KODAIKÁNAL AND MADRAS OBSERVATORIES.

REPORT FOR THE YEAR 1905.

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KODAIKÁNAL AND MADRAS OBSERVATORIES.

I.—REPORT OF THE KODAIKÁNAL OBSERVATORY FOR THE YEAR 1905.

1. **Staff.**—The staff of the Observatory on the 31st December 1905 was as follows:—

Director	C. Michie Smith, B.Sc.
Assistant Director	*Vacant.*
First Assistant	K. V. Sivarama Aiyar, M.A.
Second Assistant	S. Sitarama Aiyar, B.A.
Third Assistant	G. Nagaraja Aiyar.
Fourth Assistant	S. Balasundaram Aiyar.
Writer	L. N. Krishnaswamy Aiyar.
Photographic Assistant	R. Krishna Aiyar.

The First Assistant was absent on furlough and extraordinary leave from the beginning of the year till May 29. The Second Assistant was absent on privilege leave from August 15 to September 23. The Third Assistant was absent on privilege leave from September 24 to December 23. Mr. M. G. Subrahmanya Aiyar of the Madras Observatory staff, who was acting as Third Assistant during the absence of the First Assistant on furlough, was transferred to the Survey of India Department on May 6 as Magnetic Observer here. Mr. S. S. Ramaswami Aiyangar acted for three months as an extra Assistant, and subsequently acted as Fourth Assistant during the absence of the Second and Third Assistants. Towards the end of the year Government, at the request of the Director, sanctioned the addition to the staff of a permanent Photographic Assistant.

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

2. **Distribution of work.**—The Director takes charge of the spectroheliograph and is helped by the Photographic Assistant. The First, Second, and Third Assistants are also trained to use the instrument if necessary. The First, Second and Third Assistants are in charge of the work with the Cooke equatorial (spectroscopic), the Lerebour and Secretan equatorial (visual), the photoheliograph, the transit instrument, and the seismometer. They have also to do the astronomical computing and the preparation of the observations for the press. The Fourth Assistant has charge of the clock comparisons and, with the help of the writer, is responsible for the whole of the meteorological work. The writer is responsible for the accounts, correspondence, and all office records.

3. **Buildings and grounds**—(*a*) *Spectroheliograph building.*—This building has continued to give much trouble In the main building venetian shutters have been placed in six of the windows with most beneficial results, but the roof continues to leak in several places. There is no particular difficulty in curing this as a suitable material has been found for the purpose but for some unexplained reason, and in spite of frequent reminders, only a small part of the work has been done. The sliding roof which covers the siderostat was nearly blown off the rails several times during the south-west monsoon, and had to be temporarily strengthened internally by wooden struts. A design for a new and much smaller roof has been submitted and sanction for this is now awaited.

(*b*) *Photoheliograph house.*—It was mentioned in last year's report that plans for a new building for the photoheliograph had been prepared. These were sanctioned and the walls of the building have been completed except for the cut stone ring which carries the rails. The dome has not yet arrived from the makers. The building consists of a 15-foot dome with a small dark room on the south side and a porch to protect the door on the north.

(*c*) *Workshop.*—The new workshop has been finished and brought into use. The old workshop is now occupied by the book-binder and the old book-binder's shed is used as a store room. These changes add greatly to the convenience of the establishment.

(*d*) *The Fourth Assistant's quarters* were completed and occupied, but they still want a fence to keep off straying cattle.

(*e*) *House for the Assistant Director.*—Plans and estimates for this were prepared and after much delay have been forwarded to the Government of India for sanction. Work has not yet been begun on the building.

(*f*) The usual repairs have been carried out and the buildings, with the exception of the spectroheliograph house referred to above, are all in good order.

(*g*) *Grounds.*—The roads and paths have been kept in good order, and a number of trees and shrubs have been planted. Much more requires to be done in this direction, but the season was not a favourable one for planting out young trees. A number of seedlings have, however, been raised and if the weather is favourable will be planted out in the coming spring. In January some damage was done to the young trees in part of the compound by a forest fire which swept round nearly half a mile of the boundary of the Observatory grounds. Fortunately the Observatory fire lines were in good order and the long grass had been removed from the chief plantation so that it was found possible to stop the fire soon after it crossed the boundary. Some fifty blue gums were badly burned and had to be coppiced, and a number of young trees were scorched by the heat as much as 50 yards from the point actually reached by the fire. A few of these have died, but most of them have recovered.

(*h*) The well from which the aermotor pumps was dry for about three months, but a new well had been opened which fortunately proved permanent and yielded an ample supply of water. All the water, however, had to be carried from this well for a distance of a quarter of a mile with a rise of over 100 feet. During the rest of the year the aermotor and pumps gave satisfaction.

4. **Instruments.**—The following are the principal instruments belonging to the Observatory :—

Six-inch Cooke equatorial.
Six-inch Lerebour and Secretan equatorial, remounted by Grubb with a 5-inch Grubb portrait lens of 36-inches focus attached.
Spectrograph—consisting of an 11-inch polar siderostat, 6-inch Grubb lens of 40-feet focus, and a 4-inch concave grating of 10-feet focus, mounted on Rowland's plan. A plane grating with collimator and camera lenses of 8-feet focus can be substituted for the concave grating.
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.
Six-inch transit instrument and barrel chronograph, formerly the property of the Great Trigonometrical Survey of India.
Six-prism table spectroscope—Hilger.
Photoheliograph Dallmeyer No. 4.
Theodolite, six-inch—Cooke.
Two phototheodolites by Steinheil for cloud photography.
Sextant.
Spectroheliograph with 18-inch siderostat and 12-inch Cooke triple achromatic lens of 20-feet focus, by the Cambridge Scientific Instrument Company, Limited.
Evershed spectroscope with three prisms for prominence and sunspot work, by Hilger.
Mean time clock, Kullberg 6326.
Sidereal clock, 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 was received at the end of the year.

The Spectroheliograph.—The spectroheliograph has been in constant use throughout the year and has given satisfaction except as regards the slits. These are of a complicated structure and have proved far from satisfactory. A grain of dust—and dust is sadly too abundant here at certain seasons—throws them out, and it is exceedingly difficult to keep both jaws in the same plane. Various plans have been tried to make them work better with fair success so far as the camera slit is concerned. The collimating slit has been more difficult to correct and a new slit of a simpler design has been asked for. The negative lens for enlarging the image formed by the 12-inch lens was received on May 9 and was at once set up, but has not been much used. It is not often that the sun's image is sufficiently steady to make it possible to get a really satisfactory enlarged image, and it is only when there is some special feature to photograph that the attempt is made. The want of steadiness in the image of the sun is due to several causes. The most prominent is, doubtless, the unsatisfactory position of the building. Why the present site was chosen is not known as two much better sites were available, but as it is too late to make a change now various attempts have been made to improve the surroundings. Unfortunately the ground surrounding the building is very rocky and it is difficult, if not impossible, to cover it with vegetation. An attempt is being made to cover it as far as possible but this will take time. Inside the large siderostat building blankets and mats have been placed on the floor and a wind screen has been placed near the mirror. These have done some good. Inside the main building the placing of venetian shutters in the windows had a good effect but it was not sufficient. A tube consisting of a wooden frame covered with very loosely woven cloth has been placed between the lens and the photoheliograph and this has made a most marked improvement. When the new building for the siderostat is erected the mirror will be brought much closer to the lens and it is hoped that this will improve matters still further.

It is not always easy to distinguish between unsteadiness due to purely local conditions and that due to the state of the higher atmosphere, but the contrast between the conditions at the spectroheliograph and at the spectroscope in the dome on the top of the hill is often so marked that there can be no doubt that the trouble at the former is often purely local. Some of the trouble here, as elsewhere, is probably due to deformation of the mirror by heat. This has been reduced to a minimum by keeping a lamp burning under the mirror case all night and by adopting Professor Hale's suggestion of removing the mirror cover only when a photograph is being taken. Changes in focus are usually small.

The inner surface of the back lens of the 12-inch having become badly covered with fungus the lenses were taken apart and successfully cleaned during the visit of the Director-General in December.

All the other instruments belonging to the observatory are in good order and working well.

OBSERVATIONS.

(*a*) Solar Physics.

5. The year was, on the whole, a favourable one for solar observations, and there were only nineteen days on which no observations were possible. At the same time it should be noted that, especially in the latter part of the year, observations of prominences were to a larger extent than usual interfered with by cirrus clouds. Satisfactory statistics on the subject are not available, but the impression left on the observers is that trouble from this source, in otherwise fine weather, has been distinctly greater than in former years. On the other hand the increased skill of the observers has made it possible to record the prominences on days when the conditions were far from satisfactory. The following table shows for each day the observations that were made.

SOLAR Observations in 1905.

