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[Despatch Abstract.

MADRAS OBSERVATORY.

Recording letter from the Government Astronomer forwarding three copies of the Administration report of the---for 1894; and forwarding a copy of the Proceedings to the Government of India.

Govt. of {1895} Madras.

PUBLIC.

Issued

Recd. *Encl.*

G.O., &c., 8th June 1895,
Nos. 457, 458.

JUNE.

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GOVERNMENT OF MADRAS.

PUBLIC DEPARTMENT.

READ—the following papers:—

From the Government Astronomer, dated 13th May 1895, No. 112.

ABSTRACT.—Forwarding three copies of the annual administration report of the Madras Observatory.

ENCLOSURE.

ADMINISTRATION REPORT OF THE MADRAS OBSERVATORY FOR THE YEAR 1894.

Buildings and Instruments.—The buildings were put into a thorough state of repair towards the close of the year and are now in good condition with the exception of the small dome, which is worn out, and the transit shutter which, owing to faulty construction, never remains water-tight for more than a few weeks at a time. The instruments have been maintained in good order throughout the year. A 6-inch equatoreal telescope by Messrs. Cooke and Sons fitted, with a powerful spectroscope, was received from Poona at the beginning of the year. It is intended for use at the Kodaikánal Solar Physics Observatory, but it was considered advisable to unpack it and to set it up so that it might be properly examined. This has been done so far as possible, but it was found to be too large to be completely put together in the only room available for it.

2. *Time Service.*—The time service has been maintained as in former years. The time-gun at Fort St. George was fired correctly on 709 occasions, giving a percentage of success of 97·1. The semaphore at the Port office was not dropped from April 13 to April 19 as the mast which carries it was being shifted from the old to the new Port Office. It was dropped on every other day of the year, and on only two occasions did it fail at 1 P.M. The 4 P.M. time-roll which is transmitted all over India failed on three occasions.

The following table shows all the failures and the reason for them so far as can be ascertained:—

Date.		Signal.	Fault.	Cause.
1894.				
January	8.	8 P.M. gun	Failed	Tube broke.
	24.	Noon gun	Do.	Do.
February	6.	4 P.M. roll	Do.	Pegs wrongly placed.
	18.	8 P.M. gun	Do.	Tube broke.
March	2.	Semaphore	Failed 1 P.M., dropped 2 P.M.	Unknown.
	13	4 P.M. roll	Failed	Do.
	14.	8 P.M. gun	Do.	Lanyard broke.
	31.	Do.	Do.	Telegraph line broken.

Date.		Signal.	Fault.	Cause.
1894.				
April	1.	8 P.M. gun	Failed	Tube bad
	7.	Noon gun	Do.	Tube broke.
	13–19.	Semaphore	Not dropped	Semaphore being shifted to new office.
	17.	Noon gun	Failed	Broken telegraph line in contact with gun line.
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	19.	Do.	Do.	Unknown.
July	3.	4 P.M. roll	Do.	Do.
	25.	8 P.M. gun	Fired 15 minutes too soon ..	Firing weight broke from holder.
	29.	Semaphore	Failed 1 P.M., dropped 2 P.M	Line broken.
August	2.	8 P.M. gun	Failed	Tube broke.
September	28.	Noon gun	Do.	Do.
October	1.	Do.	Do.	Do.
	3.	Do.	Do.	Do.
	4.	8 P.M gun	Do.	Missed fire.
	5.	Noon gun	Do.	Do.
	6.	Do.	Do.	Tube bad.
	8.	Do.	Do.	Missed fire. Tube slipped out of vent.
November	10.	8 P.M. gun	Do.	Tube broke.
	13.	Do.	Do.	Gunner late.

This table shows that, as regards the failures in the gun, only one can be ascribed to any fault at the Observatory, two were due to faults in the telegraph line, while at least fourteen were due either to bad friction tubes or careless fixing of the tubes in the gun. This number of failures is far in excess of what might reasonably be expected and is largely due to the use of old or inferior friction tubes. The six failures between October 1 and October 8 were ascribed by the Officer Commanding Royal Artillery, Fort St. George, to bad tubes, but it is at least an unfortunate coincidence that at the beginning of that month the gunner in charge of the time gun had been changed without communicating with the Government Astronomer or giving him any opportunity of instructing the new gunner in his duties. During the year steps were taken towards the introduction of a scheme for sending time signals daily along both the lines of railway leading from Madras. It is proposed that the signals so sent shall be made available for the use of towns near the line of railway as well as for setting the clocks at the stations on the lines. The scheme was originally started in compliance with a request made by the Station Staff Officer in Bangalore that the Government Astronomer would undertake to fire the daily time gun there. Unfortunately, after all arrangements had been made, the military authorities intimated that they were satisfied with the existing system and the inhabitants of Bangalore have to put up with a so-called *time* gun which is fired at any time within five or ten minutes of the true time.

