	45·2	287	21	S. W. by W.	2·94	5	42	201·7
August	·785	·057	58·3	65·1	51·5	13·6	53·8	48·7	·383	82	126·2	45·9	300	25	W. by N.	5·73	11	27	163·1
September	·822	·062	58·2	65·4	51·1	14·3	53·5	48·1	·373	79	126·7	43·6	188	20	S. W.	1·94	4	34	163·6
October	·849	·060	57·7	64·9	50·5	14·4	53·3	48·4	·372	81	127·0	44·6	227	1	N. by E.	7·08	17	41	201·7
November	·813	·072	56·3	61·2	51·5	9·7	53·9	50·5	·403	92	112·2	47·9	255	6	E. N. E.	14·00	20	15	95·6
December	·851	·062	54·5	61·1	47·9	13·2	49·1	44·0	·301	74	115·1	42·7	297	3	N. E. by N.	4·85	9	36	160·3
Annual	22·817	0·060	57·6	65·3	49·8	15·5	51·5	46·1	0·334	73	125·0	43·3	276	30	N. N. W.	57·37	104	45	2399·4

EXTREME Monthly Meteorological Records at the Kodaikanal Observatory in 1918.

Month.	Baromoter.					Dry Bulb Thermometer.				Wet Bulb.		Humidity.		Sun Th. in Vacuo.		Grass Therm.		Wind.				Rain.	
	Highest.		Lowest.		Range.	Highest.		Lowest.		Lowest.		Lowest.		Highest.		Lowest.		Highest.		Lowest.		Greatest Fall.	
	Inches.	Day.	Inches.	Day.	Inches.	°	Day.	°	Day.	°	Day.	Cents.	Day.	°	Day.	°	Day.	Miles.	Day.	Miles.	Day.	Inches.	Day.
January	22·879	4	22·720	17	0·159	68·4	1	**37·2**	**29**	**32·2**	**29**	23	17&29	133·1	10	28·0	30	**740**	**27**	104	21	**2·48**	**27**
February	**·945**	**25**	·774	5	·171	70·6	10	40·3	4	33·2	21	12	11	135·9	16&26	**23·0**	**3**	485	12	178	1	0·45	23
March	·916	9	·764	24	·152	74·2	20	44·2	3	34·1	4 & 8	12	29	140·6	15	32·1	4	511	29	153	22	0·37	27
April	·931	30	·757	3	·174	**76·4**	**18**	47·7	1	37·1	1	14	1	143·1	8	35·6	1	430	25	173	4	1·76	29
May	·839	1	**·674**	**17**	·165	74·4	2	49·8	7	43·9	1	36	2	141·9	15	43·5	31	580	21	92	31	1·67	8
June	·866	5	·677	29	·189	69·8	20	47·3	7	39·9	8	38	8 & 9	136·6	10&28	38·9	7	454	18	**85**	**1**	1·17	5
July	·854	9	·716	1	·138	72·3	8	49·2	5 & 31	41·1	8	32	8	145·1	12	40·3	11	590	29	108	14	1·05	27
August	·876	11	·699	28	·177	69·4	8	49·4	16	43·6	12 & 14	53	14	140·9	13	40·3	7	478	16	128	23	1·40	10
September	·908	18	·744	4	·164	69·2	26	49·2	22	42·0	23	42	26	**148·4**	**24**	39·4	7	399	24	88	5	0·76	17
October	·909	11	·786	31	·123	68·7	4 & 5	45·2	26	41·2	26	26	26	141·6	30	35·1	26	373	21	109	13	1·05	20
November	·906	30	·710	17	·196	64·9	13	47·0	9	42·9	10	46	9	141·0	13	39·2	9	493	17	118	22	1·85	13
December	·918	4,19 & 20	·752	9	·166	67·8	30	41·3	23	35·3	30	**7**	**9**	136·3	9	29·1	23	490	9	171	13	0·95	18

APPENDIX III.

KODAIKANAL mean hourly wind velocity for the year 1918.