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 ——	A B C D E	A B C D E	A— D E	A— C D E	A— *C* D E	A B C D E	A— C D E	A— D E	A B C D E	A B C D E	A B C D *E*
2 ..	——	A B C D E	A B C D E	A— C D E	A— C D E	A B C D E	A— C D E	A— *E*	——	A B C D E	A— *C* D E	A— C D—
3 ..	A ——	A B C D E	A B C D E	A— D—	A B C D E	A B C D E	A— C D E	A— *C* D *E*	A B C D E	A B *C* D *E*	A B *C* D *E*	A— *C* D *E*
4 ..	A B C D E	A B C D E	A— D E	A— C D *E*	A B C D E	A— *C* D *E*	A B C D E	A B C D E	A— C D E	A B— D *E*	A— C D E	A B C D E
5 ..	A— C D E	A B C D—	A B C D E	A— *C* D *E*	A B C D E	A B C D E	A B C D E	A B C D E	A— D E	A— D—	A B C D E	A B C D E
6 ..	A— *C* ——	A B C D E	A B C D E	A B C D E	A B C D E	A B C D E	A B C D E	A B C D E	A— D—	——	A B C D E	A— C D E
7 ..	A— C D E	A B C D E	A B C D E	A— C D E	A B C D E	A B C D E	A B C D E	A B C D E	A— D—	——	A B C D E	A B C D E
8 ..	A— *C* D E	A B C D E	A B C D E	A B C D E	A— *C* D E	A B— *E*	A B C D E	A B C D E	A— D—	——	A— D—	A B C D *E*
9 ..	A B C D E	A B C D E	A B C D E	A— C D E	A B C D E	A B— E	A— C D E	A B C D E	A— D *E*	A B C D E	A B *C* D E	A— C D E
10 ..	A B C D E	A B C D E	A B C D E	A— D—	A B C D E	——	A— *E*	A— *C* D E	A— *C* D E	A— *C* D E	A— D *E*	A *B* C D E
11 ..	A B C D E	A B C D E	A— C D E	A— C D E	A B C D E	A B C D E	——	A B C D E	A— C D E	A— *C* D E	A B C D E	A B C D E
12 ..	A B C D E	A B C D E	A— C D E	A— *C* D E	——	A B C D E	A B C D E	A B C D E	A— D *E*	——	A— D E	A— *C* D *E*
13 ..	A B C D E	A B C D E	A— C D E	A B C D E	A— D *E*	A B C D E	A— C D E	A— C D E	——	A— *C* D—	A ——	A— *C* D *E*
14 ..	A B C D E	A B C D E	A— C D E	A B C D E	A— C D E	A— C D *E*	A B C D E	A ——	A— *C* D E	A— D—	A— D—	A B C D E
15 ..	A B C D E	A— C D E	A— C D E	A B C D E	A B *C* D E	A B C D E	A B C D E	A B C D E	A— *C* D E	A ——	A— D—	A B C D *E*
16 ..	A B C D E	A B *C* D E	A— C D E	A *B* C D E	A B C D E	A B C D E	A *B* C D E	A— *C* D E	A— *C* D E	A B C D E	A B C D E	A B C D *E*
17 ..	A B C D E	A— *C* D E	A— C D E	A ——	A B C D E	A— C D E	A B C D E	A B C D E	A— C D E	A— *C* D E	A B C D E	A B C D *E*
18 ..	A B C D E	A B C D E	A— C D E	——	A— C D E	A ——	A— D—	A— D—	A— D—	A B *C* D E	A B C D E	A B C D E
19 ..	A B C D E	A— C D E	A— C D E	A B C D E	A B C D E	——	A— ——	A— D E	A— C D E	A— *C* D—	——	A B C D E
20 ..	A B C D E	A— C D E	A— C D E	A B C D E	——	A ——	A— D *E*	A B C D E	A— C D E	A B C D E	A ——	A— *C* D E
21 ..	A B C D E	A— C D E	A— *C* D E	A B C D E	A— *E*	A— *C* ——	A— D *E*	A B C D E	A— C D *E*	A B C D E	A— *C* D *E*	A B C D E
22 ..	A B C D E	A— C D E	A— *C* D E	A— C D *E*	A— C D E	A— C D E	A ——	A— D *E*	A— C D E	A B C D E	——	A B C D E
23 ..	A B *C* D E	A— D E	A B C D E	A B C D E	A— C D E	A B C D E	A— *C* D *E*	A— D *E*	A— C D *E*	A B C D E	——	A B C D E
24 ..	A— C D E	A B C D E	A— C D E	A B C D E	A— C D E	A B C D E	A B C D E	A— D *E*	A— *C* D *E*	A B C D E	——	A B C D *E*
25 ..	A— C D E	A B C D E	A— C D E	A— C D E	A— C D E	A— *C*— *E*	A— C D E	A— C D E	A— *C* D E	A B C D E	A— D—	A B C D *E*
26 ..	A— C D E	A B C D E	A B C D E	A— C D E	A— C D E	——	A— C D E	A— *C* D E	A— C D E	A B C D E	A— *C* D *E*	A *B* *C* D *E*
27 .	A— C D E	A B C D E	A B C D E	A— C D E	A— C D E	——	A— *C* D E	A B C D E	A— C D E	A B C D E	A— C D *E*	A B C D E
28 ..	A— C D E	A B C D E	A— D E	A— C D E	A— C D *E*	A B C D E	A— C D E	A B C D E	A— C D E	A B C D E	A B C D *E*	A B C D E
29 ..	A B C D E		A B C D E	A— C D E	A— C D E	A B C D E	A— C D E	A— C D E	A B C D E	A B C D E	A B C D *E*	A— D *E*
30 ..	A B C D E		A— C D E	A— C D E	A— C D E	A— C D E	A— C D *E*	A B C D E	A B C D E	A B C D E	A B C D *E*	A B C D E
31 ..	A B C D E		A— *C* D E		A— C D E		A— *C* D E	A B C D E		A B C D E		A B C D E

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

Solar observations—abstract.

	January.	February	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Total.
A	30	28	31	29	29	26	30	31	28	27	26	31	346
B	19	21	13	12	12	16	12	16	3	19	13	23	179
C	28	27	29	25	27	22	24	24	20	23	18	30	297
D	27	28	31	28	28	20	27	29	28	26	24	31	327
E	27	28	31	26	29	23	27	29	24	22	21	30	317

6. **Photographs of the sun** with the Dallmeyer photoheliograph were taken on 327 days as against 264 in 1904. June was the least favourable month for this work as there were 10 days on which no photograph could be obtained. In February, March, and December there was no day on which a photograph could not be obtained. As a rule only one photograph is taken daily. Negatives for 45 days have been sent to the Astronomer Royal at his request.

7. **Observations of sunspots.**—The sun is examined for spots and faculae every morning when the weather permits. When possible, the sun's image is projected on an 8 inch disc, and the positions of the spots and faculae are marked on it. Eye observations are also made of important features. There were only 19 days on which no observations of this class could be made, but on a good many other days the observations were made with difficulty through breaks in clouds.

8. **Sunspot spectra.**—Observations of widened lines in sunspot spectra were made with the Evershed three-prism spectroscope on 179 days. Observations of widened lines are made only when the spots are large enough to render the results satisfactory, but on all other days, when the weather permits, the neighbourhood of spots is carefully studied as regards the behaviour of the hydrogen and helium lines. The study of the helium line D_3 has proved particularly interesting.

9. **Prominences.**—Prominences were recorded visually on 297 days, but on 47 of these the observations were either not complete or not satisfactory on account of the weather. On some other days, though the whole limb was swept for prominences, the work had to be done hurriedly through breaks in the clouds, and small prominences may have been overlooked. The record of the prominences is made round the disc on which the spots and faculae have been projected. This record is compared next day with the photographs taken with the spectroheliograph and all prominences shown in the photograph but not in the drawing are added in blue pencil. Where there is much difference between the photograph and the drawing the differences are noted on the disc. On a number of days the photographs have rendered it possible to complete the eye record which had been interrupted by clouds. Usually, however, a day on which it is impossible to get eye observations of prominences is one on which good spectroheliograms are also impossible. It has not been possible to devote much time to prominence spectra, and only the most conspicuous bright lines are recorded.

10. **Spectroheliograms.**—Photographs were obtained with the spectroheliograph on 317 days, but on 47 of these the results were not satisfactory. These failures were due mainly to unsatisfactory weather conditions, but a few of them were due to slit troubles. When the weather is cloudy it is often found to be almost impossible to set the second slit on the H line with sufficient accuracy, and the construction of the slits is such as to render it impossible to use Professor Hale's old device of having a small window through which setting can be made on another and more easily seen line. The present setting arrangement is not quite satisfactory and a modified form of apparatus has been asked for.

As mentioned above, much trouble has been caused by the want of steadiness in the sun's image, and the best results are usually obtained early in the forenoon. On some occasions excellent photographs of flocculi have been got through comparatively thick clouds but, naturally, it is rarely possible to obtain good prominence pictures except with a clear sky. The plan of taking composite pictures of the flocculi and prominences on the same plate with two exposures has been given up as it is found much more satisfactory to take the two on separate plates. If the instrument was fed by means of a cœlostat, there might be some advantage in the composite pictures, but when a siderostat is employed, as is the case here, the rotation of the image between the two exposures causes an objectionable displacement of the one image relatively to the other. On the whole, including plates taken for focussing and other adjustments, 1,177 photographs were taken with the instrument, of which 215 have been rejected for various reasons. An enlarged copy of the best flocculi plate for each day is made on bromide paper, and these are found very useful for reference. Of course, any serious studies must be made on the negatives themselves, but the copies are useful for selecting suitable negatives and as a convenient index to the series. The general results obtained with the instrument may be described as satisfactory, but the plates are not yet so uniformly good as is to be hoped they will soon be. The various changes which have been made in and about the buildings have undoubtedly done good, and the farther changes which are projected should improve the conditions still farther, while the small instrumental changes which are proposed would greatly simplify the use of the instrument.

Summary of Results.

11. **Sunspots.**—The following table shows the monthly number of new groups observed, the mean daily number of spots visible, and the distribution as regards the northern and southern hemispheres:—

—	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Year.
New groups	24	26	20	27	27	17	32	28	27	16	29	22	295
Daily number	5·8	6·1	3·6	3·7	4·3	3·6	5·0	5·1	4·9	3·3	6·7	4·0	4·7
North	13	11	10	14	20	8	17	22	17	11	13	13	169
South	11	15	10	13	7	9	15	6	10	5	16	9	126

The total number of new groups seen during the year was 295 against 239 in 1904. There were two days, July 28 and 29, when the visible disc was free from spots, and there were 13 days on which only one group was visible. The greatest number of groups seen on any day was 15 on January 14. Ten or more groups were seen also on January 14 and 16 and on February 9 to 14.