3. *Observations.*—Observations have again been sacrificed to reduction and publication of old observations. Observations were, however, made of the two solar eclipses of April 6 and September 29 and the results were communicated to the Royal Astronomical Society. The variable star Z Herculis was observed on five nights and the results were communicated to the *Astronomische Nachrichten.* A large number of readings of the meridian circle have also been taken for the determination of the errors of graduation. These errors have never been determined and it is impossible to complete the reduction of the Meridian Circle Observations till this has been done.

4. *Reduction and publication of old observations.*—Volume VII. of the Madras Meridian Circle Observations was completed and issued during the year, and volume VIII. was completed and copies were received from the Press a few days before the close of the year. The revision of the volumes already published for the errors arising from the causes explained in last report was also completed and the *errata* were printed and ready for distribution along with volume VIII. Considerable progress was also made with the reduction of the observations of circumpolar stars (amounting to nearly 3,000) for the determination of the latitude of the Observatory. Tables of the mean daily meteorological results for the wet and dry bulb, the dry maximum and minimum, the solar maximum, and the grass minimum thermometers, for the amount of humidity and cloud and for the wind direction and velocity were prepared and printed.

5. *The Library.*—During the year 254 volumes and pamphlets were presented to the library. This includes a valuable contribution of 67 volumes from the library of Great Trigonometrical Survey at Dehra Dun.

6. *Meteorological.*—The meteorological registers were maintained as in former years and the chief features of the year's meteorology are shown in the appended tables and diagram.

The mean barometer was above the normal in February, November, and December, and below the normal during the rest of the year. The highest reading (reduced daily mean) was 30·120 on December 23, and the lowest 29·510 on May 31.

The temperature of the air was normal in April, below normal in August, September, and November and above normal during the rest of the year. The greatest excess was 1°·5 in May. The two hottest days of the year were May 31 and June 1, on both of which temperatures above 109° were registered. The lowest temperature recorded was 60°·6 on January 31.

The percentage of humidity was above the normal in every month of the year except July when it was normal. The driest day was June 13 with only 31 per cent. of saturation.

The rainfall was above normal in February, April, August, September, and October, and below during the rest of the year. The most remarkable features were the great excess (8·68 inches) in August and the defect (4·66) in December. The monsoon rainfall from October 15 to December 31 was 21·14 inches against an average of 27·6 inches, but the fall for the whole year was in defect by only 1·24 inches. The heaviest fall in any day was 3·58 inches on November 4. On September 7, 2 inches of rain fell in 25 minutes.

The general direction of the wind differed little from the normal except in September when it was two points more westerly than usual. The daily velocity was below normal in all months except July, the defect being greatest in January, August, and December. The highest wind velocity for any day was only 295 miles (November 23).

The amount of cloud was above average in January, February, March, April, and August and below during the rest of the year.

There were 2,616 hours of bright sunshine during the year.

MADRAS,
13*th May* 1894.

(Signed) C. MICHIE SMITH,
Government Astronomer.

[Statement.

APPENDIX I.

Mean Monthly and Annual Meteorological Results at the Madras Observatory in 1894.

Month.	Barometer. Reduced to 32° F.	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.		Rain. Amount.	Rain. Days.	Clear Sky.	Bright Sunshine.	Remarks.
	INCHES.	INCHES.	°	°	°	°	°	°	INCHES.	CENTS.	°	°	MILES.	POINTS.	POINTS.	INCHES.	NO.	CENTS.	HOURS.	
January ..	29·977	0·106	75·4	85·1	66·7	18·4	70·2	..	0·671	76	139·8	63·2	112	4	N. E.	0·39	1	62	8·0	
February ..	·979	·114	77·3	86·7	68·1	18·6	72·2	..	·725	77	140·3	65·2	114	7	E. by N.	1·14	2	72	9·7	
March ..	·883	·125	81·4	90·9	73·0	17·9	75·7	..	·812	76	148·4	70·2	149	12	S. E.	..	..	75	8·9	
April	·799	·123	84·2	93·6	77·3	16·3	78·2	..	·883	76	143·9	75·7	180	13	S. E. by S.	0·86	5	63	9·0	April 18 thunder-storm with hail 9 P.M. to mid-night.
May	·724	·129	88·5	101·1	81·7	19·4	80·0	..	·911	68	147·9	80·6	209	15	S. by E.	0·00	..	75	9·9	
June	·681	·122	87·8	101·1	81·5	19·6	78·4	..	·845	65	144·0	80·0	218	18	S. S. W.	1·54	8	39	5·9	
July	·719	·115	86·1	97·3	79·4	17·9	77·0	..	·806	65	141·3	78·4	202	19	S. W. by S.	1·89	10	34	5·1	
August ..	·713	·111	82·2	92·3	76·0	16·3	77·1	..	·865	79	137·2	74·9	146	19	S. W. by S.	13·24	21	80	4·9	
September ..	·751	·124	82·1	90·8	76·1	14·7	77·1	..	·864	79	139·1	74·6	137	20	S. W.	6·41	13	39	5·0	
October ..	·817	·119	81·5	89·8	75·5	14·4	76·8	..	·859	80	142·3	73·9	106	12	S. E.	11·18	14	47	6·6	
November ..	·955	·105	77·5	84·7	72·0	12·7	73·5	..	·773	82	138·3	70·3	161	3	N. E. by N.	10·50	19	43	5·9	
December ..	·991	·107	76·4	84·6	70·0	14·6	71·7	..	·717	78	144·0	66·5	158	2	N. N. E.	0·63	6	58	7·5	
Annual ..	29·832	0·118	81·7	91·5	74·8	16·7	75·7	..	0·811	75	141·8	72·8	158	12	S. E.	47·78	99	53	7·2	