Month.	Hours.																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
January	14	14	14	14	14	13	13	13	13	14	13	12	12	11	9	9	8	9	10	11	12	11	13	12
February	15	15	15	16	15	14	14	14	14	15	16	16	14	11	11	9	8	8	9	11	12	13	14	15
March	15	15	15	15	15	14	15	14	15	15	16	15	13	13	12	10	9	8	8	9	9	11	14	14
April	10	10	10	10	10	11	12	12	13	14	16	14	13	11	11	11	10	9	10	11	9	9	10	11
May	14	14	15	16	15	15	15	14	12	13	13	13	12	12	12	13	12	12	12	14	14	14	14	14
June	13	12	12	12	12	12	12	10	9	8	9	9	9	9	8	9	9	10	11	12	12	12	11	11
July	13	13	12	13	12	13	12	11	11	12	11	10	11	11	11	11	10	12	13	13	12	13	14	13
August	15	10	15	14	14	14	13	12	11	11	11	11	10	11	10	10	11	12	12	13	13	14	14	15
September	8	8	8	8	8	8	8	7	7	8	8	8	8	8	8	9	8	7	8	7	7	8	8	8
October	9	10	11	11	11	11	11	11	11	12	11	10	9	9	9	8	8	8	7	8	8	8	8	9
November	12	12	12	12	11	11	12	12	11	11	12	11	11	10	9	8	8	8	9	10	10	10	11	12
December	14	13	14	13	13	13	14	13	13	13	13	13	12	11	10	9	8	10	12	13	13	13	14	14
Mean	13	12	13	13	13	12	13	12	12	12	12	12	11	11	10	10	9	9	10	11	11	11	12	12

APPENDIX IV.

KODAIKANAL mean hourly bright sunshine for the year 1918.

Month.	Hours.											
	6–7	7–8	8–9	9–10	10–11	11–12	12–13	13–14	14–15	15–16	16–17	17–18
January	0·36	0·76	0·82	0·78	0·76	0·74	0·67	0·59	0·51	0·45	0·29	0·05
February	·56	·92	·93	·93	·95	·94	·92	·93	·85	·87	·81	·53
March	·53	·92	·97	·97	·97	·92	·87	·82	·79	·74	·72	·37
April	·48	·96	·99	1·00	1·00	·98	·94	·89	·77	·64	·51	·26
May	·14	·37	·46	0·56	0·56	·68	·49	·40	·34	·32	·18	·07
June	·22	·76	·88	·91	·87	·77	·71	·51	·33	·32	·23	·09
July	·27	·71	·80	·80	·80	·72	·63	·52	·53	·45	·23	·05
August	·20	·60	·72	·71	·64	·55	·46	·42	·40	·29	·20	·08
September	·27	·64	·81	·78	·75	·57	·52	·36	·29	·23	·15	·07
October	·26	·67	·78	·79	·84	·75	·71	·54	·46	·36	·26	·10
November	·05	·23	·32	·31	·28	·37	·42	·38	·38	·26	·17	·02
December	·07	·40	·52	·61	·66	·58	·58	·55	·48	·39	·29	·02
Mean	0·28	0·66	0·75	0·76	0·76	0·71	0·66	0·58	0·51	0·44	0·34	0·14

APPENDIX V.

NUMBER of days in each month on which the Nilgiris were visible in 1918.

Month.	Very clear.	Visible.	Just visible.	Tops only visible.	Total.
January	...	12	3	..	15
February	...	3	5	...	8
March	...	4	3	...	7
April	.	...	...	...	...
May	2	5	2	...	9
June	1	7	...	...	8
July		4	3	...	7
August	1	3	...	...	4
September	2	8	2	...	12
October	...	1	1	...	2
November	2	5	...	...	7
December	2	13	...	1	16
Total	10	65	19	1	95

APPENDIX VI.

MADRAS OBSERVATORY.—Abnormals from monthly means for the year 1918.

