KODAIKÁNAL AND MADRAS OBSERVATORIES.

REPORT FOR THE YEAR 1910.

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KODAIKANAL AND MADRAS OBSERVATORIES.

I.—REPORT OF THE KODAIKÁNAL OBSERVATORY FOR THE YEAR 1910.

Staff.—The staff of the Observatory on the 31st December 1910 was as follows :—

Director	C. Michie Smith, C.I.E., B.Sc.
Assistant Director	J. Evershed.
First Assistant	S. Sitarama Aiyar, B.A.
Second Assistant	G. Nagaraja Aiyar.
Third Assistant	A. Y. Subrahmanya Aiyar, B.A.
Fourth Assistant	S. Balasundaram Aiyar.
Writer	L. N. Krishnaswamy Aiyar.
Photographic Assistant	R. Krishna Aiyar.

The Assistant Director was on privilege leave from May 20 to August 19. The appointment of a temporary extra assistant was sanctioned for four months from April 23, and Mr. T. K. Raghunatha Rao, B.A., was appointed to the post. His services were retained as acting third assistant from August 19 to December 23 during the successive absences on privilege leave of the first, second, and third assistants. The writer and the photographic assistant were on privilege leave from July 27 to December 28.

The subordinate staff consists of a book-binder, a book-binder's boy, a mechanic, five peons, a boy peon for the dark room, and two lascars.

2. **Distribution of work.**—The distribution of work amongst the staff was the same as last year.

3. **Buildings and grounds.**—Plans and estimates have been prepared and forwarded to the Government of India, for sanction, for the construction of a house for the photographic assistant who has at present to live at a distance of three miles from the Observatory.

There has been much delay in connection with the electric installation for the Observatory, but a revised estimate has recently been sanctioned by the Government of India and it is hoped that the work will be begun early in 1911.

About 1,000 young seedlings, chiefly pines, were planted during the year. Those formerly planted have made remarkably good progress and if fire can be kept out they will soon form a most valuable screen. The old fire lines have been broadened and new ones cut. During the year fires from the outside have been successfully warded off, but one fire lighted inside—evidently maliciously—destroyed 50 young trees before it could be extinguished.

4. **Instruments.**—The following are the principal instruments belonging to the Observatory, or in use, at the present time :—

Six-inch Cooke equatorial.

Six-inch Lerebour and Secretan equatorial remounted by Grubb with a five-inch Grubb portrait lens of 36 inches focus attached.

Spectrograph I.—consisting of slit, collimator lenses of 4 and 7 feet focus, 2-inch parabolic grating, and camera tube without lens. Used in connection with an 11-inch polar siderostat and 6-inch Grubb lens of 40 feet focus.

A rhomb with ends cut at 45° mounted on a graduated circle can be placed in front of the slit so as to enable any part of the limb to be brought on to the slit.

Spectrograph II.—Spectrograph II. has been dismantled, the grating is used in spectrograph III.
Spectrograph III.—consisting of slit provided with vertical and horizontal millimetre scales for measuring position angles, and a reflecting device for rotating the sun's image, collimator lens of 210 c.m. focus, 6-inch Michelson grating, and camera lens of about 4 metres focus. The spectrograph is used with the 18-inch concave mirror.
Spectroheliograph—with 18-inch siderostat and 12-inch Cooke photo-visual lens of 20 feet focus, by the Cambridge Scientific Instrument Company.
An auxiliary spectroheliograph attached to the above, made in the Observatory workshop.
Six-inch transit instrument and barrel chronograph, formerly the property of the Survey of India.
Six-prism table spectroscope—Hilger.
Photoheliograph Dallmeyer No. 4.
Theodolite, six-inch—Cooke.
Sextant.
Evershed spectroscope with three prisms for prominence and sunspot work, by Hilger.
Mean time clock, Kullberg 6326.
Do. Shelton.
Mean time Chronometer, Kullberg 6299.
Sidereal chronometer, Kullberg 6134.
Tape chronograph, Fuess.
Micrometer for measuring spectrum photographs, Hilger.
Dividing engine, Cambridge Scientific Instrument Company, Limited.
Two Balfour Stewart actinometers.
Buchanan's solar calorimeter.
Induction coil with necessary adjuncts.
Small polar siderostat.
Universal instrument.
Complete set of meteorological instruments, including Richard barograph and thermograph, and wind recorders.
A high class screw cutting turning lathe by Messrs. Cooke & Sons.
Ångström Pyrheliometer.
An 18-inch concave mirror by Henry of Paris belonging to the Assistant Director has been mounted in the spectroheliograph room for general spectrum work and for large scale photographs of sunspots.

Sanction having been obtained for sending home the 18-inch mirror of the spectroheliograph to be refigured, an application was made to the Joint Eclipse Committee for the loan of a mirror. This was kindly granted and one of the eclipse cœlostats with a 16-inch mirror was sent out. This was used while the 18-inch mirror was away, except for a short time when the cœlostat was fitted up for taking photographs of Halley's comet. During this time the 11-inch mirror belonging to the 40-foot spectrograph was used. The 18-inch mirror was returned on September 27 greatly improved.

OBSERVATIONS.

(a) Solar Physics.

5. The following table shows for each day the solar observations that were made :—

Table A.

Solar Observations in 1910.

A = Spots observed. B = Spot spectra. C = Prominences. D = Photoheliograms. E = Spectroheliograms.

Date.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1 ..	A—CDE	A—*C*DE	A—CDE	A—CDE	A—CDE	A—CDE	A—CDE	A—*C*DE	A—CDE	ABCDE	A—CD*E*	A—CDE
2 ..	A*B*CDE	A—*C*DE	A—CDE	A—CDE	A—CDE	A—CDE	A——D*E*	A—*C*DE	A—CDE	A—CDE	A——D*E*	A—CDE
3 ..	A—*C*D*E*	A——DE	A—CDE	A—CDE	A—CDE	A—CDE	A——D*E*	A—*C*———	A——D*E*	A—CDE	A————	A—CDE
4 ..	A——D*E*	A—*C*DE	ABCDE	A—CDE	A—CDE	A—CDE	A——D*E*	A——D—	—	A—CDE	A——D*E*	A—CDE
5 ..	A————	A—CDE	ABCDE	A—CDE	A—CDE	A—CDE	A—*C*D*E*	A—CD—	A——D*E*	ABCDE	A—CDE	A—CDE
6 ..	AB*C*DE	A—CDE	ABCDE	A—CDE	A——D*E*	A—*C*DE	A——D*E*	A—CDE	A—*C*DE	ABCDE	—	A—CDE
7 ..	A—CDE	A—CDE	ABCDE	A—CDE	A—*C*DE	A—*C*DE	A——D—	A—*C*D*E*	A—CDE	A—*C*DE	A——D—	A—CDE
8 ..	A—CDE	A—CDE	A—CDE	A—*C*DE	A—*C*DE	A——D*E*	AB*C*DE	A—*C*DE	A—CD*E*	A—CDE	A—CDE	A—CDE
9 ..	A—*C*DE	A—CDE	A—CDE	A—CDE	A—CDE	A—CDE	A——D*E*	ABCDE	A—*C*D*E*	A—CDE	A—CDE	A—CDE
10 ..	A—CDE	A—CDE	A—CDE	A—CDE	A—CDE	A—*C*DE	A—CDE	ABCDE	A—CDE	A—*C*DE	A—CDE	A—CDE
11 ..	A—CDE	A—CDE	A—*C*DE	A—CDE	A—CDE	A——D*E*	A—CDE	A—*C*D*E*	A—*C*DE	A—CDE	A—CD—	A—CDE
12 ..	ABCDE	A—CDE	A—CDE	A—CDE	A—CDE	A—CDE	A—CDE	ABCDE	A—CDE	A—CDE	A——D—	A—CDE
13 ..	A—*C*D*E*	A—CDE	A—CDE	A—CDE	A—*C*DE	A—CDE	A—CDE	A—CD*E*	A—*C*DE	A—CDE	A—*C*DE	A—CDE
14 ..	A—*C*DE	ABCDE	A—CDE	A—CDE	A—CDE	A—CDE	A—*C*DE	A—CDE	A—CDE	A—CDE	A—CDE	A—CDE
15 ..	ABCDE	ABCDE	A—CDE	A—CDE	A—CDE	A—*C*DE	A—*C*DE	A—*C*DE	A—CDE	A—CDE	A——D—	A—CDE
16 ..	A—*C*DE	ABCDE	A—CDE	A—*C*DE	ABCDE	A——D*E*	A—*C*DE	A—CDE	A—CDE	A—*C*D*E*	A—CDE	A—CDE
17 ..	ABCDE	ABCDE	A—CDE	A—CDE	ABCDE	A——D*E*	A—CDE	A—CDE	A—*C*D*E*	A—CDE	A——DE	A—CDE
18 ..	A—CDE	A——D*E*	A—CDE	A—CDE	A*B*CDE	A—*C*DE	A—*C*DE	A—*C*DE	A—CDE	A————	A—CDE	A—CDE
19 ..	A—CDE	A—*C*D*E*	A—CDE	A—CDE	A—CD*E*	A—*C*D*E*	A—CDE	A——D—	A—CDE	A—CDE	A—CDE	A—CDE
20 ..	A—CDE	A—CD*E*	A—CDE	A—CDE	A—CDE	A—*C*DE	A—*C*DE	A——D*E*	A—CD*E*	A—CDE	A—CDE	A—CDE
21 ..	A—CDE	ABCDE	A—CDE	A—CDE	A—CDE	*A*————	A—*C*DE	A—CDE	A—*C*DE	A—CD*E*	A—CD*E*	A—CDE
22 ..	A—CDE	A—*C*DE	A—CDE	A—CDE	ABCDE	*A*————	A—CDE	A—*C*DE	A—*C*DE	A——D*E*	A—*C*DE	A—CDE
23 ..	A*B*CDE	A—CDE	A—CDE	A—CDE	ABCDE	*A*————	A———*E*	A—CDE	A—*C*DE	A——D*E*	A—CDE	A—CDE
24 ..	A—CDE	ABCDE	A—CDE	A—CDE	A—CDE	*A*————	A—CDE	A—*C*DE	A—*C*D*E*	A—CDE	A—CDE	A—CDE
25 ..	ABCDE	AB*C*DE	A—CDE	A—CDE	A—CDE	—	A—CDE	A—CDE	A——D—	A—CDE	A—CDE	A—CDE
26 ..	A—CDE	ABCDE	A—CDE	A—CDE	A—CDE	A—*C*DE	A—*C*DE	A——D*E*	A—CDE	A—CDE	A—CDE	A—CDE
27 ..	ABCDE	ABCDE	A—CDE	A—CDE	A—CDE	A—CDE	—————*E*	—	A—CDE	A—*C*DE	A—CDE	A—CDE
28 ..	ABCDE	A—CDE	A—CDE	A—CDE	A—*C*DE	—	—	A———*E*	A—*C*D*E*	—	A—CDE	A—CDE
29 ..	A——D—		A—CDE	A—CDE	A—CDE	A—*C*DE	—	A—*C*D*E*	A—*C*DE	A——D—	A—CDE	A—CDE
30 ..	A—*C*DE		A—CDE	A—CDE	A—CDE	A—CDE	A——D—	A—*C*D*E*	AB*C*DE	A——D—	A—CDE	A—CDE
31 ..	A—CDE		A—CDE		A—CDE		A—CD*E*	A—*C*DE		A—CDE		—