The distribution of the groups between the two hemispheres was again very far from uniform, there being 33 per cent. more groups seen in the northern than in the southern hemisphere. In the two months May and August there were 42 northern to only 13 southern groups. The mean latitude of the spots was less than in 1904, and in September there was a group within 1° of the equator. The most important groups seen during the year were the following:—

Nos. 449, 450, 451 came round the east limb as detached spots on the 10th and 11th January but in two or three days they formed into a continuous train covering 16° of longitude.

No. 443, 464, 488, 507 was the largest spot that had been seen for many years. It was seen during four rotations. It was a disturbed spot and was associated with very disturbed prominences at both limbs. It formed on the visible disc on January 5 and was last seen on April 5.

No. 465, 491 was seen first from February 2 to February 14. It returned to view as a very large spot on March 1, but soon began to grow smaller, and by the time it reached the western limb it was reduced to a small dot in a large field of faculae.

No. 547 appeared at the east limb on May 11. It was preceded by intensely bright prominences which were seen for two days. At its maximum it covered 18° of longitude.

Nos. 589, 590, 613, 637, 656 When spots Nos. 589 and 590 came round the limb on July 6, they appeared to form two separate groups but these rapidly increased in size and joined together forming one large group consisting of two main clusters joined by a number of small spots. It remained visible during four rotations.

Nos. 594, 620 came round the east limb on July 10 and was the largest since the great spot of February. On the 16th the group was at least 120,000 miles long with a maximum width of about 44,000 miles. It was seen during two rotations.

No. 674, which appeared at the east limb on October 14 consisted of a large number of small spots covering about 130,000 miles in length and 65,000 miles in breadth.

No. 676, which appeared on October 22 was also a very large spot group but of a totally different type from 674 as it consisted mainly of one large spot. Both 674 and 676 were easily seen without a telescope.

No. 708, consisted of a very long train of large spots and was first seen on November 25. It broke up into several groups which extended over some 28° of longitude.

12. **Prominences.**—As the prominence observations are being published in full in the Bulletins of the observatory it is not necessary to give a complete list here, but a few notes are given on some of the more important prominences of the year.

January.—Prominences were very abundant during this month. The highest noted was on the 22nd in latitude + 42° (east). It was 3′ high. There were four prominences seen of about 2′ and 13 of about $1\frac{1}{2}'$ high. On the 27th there was a group of small prominences covering about 20° of the limb, on three days there were groups covering 15°, and on eight other days groups covering 10°.

February.—The tallest prominence that has been observed here was photographed on the 20th in the calcium line H, at position angle 45°. When the first photograph was taken at $8^h\ 36^m$ it had a height of 95,000 miles, another photograph at $9^h\ 18^m$ showed that it had risen to 108,000 miles, while in a photograph taken at $10^h\ 14^m$ its height exceeded 162,000 miles, and it had got beyond the limits covered by the spectroheliogram. On the 25th, 26th, and 27th nearly 28° of the eastern limb was covered with bright prominences.

March.—On the 1st, where spot No. 491 was coming round the limb, there was a large and rapidly changing prominence which reached a height of about 3′, and the next day, near the same place, an eruptive jet was observed to reach a height of nearly 4′. Even on the following day a prominence nearly 2′ high was seen at the limb near the same place. Prominences more than 2′ high were observed on the 8th, 11th, 13th, and 30th. On the 15th a long series of prominences extended from position angle 230° to 287° and on the 23rd nearly 70° of the eastern limb was covered with prominences.

April.—The tallest prominence seen was one of 2′ on the 15th at position angle 59°. On the 14th about 40° of the limb was covered with short bright prominences none of which exceeded 45″ in height. On the 24th two great arches, each covering 8° of the limb and joined in the middle, were photographed in calcium light. These reached heights of 65″ and 70″ respectively.

May.—A large number of conspicuous prominences were observed during this month. There were 50 of or over 1′ in height of which 7 were above 2′. The most striking display was on the 1st near the south point of the sun. At $8^h\ 28^m$ it was about $2\frac{1}{2}'$ high and at $10^h\ 31^m$ it reached a height of at least $4\frac{1}{2}'$. On the same day a large cloud was seen at position angle 10° which at one time was apparently quite detached from limb and about $2\frac{1}{2}'$ above it. On the 2nd nearly 50° of the west limb was covered with short prominences.

June.—There were 27 prominences seen of or over 1′ in height, of which one exceeded 3 minutes and two others exceeded 2 minutes. The tallest of these was seen and photographed about 9 o'clock on the morning of the 22nd. It rose from the sun's limb at position angle 58° and drifted northwards like the smoke from a steamer till it could be traced to a height of 195 seconds over a point on the limb 20° north of where it was issuing. The form changed very rapidly.

July.—There were no very conspicuous prominences seen during the month. Some 20 exceeded one minute in height and of these only two exceeded 100 seconds.

August.—Prominences exceeding 1′ in height numbered 44, and on 12 days prominences covering 15° or more of the limb were observed. The tallest prominence seen was one 3½′ high which was photographed on the 15th. The gas apparently issued at position angle 100° in a nearly vertical jet which reached a height of 90″; it then streamed away northward reaching its maximum height over about position angle 80° where it seemed to settle down again towards the sun's surface. For four days, (10th to 13th), prominences, showing great changes from day to day, covered practically the same part of the limb (position angle 70°—90°). On the 30th, the day of the total eclipse, a group of four prominences about 1′ in height and joined at the tops formed a very conspicuous feature on the east limb.

September.—This month was a very unfavourable one for prominence work. There were four prominences seen of 100 seconds and upwards. One of these seen on the 10th was a slender arch reaching to a height of 120″ and joining two points of the limb 16° apart. On the 30th one was seen 140″ high which was particularly bright in hydrogen light and very faint in calcium light.

October.—The daily number of prominences was rather lower than usual, especially towards the end of the month. Prominences exceeding 100″ in height were seen on four days, one on the 17th, two on the 23rd, one on the 29th, and one on the 30th. The last two were rather remarkable as they were apparently different parts of one enormous prominence. It reached a height of 165″ on the 29th and was still 140″ high on the 30th. On the 27th and 28th there were lower prominences visible at almost exactly the same latitude.

November.—Prominences were fairly numerous. Four were observed of a height exceeding 100″, one on the 4th, one on the 17th and two on the 18th There was a slightly disturbed prominence on the 3rd, at latitude + 12° west, which when first seen was 75″ high. Later it apparently rose up bodily and became quite separated from the limb. Metallic prominences were seen on the 1st, 6th, 7th and 16th.

December.—The prevalence of cirrus was unfavourable for prominence work. Only one prominence was seen of a height exceeding 100″. This was observed on the 17th and consisted of a group of tall slanting jets covering about 20° of the limb which attained a maximum height of 120″. Metallic prominences were observed on four days (1st, 6th, 7th, and 9th) and on three of these the prominences were associated with spots.

(*b*) Other Observations.

13. **Time.**—Time is determined with the transit instrument when necessary. The standard clock of the observatory is also compared daily with the Madras standard clock by means of the signal sent at 4 P.M. over all the telegraph lines in India. From July 1 all time signals have been sent by Indian Standard time, 5 hours 30 minutes fast of Greenwich mean time. All observations, from the same date, have been recorded in Standard time. A time signal is given daily from this observatory by means of a flag at 10 A.M.

14. **Meteorology.**—Meteorological observations have been carried on exactly as in former years. The instruments are read at 8^h, 10^h, and 16^h, local mean time. Temperature and pressure are recorded by a Richard thermograph and barograph and the mean daily temperature and pressures are obtained from the traces corrected by reference to the eye observations. The wind direction and velocity are got from a Beckley anemograph placed on a tower some little distance from the observatory. The cups and wind vane are at a higher level than the tops of the domes.

Temperature.—The mean temperature for the year was nearly normal, but it was slightly in defect in January and in excess in December. The shade maximum rose to 74°·7 on May 5, and the shade minimum fell to 39°·8 on January 29. The grass minimum fell to 18°·5 on December 11, which is the lowest reading which has been recorded here. The mean temperature of the year was 56°·5 and the difference between the means of the hottest and coldest months was 8°·9, which is greater than the average.

Humidity.—The relative humidity was above the average for the first six months of the year and below it during the second six months. The difference was large in January, July, and December. The minimum recorded was 10 per cent. on January 16.

Wind.—The daily wind velocity was about the average. The highest record for any one day was 709 miles on August 24. The mean direction was N.N.E. which is the same as the average.

Rain.—The rainfall was above average in February, August, and October, and below average in all other months. The deficiency for the whole year was about 6 inches. The heaviest fall in one day was 3·80 inches on October 9.

Cloud and Sunshine.—As judged by cloud observations at 8^h, 10^h, and 16^h, the year was rather more cloudy than usual, but, at the same time, the number of hours of bright sunshine recorded was considerably above the average. This is probably due to the abundance of cirrus cloud which has already been referred to. Curiously enough the largest number of hours of bright sunshine was recorded in December, when there was a daily average of 8·3 hours.

The transparency of the lower atmosphere, as judged by the visibility of the Nilgiris, was slightly below the average of the last five years and much below that for 1902.

15. **Seismology.**—The Milne horizontal pendulum was in use throughout the year and the results are given in appendix I. The instrument has worked well, but the record of one large earthquake on July 9 was lost by bad driving of the paper, due to the clamp not having been properly adjusted. The first and last parts of the great Indian earthquake of April 4 were well recorded, but during the large motion the boom went completely off the scale and remained there till brought back by hand. Stops have now been placed in the box to limit the motion of the boom.

16. **Library.**—In addition to a large number of books and pamphlets received as exchanges, the library received 186 sheets of the Greenwich Astrographic Chart and 28 sheets of the French *Carte Photographique du ciel:* 171 volumes were bound during the year.