Abnormals of	January.	February.	March.	April.	May.	June.	July.	August.	September	October.	November.	December.	Annual.
Reduced atmospheric pressure	− 0·052	+ 0·039	+ 0·008	− 0·002	− 0·043	+ 0·012	+ 0·023	− 0·006	+ 0·023	+ 0·049	− 0·049	+ 0·005	+ 0·001
Temperature of air	+ 0·4	− 1·1	− 0·7	− 0·2	− 0·5	− 0·5	+ 2·4	+ 2·4	+ 1·3	+ 2·8	+ 1·2	+ 1·5	+ 0·8
Do. of evaporation	+ 2·3	− 0·6	+ 0·5	+ 0·9	+ 0·8	+ 0·6	+ 0·8	+ 0·8	+ 2·2	+ 0·5	+ 3·2	+ 2·0	+ 1·1
Percentage of humidity	+ 8	+ 2	+ 4	+ 4	+ 5	+ 4	− 4	− 4	+ 5	− 8	+ 9	+ 3	+ 2
Greatest solar heat in vacuo	+ 2·1	+ 11·2	+ 11·2	+ 10·4	+ 6·4	+ 4·8	+ 10·8	+ 11·8	+ 10·1	+ 16·4	− 4·9	+ 9·5	+ 8·3
Maximum in shade	− 2·8	− 1·1	− 1·4	+ 0·4	− 1·5	− 0·1	+ 3·4	+ 3·6	+ 1·3	+ 3·1	− 1·3	− 0·5	+ 0·3
Minimum in shade	+ 2·4	− 1·7	− 1·5	− 1·0	− 1·3	− 1·1	+ 1·7	+ 1·6	+ 1·0	− 0·2	+ 2·7	+ 2·2	+ 0·4
Do. on grass	+ 4·2	− 0·6	− 1·0	− 1·0	− 1·0	− 0·9	+ 2·0	+ 2·1	+ 1·4	− 0·4	+ 4·4	+ 3·5	+ 1·4
Rainfall in inches	+ 7·16	+ 1·90	− 0·37	− 0·62	+ 3·68	− 0·31	− 3·22	− 1·50	− 1·44	− 6·66	+ 25·97	+ 1·39	...
Do. since January 1st	...	+ 9·06	+ 8·69	+ 8·07	+ 11·75	+ 11·44	+ 8·22	+ 6·72	+ 5·28	− 1·38	+ 24·59	+ 25·98	+ 25·98
General direction of wind	2 points N.	same as	same as	1 point S.	2 points W.	1 point S.	1 point S.	same as	same as	1 point E.	3 points E.	1 point E.	same as
Daily velocity in miles	+ 46	− 29	− 37	− 5	− 47	− 86	− 57	− 74	− 89	− 52	− 56	− 68	− 43
Percentage of cloudy sky	+ 15	− 6	− 9	− 11	+ 8	− 12	− 21	+ 3	same as	− 27	+ 17	+ 1	− 4
Do. of bright sunshine	− 17·6	− 1·1	same as	+ 10·5	− 4·6	+ 6·8	+ 13·0	+ 2·1	− 5·1	+ 18·4	− 26·0	− 8·1	− 5·5

+ means *above* normal ; − means *below* normal.

APPENDIX VII.

ABSTRACT of the Mean Meteorological Condition of Madras in the year 1918 compared with the average of past years.

Mean values of	1918.	Difference from	Average.
Reduced atmospheric pressure	29·865	0·001 above.	29·864
Temperature of air	81·9	0·8 "	81·1
Do. of evaporation	75·6	1·1 "	74·5
Percentage of humidity	74	2 "	72
Greatest solar heat in *vacuo*	148·0	8·3 "	139·7
Maximum in shade	91·1	0·3 "	90·8
Minimum in shade	75·1	0·4 "	74·7
Do. on grass	73·3	1·4 "	71·9
Rainfall since January 1st on 88 days	75·00	25·98 "	49·02
General direction of wind	S.E.	same as	S.E.
Daily velocity in miles	128	43 below.	171
Percentage of cloudy sky	45	4 "	49
Do. of bright sunshine	52·9	5·5 "	58·4

DURATION and quantity of the wind from different points.