Note.—When a letter is in italics, it means that on that day the observations were not complete

SOLAR Observations—Abstract.

—	1910.												
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Total.
A	31	28	31	30	31	28	28	30	29	30	29	30	355
B	9	9	4	..	5	..	1	3	1	3	..	..	35
C	28	26	31	30	30	20	20	25	26	25	22	30	313
D	30	28	31	30	31	24	27	28	29	29	28	30	345
E	29	28	31	30	31	24	27	26	28	27	24	30	335

Though the year was one of heavy rainfall during the summer months it was not unfavourable for solar observations in the morning hours, and there were only ten days on which no observations were possible.

6. **Photographs of the sun** with the Dallmeyer photoheliograph were taken on 345 days as against 332 in 1909. Even in June, when the defect was greatest, they were lost on only 6 days. Double exposures are taken twice a month for determining the error of orientation of the photographs. The Greenwich Observatory asked for only 2 solar negatives to complete its series and of these only one could be supplied.

7. **Observations of sunspots.**—The sun is examined for spots and faculae every morning when the weather permits. The sun's image is projected on an 8-inch disc and the positions of spots and faculae are marked on it. The discs are prepared by the cyanotype process from the large scale drawings of Father R. de Beaurepaire, as mentioned in last report.

8. **Sunspot spectra.**—(*a*) *Visual.*—This work is done in accordance with the suggestions issued by the committee of the International Union for Solar Research. It includes the comparison of the spot spectrum with a standard map for the region 5210 to F., a detailed study of C and D_3, and observations of variations in intensity of the following iron lines :—5383·58, 5397·34, 5404·36, 5405·99, 5424·29, 5429·91, 5445·26, 5447·13, 4924·11, 5234·79, 5316·79 and 5535·06. This work was possible on only 35 days owing to the small number of large spots visible during the year.

(*b*) *Photographic.*—Studies in connection with the radial movement of the gases over sunspots have been continued and a large number of photographs of spot spectra have been obtained. Particular attention has been paid to the behaviour of the C line of hydrogen and this line has been found to be almost always inclined over spots, the inclination being towards the violet on the side of the spot nearest the limb and towards the red on the side nearest the centre of the disc. This shows that the hydrogen in the higher regions of the chromosphere is drawn inwards towards the umbrae of spots, sharing in the movement which had already been detected in the case of calcium vapour, and opposed to the movement of the low level gases of the reversing layer.

Measures of the displacements of the lines H_3 and K_3 have been made showing the inward movement to be of the same order of magnitude as the outward motion of the low level gases.

The relatively slow rotational movement in spots, evidence of which was mentioned in the last report, has been confirmed by measures of the displacements of the lines in three northern and three southern spots; and the direction of rotation in these instances has been found to be opposite in the two hemispheres.

The rotational or spiral movement has not so far been found to affect the inflowing gases of the higher chromosphere, but owing to the width of the hydrogen and calcium lines such motion would be very difficult to detect.

A general discussion of the radial and rotational movements in spots has been published in the monthly notices of the Royal Astronomical Society, Vol. LXX.

A long series of photographs has been obtained of the H and K region of the spectrum for the purpose of detecting movements in a vertical direction of calcium vapour in and near spots. Measurements of these plates are in progress.

A few measures have been made of the Zeeman separations of a line in the red region which is doubled in sunspots; and some lines in the ultra violet which are normally single in spots have been recorded on one plate as doubled at a time when a great eruption of gases was in progress. This indicates that a greatly increased magnetic field may accompany such outbursts.

9. **General spectroscopic work.**—A series of photographs of the H and K lines in prominences and of the hydrogen line C have been obtained with spectrograph III. using the Rowland 3¼ inch grating. These are being measured for the purpose of determining the angular speed of rotation of the prominences at various heights above the sun's limb. A comparison spectrum of the centre of the sun's disc is impressed on each side of the prominence spectrum on every plate, and determinations of the wave-length of the H and K absorption lines at the centre of the disc are also made. The results will be discussed when sufficient material has been obtained.

Photographs of the spectrum of Halley's comet were obtained on 22 mornings from April 18 to May 16 inclusive, using a prismatic camera of 1·7 inch aperture attached to the South dome equatorial. The best plates of the series have been measured and the results published in Bulletin No. XX. and in the Monthly Notices of the Royal Astronomical Society, Vol. LXX.

Laboratory work.—The spectrum of glowing iodine vapour heated externally in a quartz tube has been photographed and the apparently anomalous nature of the emission spectrum has been proved to be a subjective phenomenon, the heated vapour giving a banded emission spectrum identical with the absorption spectrum photographed under the same conditions.

10. **Prominences.**—Prominences were recorded visually on 312 days as against 309 in 1909, but on 65 days the combined visual and photographic record was imperfect owing to unfavourable weather conditions. June and July were, as usual, the most defective months. In June complete prominence records were obtained on only eight days. The record of the prominences is made round the disc on which spots and faculae have been projected and with the discs now in use the apparent positions of prominences are easily read off directly. The visual record is compared with the spectroheliograms and all prominences shown in the photographs but not in the drawing, as well as conspicuous extensions of calcium prominences inside the disc of the sun, are added in blue pencil. Where there is much difference between the photograph and the drawing the differences are noted. In the case of eruptive or metallic prominences the spectra are examined, the most conspicuous bright lines are recorded, and all large displacements of the C line are also noted and their amounts estimated.

11. **Work with the spectroheliograph.**—Photographs of the sun's disc in K_2 light were obtained on 335 days, and limb photographs showing the prominences on 289 days. A few plates were also obtained with the camera slit set at the cyanogen radiation at λ 3883. These show faculæ very clearly, the images resembling those taken in the stronger iron lines. On May 19 the disc was photographed in the cyanogen radiation in an attempt to show the head of Halley's comet in transit, but no trace of the comet can be seen on the plates.

The best disc plate of each day has been copied on an enlarged scale on bromide paper as heretofore, the prints so obtained being oriented and pasted in order on card sheets for convenience of reference. The best limb plates have been measured and the position angles and heights of all prominences recorded.

A few photographs of the sun's disc in Hα light have been obtained with the auxiliary spectroheliograph using the 6-inch Michelson grating. The photographs, although underexposed, show the dark flocculi due to prominences in projection on the disc. Owing to the long exposures needed it has been decided to substitute prisms for the grating and two large prisms of 45° angle have been kindly lent for this purpose by Professor Naegamvala of the Poona Observatory. At the end of the year the prisms had been mounted and new slits made of the necessary curvature.

Prominence spectroheliograms for 52 days were received from the Solar Observatory, South Kensington, and flocculi plates for 335 days were sent in exchange.

12. **Solar Radiation.**—Observations with the Ångström pyrheliometer were made on only a few days. This was partly owing to the great pressure of other work and partly to the feeling that under present conditions time spent on this was largely wasted as there are no means available of standardizing the instrument.

The method of estimating changes in the solar radiation by comparing the intensity of moonlight with first type stars has now become part of the routine work, and photographic comparisons are made whenever the atmospheric conditions permit. Owing to the rarity of perfectly uniform skies comparisons are now made not only near full moon, but also at any phase between half and full. A separate investigation is required to determine the exact relations between phase and intensity.

During the year comparisons were obtained in the January, March, April, and December lunations and the stars used were Alpherat, Rigel, Sirius, Procyon, and Regulus, all assumed to be invariable in their light.

A special photometer is under construction for the measurement of the plates.

Summary of Results.