17. **Publications.**—Three bulletins were published and distributed during the year, and a fourth is in type. Bulletin No. I. gives the observations on widened lines in sunspot spectra made between January 1903 and February 1904. No. II. contains a list of prominences observed between 1903 September 1 and 1904 December 31. No. III. gives an account of the observations of D_3 as a dark line in the solar spectrum. No. IV. will bring the record of sunspot spectra up to the end of June 1905.

18. **General.**—The Director inspected the Madras Observatory in November. The whole staff has worked well during the year, and it is mainly due to the activity and interest shown by them that observations have been obtained on such a large number of days.

This observatory has, with the sanction of the Government of India, promised to take part in the scheme now being elaborated by the "International Union for Co-operation in Solar Research". It is intended to help both in spectroheliography and in photographic spectra of sunspots, but the latter must lie over till the arrival of the long expected assistant to the Director, as the work at present going on is quite as much as the existing staff can perform efficiently.

KODAIKÁNAL,
31*st January* 1906.

C. MICHIE SMITH,
Director, Kodaikánal and Madras Observatories.

II.—REPORT OF THE MADRAS OBSERVATORY FOR THE YEAR 1905.

I was away on leave for two months from 17th May to 16th July. Mr. R. Littlehailes, Professor of Mathematics, Presidency College, acted as Deputy Director, during this period.

Mr. C. Chengalvaraya Mudaliar of the Meteorological office continued to act for Mr. M. G. Subrahmanyam, the First Assistant, who was on duty at Kodaikánal, throughout the year.

The Second Assistant took two months' privilege leave from the 23rd March.

2. **Time Service.**—The astronomical observations made during the year were, as usual, solely directed to time determinations. They were made by the Computer and the acting First Assistant. Transits of the Sun were also taken occasionally in order to check the rate of the clock when cloud or unfavourable weather prevented the regular star observations from being made.

The Government of India having sanctioned the introductiou of Standard Time for India, all the time signals from the Observatory have, from 1st July 1905, been sent in accordance with this new system, which is 5½ hours in advance of Greenwich mean time and 0 hr. 9 m. 0·4 s. in advance of Madras mean time.

The time gun at the Fort was fired correctly at noon and at 8 P.M. on 702 occasions out of 730, giving a percentage of success of 96·2.

The time ball at the Port office was dropped correctly on all occasions except one when it failed at 1 but was dropped correctly at 2 P.M.

3. **Meteorological Observations.**—Meteorological observations were made as usual, viz., at 8 hr. 10 hr., 16 hr., and 20hr. A wet minimum thermometer was brought into use and observations recorded from 1st September. The observations of 10 hr. and 16 hr. were reduced and sent to the office of the Meteorological Reporter to the Government of India, Alipore (Calcutta), on Form A till September and on Form F—a more elaborate one—from October. The record of movements of the clouds observed by means of the nephescope were also sent to that office every month. Besides the ordinary daily weather messages, special storm observations were called for and supplied to (1) Simla on one occasion and (2) Calcutta on the following dates—April 16 and 17, October 8 to 16 and 20 to 24.

The tabulation of the traces of the Barograph, Thermograph and Anemograph at Madras and of the Anemograph at Dodabetta are up to date.

4. **Buildings.**—Considerable repairs to the buildings have been effected during the year.

5. **Instruments.**—A tape chronograph by R. Feuss, Berlin, was received during the year, but has not yet been brought into use, as there is no seconds contact fitted to the Transit Clock as yet. The Transit Clock by Dent and the Chronometer by Kullberg were cleaned during the year. The rate of the Transit Clock was very variable for the greater part of the year, but has become fairly steady since it was cleaned in November. Annexed is the list of instruments at the Madras Observatory on 31st December 1905:—

(a) *Astronomical.*

Eight-inch Equatorial Telescope—Troughton and Simms.
Sidereal Clock—Haswall.
" Dent No. 1408.
Electric Mean Time Clock with galvanometer—Shephard & Sons.
Meridian Circle—Troughton & Simms.
Mean Time Clock—J. Monk.
Mean Time Chronometer—V. Kullberg 5394.
" " " 6544.
" " Parkinson & Frodsham 2352.
Portable Transit Instrument—Dollond.
Portable Telescope with stand.
Tape Chronograph—R. Feuss.

(b) Meteorological.

Richard's Thermograph—No. 36188 L. Casella.
Beckley's Anemograph—Adie.
Sunshine Recorder—No. 149 L.C.
Anemoscope—P. Orr & Sons.
Nephescope—Mons. Jules Daboseq & Ph. Pellin.
Wind Resultant Indicator—G. K. Winter.
Barometer, Fortins—No. 1771 L.C.
Barometer—No. 725 L.C. (spare).
Dry bulb thermometer—No. 94221 L.C.
Dry bulb thermometer—No. 38037 Negretti and Zambra (spare).
Wet bulb thermometer—94219 L.C.
Wet bulb thermometer—38037 N. & Z. (spare).
Dry maximum thermometer—No. 8581 N. & Z.
Dry minimum thermometer—No. 69047 L.C.
Wet minimum thermometer—No. 91753 N. & Z.
Sun maximum thermometer—No. 10479 „
Grass minimum thermometer—No. 3377 „
Raingauge (8″ diameter). 1042 N. & Z.
Measure Glass for above.
Raingauge (5″ diameter).
Measure Glass for above.

6. **Weather Summary.**—The following is a summary of the meteorological and weather conditions at Madras during the year 1905 :—

Pressure.—The mean atmospheric pressure was normal in February and June, below normal in March, August and September and above normal during the other months. The excess in November was 0·061 inch. The highest pressure recorded was 30·230 inches on January 1, and the lowest 29·820 inches on June 14.

Temperature.—The mean temperature was normal in May, below normal in January, April and December and above normal during the rest of the year, the excess being 2°·8 in July and 2°·3 in September. The highest shade temperature recorded was 108°·2 on June 2 and the lowest 57°·4 on January 29. The mean maxima in June and July were 102°·4 and 100°·3, respectively, being much above the average. The greatest solar heat in vacuo was 152°·1 on September 26 and the lowest on grass 52°·8 on January 29.

Humidity.—Humidity was much above normal in October and almost normal in the other months, the lowest being 24 on July 24.

Wind.—The wind direction was normal in April, May, July, August and September. It was two points more easterly in January, November and December and three points more northerly in October. The wind velocity was deficient in all the months except February, March, July and September. The highest wind velocity on any day was 327 miles on March 21 and the lowest 65 on December 28 and 29.

Cloud.—The percentage of cloud was in excess in February, March and April and below normal in all the other months.

Sunshine.—The percentage of bright sunshine was below normal in all months except July and December.

Rain.—The rainfall was above the average during the first three months of the year and in October, and below during the rest of the year. The fall in October was 19·65 inches — 8·65 inches in excess of the average for the month. The north-east monsoon rainfall from October 15 to the end of the year was 17·85 inches against an average of 27·6 inches.

Storms.—No storm crossed the coast of Madras during the year.

MADRAS,
7th February 1906.

R. LL. JONES,
Deputy Director.

Appendix I.

Kodaikánal Observatory Seismological Records.

Number.	Date.	P.T. Commence G.M.T.	L.W. Commence G.M.T.	Maxima G.M.T.	End.	Max. Amp.	Duration.	Remarks.
	1905.	H. M.	H. M.	H. M.	H. M.	MM.	H. M.	
1	Jan. 22	2 51·9	2 57·5	3 1·7 13·0	... 4 21	1·5 = 0·7 1·8 = 0·9	... 1 28	
2	Feb. 2	21 13·4	21 14·9	21 16·9	21 31	0·3 = 0·2	0 18	
3	4	6 32·3	6 36·3	6 37·6	6 39	0·3 = 0·2	0 07	
4	13	5 47·3	...	...	...	...	0 02	Widening of line.
5	14	9 10·5	9 32·8	9 40·5 48·3 52·4	... ... 10 39	2·0 = 1·0 2·5 = 1·3 2·0 = 1·0	... ... 1 29	
6	17	11 46·2	11 51·1	11 52·4 59·6 12 01·8 05·8	... ... 13 10	1·0 = 0·5 1·5 = 0·7 1·5 = 0·7 1·1 = 0·6	... ... 1 24	
7	19	4 58·6	...	...	6 20	...	1 22	Many small maxima.
8	27	17 47·3	...	17 52·4	18 44	...	0 57	Small but well marked.
9	March 4, 5	23 28·9	23 38·0	23 47·2 0 14·9	... 0 34	0·4 = 0·2 0·5 = 0·3	... 1 05	
10	19	0 10·8	0 22·1	0 24·1 52·8 1 22·6	... ... 2 28	1·0 = 0·5 1·0 = 0·5 1·0 = 0·5	.. ... 2 17	
11	22	4 02·7	4 32·6	4 33·5 38·7	... 5 32	0·6 = 0·3 0·8 = 0·4	... 1 29	
12	April 2	3 28·4	...	...	...	0·6 = 0·3	0 03	Felt in Madras and north of it.
13	4	0 55·6	1 00·8	Lost.	4 32	>22 >12	3 36	Boom driven off scale and caught.
14	4	12 43·6	...	...	...	...	0 04	
15	7	4 29·7	4 32·8	4 33·3	4 55	2·0 = 0·9	0 25	
16	19	10 03·8	...	...	10 07	0·6 = 0·3	0 03	
17	19	12 56·6	...	...	13 55	..	0 58	Widening of line.
18	23	2 36·0	2 37·8	...	2 42	0·5 = 0·3	0 06	
19	May 11	17 22·2	...	...	18 10	...	0 48	Widening of line.
20	18	13 48·3	...	...	13 52	0·6 = 0·3	0 04	Do.
21	23	7 10·8	7 25·2	7 28·2 35·4	... 8 16	0·3 = 0·2 0·4 = 0·2	... 1 06	
22	31	18 41·6	18 49·3	18 53·4	19 13	0·9 = 0·5	0 31	
23	June 2	5 52·4	Lost.	Lost.	6 31	Lost.	0 38	Sheet changed 6h 02m to 6h 14m.
24	12	5 41·1	...	...	6 36	...	0 55	Slight.
25	14	11 54·3	11 57·4	11 58·5	13 19	0·5 = 0·2	1 25	
26	19	1 42·0	...	...	1 49	...	0 07	Widening of line.
27	30	17 31·3	18 03·6	18 08·7 19·0	... 19 48	1·5 = 0·7 1·1 = 0·5	... 2 17	