From	Hours.	Miles.	From	Hours.	Miles.	From	Hours.	Miles.	From	Hours.	Miles.
North.	228	1640	East.	240	936	South.	252	1415	West.	334	2487
N. by E.	289	2182	E. by S.	302	1288	S. by W.	186	1031	W. by N.	172	1123
N.N.E.	221	1622	E.S.E.	135	621	S.S.W.	190	1163	W.N.W.	129	979
N.E. by N.	531	3178	S.E. by E.	400	1815	S.W. by S.	137	595	N.W. by W.	74	421
N.E.	226	1457	S.E.	589	3078	S W.	133	676	N.W.	41	280
N.E. by E.	108	736	S.E. by S.	709	4345	S.W. by W.	139	700	N.W. by N.	86	555
E.N.E.	79	461	S.S.E.	655	4849	W.S.W.	217	1461	N.N.W.	53	363
E. by N.	207	942	S. by E.	280	1744	W. by S.	225	1392	N. by W.	144	1165

There were 1,049 calm hours during the year. The resultant corresponding to the above numbers is represented by a S.E. wind, blowing with a uniform daily velocity of 25 miles.

APPENDIX VIII.

MADRAS OBSERVATORY.—Number of hours of wind from each point in the year 1918.

Month.	N.	1	2	3	4	5	6	7	E.	9	10	11	12	13	14	15	S.	17	18	19	20	21	22	23	W.	25	26	27	28	29	30	31	Calm.
January	81	64	147	214	56	14	10	10	24	7	1	...	...	20	4	18	..	...	..	...	1	...	...	11	1	8	...	3	5	12	13	13	7
February	...	19	...	89	37	24	16	44	86	113	31	63	17	15	29	16	24	2	3	2	...	2	...	...	...	...	...	...	...	...	...	6	34
March	...	...	...	...	...	...	...	16	39	59	12	72	192	175	93	15	15	12	4	4	...	..	...	...		.	..	...		...	...	..	36
April	...	...	...	...	...	...	..	..	...	...	...	10	60	254	249	39	30	29	33	7	3	..	2	1	...	...	...	...	...	...	...	...	3
May	...	1	.	...	2	...	..	1	...	1	1	36	125	68	86	32	32	25	20	17	32	25	61	30	76	20	19	18	1	9	.	...	6
June	...	..	..	..	5	...	1	1	6	17	13	26	48	19	80	55	70	37	51	11	25	27	52	32	66	26	28	6	10	4	2	..	2
July	2	1	3	5	...	...	1	...	2	3	8	41	30	58	49	57	26	30	23	29	34	33	42	60	65	49	33	23	2	7	1	...	27
August	1	...	1	1	1	...	2	3	5	6	10	26	56	54	41	29	35	17	17	20	20	29	40	62	94	49	22	7	6	6	1	...	83
September	2	2	2	1	7	4	4	4	11	16	21	58	33	31	16	17	5	21	34	34	16	17	20	28	30	20	25	16	16	16	14	2	177
October	15	27	3	18	25	20	20	48	41	49	30	59	25	8	6	1	5	3	4	1	2	4	...	...	...	.	...	...	...	...	1	7	322
November	54	107	22	31	15	27	16	31	21	31	8	8	2	7	2	1	10	10	1	12	...	2	...	1	2	...	2	1	1	32	20	62	181
December	73	68	43	172	78	19	9	49	5	...	...	1	1	..	...	..	...	...	..	...	...	...	...	...	...	..	...	...	..	..	1	54	171
Annual total.	228	289	221	531	226	108	79	207	240	302	135	400	589	709	655	280	252	186	190	137	133	139	217	225	334	172	129	74	41	86	53	144	1049

APPENDIX IX.

MADRAS OBSERVATORY.—Number of miles of wind from each point in the year 1918.