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

—	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Year.
New groups	17	9	9	13	14	14	16	7	14	17	13	9	152
Daily number	3·5	2·1	1·9	1·3	2·2	1·2	1·5	1·0	2·3	2·4	1·0	0·9	1·8
North	6	2	4	6	4	4	5	..	2	4	7	2	46
South	11	7	5	7	10	10	11	7	12	13	5	7	105
Equator .. .	..	..	..	..	..	..	..	..	..	..	1	..	1

The most notable feature of the year was the rapid decrease in spot activity as indicated by the following figures :—

	1909.	1910.
Number of new groups	220	152
Mean daily numbers	3·9	1·8
Large spot groups	45	15
Spot returns	22	6
Number of days on which no spots were seen	5	56

The number of new groups in 1907 and 1908 were respectively 301 and 262. The very abrupt decline in spot activity in 1910 is especially shown by the large proportion of days on which the sun's disc was free from spots at the time of observation.

The proportion of southern spots to northern, which has been increasing since 1906, was highest in 1910, *i.e.*, 105 to 46. The mean latitudes in the two hemispheres were 7°·2 north and 9°·6 south—closer to the equator by about 1°$\frac{1}{2}$ than in 1909. The highest latitudes were 18° in the northern hemisphere in March and 20° in the southern in February.

The following were the most important spot groups seen during the year :—

January—

Nos.	1804 1806 1811 1813	These contained fairly large spots.

February—

Nos.	1816 1819	Group No. 1819 occupied 10° in longitude and 7° in latitude and was made up of several large and numerous small spots.

March—

Nos.	1825 1829 1830 1832	contained fairly large spots.

May—

No. 1855 was a large and active group and underwent much change from day to day. The C line was frequently observed to be reversed and displaced. The greatest disturbance was observed on the 17th; the maximum was displacement 2 Å to red in F.

July—

No. 1875 was first seen at the east limb as a group of two small spots, the leader soon developed into a large spot of round and regular outline.

August—

No. 1891 contained a large but quiescent spot.

September—

No. 1911 was the second return of group No. 1891 observed early in August. During its two previous apparitions it contained spots of round and regular outline but now had developed into an extensive, broken group covering about 18° of longitude and 10° of latitude. C was frequently observed reversed and D_3 was dark in the spot region. Eruptive prominences were observed on the limb of the sun when the group was close to it.

October—

No. 1915 was first seen as a small spot and subsequently developed into a large spot of round and regular outline. After crossing the central meridian it broke up into an irregular group of fairly large but scattered umbral and penumbral patches. Disturbance was indicated in the spot region on several days by the reversal of the C line and the darkening of D_3.

14. **Prominences.**—Notwithstanding the great reduction of spot activity compared with 1909 the prominences, as estimated by profile areas, show a diminution of only 1 per cent., while there was an actual increase in the average daily number.

The activity for the two hemispheres compared with 1909 is given in the following table :—

Mean daily profile Areas of Prominences.

	1909. Square minutes.	1910. Square minutes.
North	2·10	2·03
South	2·04	2·07
Total	4·14	4·10

The distribution in latitude has been practically the same as in 1909. There was a tendency during the first six months to form two zones of activity in each hemisphere separated by a less active zone between the parallels of 30° and 40°. Later, the distribution became more uniform from the equator to latitude 60° north and south. Beyond 60°, in the polar areas, small and very transient jets have been frequently recorded

Metallic prominences have been infrequent, only 33 having been observed during the year. The high latitudes recorded for some of these is an unusual feature and shows that these prominences are not invariably associated with spots. The mean and extreme latitudes observed are given in the following table :—

Metallic Prominences

—	Number observed.	Mean latitude.	Extreme latitude.	
North	10	28°·2	2°	76°
South	23	17°·7	2°	83°

The prominence activity in each month may be estimated from the following table :—

Numbers of Prominences.

Month.	Prominences one minute or more in height.	Metallic.	Eruptive.
January	45	3	7
February	44	2	5
March	70	7	4
April	53	6	3
May	56	7	4
June	29	1	3
July	27	..	4
August	18	..	2
September	36	1	4
October	54	2	6
November	37	1	4
December	54	3	4

The following were the more noteworthy prominences observed during the year :—

January.—The tallest prominence of the month was photographed at + 33° west on the 15th. It was a slanting streak 210″ high which underwent some changes of form and soon disappeared. The spectrum of a prominence observed near the west limb on the 7th, associated with spot No. 1793, showed considerable motion in the line of sight, both towards and away from the observer, and the form of the prominence underwent great and rapid changes. The calcium photographs show a remarkable series of slender arched filaments.

February.—The tallest prominence of the month was only 165″ high but covered 20° of the limb.

March.—A strongly eruptive prominence was recorded at the west limb on the 1st. Its height varied from 15″ at $8^h\ 0^m$ to 70″, 345″, 295″, 165″ and 60″ at $8^h\ 10^m$, $8^h\ 48^m$, $9^h\ 13^m$, $9^h\ 49^m$ and $10^h\ 30^m$ respectively; there were corresponding changes in the form also. The hydrogen lines at the base were displaced, corresponding to a velocity towards the observer of 75 miles a second. Large prominences continued to be visible at the same position angle for a week. From the 17th to the 19th the east limb was covered by a group which extended for more than 35°. This group was remarkable for its long life; the phtographic records show it on alternate limbs during three rotations of the sun, and it was also photographed as an absorption marking when near the central meridian during three successive apparitions.

April.—The tallest prominence of the month was only 135″ high.

May.—On the 25th a series of connected prominences was recorded extending from — 24° west to + 23° west. They were changing both in shape and height, the greatest height reached was 200″, which was the greatest also for the month.

June.—One very high prominence was photographed on the 20th at latitude + 36° west. At $10^h\ 4^m$ it was a detached pillar 420″ high with the base 240″ above the limb. By $10^h\ 22^m$ the whole prominence had risen bodily 30″. Bad weather prevented further observations.

July.—The largest prominence observed in the month was an eruptive one which during its rapid changes attained a maximum height of 170″. It was observed on the 11th.

August.—No prominence recorded in the month exceeded 90″ in height.

September.—The tallest prominence recorded was a slender streak 210″ high on the 30th.

October.—The tallest prominence recorded was only 200″ high, but there was on the whole a marked increase of prominence activity during the month.

November.—The tallest prominence of the month was only 165″ high. On the 19th a metallic prominence was observed which showed some disturbance.

December.—The highest prominence of the month, recorded on the 20th, was 225″ high.

(*b*) Other Observations.

15. The daylight Comet, 1910*a*, was picked up readily with the naked eye soon after the receipt of the telegram announcing its discovery. It was observed with the Lerebour and Secretan equatorial on January 17, 18, and 19 and meridian transits were obtained on the 18th and 19th. After it became an evening object the weather was very cloudy and no photographs could be obtained. The results of the observations were communicated to the *Astronomische Nachrichten* (No. 4392).

16. **Halley's Comet.**—Halley's comet made a magnificent display as it approached the earth during the second and third weeks of May, and it was also a conspicuous object on and after April 18 when it was first seen as a morning star. Arrangements had been made to photograph it with the instruments available and the following series were secured:—

(1) Direct photographs taken with the Grubb lens; scale $1^{mm} = 3'{\cdot}96$.

(2) Direct photographs taken with a Ross lens; scale $1^{mm} = 17'{\cdot}5$.

(3) Direct photographs taken with a reflector $9\frac{1}{4}$ inches aperture, 74 inches focal length; scale $1^{mm} = 110''$.

(4) Direct photographs on a small scale taken with two small cameras.

(5) Spectrum photographs with a prismatic camera with two 60° prisms, 1·7 inches effective aperture and lens of 11·5 inches focus.

(6) Visual and photographic observations during the transit across the sun's disc on May 19.

(7) Visual observations on the mornings of May 20 and 21.

The weather, though not by any means perfect, was quite as favourable as could be expected at the season and from April 19 to May 16 there were only six days on which no photographs could be obtained.

The results were on the whole good and have been published in detail in Bulletin No. XX. of this observatory.

17. **Time.**—The error of the standard clock is usually determined by reference to the 16^h 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 officer in charge of the Trichinopoly division. Time determinations are made with the transit instrument, when necessary, as a check.

18. **Meteorology.**—Meteorological observations were carried on as in former years. Eye observations are made at 8^h, 10^h, and 16^h local mean time. Temperatures and pressures are recorded continuously by a Richard thermograph (wet and dry bulb) and barograph, and the mean temperature and pressure are obtained from the traces, corrected by reference to the eye observations. The wind direction and velocity are obtained from a Beckley anemograph.

Pressure.—The mean pressure for the year was 0·020 in below normal. It was normal in December above normal in February and May and below in all other months. The highest mean daily pressure recorded was 22·923 on December 26 and the lowest 22·614 on June 24.

Temperature.—The mean temperature of the year was 0°·1 above normal. The defect in February amounted to 1°·1 and the excess in December to 2°·9; in no other month did the difference from normal exceed 0°·8. The highest shade temperature recorded was 75°·4 on April 1 and the lowest 40°·8 on February 8th and December 17th. The lowest temperature shown by the grass minimum was 16°·3 on December 17th.

Humidity.—The mean humidity for the year was 3% below normal. It was below normal from January to May and in November and December and above it for the rest of the year. The defect in December amounted to 29%.

Rain.—The rainfall for the year was largely above normal (12·25 inches). The fall was considerably in defect for the first four months of the year and in September, and largely in defect in December. It was largely in excess in all the other months. The greatest fall on any one day was 3·62 inches on November 16.

Wind.—On the average for the year the wind was nearly normal in both direction and strength. The strength was considerably in excess in February, April, September, and December and considerably in defect in July, October, and November. The only months in which the direction differed largely from the normal were July when it was 5 points more northerly and October when it was 7 points more westerly than usual. The largest amount of wind on any one day was 800 miles on July 3, and the smallest amount 96 miles on November 14.

Transparency of the atmosphere.—The transparency of the lower atmosphere as judged by the visibility of the Nilgiris, about 100 miles distant, was again below average though somewhat better than in 1909.