Kodaikánal Observatory Seismological Records—*cont.*

Number.	Date.	P.T. Commence G.M.T.	L.W. Commence G.M.T.	Maxima G.M.T.	End.	Max. Amp.	Duration.	Remarks.
	1905.	H. M.	H. M.	H. M.	H. M.	MM. ″	H. M.	
28	July 6	16 31·5	17 00·5	17 03·6 09·7	18 21 ...	3·0 = 1·3 2·0 = 0·9	1 49 ...	
29	9	..	...	...	...	...	...	Very large earthquake but time uncertain as clock was driving badly.
30	14	9 43·3	?	9 55·6	10 09	0·4 = 0·2	0 26	
31	14	22 25·4	22 26·0	22 26·2	22 45	1·1 = 0·6	0 20	
32	16	18 56·7	18 59·6	19 02·1	19 13	C·8 = 0·3	0 16	
33	17	0 47·3	...	...	1 4C	...	0 59	? E.Q. Widening of line.
34	23	2 54·6	3 03·8	?	5 39	24+ = 9+	2 45	Light went off scale for some time (Chita E.Q.).
35	27	22 55·4	...	...	23 03	..	0 08	Widening of line.
36	Sept. 8	1 52·8	2 21·7	2 22·8 31·0	... 3 43	1·4 = 0 8 1·0 = 0·5	... 2 50	Italian E.Q.
37	8	5 33·1	5 33·1	5 33·1	5 37	1·0 = 0·5	0 04	? E.Q.
38	14	20 05·6	?	20 35·1 39·2 43·6	... ... 21 11	0·4 = 0·2 0·5 = 0·2 0·4 = 0·2	... ... 1 05	
39	15	6 15·1	6 51·0	6 56·7	9 13	7·5 = 3·6	2 58	
40	27	1 36·2	1 42·3	1 43 3	2 37	1·6 = 0·8	1 01	
41	29	11 53·6	12 12·9	12 13·9	13 24	1·1 = 0·4	1 30	
42	Oct. 19	16 27·0	16 32·0	16 32·5	17 00	4·2 = 2·0	0 33	
43	Nov. 8	22 19·7	22 40·3	22 48·1	23 34	1·6 = 0·7	1 14	
44	22	23 29·6	...	...	25 36	...	0 06	Widening of line.
45	22, 23	23 55·6	0 13·1	0 14·1	0 29	0·6 = 0·3	0 33	
46	26	9 59·5	10 12·7	10 12·7	10 23	0·7 = 0·3	0 23	? E.Q.
47	Dec. 4	7 20·3	7 32·0	7 33·6 37·7	... 8 05	0·6 = 0·3 0·8 = 0·4	... 0 45	
48	10	13 27·9	13 33·1	13 35·1 37·2	... 14 04	0·5 = 0·2 0·6 = 0·3	... 0 36	Felt in N. India.
49	10	18 19·4	18 30·5	18 31·0	19 02	0·6 = 0·3	0 43	

Appendix II.

MEAN monthly and annual Meteorological Results at the Kodaikánal Observatory in 1905.

Month.	Barometer. Reduced to 32°.	Barometer. Daily range.	Dry bulb thermometer Mean.	Dry bulb thermometer Max.	Dry bulb thermometer Min.	Dry bulb thermometer Range.	Wet bulb. Mean.	Wet bulb. Min.	Tension of vapour. By Blanford's tables.	Relative humidity. By Blanford's tables.	Sun Max. in Vac.	Min. on grass.	Wind. Daily velocity.	Wind. Mean direction.	Wind. Mean direction.	Rain. Amount.	Rain. Days.	Clear sky.	Bright sunshine.
	INCHES.	INCHES.	°	°	°	°	°	°	INCHES.	CENTS.	°	°	MILES.	POINTS.	POINTS.	INCHES.	NO.	CENTS.	HOURS.
January	22·852	0·071	51·8	61·3	44·9	16·4	47·4	40·7	0·287	75	113·6	35·4	267	1	N. by E.	0·56	2	61	205·2
February ...	·857	·071	54·9	66·2	48·0	18·2	49·1	43·0	·293	67	124·8	38·7	308	6	E.N.E.	1·66	2	60	204·2
March	·857	·073	57·5	67·6	51·1	16·5	51·4	45·5	·323	67	127·5	41·4	295	13	S.E. by S.	2·34	5	61	221·5
April	·850	·071	58·6	67·3	53·6	13·7	54·4	48·7	·382	77	133·0	46·5	315	6	E.N.E.	3·79	10	47	164·2
May	·805	·063	60·7	69·9	54·8	15·1	55·4	50·3	·390	74	134·6	48·6	292	2	N.N.E.	6·52	9	47	206·4
June	·778	·056	58·4	65·5	54·2	11·3	54·4	50·7	·386	79	129·0	49·8	398	27	N.W. by W.	3·38	11	31	131·9
July	·782	·054	57·2	64·6	52·7	11·9	52·8	48·2	·359	76	126·6	47·3	389	28	N.W.	2·68	7	37	169·8
August	·777	·063	57·0	64·4	52·7	11·7	53·3	48·7	·373	80	127·1	47·7	323	27	N.W. by W.	8·54	13	55	149·6
September ...	·792	·071	56·6	63·8	52·4	11·4	53·1	48·8	·372	81	123·7	46·6	274	26	W.N.W.	7·34	13	31	122·0
October	·809	·078	56·3	63·4	51·4	12·0	51·3	48·1	·331	73	119·8	46·1	292	2	N.N.E.	15·36	14	47	166·9
November ...	·869	·072	54·2	60·8	49·5	11·3	52·2	47·3	·373	88	112·5	45·8	349	7	E. by N.	7·77	11	37	113·9
December ...	·837	·071	55·0	66·8	47·5	19·3	45·6	38·7	·217	51	120·8	36·1	324	5	N.E. by E.	0·02	...	65	258·6
Annual ...	22·822	0·068	56·5	65·1	51·1	14·1	51·7	46·6	0·340	74	124·4	44·1	319	2	N.N.E.	59·96	97	47	2,114·2

EXTREME monthly Meteorological Records at the Kodaikánal Observatory in 1905.

Month.	Barometer. Highest.		Barometer. Lowest.		Barometer. Range.	Dry bulb thermometer. Highest.		Dry bulb thermometer. Lowest.		Wet bulb. Lowest.		Humidity. Lowest.		Sun Th. in Vacuo. Highest.		Grass therm. Lowest.		Wind. Highest.		Wind. Lowest.		Rain. Greatest fall.	
	INCHES.	DAY.	INCHES.	DAY.	INCHES.	°	DAY.	°	DAY.	°	DAY.	CENTS.	DAY.	°	DAY.	°	DAY.	MILES.	DAY.	MILES.	DAY.	INCHES.	DAY.
January	22·974	1	22·776	26	0·198	67·4	30, 31	**39·8**	**29**	**33·2**	**18**	**10**	**16**	121·4	30	23·2	16	588	2	165	10	0·32	6
February	·969	27	·780	17	·189	69·4	17	43·8	4	37·0	2	21	26	134·6	21	23·6	8	644	26	175	6	1·27	23
March	**·977**	**5**	·765	21	·212	73·3	13	45·9	6	36·6	5, 7	22	4	138·4	29	32·1	7	559	4	135	20	0·83	19
April	·936	27	·763	18	·173	72·5	27	51·8	7	40·5	9	35	9	144·9	10	41·4	7	656	17	194	3	0·44	29
May	·901	4	·699	22	·202	**74·7**	**5**	50·9	28	40·2	4	22	4	**149·0**	**16**	43·7	2	454	24	168	21	2·49	12
June	·853	8	·682	20	·171	70·9	3	49·7	12	43·5	16	34	16	146·0	6	44·4	14	687	19	129	3	0·41	19
July	·858	10	·706	20	·152	69·4	4	49·7	7	41·4	14	39	3	146·6	2	41·7	29	683	7	198	3	1·02	11
August	·872	6	**·681**	**18**	·191	68·4	6	50·1	4	42·4	10	36	10	144·6	27	40·4	6	**709**	**24**	119	6	1·53	30
September ...	·886	17	·697	6	·189	69·0	30	50·4	28	39·6	23	31	23	140·6	21	32·8	28	597	6	**106**	**18**	1·24	26
October	·891	4	·724	17	·167	69·0	1	46·4	30	38·7	25	34	24	143·9	1	32·6	30	499	7	177	13	**3·80**	**9**
November ...	·966	8	·802	11	·164	65·1	1	41·8	6	36·8	6	61	29	131·8	1	35·3	29	634	25	151	2	1·26	25
December ...	·930	**25**	·735	10	·195	73·3	23	41·7	11	33·3	28	12	22, 25, 28	131·1	21	**18·5**	**11**	597	16	144	21	0·02	8

Appendix III.

KODAIKÁNAL mean hourly Wind Velocity for the year 1905.