Month.	N.	1	2	3	4	5	6	7	E.	9	10	11	12	13	14	15	S.	17	18	19	20	21	22	23	W.	25	26	27	28	29	30	31	Total.
January	718	697	1097	1476	386	141	106	98	124	49	8	...	.	80	34	66	...	...	...	...	6	...	...	80	12	52	...	40	86	193	179	156	5884
February	..	60	...	354	230	147	86	179	306	399	133	225	55	86	99	70	108	12	18	11	...	10	...	...	..	...	...	...	..	...	...	28	2616
March	..	...		...	...	...	...	81	156	226	52	305	910	940	540	113	93	77	38	25	...	...	...	...	...	...	...	..	..	...	.	..	3556
April	.		...	...	...	..	...	..	...	..	...	44	363	1744	2015	349	300	280	372	62	19	..	13	8	...	...	.	...	...	...	...	...	5569
May		11	...	...	16	..	...	6	..	8	6	192	724	587	838	262	221	150	148	122	182	156	464	224	790	152	199	62	7	45	...	.	5572
June	...	...	...	...	37	...	10	9	49	111	112	210	368	146	634	377	375	175	289	42	167	169	400	214	449	218	269	57	79	28	12	...	5006
July	8	4	3	12	...	...	4	...	18	21	63	229	148	285	403	334	137	122	89	141	187	169	301	405	523	317	272	135	12	26	4	...	4372
August	8	..	5	4	3	...	10	11	26	25	29	93	270	238	175	108	118	53	62	65	64	106	199	357	548	310	133	34	25	15	1	.	3095
September	5	14	8	6	35	34	9	21	27	91	73	212	116	158	70	55	16	53	109	101	47	49	84	100	112	74	95	87	66	53	35	6	2021
October	106	209	28	91	194	153	78	203	162	251	114	280	119	60	32	5	18	12	14	4	4	6	...	.	...	..	...	...	.	..	8	41	2192
November	412	727	175	233	106	163	100	102	50	107	31	24	3	21	9	5	29	97	24	22	.	35	.	4	53	...	11	6	5	195	114	404	3267
December	383	460	306	1002	450	98	58	232	18	...	.	1	2	...	...	...	..	..	...	...	...	.	...	.	...	...	...	.	.	..	10	530	3550
Annual	1640	2182	1622	3178	1457	736	461	942	936	1288	621	1815	3078	4345	4849	1744	1415	1031	1163	595	676	700	1461	1392	2487	1123	979	421	280	555	363	1165	46700

APPENDIX X.

MADRAS OBSERVATORY.—Number of inches of rain from each point in the year 1918.

Month.	N.	1	2	3	4	5	6	7	E.	9	10	11	12	13	14	15	S.	17	18	19	20	21	22	23	W.	25	26	27	28	29	30	31	Calm.
January	0·45	0·52	0·30	1·32	0·65	0·14	...	0·31	0·24	1·05	...	..	...	...	...	...	...	...	...	...	...	..		0·14	0·06	0·46	...	0·45	...	0·26	0·84	0·86	...
February	...	...	...	0·19	0·68	...	1·20	...	...	..	0·11	...	...	...	...	...	...	...	...		..	...	...	...	...	...	...	...	...	...	...	...	...
March	...	...	..	...	...	...	...		...	...	..	...	...	...	...	...	0·02	...	...	...	...	...	..	...	...	...	...			...	...	...	...
April	...	..	..	...	...	...	...	...	...	..	.	...	...	...	..	...	...	...	..		...	...	...	...	...	...	...	...	..	...	...	...	...
May	..	...	...	..	..	...	...	..	..	...	...	0·04	0·01	...	0·05	.	0·08	0·02	0·51	0·86	0·73	...	1·17	0·03	0·47	0·66	...	1·17	...	.	...	...	...
June	...	...	..	...	..	...	...	...	...	...	...	...	...	...	0·05	...	0·82	0·05	0·43	.	0·06	...	0·07	0·04	0·27	...	...	...	...	0·01	...	..	...
July	..		...	.	...	..	...	...	...	...	...	...	...	...	0·03	0·04	0·12	...	0·32	...	...	0·05	0·09	...	...	...	..	...	.	..	..	...	...
August	...	...	0·01	...	...	..	0·49	...	0·07	..	0·02	0·01	0·11	0·15	0·07	0·22	...	...	0·81	...	...	...	0·01	0·11	0·13	...	...	0·32	...	0·40	.	...	0·13
September	..	0·17	...	...	0·65	0·34		...	.	..	0·55	...	..	...	...	...	...	...	...	..	0·01	0·19	0·03	0·08	0·31	...	0·05	0·02	...	0·10	...	...	0·75
October	2·50	0·34		..	...	...	..	...	...	0·11	...	...	...	...	...	...	...	...	...		...	...	...	...	...	..	...	...	...	...	0·11	1·21	0·07
November	1·38	2·59	1·30	1·77	1·65	1·39	1·00	1·24	1·78	0·97	1·59	3·32	0·79	0·30	...	1·73	2·40	2·21	...	...	...	0·13	...	1·49	3·06	...	..	...	..	1·38	0·23	2·09	3·39
December	0·05	0·51		0·65	0·01	1·16	1·60	0·07	0·16	...	...	...	1·05	...	...	.	...	...	..	...	...	...	..	...	...	...	...	.	...	...	...	1·39	0·02
Annual	4·38	4·13	1·61	3·93	3·64	3·03	4·29	1·62	2·25	2·13	2·27	3·37	1·96	0·45	0·20	1·99	3·44	2·28	2·07	0·86	0·80	0·37	1·37	1·89	4·30	1·12	0·05	1·96	..	2·15	1·18	5·55	4·36