Cloud and Sunshine.—The year as a whole was somewhat less cloudy than usual. There were 2,117 hours of bright sunshine against an average for the last 11 years of 2,028.

19. **Seismology.**—The Milne horizontal pendulum worked well throughout the year and 81 earthquakes, many of them large, were recorded.

20. **Library.**—One hundred and sixty-eight volumes were bound during the year.

21. **Publications.**—Bulletins Nos. XIX. to XXII. were published during the year and No. XXIII. was in type at the end of the year. Bulletins Nos. XIX. and XXI. deal with observations of prominences, No. XX. with the observations of Halley's comet, and No. XXII. with the magnetic field in the sunspot of September 1909. In addition to these the following papers were published :—

"Observations of Comet 1910*a*" by C. Michie Smith. (Astronomische Nachrichten No. 4392).

"Radial Movement in Sunspots" (second paper) By J. Evershed (M.N., R.A.S., LXX).

"Halley's comet and its Spectrum" (M.N., R.A.S., LXX.).

"Transit of Halley's comet" (M.N., R.A.S., LXX.).

"Observations of the Tail of Halley's comet before and after the day of transit" by J. Evershed (M.N., R.A.S., LXX).

22. **General.**—The Director-General of Observatories inspected the Madras and Kodaikánal Observatories in January. The Director inspected the Madras Observatory in November and rewired the transit instrument.

The staff of the observatory has worked well throughout the year. The First Assistant Mr. S. Sitarama Aiyar has shown his usual ability and zeal, and in the photographic work Mr. R. Krishna Aiyar has rendered most efficient service.

THE OBSERVATORY, KODAIKÁNAL,
7th February 1911.

J. EVERSHED,
Director, Kodaikánal and Madras Observatories.

II.—REPORT OF THE MADRAS OBSERVATORY FOR THE YEAR 1910.

Staff.—I handed over charge of the Observatory on the afternoon of the 28th April to Professor E. B. Ross of the Madras Christian College and resumed charge again from him on July 9th. The first assistant was on privilege leave for one month and 13 days and the second assistant for two months.

2. **Time Service.**—Astronomical observations for determination of time were carried on as in previous years. No change was made in the signals distributed from the Observatory. The fort gun failed on 5 occasions and in addition to these on every evening at 8 P.M. between the 6th March and 13th April. It was fired correctly on 686 occasions out of a maximum of 730: this gives a precentage of 94 of successes. The evening gun failed between the 6th March and 13th April because the Adjutant-General had issued orders to the Military authorities that it was to be abolished from March 6th. As I had received no orders from the Director of the Observatory to discontinue these signals, I had to enter them as failures. Orders to resume the firing of the gun at 8 P.M. were issued subsequently. and came into effect on 14th April. Leaving out these failures the percentage of successes was 99·3. The time ball at the Port Office was dropped correctly at 1 P.M. on every day except 10 and on 9 out of these 10 it was dropped at 2 P.M.

3. **Meteorological observations.**—In addition to the ordinary meteorological observations, extra observations and telegrams were taken and sent to Simla on 4 occasions and on 99 occasions to Calcutta. The tabulation of the traces of the autographic instruments are up to date.

4. **Buildings.**—Certain repairs to the quarters of the Deputy Director were effected during the year. The Observatory building and the dome over the Equatorial were painted.

5. **Instruments.**—The following is a list of the instruments at the Madras Observatory on the 31st December 1910 :—

(*a*) *Astronomical.*

Eight-inch Equatorial Telescope—Troughton & Simms.
Sidereal Clock—Haswall.
" Dent, No. 1408.
" S. Reifler, No. 61.
Mean Time Clock with galvanometer—Shepherd & Sons.
Meridian Circle—Troughton & Simms.
Mean Time Clock—J. Monk.
Mean Time Chronometer—V. Kullberg, No. 5394.
" " No. 6544.
" Parkinson and Frodsham, No. 2352.
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.
" Thermograph—No. 3618, L. Casella.
Beckley's Anemograph—Adie.
Sunshine Recorder—No. 149, L. Casella.
Anemoscope—P. Orr & Sons.
Nephoscope—Mons Jules Dabosoq & Ph. Pellin.
Barometer, Fortin's—No. 1771, L. Casella.
" No. 725, L. Casella (spare).
" No. 1420, L. Casella (spare).
Dry Bulb Thermometer—No. 94221, L. Casella.
" No. 38037, Negretti & Zambra (spare).
Wet Bulb Thermometer—No. 94219, L. Casella.
" No. 38037, Negretti & Zambra (spare).
Dry Maximum Thermometer—No. 8581, Negretti & Zambra.
Dry Minimum Thermometer—No. 69047, L. Casella.
Wet Minimum Thermometer—No. 91753, Negretti & Zambra.
Sun Maximum Thermometer—No. 10479, Negretti & Zambra.
Grass Minimum Thermometer—No. 3377, Negretti & Zambra.

Raingauge (8″ diameter)—No. 1042, Negretti & Zambra.
Measure glass for above.
Raingauge (5″ diameter).
Measure glass for above.

The wires of the Transit Instrument had to be renewed in May 1910. In November the Director inspected the Observatory and brought the dividing engine from Kodaikánal; the carrier was redivided, and new wires were put in. These are much more satisfactory than the old ones. The Transit Instrument has undergone a very large change in level. This change commenced in December 1909 and went steadily on in the same direction till the heavy rain in September, when it stopped and began to go back again. There has been very little change in azimuth; but the level error had to be cleared on two occasions.

The rate of the Riefler clock has been on the whole very satisfactory; the Dent clock too has had a fairly steady rate. They were both adjusted to a small losing rate during the inspection of the Director.

The recording apparatus of the Beckley's Anemograph was overhauled and partly repaired during the year.

6. **Weather summary.**—The following is a summary of the meteorological conditions at Madras during the year 1910:—

Pressure.—Pressure was below normal in all months except May and December. The greatest excess was 0·025 inch in December and the greatest defect 0·059 inch in September. The highest pressure recorded was 30·129 inches on December 26 and the lowest 29·516 inches on June 24.

Temperature.—The mean temperature was above normal in all months except July, August, November, and December. The maximum temperature was below normal from June to September and in November, the greatest excess being 2°·9F. in May and the greatest defect 2°·5F. in August. The minimum was normal in September, below normal in January, March, July, November, and December and above in the remaining months. The minimum on grass was above normal in all months except March, July, November, and December. The highest shade temperature was 112°·9F. on May 20 and the lowest 62°·3F. on December 18.

Humidity.—The percentage of humidity was normal in February, below normal in May and December and above normal during the rest of the year.

Wind.—Wind direction was normal in February, June, and December and it differed most from normal in October when it was 7 points more southerly than usual, the average direction being east by north. The air movement recorded was lower than the average throughout the year.

Cloud.—The percentage of cloud was normal in September, above normal in June and below in the remaining months.

Sunshine.—The percentage of bright sunshine was below normal in all months except April, July, and December, the greatest defect being in June. The total number of hours of bright sunshine during the year was 2,243·9.

Rainfall.—The rainfall was above the average in July, August, and November and below during the other months, the greatest excess being 4·21 inches in July and the greatest defect 5·23 inches in December. The rainfall for the year was 44·47 inches on 85 days, being 4·55 inches below the average. The monsoon rainfall from October 15 to the end of the year was 25·47 inches against an average of 26·00 inches. The heaviest fall on any civil day was 5·47 inches on November 5.

Storm.—A storm formed in the south-west of the Bay on July 22 and moved in a northerly direction towards Gopalpore, when Madras received 4¼ inches. Another storm formed between Port Blair and Negapatam on November 2 and moved on a north-westerly course and crossed the coast near Nellore on the 6th. It gave very heavy rain at and around Madras, a little over 7 inches being recorded at Madras between 8 A.M. on the 5th and 8 A.M. on the 6th.

MADRAS OBSERVATORY,
5th January 1911.

R. LL. JONES,
Deputy Director.

EXPLANATION OF TABLES.

(1) APPENDICES II. TO VI. (KODAIKÁNAL).

Barometer.—The readings are reduced to 32°F. but are not corrected to latitude 45°. As the value of g at Kodaikánal is 977·643 this correction would be—0·067 at 22 inches and—0·070 at 23 inches.

The daily mean is obtained from the readings of the Richard Barograph corrected to the three daily readings of the standard barometer.

Thermometers.—The daily mean temperatures of the wet and dry bulbs are obtained from the hourly readings of the Richard hygrometer corrected by reference to the readings of the standard wet and dry bulb thermometers.

Wind.—The mean direction given is the arithmetical mean of the hourly directions corrected by the addition or subtraction of a multiple of 32 points.

The Beckley anemograph is carried on a small tower well separated from the other buildings. The height of the cups above the top of the hill is 40 feet. So far no corrections have been applied to the readings.

Rain.—A " day of rain " is one on which 0·10 inch and upwards falls.

Clear sky is estimated at 8 A.M., 10 A.M., and 4 P.M. and the mean is taken.

The averages referred to are those given in appendix VI. to the present report.

(2) APPENDICES VII. TO XIII. (MADRAS).

The methods employed and the averages used are given in full in " Results of the Meteorological Observations made at the Government Observatory, Madras, during the years 1861—1890 " and in " Madras Observatory Daily Meteorological Means."

The Barometer readings are not reduced to sea level or to gravity at latitude 45°. The corrections to be applied to reduce the readings to sea level and gravity at latitude 45° are as follows:—

Barometer.	Temperature.		
Inches.	70°	80°	90°
29	— 0·044	— 0·044	— 0·045
30	·046	·046	·047
31	·048	·048	·049

Wind.—The cups of the Beckley anemograph are 44 feet above the ground and 18 feet above the parapet of the flat-roofed building. The readings are uncorrected.