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	13	13	13	13	13	13	12	11	12	10	11	11	11	11	10	10	8	8	8	9	9	11	13	14
February	14	15	15	14	15	14	15	15	15	15	16	15	14	12	11	10	9	9	9	9	10	10	12	14
March	10	11	11	12	12	12	12	13	13	13	14	15	14	13	13	13	12	12	13	14	12	11	11	10
April	14	13	13	13	12	13	13	13	14	14	15	14	14	13	14	14	13	12	11	11	11	12	14	14
May	12	12	13	12	13	13	13	13	13	14	14	14	14	13	13	12	11	10	9	11	10	11	10	12
June	18	18	19	19	18	18	16	14	14	14	16	16	16	15	16	15	15	16	17	18	17	18	17	18
July	19	19	18	19	17	17	16	14	12	12	13	13	13	13	14	15	15	16	19	18	18	18	20	20
August	16	16	17	18	17	17	17	15	15	13	13	12	11	10	10	10	10	10	11	11	11	13	13	15
September	12	12	13	12	13	13	13	11	11	11	11	11	11	10	11	10	10	10	11	12	11	11	12	12
October	13	13	13	12	13	12	12	13	13	13	13	13	12	12	11	11	10	10	11	12	12	12	14	13
November	15	15	14	15	15	14	16	15	14	15	16	15	14	13	12	12	12	14	14	15	15	15	15	15
December	13	13	13	13	13	13	13	13	14	14	17	15	15	13	11	10	9	9	10	13	15	15	15	15
Mean ...	14	14	14	14	14	14	14	13	13	13	14	14	13	12	12	12	11	11	12	13	13	13	14	14

Appendix IV.

KODAIKÁNAL.—Mean hourly Bright Sunshine ~~for~~ the year 1905.

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 ...	0·05	0·71	0·81	0·84	0·86	0·78	0·65	0·57	0·48	0·49	0·33	0·04	The total number of hours of bright sunshine was 2,114·2 or 48·3 per cent. of the maximum possible.
February ...	·11	·79	·94	1·00	·95	·83	·72	·60	·56	·42	·34	·04	
March ...	·10	·82	·91	0·86	·80	·78	·71	·60	·53	·51	·40	·14	
April ...	·15	·64	·72	·74	·83	·75	·64	·41	·35	·30	·18	·10	
May ...	·13	·62	·82	·85	·81	·88	·73	·56	·47	·38	·35	·10	
June ...	·13	·44	·55	·60	·59	·55	·47	·39	·31	·21	·11	·05	
July ...	·18	·60	·78	·74	·71	·61	·53	·42	·36	·31	·21	·04	
August ...	·29	·69	·75	·70	·63	·51	·39	·28	·23	·15	·17	·04	
September ...	·10	·48	·55	·56	·55	·51	·42	·33	·26	·17	·10	·03	
October ...	·74	·52	·65	·64	·66	·59	·56	·50	·43	·35	·31	·10	
November ...	·02	·25	·33	·46	·48	·45	·40	·40	·46	·32	·21	·02	
December ...	·07	·71	·92	·97	·96	·93	·90	·86	·81	·74	·45	·02	
Mean ...	0·17	0·61	0·73	0·75	0·74	0·68	0·59	0·49	0·44	0·36	0·26	0·06	

Appendix V.

KODAIKÁNAL OBSERVATORY.—Number of days in each month on which the Nilgiris were visible in 1905.

Month.	Very clear.	Visible.	Just visible.	Tops only visible.	Total.
January ...	2	5	1	8	16
February ...	...	2	3	1	6
March ...	1	2	4	...	7
April ...	1	3	3	1	8
May ...	6	4	...	...	10
June ...	8	10	1	...	19
July ...	1	5	1	1	8
August ...	6	5	10	1	22
September ...	5	6	4	...	15
October ...	6	3	4	...	13
November ...	2	2	3	1	8
December ...	7	15	6	...	28
Total ...	45	62	40	13	160

Appendix VI.

PROVISIONAL Monthly Meteorological Means for Kodaikánal Observatory.

Month.	Barometer.		Dry bulb thermometer.				Wet bulb.	Tension of vapour.	Relative humidity.	Min. on grass.	Wind.		Rain.		Bright sunshine.
	Reduced to 32°	Range.	Mean.	Max.	Min.	Range.	Mean.	By Blanford's tables.	By Blanford's tables.		Daily velocity.	Mean direction.	Amount.	Days.	
	INCHES.	INCHES.	°	°	°	°	°	INCHES.	CENTS.	°	MILES.	POINTS.	INCHES.	NO.	HOURS.
January ...	22·851	0·072	53·1	62·6	46·7	15·8	47·1	0·267	66	38·2	322	E.N.E.	2·92	4	219·7
February ...	·868	·070	54·9	65·4	47·9	17·5	48·2	·272	62	39·0	303	E.N.E.	1·57	3	215·5
March	·856	·069	57·9	68·7	50·9	17·8	49·0	·261	54	41·7	326	E.	1·79	3	252·8
April	·835	·070	59·4	69·0	53·5	15·5	53·5	·352	69	46·0	288	E. by N.	4·50	8	196·9
May	·812	·068	60·1	68·6	54·6	14·0	55·2	·387	74	49·0	263	N.N.E.	5·37	13	187·1
June	·774	·058	57·9	65·0	53·7	11·3	54·0	·380	79	49·6	398	N.W.	3·63	11	127·8
July	·760	·056	56·4	63·1	52·5	10·6	53·2	·376	82	48·8	448	N.W.	4·27	12	107·5
August	·775	·063	56·8	63·8	52·5	11·3	53·7	·384	83	48·0	314	N.W. by N.	5·69	12	123·4
September ..	·803	·073	56·5	63·7	52·4	11·0	54·7	·389	85	48·5	299	N.W. by N.	7·67	15	110·8
October ...	·814	·076	55·6	62·6	51·3	11·3	52·7	·373	84	46·6	276	N. by E.	11·14	18	137·6
November ...	·838	·071	53·9	61·5	48·8	12·7	51·1	·352	83	44·0	260	N.E. by N.	5·73	12	129·1
December ...	·838	·072	53·5	62·2	47·8	14·5	48·0	·286	70	41·0	302	N.E.	5·41	7	185·0
Year ...	22·819	0·068	56·3	64·7	51·1	13·6	51·7	0·340	74	45·0	333	N.N.E.	59·69	118	1,993·2
Number of years.	6–7	6–7	6 7	6–7	6–7	6–7	6	6	6	6	5–6	6	6–7	6–7	6

Appendix VII.

MEAN monthly and annual Meteorological Results at the Periyakulam Observatory in 1905.

Month.	Barometer.		Dry Bulb Thermometer.				Wet bulb.		Tension of vapour.	Relative humidity.	Sun Max. in Vac.	Min. on grass.	Wind.			Rain.		Clear sky.
	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	29·050	0·151	77·0	89·1	64·8	24·3	67·3	61·6	0·542	58	141·6	58·5	63·1	13	S.E. by S.	0·05	...	68
February .	·011	·169	80·6	93·9	67·5	26·3	69·2	63·7	·563	54	146·9	61·5	75·2	11	S.E. by E.	0·43	1	72
March	28·964	·163	83·6	97·7	70·6	27·2	71·0	66·4	·593	51	152·2	65·0	70·3	14	S.S.E.	1·21	3	73
April	·943	·141	82·8	95·7	73·3	22·4	73·6	70·7	·706	63	155·4	69·7	58·9	15	S. by E.	5·02	11	58
May	·866	·125	84·2	96·5	74·7	21·8	74·0	71·5	·706	61	153·6	70·8	74·5	19	S.W. by S.	5·84	6	55
June	·856	110	81·8	93·3	72·9	20·4	72·5	70·1	·673	62	151·1	68·9	95·2	19	S.W. by S.	1·82	6	44
July	·873	·117	82·2	95·4	71·1	24·4	70·9	67·3	·607	55	156·4	66·2	106·4	17	S. by W.	0·14	...	56
August	·877	·118	81·7	95·7	71·2	24·4	71·1	68·0	·609	57	159·3	66·5	85·4	20	S.W.	0·68	4	53
September ...	·887	·138	82·1	94·7	71·7	23·0	71·6	68·8	·639	58	156·8	67·0	75·1	13	S.E. by S.	3·12	5	52
October	·937	·132	80·1	89·9	71·4	18·5	72·6	69·3	·703	69	145·5	67·2	49·0	17	S. by W.	10·66	11	54
November	29·030	·130	77·7	87·0	70·6	16·4	71·0	68·3	·673	71	139·3	65·7	52·6	13	S.E. by S.	2·17	7	43
December ...	·016	·140	74·4	87·5	62·3	25·2	65·7	60·2	·520	60	138·1	54·7	51·7	14	S.S.E.	0·06	...	68
Annual ...	28·943	0·136	80·7	93·0	70·2	22·9	70·9	67·2	0·628	60	149·7	65·1	71·5	15	S. by E.	31·20	54	58

EXTREME monthly Meteorological Records at the Periyakulam Observatory in 1905.

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	29·226	1	28·892	25, 31	0·334	92·9	31	57·7	30	54·7	30	22	29	154·1	22	50·4	30	155·4	1	33·8	20	0·05	6
February ...	·158	27	·847	20	·311	97·1	26, 28	60·1	4	56·1	4	21	28	156·3	20	53·3	4	129·7	14	44·7	6	0·42	23
March	·181	5	·777	21	·404	101·1	14	60·5	5	57·0	6	20	1	158·9	30	53·2	5	130·0	31	44·7	14	0·78	20
April	·075	6	·761	1	·314	101·6	1	68·1	9	67·1	9	33	3, 4	164·8	2	65·9	9	130·8	18	31·0	13	1·77	9
May	·001	8	·701	19	·300	101·1	2	72·1	26	68·1	4	24	2	159·8	11	67·2	4	153·8	22	28·8	14	3·33	12
June	28·945	8,14	·740	28	·205	100·8	5	67·8	12	65·1	16	32	15	163·0	5	61·3	12	137·7	26	29·2	21	0·93	6
July	·965	10	·737	7	·228	99·5	24	65·7	7	61·2	7	29	25	164·2	16	59·3	7	157·9	1	41·7	20	0·07	11
August	29·008	6	·721	25	·287	98·9	9	66·8	4	63·7	11	29	7, 24	168·5	31	61·1	11	124·9	10	46·7	18	0·15	17
September ...	·024	17	·728	9	·296	99·1	29	67·1	28	64·2	28	23	28	168·3	26	60·7	28	128·2	12	47·6	16	1·14	14
October	·033	31	·787	17	·246	98·6	1	66·7	25	64·2	30	30	31	161·2	3	60·1	30	114·1	5	14·3	13	3·77	14
November ...	·143	8	·900	11	·243	92·7	2	62·4	6	59·9	6	37	6	151·4	2	55·0	6	84·9	18	19·3	16	0·52	24
December ...	·140	25	·876	9	·264	89·9	13	55·0	27	52·7	27	28	25, 28	152·9	15	46·0	27	94·2	2	25·8	7	0·05	8

Appendix VIII.