APPENDIX XI.

MADRAS OBSERVATORY.—Wind, cloud and bright sunshine, 1918.

Month.	Wind resultant.		Cloud (0—10).					Bright sunshine.	
	Velocity.	Direction.	8 H.	10 H.	16 H.	20 H.	Mean.	Average per day.	Greatest number of hours in a day.
	MILES.	POINTS.						HOURS.	HOURS.
January	154	N N.E.	5·6	5·7	4·7	4·6	5·2	5·8	9·3
February	67	East	1·6	2·2	1·9	1·5	1·8	8·9	10·1
March	107	S E. by S.	1·5	1·9	1·1	1·2	1·5	8·9	10·8
April	113	S.E. by S.	3·3	2·4	0·7	0·5	1·7	9·9	10·8
May	90	South.	5·1	4·2	4·9	4·4	4·6	7·1	9·9
June	86	S.S.W.	5·1	4·3	5·8	5·8	5·2	6·0	8·8
July	76	S. by W.	4·4	4·4	5·9	5·0	5·0	5·6	8·8
August	51	S.W.	6·3	5·7	8·1	5·3	6·4	4·6	8·6
September	19	S. by W.	6·7	6·8	6·7	4·6	6·2	4·4	10·6
October	49	E. by N.	3·7	4·0	2·9	1·8	3·2	8·0	10·3
November	73	N. by E.	7·8	7·9	8·3	6·4	7·6	2·5	8·9
December	104	N.N.E.	5·3	6·2	6·0	3·5	5·3	5·1	8·2
Annual	25	S.E.	4·7	4·6	4·7	3·7	4·5	6·4	...

APPENDIX XII.

MEAN Monthly and Annual Meteorological Results at the Madras Observatory in 1918.

Month.	Barometer.		Dry Bulb Thermometer.				Wet Bulb.		Tension of Vapour.	Relative Humidity.	Sun Max. in Vac.	Min. on Grass.	Wind.			Rain.		Clear sky.	Bright Sunshine.
	Reduced to 32°.	Daily Range.	Mean.	Max.	Min.	Range.	Mean.	Min.	By Blandford's Tables.				Daily Velocity.	Mean Direction.		Amount.	Days.		
	Inches.	Inches.	°	°	°	°	°	°	Inches.	Cents.	°	°	Miles.	Points	Points.	Inches.	No.	Cents.	Hours.
January	29·946	0·109	75·5	81·9	69·9	12·0	71·5	68·7	0·720	81	140·5	67·3	190	3	N E. by N.	8·05	10	52	178·6
February	30·003	·118	75·6	85·5	66·3	19·2	70·2	65·9	·666	75	150·9	63·2	93	8	East.	2·18	2	18	248·7
March	29·913	·124	79·3	88·1	70·9	17·2	74·4	70·6	·802	78	151·7	67·6	115	12	S E.	0·02	1	15	275·3
April	·823	·127	83·8	93·3	76·2	17·1	78·5	75·8	·906	78	152·1	73·7	186	14	S S E.	...	.	17	297·5
May	·692	·121	86·2	96·3	79·5	16·8	79·1	76·0	·897	72	149·4	77·9	180	17	S. by W.	5·80	7	46	219·9
June	·715	·120	85·9	98·2	79·2	19·0	77·2	73·7	·815	66	145·3	77·7	167	18	S S W.	1·80	10	52	180·0
July	·744	·113	86·9	99·0	80·2	18·8	76·7	73·7	·780	61	149·5	78·6	141	19	S W. by S.	0·65	5	50	175·1
August	·744	·129	85·7	97·3	78·9	18·4	76·8	73·8	·835	66	151·8	77·5	100	19	S.W. by S.	3·06	12	64	142·7
September	·800	·138	84·3	94·5	78·1	16·4	78·5	75·2	·928	77	151·4	76·4	67	18	S.S.W.	3·25	8	62	132·0
October	·890	·118	83·4	92·1	75·0	17·1	76·1	73·1	·803	70	155·5	76·1	71	8	East.	4·34	2	32	250·0
November	·875	·112	78·7	83·7	75·0	8·7	76·1	73·9	·862	88	132·5	73·9	109	5	N.E. by E.	39·18	23	76	74·8
December	·983	·106	77·0	83·1	72·0	11·1	72·6	70·4	·743	80	145·3	69·9	115	3	N.E. by N.	6·67	8	53	157·0
Annual	29·844	0·120	81·9	91·1	75·1	16·0	75·6	72·6	0·813	74	148·0	73·3	128	12	S E.	75·00	88	45	2331·6