Rain.—A day of rain is one on which 0·01 inch and upwards falls.

Appendix I.

KODAIKÁNAL Observatory Seismological Records in 1910.

No.	Date	P.T. commence G.M.T.	L W. commence G.M.T.	Maxima G.M.T.	End.	Max. Amp.	Duration	Remarks.
	1910.	H. M.	H. M.	H. M.	H. M.	MM. ″	H. M.	
1	Jan. 1 ..	11 22·3	12 28·7	12 46·5	14 06	0·4 = 0·2	2 44	
2	8 ..	14 59·9?	15 21·5	15 23·0	15 59	0·4 = 0·2	0 59	
3	14 ..	8 40·3	8 52·8	8 53·8	9 14	0·4 = 0·2	0 34	
4	15 ..	22 34·1	..	..	23 10	..	0 36	Widening of line.
5	22 ..	8 54·7	9 33·6	9 36·2 43·4	.. 11 27	0·9 = 0·5 1 0 = 0·5	.. 2 32	
6	28 ..	19 36·2	20 08·1	20 11·2	21 09	0·3 = 0·2	1 32	
7	30 ..	4 09·6	4 40·3	4 43·4	5 25	0·6 = 0·3	1 15	Sheet marked 4h 47m.
8	Feb. 4 ..	14 24·4	14 52·6	..	16 50	0·5 = 0·2	2 26	Many small maxima.
9	4 ..	18 00·8	..	..	20 28	..	2 27	Widening of line.
10	12 ..	18 18·2	18 53·3	18 53·3	19 51	0·6 = 0·3	1 38	
11	28 ..	21 55·6	22 04·3	22 06·8	22 39	0·6 = 0·3	0 43	
12	March 30 ..	17 16·4	18 07·1	18 10·7	20 18	2·0 = 1·0	2 57	
13	31 ..	18 52·8	19 32·5	19 35·6	20 43	0·7 = 0·4	1 51	
14	April 1 .	14 06·2	..	..	14 56	..	0 50	Widening of line.
15	12 ..	0 22·8	0 30·5	0 38·3	2 20	2·0 = 1·0	1 57	
16	16 ..	12 37·2	13 05·2	13 06·1	13 36	0·5 = 0·3	0 59	
17	17 ..	1 38·6	1 50·3	1 55·4	2 45	0·4 = 0·2	1 06	
18	27 ..	2 50·3	2 55·9	3 02·5	3 29	0·6 = 0·3	0 39	
19	May 1 ..	18 54·6	19 38·2	19 43·3	20 51	2·1 = 1·1	1 56	
20	10 ..	18 43·2	19 01·8	19 03·9?	19 26	0·5 = 0·2	0 43	
21	11 ..	15 59·7	..	..	16 16	..	0 16	Widening of line.
22	13 ..	8 21·7	9 02·6	9 06·2	10 53	0·6 = 0·3	2 31	
23	15 ..	16 17·1	16 36·7	16 39·3	17 10	0·5 = 0·2	0 53	
24	18 ..	16 15·6	16 22·3	16 34·6	17 18	1·1 = 0·5	1 02	
25	20 ..	13 40·6	..	..	13 59	..	0 18	Widening of line.
26	22 ..	6 36·1	7 08·4	7 12·5	8 15	1·2 = 0·5	1 39	
27	June 1 ..	6 17.2	..	..	7 23	..	1 06	Widening of line.
28	16 ..	6 44·4	6 54·6	6 55·9	10 20	4·0 = 2·2	3 36	
29	17 ..	5 36·2	5 55·9	5 59·0	6 11	..	0 35	Widening of line.
30	19 ..	15 11·0	..	..	16 53	..	1 42	Widening of line.
31	24 ..	3 36·7	4 00·8	4 01·8	4 22	..	0 45	Widening of line.
32	24 ..	13 40·3	14 09·0	14 12·0	15 24	0·4 = 0·3	1 44	
33	29 ..	9 17·2	..	..	9 41	..	0 24	Widening of line.
34	29 ..	11 20·6	11 50·5	11 52·5	13 34	1·1 = 0·6	2 13	
35	29 ..	14 42·8	15 26·4	15 28·7	16 52	1·2 = 0·7	2 09	
36	July 7 ..	8 24·4	8 44·4	8 46·4	9 57	2·5 = 1·4	1 33	
37	12 ..	7 46·4	..	..	8 00	..	0 14	Widening of line (Kashmir).
38	15 ..	13 10·8	..	13 17·2	13 27	..	0 16	Widening of line.
39	21 ..	22 10·5	..	..	22 55	..	0 45	Widening of line.
40	24 ..	16 16·4	16 23·4	16 29·5	16 50	..	0 34	Widening of line.
41	29 ..	10 46·4	11 17·2	11 22·3	12 40	1·1 = 0·5	1 54	
42	Aug. 13 ..	8 06·4	..	8 08·0	8 22	..	0 16	Widening of line.
43	16 ..	7 48·5	..	..	8 16	..	0 28	Widening of line.
44	17 ..	11 54·5	12 12·9	12 14·4	13 16	4·0 = 1·9	1 22	
45	17 ..	23 33·6	..	23 36·1	24 00	..	0 26	Widening of line.
46	21 ..	5 47·4	6 01·8	6 06·9	7 56	0·6 = 0·3	2 09	
47	Sept. 1 ..	0 52·6	1 11·0	1 16·6	2 12	3·5 = 1·7	1 19	
48	1 ..	14 33·1	14 48·5	14 52·6	15 26	0·8 = 0·4	0 58	
49	6 ..	20 26·4	21 21·6	21 30·0	22 08	1·0 = 0·5	1 42	
50	7 ..	6 35·2	7 33·1	8 05·6	9 38	0·6 = 0·3	3 03	
51	9 ..	1 25·9	2 05·5	2 18·4	4 13	0·6 = 0·3	2 47	Many small maxima.
52	9 ..	9 36·2	..	..	11 25	..	1 49	Widening of line.
53	10 ..	12 38·6	..	12 50·0	13 26	..	0 47	Widening of line.
54	12 ..	16 42·7	..	..	16 52	..	0 09	Widening of line.
55	14 ..	14 09·0	14 50·3	14 52·3	15 09	0·4 = 0·2	1 00	
56	16 ..	23 16·8	..	..	23 58	..	0 41	Widening of line.
57	Oct. 4–5 ..	23 12·6	..	..	0 54	..	1 41	Widening of line.
58	7 ..	12 54·6	..	..	13 12	..	0 17	Widening of line.
59	7 ..	16 04·7	16 10·0	16 11·6	16 25	0·4 = 0·2	0 20	
60	18 ..	3 02·8	3 39·2	3 40·3	4 06	0·6 = 0·2	1 03	
61	20 ..	5 02·8	5 15·6	5 17·2	5 55	1·7 = 0·6	0 52	
62	Nov. 9 ..	* 6 10·5	6 58·7	7 06·0 7 11·0	.. 9 36	7·5 = 3·8 7·0 = 3·6	.. 3 26	Possibly not till 6h 15m·1.
63	14 ..	7 44·4	8 02·8	8 06·0	9 13	0·5 = 0·3	1 29	
64	15 ..	14 46·4	15 26·4	15 27·4	16 21	0·7 = 0·4	1 35	
65	24 ..	..	15 48·9	15 50·4	16 14	0·6 = 0·3	0 25	
66	25 ..	20 57·7	21 04·3	21 06·9	21 19	..	0 21	Widening of line.
67	26 ..	5 53·6	6 38·7	6 41·2 6 43·8	.. 9 37	5·0 = 2·4 5·0 = 2·4	.. 3 43	

Kodaikánal Observatory Seismological Records in 1910—*cont.*

No.	Date.	P.T. commence G.M.T.		L.W. commence G.M.T.		Maxima G.M.T.		End.		Max. Amp.	Duration.		Remarks.
	1910.	H.	M.	H.	M.	H.	M.	H.	M.	MM. ″	H.	M.	
68	Nov. 29 ..	2	41·6	2	53·6	2	55·4	3	31	1·6 = 0·8	0	49	
69	Dec. 1 ..	15	57·8	16	14·3	16	15·3	17	05	2·5 = 1·2	1	07	
70	3 ..	8	33·6	..		8	52·6	9	18	..	0	44	Widening of line.
71	4 ..	11	27·9	11	55·1	11	58·8	12	29	1·1 = 0·5	1	01	
72	10 ..	9	42·3	10	21·3	10	32·6	12	18	2·0 = 0·9	2	36	
73	13 ..	11	42·7	11	57·8	12	06·5	15	13	15·2 = 7·2	3	30	
74	16 ..	14	50·6	15	00·9	15	19·4	18	41	15 = 7·1	3	50	
75	16 ..	19	01·0	19	25·6	19	27·7	20	01	1·6 = 0·8	1	00	
76	18 ..	2	52·6	3	04·0	3	04·9	4	06	0·6 = 0·3	1	13	
77	18 ..	5	38·2	..		5	42·8	5	53	0·4 = 0·2	0	15	
78	18 ..	19	23·4	..		..		19	48	..	0	25	Widening of line.
79	23 ..	1	04·9	1	06·9	1	08·9	1	45	0·8 = 0·4	0	40	
80	29 ..	13	12·5	13	37·6	13	38·6	14	15	0·4 = 0·2	1	02	
81	30 ..	0	55·8	1	07·6	1	09·1	1	56	1·0 = 0·5	1	00	

Appendix II.