Abstract of the mean meteorological condition of Madras in the year 1905 compared with the average of past years.

Mean values of	1905.	Difference from	Average.
Reduced atmospheric pressure	29·875	0·011 above.	29·864
Temperature of air	82·2	1·1 „	81·1
Do. of evaporation	75·7	1·2 „	74·5
Percentage of humidity	73	1 „	72
Greatest solar heat in *vacuo*	137·1	2·6 below.	139·7
Maximum in shade	91·7	0·9 above.	90·8
Minimum in shade	75·3	0·6 „	74·7
Do. on grass	73·3	1·4 „	71·9
Rainfall since January 1st on 85 days	42·72	6·30 below.	49·02
General direction of wind	S.E.	Same as	S.E.
Daily velocity in miles	167	4 below.	171
Percentage of cloudy sky	45	4 „	49
Do. of bright sunshine	53·1	5·3 „	58·4

Duration and quantity of the wind from different points.

From	Hours.	Miles.	From	Hours.	Miles.	From	Hours.	Miles.	From	Hours.	Miles.
North ..	107	618	East ..	198	1,165	South ..	132	991	West. ..	226	2,310
N. by E. ..	177	1,114	E. by S. ..	384	2,001	S. by W...	262	1,805	W. by N...	230	2,215
N.N.E. ..	171	1,095	E.S.E. ..	316	1,677	S.S.W. ..	212	1,531	W.N.W. ..	139	1,326
N.E. by N...	418	2,745	S.E. by E.	519	3,318	S.W. by S.	215	1,412	N.W. by W.	126	994
N.E. ..	220	1,661	S.E. ..	381	2,720	S.W. ..	129	903	N.W. ..	48	281
N.E. by E.	299	1,837	S.E. by S.	1,272	10,954	S.W. by W.	204	1,390	N.W. by N.	55	238
E.N.E. ..	222	1,345	S.S.E. ..	451	3,439	W.S.W. ..	203	1,351	N.N.W. ..	122	631
E. by N. ..	316	1,696	S. by E. ..	284	2,148	W. by S...	364	2,958	N. by W...	204	1,033

There were 155 calm hours during the year. The resultant corresponding to the above numbers is represented by a S.E. by S. wind, blowing with a uniform daily velocity of 51 miles.

Appendix IX.

MADRAS OBSERVATORY.—Number of hours of wind from each point in the year 1905.

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	1	6	15	114	21	72	36	120	77	114	78	63	2	4	1	..	1	..	1	2	..	1	..	..	..	..	..	..	..	..	..	..	15
February	..	1	1	..	..	17	28	61	22	100	59	192	36	101	3	3	3	6	7	7	2	4	3	..	..	..	..	..	..	..	..	..	16
March	..	..	..	..	1	3	16	18	6	27	40	27	36	300	122	34	27	24	20	14	6	4	1	1	2	..	..	..	..	..	..	..	15
April	..	..	..	..	..	..	2	8	12	29	38	58	137	292	46	12	14	26	15	8	1	1	..	..	..	..	..	..	..	..	..	..	21
May	1	1	..	2	..	..	1	2	1	5	12	44	39	276	92	48	25	45	36	23	12	12	9	18	7	12	1	3	2	1	..	3	11
June	..	1	1	1	2	2	..	1	4	7	11	17	16	51	29	50	10	36	39	47	19	56	32	104	61	54	25	16	10	5	10	1	2
July	3	3	2	..	..	1	..	2	2	7	4	27	27	53	36	41	13	25	19	25	21	28	51	104	79	82	42	20	3	4	7	8	5
August	2	..	1	..	3	..	2	2	1	9	7	27	39	72	44	45	14	55	32	37	23	46	39	62	30	52	32	48	5	3	1	1	10
September	..	2	2	2	..	2	..	6	2	12	27	18	17	93	70	47	22	41	33	41	39	34	44	58	33	24	21	18	4	5	1	2	..
October	14	9	15	27	25	32	43	45	42	35	23	26	19	26	4	3	3	4	9	11	6	18	24	16	13	4	18	17	20	16	50	79	48
November	30	52	66	119	99	106	75	27	22	27	5	4	1	..	1	1	..	..	1	..	..	.	..	1	1	2	..	2	3	3	20	50	2
December	56	102	68	153	69	64	19	24	7	12	12	16	12	4	3	..	..	..	..	..	..	..	..	..	..	..	..	1	1	18	33	60	10
Annual ..	107	177	171	418	220	299	222	316	198	384	316	519	381	1272	451	284	132	262	212	215	129	204	203	364	226	230	139	125	48	55	122	204	155

Appendix X.

Madras Observatory.—Number of miles of wind from each point in the year 1905.

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	9	73	117	776	164	401	225	496	397	517	372	310	11	27	7	..	3	..	4	9	..	4	..	..	..	..	..	..	..	..	..	..	3922
February	..	3	6	..	..	118	161	423	192	535	342	1016	190	760	10	20	12	36	42	55	6	28	7	..	..	..	..	..	..	..	..	..	2962
March	..	..	..	..	15	20	74	76	53	129	197	211	324	2841	976	310	233	222	161	78	58	31	4	4	11	..	..	..	..	..	..	..	6028
April	..	..	..	..	..	..	18	71	97	149	233	474	911	2317	341	101	107	139	98	51	5	5	..	..	..	..	..	.	..	..	..	..	5117
May	11	11	..	17	..	..	13	24	9	58	90	394	395	2428	752	408	185	342	309	174	109	102	46	115	69	74	8	29	13	5	..	46	6236
June	..	6	10	10	15	12	..	8	39	47	77	138	136	531	258	389	83	298	297	346	132	417	281	1071	722	558	274	141	83	19	56	2	6486
July	16	21	12	..	..	3	..	11	12	28	22	230	220	471	294	314	98	163	115	170	130	195	373	857	880	940	515	196	23	17	35	38	6402
August	13	..	10	..	20	..	22	11	9	82	65	229	269	582	321	518	100	334	210	213	161	278	215	341	207	404	258	396	24	17	10	2	5111
September	..	18	11	9	..	16	..	42	12	99	155	131	117	762	437	266	157	249	251	274	283	241	312	493	365	188	199	165	38	47	6	10	5353
October	68	54	55	85	134	150	250	277	168	192	77	123	98	207	26	17	13	22	41	42	29	89	113	76	52	15	69	58	87	58	281	342	3368
November	118	309	455	902	851	736	442	167	134	116	16	23	1	..	6	5	..	..	3	..	..	..	..	1	4	6	..	6	11	14	84	221	4631
December	383	619	419	946	462	381	140	90	43	49	31	39	48	28	11	..	..	..	..	.	..	..	..	..	..	..	..	3	2	61	159	372	4286
Annual ..	618	1114	1095	2745	1661	1837	1345	1696	1165	2001	1677	3318	2720	10954	3439	2148	991	1805	1531	1412	903	1390	1351	2958	2310	2215	1326	994	281	238	631	1033	60902

Appendix XI.

MADRAS OBSERVATORY.—Number of inches of rain from each point in the year 1905.

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	..	0·08	0·24	0·78	..	0·34	0·48	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
February	..	..	..	..	..	..	..	0·18	..	..	..	0·07	0·06	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
March	..	..	..	..	..	..	..	..	..	..	..	..	..	..	0·16	..	..	0·18	..	..	0·44	0·01	..	0·16	..	..	..	..	..	..	..	..	..
April	..	..	..	..	..	..	..	..	0·04	..	0·05	..	0·25	0·22	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
May	..	..	..	..	..	..	..	..	..	..	..	..	..	..	0·03	0·02	..	..	..	..	0·01	..	..	..	..	..	..	..	..	..	..	..	..
June	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	0·06	..	0·04	0·01	0·08	0·05	..	0·13	0·14	0·07	0·09	0·09	0·10	0·07	..	0·05	..
July	0·41	..	..	..	..	0·01	..	..	..	..	..	..	0·06	0·09	0·11	..	0·14	0·03	0·03	0·04	..	0·26	0·06	0·14	0·40	0·06	0·05	0·21	..	..	0·04	0·17	..
August	..	..	..	..	..	..	..	..	..	..	..	..	..	0·02	0·68	..	0·05	0·19	0·01	0·12	..	0·07	0·15	0·02	0·19	0·53	0·41	..	..	..	..	0·08	..
September	..	..		..	..	..	..	..	0·0[illegible]	0·05	0·89	0·67	0·01	..	0·01	0·05	..	0·01	0·08	0·03	0·43	0·06	..	..	..	0·19	0·02	..	..	..	..	0·23	..
October	0·01	0·32	0·41	0·78	0·51	0·68	0·26	1·42	0·23	0·35	0·16	0·05	..	..	..	..	..	..	0·76	0·95	..	0·45	0·03	0·67	..	0·08	0·04	0·03	0·03	1·70	5·05	4·53	0·15
November	0·90	0·78	0·29	1·21	0·13	1·75	1·20	0·18	0·92	0·49	0·22	0·20	..	..	..	0·27	..	..	0·31	..	..	..	..	..	0·67	..	..	0·06	..	..	0·65	0·76	..
December	0·17	0·03	0·03	..	..	..	..	0·01	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	0·11	..	0·05	..
Annual ..	1·49	1·21	0·97	2·77	0·64	2·78	1·94	1·79	1·23	0·89	1·32	0·99	0·38	0·33	0·39	0·34	0·25	0·41	1·23	1·15	0·96	0·90	0·24	1·12	1·40	0·93	0·61	0·39	0·13	1·88	5·74	5·87	0·15

Appendix XII.