EXTREME Monthly Meteorological Records at the Madras Observatory in 1918.

Month.	Barometer.					Dry Bulb Thermometer.				Wet Bulb.		Humidity.		Sun Th. in Vacuo.		Grass Therm.		Wind.				Rain.	
	Highest.		Lowest.		Range.	Highest.		Lowest.		Lowest.		Lowest.		Highest.		Lowest.		Highest.		Lowest.		Greatest Fall.	
	Inches.	Day.	Inches.	Day.	Inches.	°	Day.	°	Day.	°	Day.	Cents.	Day.	°	Day.	°	Day.	Miles.	Day.	Miles.	Day.	Inches.	Day.
January	30·081	30,31	29·723	17	0·358	85·0	26	64·9	6	64·0	6	54	31	152·6	3,6	61·7	6	**355**	**17**	95	28	2·41	11
February	**·119**	**10**	·890	26,27	·229	94·5	15	**60·8**	**15**	**60·3**	**15**	**35**	**15**	157·1	15	**56·6**	**15**	189	19	61	24	2·07	20
March	·086	4	·704	21	**·382**	91·7	21	66·6	12	66·6	12	53	17	156·2	4	62·2	12	202	22	81	9	0·02	26
April	29·977	10	·674	7	·303	99·2	27	68·5	1	68·5	1	49	14	158·4	6	64·6	1	248	15	112	11	...	..
May	·827	1	**·555**	**24**	·272	102·8	15	72·7	17	72·7	17	39	22	156·3	20	72·9	16	265	22	96	31	4·99	16
June	·852	3	·578	29	274	102·3	9	72·8	15	70·9	15	38	8	155·2	9	73·3	15	213	20	95	30	0·82	14
July	·852	21	·635	31	·217	103·2	12	75·9	2	69·2	31	36	5	162·4	31	74·3	1	235	4	69	28	0·32	1
August	·892	11	·589	15	·303	**104·1**	**4**	74·8	11	70·5	4	36	1,2	164·1	12	71·7	11	154	4	43	11	0·81	9
September	·955	19	·655	3	·300	101·1	7	72·8	23	72·1	23	39	3	**166·9**	**8**	71·9	23	139	2	**16**	**25**	0·92	14
October	·996	28	·759	30	·237	96·3	12	68·6	26	66·4	26	42	12,13,25,26	165·5	29	65·4	26	209	30	**16**	**10**	4·23	31
November	30·060	30	·707	19	·353	87·6	23	70·9	11	70·6	11	61	19	161·6	23	60·5	11	317	17	18	13	**6·33**	**2**
December	·097	25	·801	12	·296	86·0	16	67·3	30	63·3	10	55	10	156·7	4	63·5	30	274	11	26	1	2·05	1