Latitude 10° 13′ 50″ N.
Longitude 5h 09m 52s E.

Height of barometer cistern above mean sea level, 7,688 feet.

MEAN monthly and annual Meteorological Results at the Kodaikánal Observatory in 1910.

Month.	Barometer.		Dry bulb thermometer.				Wet bulb.		Tension of vapour.	Relative humidity.	Sun Max. *in vac.*	Min. on grass.	Wind.			Rain.		Clear sky.	Hours of bright sun-shine.
	Reduced to 32°.	Daily range.	Mean.	Max.	Min.	Range.	Mean.	Min.	By Blanford's tables.				Daily velocity.	Mean direction.		Amount.	Days.		
	INCHES.	INCHES.	°	°	°	°	°	°	INCHES.	CENTS.	°	°	MILES.	POINTS.	POINTS.	INCHES.	NO.	CENTS.	
January	22·809	0·073	53·2	62·9	46·3	16·6	45·3	38·2	0·227	56	112·0	34·9	316	5	N.E. by E.	1·77	4	65	247 6
February ..	·812	·068	53·9	63·6	47·0	16·6	46·4	40·7	·248	59	117·9	38·0	320	2	N.N.E.	1·30	4	66	230·7
March	·830	·063	58·0	68·6	50·8	17·8	47·7	41·4	·232	48	125·2	39·9	328	7	E. by N.	0·01	..	85	279·8
April ..	·821	·066	60·4	69·5	54·6	14·9	51·5	45·9	·296	57	127·5	46·1	353	8	E.	4·10	5	62	232·9
May	·827	·068	60·4	69·0	54·9	14·1	54·8	50·4	·375	72	127·6	46·4	225	5	N.E. by E.	6·29	13	52	203·9
June	·743	·060	57·2	63·2	53·6	9·6	54·2	50·5	·391	83	113·1	49·1	358	25	W. by N.	8·57	14	23	104·0
July	·749	·058	55·9	62·2	52·2	10·0	53·7	50·3	·394	88	115·9	48·0	353	31	N. by W.	10·94	21	22	110·9
August	·749	·064	55·8	61·8	52·6	9·2	54·2	50·8	405	90	118·3	50·7	332	26	W.N.W.	10·23	21	21	95·0
September ..	·743	·067	55·6	62·0	51·6	10·4	53·1	48·9	·382	86	117·5	48·1	390	26	W.N.W.	4·32	8	28	137·4
October ..	·793	·077	55·8	62·3	51·7	10·6	54·4	49·9	·411	92	117·7	46·9	232	24	W.	12·86	19	23	89·2
November ..	·803	·069	54·4	61·1	49·9	11·2	51·2	46·1	·350	83	110·1	44·8	233	0	N.	11·41	13	36	118·3
December ..	·839	·066	56·2	67·6	48·2	19·4	44·7	36·9	·178	39	116·1	38·0	331	8	E.	..	..	84	267·4
Annual ..	22·793	0·067	56·4	64·5	51·1	13·4	50·9	45·8	0·324	71	118·2	44·2	314	1	N. by E.	71·80	122	47	2,117·1

EXTREME monthly Meteorological Records at the Kodaikánal Observatory in 1910.

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	22·902	29	22·704	8	0·198	68·9	21	42·9	22	33·4	25	7	24	122·7	26	23·9	10	494	6	157	9	1·02	30
February ..	·920	4	·730	18	·190	67·5	13	40·8	8	32·0	6	4	9	131·4	16	23·2	12	635	2	174	13	0·77	19
March	·918	14	·767	2	·146	74·1	20	46·9	15	35·6	18	11	18	136·7	29	33·1	17	480	14	129	6	0 01	13
April	·902	26	·742	11	·160	75·4	1	52·2	6	38·4	6	8	6	135·8	16	40·9	25,26	623	7	187	16	1·09	28
May	·890	5	·735	31	155	74·1	28	51·9	21	46·9	2	42	16	135·6	5	41 1	26	344	19	97	23	1·07	13
June	·842	2	·614	24	·228	70·2	3	51·1	30	48·0	10	54	8	140·5	3	42·2	3	641	25	119	18	1·41	6
July	·842	12, 13	·648	24	·194	68·2	13	48 1	11	46·4	11	58	19	136·3	12	41·8	17	800	3	104	20	1·22	25
August	·833	10	·672	20	·161	65·4	12	51·1	2	46·3	12	61	11	138·4	23	41 1	13	552	7	152	13	2·62	22
September ..	·823	19	·667	28	·156	65·6	16	48·7	6	44 2	16	47	15	136·9	16	41·3	16	626	5	195	1	1·37	2
October	·877	9	·719	28	·158	66·0	11	48·0	6	43·2	6	53	3	134·6	6	34·6	6	419	18	124	10	2·07	10
November ..	.903	14	·659	6	·244	70·3	29	44·6	19	32·4	29	7	29	137·5	14	33·1	29	641	7	98	14	3·62	16
December ..	·923	26	·762	8	·161	73·7	19	40·8	17	32·1	3,15	5	3	122·2	5	16·3	17	465	7	214	19	..	..

Appendix III.

KODAIKÁNAL mean hourly wind velocity for the year 1910.

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

Appendix IV,

KODAIKÁNAL Mean Hourly Bright Sunshine for the year 1910.

Month.	Hours.												Remarks.
	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	0·11	0·61	0·83	0·87	0·85	0·87	0·85	0·78	0·75	0·75	0·62	0·11	
February	·13	·68	·85	·85	·86	·88	·84	·78	·78	·73	·66	·22	
March	·05	·87	1·00	·99	·95	·91	·85	·82	·77	·78	·74	·29	
April	·16	·82	·90	·90	·91	·81	·76	·76	·61	·53	·45	·14	
May	·39	·85	·91	·95	·86	·80	·61	·44	·36	·23	·14	·08	
June	·09	·33	·52	·55	·52	·47	·35	·22	·13	·14	·09	·05	
July	·19	·43	·55	·54	·49	·45	·33	·24	·14	·12	·08	·02	
August	·06	·28	·44	·56	·50	·35	·28	·25	·14	·12	·05	·02	
September	·02	·46	·71	·69	·60	·57	·48	·37	·22	·21	·18	·07	
October	·00	·29	·53	·55	·49	·34	·24	·14	·16	·06	·06	·01	
November	·00	·13	·45	·54	·51	·52	·45	·34	·36	·33	·27	·03	
December	·04	·54	·78	·95	·94	·94	·93	·91	·90	·84	·76	·09	
Mean ..	0·10	0·52	0·71	0·74	0·71	0·66	0·58	0·50	0·44	0·40	0·34	0·09	

Appendix V.

NUMBER of days in each month on which the Nilgiris were visible during 1910.

Month.	Very clear.	Visible.	Just visible.	Tops only visible.	Total.
January	7	6	5	1	19
February	3	4	3	..	10
March	1	1	..	2	4
April	..	1	..	1	2
May	3	5	4	..	12
June	7	6	..	1	14
July	5	2	..	..	7
August	6	3	..	..	9
September	7	9	3	1	20
October	6	8	1	..	15
November	4	10	..	1	15
December	2	18	1	8	29
Total ..	51	73	17	15	156

Appendix VI.

Meteorological Means. Kodaikánal.

—	Barometer.		Dry Bulb.				Wet Bulb.		Vapour Tension.	Humidity.	Sun maximum.	Grass minimum.	Wind.		Rain.		Clear sky Cents.	Bright sunshine.
	Reduced to 32°	Range.	Mean.	Maximum.	Minimum.	Range.	Mean.	Minimum.					Velocity.	Direction.				
	inches.	inch.	°	°	°	°	°	°	inch.	cents.	°	°	miles.	points.	inches.	days.		hours.
January ..	22·845	0·071	53·4	63·0	47·0	15·9	47·0	40·6	0·263	64	117·4	37·8	309	4	3·22	4·0	64	229·7
February ..	·853	·070	55·0	65·6	48·0	17·6	48·0	41·5	·267	61	124·7	38·4	287	1	1·74	2·5	64	222·5
March ..	·856	·069	57·8	68·7	50·8	17·8	49·1	42·5	·265	55	130·3	41·2	310	6	2·14	3·4	70	252·6
April	·833	·070	59·7	69·3	53·7	15·6	53·3	47·4	·346	68	133·3	45·4	278	6	4·28	7·6	54	211·4
May	·816	·069	60·3	68·8	54·8	14·0	55·0	50·2	·382	73	132·6	48·4	253	2	5·48	11·8	46	200·5
June	·768	·059	57·9	65·1	53·6	11·4	53·9	49·8	·377	78	126·8	48·9	373	25	8·22	10·5	28	119·8
July	·755	·057	56·3	62·9	52·5	10·3	53·3	49·6	·379	84	122·0	48·7	427	26	4·19	11·8	23	102·6
August ..	·771	·065	56·5	63·2	52·5	10·8	53 8	49·8	·390	85	124·0	48·3	318	26	7·24	13·2	27	114·3
September ..	·788	·072	56·4	63·3	52·2	11·1	53·5	49·4	·385	84	125·6	48·0	297	27	6·72	13·3	32	120·5
October ..	·809	·077	55·5	62·3	51·3	11·0	53·0	49·2	·381	86	121·0	46·6	262	31	10·80	17·0	32	125·5
November ..	·829	·071	53·6	61·0	48·9	12·2	51·0	46·2	352	84	116·1	44·1	271	31	6·05	11·5	38	138·8
December ..	·832	·070	53·3	62·0	47·5	14·5	47·8	41·6	·279	68	114·2	40·2	289	4	4·47	6·2	52	195·0
Annual ..	22·813	0·068	56·3	64·6	51·1	13·5	51·6	46 5	0·339	74	124·0	44·7	306	0 (N)	59·55	113	44	2028·2
Period of means.	1900 January to 1910 December.		1899 May to 1910 April.				1900 January to 1910 December.				1899 May to 1910 April	1900 January to 1910 December.	1899 May to 1910 April	1903 January to 1910 December.	1899 May to 1910 April.			1900 January to 1910 December.