Madras Observatory.—Wind, cloud and bright sunshine.

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.	
January	106	E. by N.	2·1	3·2	2·5	1·3	2·3	7·4	9·3
February	121	E.S.E.	3·2	4·3	1·9	1·8	2·8	8·5	9·8
March	174	S.E. by S.	3·8	4·2	2·9	2·2	3·3	7·3	10·1
April	151	S.E. by S.	5·1	4·6	4·3	3·0	4·3	7·7	10·8
May	169	S.S.E.	4·6	3·5	3·9	3·0	3·8	6·8	10·6
June	128	S.W. by W.	4·9	4·4	6·3	5·5	5·3	5·4	8·2
July	117	S.W. by W.	5·2	4·5	6·8	7·2	5·9	5·6	8·0
August	81	S.W. by S.	5·8	5·7	6·4	5·0	5·8	5·0	10·0
September	96	S.S.W	5·8	5·2	6·3	5·6	5·7	5·0	9·6
October	33	N.E.	5·5	5·4	5·8	4·4	5·3	5·8	10·2
November	136	N.E.	5·7	6·2	5·7	5·4	5·8	5·4	9·
December	118	N.N.E.	3·5	3·9	3·4	2·1	3·2	7·2	8·6
Annual ..	51	S.E. by S.	4·6	4 6	4·7	3·9	4·5	6·4	..

Appendix XIII.

MEAN monthly and annual Meteorological results at the Madras Observatory in 1905.

	Barometer.		Dry bulb thermometer.				Wet bulb.		Tension of vapour.	Relative humidity.	Sun Max. in vac.	Min. on grass.	Wind.			Rain.		Cloudy sky.	Bright sunshine.	Dew point.
—	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	30·013	0·119	74·3	83·2	65 2	18·0	68·8	..	0·635	75	133·1	62·1	127	7	E. by N.	1·92	3	23	228·9	64·6
February	29·964	·135	78·5	87·2	70·0	17·2	72·4	..	·716	73	137·8	67·3	141	10	E.S.E.	0·31	2	28	238·4	68·2
March	·893	140	82·2	90·4	75·2	15·2	75·8	..	·807	73	139·8	73·3	194	13	S.E. by S.	0·85	3	33	227·6	71·5
April	·870	123	84·8	91·6	77·7	13·9	77·9	..	·877	76	139·1	76·1	171	13	S.E. by S.	0·56	2	43	231·6	74·0
May	·751	·111	86 7	96·8	80·4	16·4	79·2	..	·896	70	139·2	79·1	201	15	S. by E.	0·06	1	38	211·6	74·4
June	·703	·126	88·6	102 4	82·1	20 3	78·3	..	·832	62	144·3	80·6	216	20	S.W.	0·98	7	53	161·7	71·8
July	·725	·123	87·3	100·3	80·2	20·1	77·8	..	·825	64	138·2	78·7	207	20	S.W.	2·31	15	59	172·8	71·7
August	·746	·124	84·4	95·4	77·8	17 6	77·3	..	·843	72	136·9	76·5	165	19	S.W. by S.	1·92	11	58	154·2	72·6
September	·765	·122	85·3	95·3	79 1	16·2	78·6	75·5	·889	74	139·3	77·8	178	18	S.S.W.	2·77	8	57	150·7	74·2
October	·845	·122	80·9	88·6	74·9	13·7	77·2	74·0	·889	84	133·1	73·0	109	4	N E.	19·65	15	53	180·5	74·7
November	·984	·106	79·4	85·8	73 7	12·1	75·1	72·3	·817	81	133·2	71·7	154	4	N.E.	10·99	16	58	160·5	72·1
December	·981	·121	74·8	83 5	67·2	16·3	69·7	65·9	·662	76	131·3	63·4	138	4	N.E.	0·40	2	32	223·9	66·0
Annual ..	29·853	·123	82 2	91·7	75·3	16 4	75·7	..	0·807	73	137·1	73·3	167	12	S.E.	42·72	85	45	2342·4	71·3

EXTREME monthly Meteorological records at the Madras Observatory in 1905.

	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	30·230	1	29·871	30	0·359	87·2	24	57·4	29	..	..	36	28	140·8	27	52·8	29	243	1	71	13	1·52	7
February	·096	3	·805	7	·291	91·3	27	62·0	1	..	..	50	2	149·7	28	58·4	1	178	7, 28	97	1	0·18	13
March	·140	4, 5	·663	21	·477	96·9	31	68·8	6	..	..	53	1, 3	150·0	9	65·8	6	327	21	110	7	0·45	30
April	29·995	6	·721	21	274	94·7	29	75·3	25	..	..	55	1, 2	149·7	13	73·6	5	221	27	102	1	0·47	18
May	·919	7	·548	21, 22	·371	107·9	29	76·1	4	..	..	37	28	144·9	23	74·1	4	319	30	107	13	0·06	13
June	·820	14	·535	20	·275	108·2	2	77·2	17	..	..	34	1	149·8	14, 15	76·0	1, 17	299	19	172	26	0·39	16
July	·834	2	·597	21	·237	104·9	3	75·3	11	..	..	24	24	148·3	24	72·6	11	286	24	138	31	0·61	29
August	·879	6	·608	18	·271	101·2	21	72·7	2	..	..	41	4	151·3	21	71·3	2	225	10	104	3	0·60	29
September	·937	17	·582	6	·355	101·8	26	74·8	2	73·0	7, 8	37	8	152·1	26	73·2	2	245	9	96	12	1·55	1
October	30·020	5	·699	17	·321	93·7	28	66·7	28	65·9	28	35	27	145·2	17	62·2	28	193	13	70	6	4·71	16
November	·093	8	·862	4	·231	89·5	2	67·9	5	67·2	5	52	5	140·8	8	63·8	5	257	30	69	10	2·97	9
December	·116	25	·851	9	·265	86·2	12	59·2	10	58·0	10	48	9, 10	135·9	6	54·9	9, 10	248	1	65	28, 29	0·29	13

Appendix XIV.

MADRAS OBSERVATORY.—Abnormals from monthly means for the year 1905.

Abnormals of	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
Reduced atmospheric pressure	+ 0·016	Same as	− 0·012	+ 0·046	+ 0·017	Same as	+ 0·004	− 0·003	− 0·033	+ 0·003	+ 0·061	+ 0·003	+ 0·011
Temperature of air	− 0·8	+ 1·8	+ 2·2	− 0·2	Same as	+ 2·2	+ 2·8	+ 1·1	+ 2·3	+ 0·3	+ 1·9	− 0·7	+ 1·1
Do. of evaporation	− 0·4	+ 1·6	+ 1·9	+ 0·3	+ 0·9	+ 1·7	+ 1·9	+ 1·3	+ 2·3	+ 1·6	+ 2·2	− 0·9	+ 1·2
Percentage of humidity	+ 2	Same as	− 1	+ 2	+ 3	Same as	− 1	+ 2	+ 2	+ 6	+ 2	− 1	+ 1
Greatest solar heat in vacuo	− 5·3	− 1·9	− 0·7	− 2·6	− 3·8	+ 3·8	− 0·5	− 3·1	− 2·0	− 6·0	− 4·2	− 4·5	− 2·6
Maximum in shade	− 1·4	+ 0·6	+ 1·2	− 1·3	− 1·0	+ 4·1	+ 4·7	+ 1·7	+ 2·1	− 0·4	+ 0·8	− 0·1	+ 0·9
Minimum in shade	− 2·3	+ 2·0	+ 3·1	+ 0·5	− 0·4	+ 1·8	+ 1·7	+ 0·5	+ 2·0	− 0·3	+ 1·4	− 2·6	+ 0·6
Do. on grass	− 1·0	+ 3·5	+ 4·5	+ 1·4	+ 0·2	+ 2·0	+ 2·1	+ 1·1	+ 2·8	+ 0·2	+ 2·2	− 3·0	+ 1·4
Rainfall in inches	+ 1·03	+ 0·03	+ 0·46	− 0·06	− 2·06	− 1·13	− 1·56	− 2·64	− 1·92	+ 8·65	− 2·22	− 4·88	− 4·88
Do. since January	..	+ 1·06	+ 1·52	+ 1·46	− 0·60	− 1·73	− 3·29	− 5·93	− 7·85	+ 0·80	− 1·42	− 6·30	− 6·30
General direction of wind	2 points E.	2 points S	1 point S.	Same as	Same as	1 point W.	Same as	Same as	Same as	3 points N.	2 points E.	2 points F.	Same as
Daily velocity in miles	− 17	+ 19	+ 42	− 20	− 26	− 4	+ 9	− 9	+ 22	− 14	− 11	− 45	− 4
Percentage of cloudy sky	− 14	+ 4	+ 9	+ 15	Same as	− 11	− 12	− 9	− 5	− 6	− 1	− 20	− 4
Do. of bright sunshine	− 9·3	− 9·3	− 17·7	− 10·3	− 13·6	− 4·6	+ 11·2	− 1·2	− 2·6	− 2·7	− 5·4	+ 6·7	− 5·3

+ means *above* normal, − *below*.