Appendix VII.

MADRAS OBSERVATORY.—Abnormals from monthly means for the year 1910.

Abnormals of	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
Reduced atmospheric pressure	— 0·051	— 0·052	— 0·039	— 0·031	+ 0·009	— 0·024	— 0·002	— 0·030	— 0·059	— 0·020	— 0·025	+ 0·025	— 0·024
Temperature of air	+ 1·4	+ 1·4	+ 0·1	+ 1·1	+ 1·9	+ 0·1	— 0·3	— 0·1	+ 0·1	+ 0·8	— 0·9	— 0·8	+ 0·4
Do. of evaporation	+ 2·0	+ 1·2	+ 0·6	+ 1·4	+ 0·6	+ 0·7	+ 1·8	+ 1·6	+ 1·2	+ 1·4	— 0·6	— 1·0	+ 0·9
Percentage of humidity	+ 3	Same as	+ 2	+ 2	— 3	+ 3	+ 9	+ 7	+ 5	+ 4	+ 2	— 1	+ 0·3
Greatest solar heat *in vacuo*	— 5·7	— 6·2	— 7·5	— 4·1	— 2·8	— 12·2	— 7·7	— 12·1	— 9·1	— 3·1	— 12·5	— 3·9	— 7·3
Maximum in shade	+ 1·4	+ 0·9	+ 0·8	+ 1·9	+ 2·9	— 1·1	— 1·6	— 2·5	— 1·4	+ 0·4	— 1·9	+ 0·1	Same as
Minimum in shade	— 0·3	+ 1·2	— 1·1	+ 1·0	+ 0·8	+ 0·2	— 0·4	+ 0·1	Same as	+ 0·9	— 1·0	— 2·5	Same as
Do. on grass	+ 1·0	+ 2·3	— 0·5	+ 1·9	+ 1·2	+ 0·4	— 0·2	+ 0·4	+ 0·3	+ 2·0	— 0·2	— 3·0	+ 0·5
Rainfall in inches	— 0·69	— 0·28	— 0·39	— 0·58	— 2·11	— 0·36	+ 4·21	+ 0·57	— 0·90	— 1·36	+ 2·57	— 5·23	..
Do. since January	..	— 0·97	— 1·36	— 1·94	— 4·05	— 4·41	— 0·20	+ 0·37	— 0·53	— 1·89	+ 0·68	— 4·55	— 4·55
General direction of wind	1 point E.	Same as	1 point S.	1 point S.	1 point S.	Same as	2 points S.	1 point S.	4 points W.	7 points S.	2 points N.	Same as	1 point S.
Daily velocity in miles	— 1	+ 8	Same as	+ 8	— 12	— 35	— 32	— 33	— 22	— 8	— 18	— 26	— 14
Percentage of cloudy sky	— 5	— 1	— 10	— 2	— 6	+ 8	— 14	— 4	Same as	— 7	— 11	— 18	— 6
Do. of bright sunshine	— 9·6	— 9·5	— 6·7	+ 0·2	— 3·0	— 24·5	+ 1·3	— 11·5	— 12·6	— 11·2	— 4·0	+ 4·7	— 7·2

Appendix VIII.

ABSTRACT of the mean meteorological condition of Madras in the year 1910 compared with the average of past years.

Mean values of	1910.	Difference from	Average.
Reduced atmospheric pressure	29·840	0·024 below.	29·864
Temperature of air	81·5	0·4 above.	81·1
Do. of evaporation	75·4	0·9 ,,	74·5
Percentage of humidity	75	3 ,,	72
Greatest solar heat *in vacuo*	132·4	7·3 below.	139·7
Maximum in shade	90·8	Same as	90·8
Minimum in shade	74·7	Do.	74·7
Do. on grass	72·4	0·5 above.	71·9
Rainfall in inches since January 1st on 85 days	44·47	4 55 below.	49·02
General direction of wind	S.E. by S.	1 point S.	S.E.
Daily velocity in miles	157	14 below.	171
Percentage of cloudy sky	43	6 ,,	49
Do. of bright sunshine	51·2	7·2 ,,	58·4

DURATION and quantity of the wind from different points.

From	Hours	Miles.	From	Hours.	Miles.	From	Hours.	Miles.	From	Hours.	Miles.
North ..	143	889	East ..	211	1,074	South ..	205	1,367	West ..	261	1,855
N. by E. ..	445	2,479	E. by S ..	219	1,122	S. by W...	221	1,466	W. by N...	210	1,478
N.N.E. ..	319	1,903	E.S.E. ..	169	906	S.S.W. ..	251	1,825	W.N.W. .	141	1,065
N.E. by N.	327	1,984	S.E. by E.	305	1,654	S.W. by S.	232	1,536	N.W. by W.	145	983
N.E. ..	269	2,371	S.E. ..	415	2,881	S.W. ..	217	1,462	N.W. ..	91	498
N.E. by E.	392	2,366	S.E. by S.	882	6,606	S.W. by W.	246	1,514	N.W. by N.	110	581
E.N.E. ..	190	1,138	S.S.E. ..	643	5,184	W.S.W...	293	2,172	N.N.W. ..	98	572
E. by N. ..	151	808	S. by E. ..	292	2,015	W. by S...	323	2,391	N. by W.	187	1,198

There were 157 calm hours during the year. The resultant corresponding to the above numbers is represented by a South wind, blowing with a uniform daily velocity of 291 miles.

Appendix IX.

MADRAS OBSERVATORY—Number of hours of wind from each point in the year 1910.

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 ..	4	21	16	76	71	172	67	75	74	53	16	26	5	39	1	2	1	1	..	.	1	1	1	1	..	..	..	..	..	..	..	1	19
February ..	1	3	29	31	77	97	62	34	72	42	21	28	43	51	27	3	..	2	1	6	5	..	..	..	..	..	..	.	5	4	2	2	24
March ..	..	..	..	..	..	..	1	1	14	13	36	104	103	209	116	11	30	20	36	19	6	3	5	1	..	..	..	..	..		..	..	16
April ..	..	..	..	..	..	1	2	1	..	2	5	9	93	189	175	70	42	45	37	24	5	5	3	2		1	.	..	..	2	..		7
May	2	..	3	..	..	1	3	..	3	5	5	19	51	158	160	42	35	27	50	31	26	14	22	20	18	19	9	7	1	2	3	1	7
June	1	5	2	..	2	..	2	3	..	7	16	30	26	19	63	48	22	44	36	30	33	58	68	70	39	33	32	10	6	5	7		3
July	8	5	..	5	6	8	6	3	17	22	19	27	26	72	28	31	7	22	30	3[illegible]	27	42	52	70	44	33	17	22	16	14	12	8	9
August ..	2	2	1	2	..	2	5	15	6	24	5	11	31	38	5	14	22	18	31	27	60	59	58	59	65	39	29	28	27	28	13	4	14
September ..	1	..	1	..	..	1	..	1	5	5	8	15	15	16	10	42	5	16	11	35	35	46	42	83	74	61	40	72	18	22	16	3	11
October ..	24	52	18	14	14	22	15	11	18	15	22	29	22	89	48	16	28	20	18	9	14	10	38	11	12	14	8	3	14	17	31	39	29
November ..	67	182	53	25	18	38	16	4	1	31	16	7	.	2	10	13	3	6	1	15	5	8	4	6	9	10	6	3	4	16	14	112	15
December ..	33	175	196	174	81	50	11	3	1	..	..	.	..	..	..	..	..	.	..	..	..	..	..	..	..	..	..	..	.	..	..	17	3
Annual total ..	143	445	319	327	269	392	190	151	211	219	169	305	415	882	643	292	205	221	251	232	217	246	293	323	261	210	141	145	91	110	98	187	157

Appendix X.

MADRAS OBSERVATORY.—Number of miles of wind from each point in the year 1910.

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	14	104	94	481	572	1172	512	397	296	286	94	109	34	179	10	14	6	7	..	..	8	3	8	4	..	..	..	..	..	..	..	14	4418
February	3	10	120	162	620	448	297	184	436	254	106	111	241	370	109	21	..	15	5	44	34	..	..	..	..	..	..	..	19	14	10	8	3641
March	..	..	..	..	..	..	7	2	34	58	113	505	692	1488	908	49	182	149	273	140	55	12	34	9	..	..	..	..	..	..	..	..	4710
April	..	..	..	..	..	14	21	12	..	24	41	51	605	1622	1586	590	332	344	369	240	44	29	24	9	..	3	..	..	..	8	..	..	5968
May	18	..	27		..	11	27	..	26	44	50	174	435	1501	1527	338	247	208	394	272	222	116	213	194	175	199	97	80	9	18	27	8	6657
June	9	15	12	..	23	..	21	22	..	66	175	239	232	168	482	307	199	295	225	221	239	415	559	581	307	272	287	73	43	43	26	..	5546
July	50	20	..	27	46	61	42	19	124	94	119	198	221	528	155	191	60	124	195	195	162	286	436	563	386	192	117	154	112	101	95	65	5138
August	6	8	3	6	..	9	25	54	28	78	43	66	195	179	37	85	139	128	197	169	383	333	447	438	397	239	201	175	112	109	51	20	4360
September	5	.	4	..	..	5	..	4	34	28	27	65	62	70	43	261	80	80	68	165	195	237	285	507	478	357	227	461	108	66	76	13	4011
October	130	209	124	43	88	133	57	73	86	94	92	101	164	489	245	77	98	86	98	39	95	53	146	56	69	71	42	13	72	79	173	216	3611
November	442	1256	312	200	105	118	38	20	4	106	46	35	..	12	82	82	24	30	1	51	25	30	20	30	43	145	94	27	23	143	114	748	4406
December	212	857	1207	1065	917	395	91	21	6	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	.	..	..	..	..	..	..	106	4877
Annual ..	889	2479	1903	1984	2371	2366	1138	808	1074	1122	906	1654	2881	6606	5184	2015	1367	1466	1825	1536	1462	1514	2172	2391	1855	1478	1065	983	498	581	572	1198	57343

Appendix XI.

MADRAS OBSERVATORY.—Number of inches of rain from each point in the year 1910.

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 ..	0·02	0·02	..	0·03	..	..	..	0·13	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
February ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
March ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
April ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	0·04	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
May ..	..		..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	0·01	..	..	..	..	..	..	..	..	..	..	..
June ..	0·04	0·13	..	..	..	..	..	..	..	..	..	..	0·13	..	0·14	..	..	0·07	0·10	0·15	..	0·51		0·02	0·02	0·04	..	0·02	0·02	0·14	0·22	..	..
July ..	1·79	0·11	..	0·07	0·27	0·07	..	.	0·16	..	..	0·05	0·32	..	..	..	0·07	..	0·07	2·18	0·05	0·63	0·22	0·28	0·53	0·01	..	..	0·19	..	..	1·01	..
August ..	0·26	0·02	0·07	0·30	..	..	0·50	..	..	..	0·21	..	0·02	..	..	0·30	0·05	0·56	0·27	0·02	0·30	0·28	0·13	0·47	0·03	0·12	0·05	0·22	0·60	..	0·13	0·05	0·17
September ..	..	..	..	..	..	..	..	0·04	..	..	..	..	..	..	..	0·01	..	0·23	..	0·22	0·57	0·01	0·08	0·02	0·10	0·05	0·05	0·72	0·11	0·03	1·40	0·04	0·11
October ..	0·29	0·06	0·85	0·01	0·34	0·67	0·48	0·67	1·73	0·45	0·12	..	0·02	..	0·08	0·05	0·10	..	..	..	0·05	0·29	0·04	..	..	..	..	..	0·01	1·20	0·19	1·91	0·03
November ..	..	2·26	0·19	..	..	..	..	..	..	..	0·34	..	..	..	..	..	.	1·42	..	..	0·07	0·45	..	..	0·58	1·65	1·57	0·80	0·40	2·72	1·22	2·11	..
December ..	..	..	..	..	..	0·05	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Annual ..	2·40	2 60	1·11	0·41	0·61	0·79	0·98	0·84	1·89	0·45	0·67	0·05	0·49	..	0·22	0·36	0·26	2·28	0·44	2·57	1·04	2·18	0·47	0·79	1·26	1·87	1·67	1·76	1·33	4·09	3·16	5·12	0·81

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Appendix XII.

MADRAS OBSERVATORY.—Wind, cloud, and bright sunshine, 1910.

Month.	Wind resultant.		Clouds (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.							HOURS.	HOURS.
January	122	E.N.E.	3·3	3·7	3·3	2·4	3·2	7·3	8·6
February	94	E. by N.	2·7	2·6	2·5	1·5	2·3	8·4	10·2
March	136	S.E. by S.	2·0	1·8	1·2	0·7	1·4	8·7	10·3
April	180	S.S.E.	3·7	3·0	2·0	1·7	2·6	9·5	11·6
May	146	S. by E.	4·3	3·4	2·9	2·2	3·2	8·0	11·1
June	102	S.W. by W.	7·9	7·7	6·7	6·3	7·2	8·9	2·8
July	62	S.W. by W.	6·1	5·9	5·8	5·0	5·7	8·7	4·3
August	82	W.S.W	6·5	6·9	6·4	5·2	6·3	10·8	3·7
September	86	W. by S.	6·2	5·7	7·0	5 8	6·2	8·5	3·8
October	17	E.S.E.	5·5	5·4	5·4	4·3	5·2	9·8	4·8
November	101	North.	4·6	5·2	5·0	4·5	4·8	9·2	5·5
December	150	N.E. by N.	3·2	3·8	3·8	2·5	3·4	7·0	8·6
Annual ..	291	South.	4·7	4·6	4·3	3·5	4·3	8·7	—

Appendix XIII.

Mean Monthly and Annual Meteorological Results at the Madras Observatory in 1910.

—	Barometer.		Dry bulb thermometer.				Wet bulb.		Tension of vapour.	Relative humidity.	Sun Max. *in vac.*	Min. on grass.	Wind.			Rain.		Cloudy sky.	Bright sun-shine.	Dew point.
	Reduced to 32°.	Daily range.	Mean.	Max.	Min.	Range.	Mean.	Min.	By Blanford's tables.				Daily velo-city.	Mean direction.		Amount.	Days.			
	INCHES.	INCHES.	°	°	°	°	°	°	INCHES.	CENTS.	°	°	MILES.	PTS.		INCHES.	NO.	CENTS.	HOURS.	°
January ..	29·947	0·120	76·5	86.0	67·2	18·8	71·2	66·7	0·693	76	132·7	64·1	143	6	E. N. E.	0·20	4	32	227·6	67·5
February ..	·913	·117	78·1	87·5	69·1	18·4	72·0	68·3	·708	73	133·5	66·1	130	8	E.	..	..	23	235·7	67·8
March ..	·866	·130	80·1	89·8	71·0	18·8	74·5	70·5	·781	76	133·0	68·1	152	13	S. E. by S.	..	..	14	268·5	70·7
April ..	·795	·131	85·1	94·8	78·2	16·6	79·0	76·6	·909	76	137·6	76·6	199	14	S. S. E.	0·04	1	26	286·0	75·0
May ..	·744	·129	88·6	100·7	81·6	19·1	78·9	75·7	·858	64	140·2	80·1	215	16	S.	0·01	1	32	247·7	72·8
June ..	·679	·116	86·5	97·2	80·5	16·7	77·3	74·7	·816	65	128·3	79·0	185	19	S.W. by S.	1·75	9	72	85·2	71·4
July ..	·718	·119	84·2	94·0	78·1	15·9	77·7	74·7	·864	74	131·0	76·4	166	18	S. S. W.	8·08	14	57	133·6	73·4
August ..	·719	·112	83·2	91·2	77·4	13·8	77·6	74·9	·874	77	127·9	75·8	141	20	S. W.	5·13	14	63	114·2	73·8
September .	·719	·129	83·1	91·9	77·1	14·8	77·5	74·3	·868	77	132·2	75·3	134	22	W. S. W.	3·79	14	62	114·1	73·7
October ..	·822	·125	81·4	89·4	76·1	13·3	77·0	74·9	·871	82	136·0	74·8	115	14	S. S. E.	9·64	16	52	149·3	74·0
November ..	·899	·116	76·6	83·1	71·3	11·8	72·3	69·6	·742	81	124·9	69·3	147	0	N.	15·78	11	48	165·3	69·3
December ..	30·003	·108	74·7	83·7	67·0	16·7	69.6	66·3	·657	76	131·9	63·4	157	2	N. N. E.	0·05	1	34	216·7	65·1
Annual ..	29·819	0·121	81·5	90·8	74·7	16·2	75·4	72·3	0·803	75	132·4	72·4	157	13	S. E. by S.	44·47	85	48	2,243·9	71·2

Extreme Monthly Meteorological Records at the Madras Observatory in 1910.

—	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 ..	30·082	24	29·749	11	0·338	87·2	27	63·8	24	63·0	23	50	24	136·8	27	60·4	17, 18	281	5	66	15	0·13	29
February ..	·125	4	·755	19	·370	90·9	21	62·5	9	61·9	9	45	25	139·4	20	59·5	9	250	3	82	16	..	..
March ..	·037	13	·716	31	·321	97·2	20	65·6	18	65·6	18	52	23	140·2	8	61·7	18	228	21	91	13	..	..
April ..	29·913	30	·638	12	·275	101·7	24	71·1	7	71·1	7	44	24	143·4	24	68·0	7	277	21	122	7	0·04	4
May ..	·945	1	·552	27	·393	112·9	20	77·6	2	72·1	21	23	20	148·4	22	75·2	4	269	20	153	10,14	0·01	26
June ..	·835	30	·516	24	·319	104·5	4	73·1	23	72·3	8	37	4, 5	149·5	10	73·0	23	237	8	129	19,30	0·56	10
July ..	·874	9	·535	2	·339	102·4	6	73·9	28	72·4	9	37	5	142·5	6	72·4	10	303	4	94	25	4·58	27
August ..	·841	22	·592	3	·249	96·9	13	72·7	17	71·2	2	46	13	139·4	10	70·8	2	210	2	42	28	1·11	19
September ..	·832	17	·563	28	;269	95·1	7	71·7	13	70·7	30	52	27	143·5	11	71·8	13	185	8	85	17	1·49	13
October ..	·959	26	·654	1	·305	97·4	2	72·5	23	72·5	28	47	1, 3	142·7	7	72·4	23	179	1	32	18	2·50	28
November ..	30·042	20	·624	6	·318	89·7	13	62·5	27	62·1	27	45	16	143·4	11	59·6	27	267	6	57	13	5·47	5
December ..	·129	26	·886	10	·243	85·5	24	62·3	18	62·1	18	56	8	135·5	17	58·8	18	206	5	81	18	0·05	29