Extreme Monthly Meteorological Records at the Madras Observatory in 1894.

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.		CENTS.	DAY.	°	DAY.	°	DAY.	MILES.	DAY.	MILES.	DAY.	INCHES.	DAY.
January ..	30·091	22	29·871	4	0·220	91·2	30	60·6	31	Not recorded.	33	30	147·2	28	56·5	31	209	18	32	28	0·39	12
February ..	30·093	12	29·817	24	·276	89·2	22	62·5	17		53	16	150·3	21	58·6	17	175	3	55	17	1·12	3
March ..	30·040	14	29·704	5	·336	98·3	25	68·4	1		48	26	148·7	16	61·9	21	232	6	95	30	..	..
April	29·960	6	29·581	29	·379	103·6	29	73·5	20		42	30	152·2	8	72·0	20	276	18	119	15	0·48	10
May	29·851	4	29·510	31	·341	109·4	31	77·1	2		37	1	153·9	23	74·6	1	270	25	138	2	..	..
June	29·793	9	29·544	1	·249	109·7	1	78·3	11		31	13	155·6	2	76·2	12	262	15	147	6	1·19	6
July	29·818	31	29·578	19	·240	104·2	1	73·3	17		41	24	155·7	1	72·0	17	280	22	124	11	0·66	26
August ..	29·837	27	29·565	7	·272	97·1	4	70·8	28		53	19	153·4	25	71·2	28	211	14	80	26	2·19	30
September ..	29·887	12	29·629	9	·258	96·0	30	72·2	4		47	28	158·4	6	71·0	4	215	28	85	1	2·89	7
October ..	29·936	29	29·711	1	·225	96·8	7	70·5	31		41	1	155·6	7	70·8	31	193	1	53	29	3·01	20
November ..	30·108	17	29·718	2	·290	88·0	9	66·1	2		59	2	150·2	6	63·9	2	295	23	43	4	3·68	10
December ..	30·130	23	29·811	12	·309	87·1	15	64·7	31		53	30	150·9	11	59·3	30	264	23	74	14	0·40	19

APPENDIX II.

Madras Observatory Meteorological Observations.—Abnormals for monthly Means.

1894	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
1	2	3	4	5	6	7	8	9	10	11	12	13	14
Reduced atmospheric pressure	— 0·018	+ 0·015	— 0·026	— 0·027	— 0·009	— 0·021	— 0·005	— 0·034	— 0·022	— 0·023	+ 0·038	+ 0·012	— 0·011
Temperature of air	+ 0·5	+ 0·7	+ 1·2	..	+ 1·5	+ 1·1	+ 1·3	— 1·0	— 1·1	+ 0·7	— 0·1	+ 0·9	+ 0·5
Do. of evaporation	+ 1·1	+ 1·6	+ 1·8	+ 0·7	+ 1·6	+ 1·7	+ 1·1	+ 1·0	+ 0·9	+ 1·2	+ 0·7	+ 1·2	+ 1·3
Percentage of humidity	+ 3	+ 4	+ 3	+ 3	+ 1	+ 3	..	+ 9	+ 7	+ 2	+ 3	+ 1	+ 3
Greatest solar heat in vacuo	+ 1·7	+ 0·8	+ 2·9	+ 2·2	+ 5·4	+ 4·2	+ 4·4	— 2·1	— 1·2	+ 5·8	+ 4·8	+ 10·4	+ 3·3
Maximum in shade	+ 1·7	+ 0·8	+ 1·8	+ 0·9	+ 3·4	+ 3·1	+ 1·7	— 1·2	— 2·0	+ 1·1	+ 0·2	+ 1·9	+ 1·1
Minimum do.	— 1·0	— 0·1	+ 0·7	..	+ 0·8	+ 0·9	+ 0·7	— 1·4	— 1·1	+ 0·1	— 0·4	— 0·1	— 0·1
Do. grass	+ 0·1	+ 1·4	+ 1·6	+ 1·4	+ 1·7	+ 1·4	+ 1·7	— 0·4	— 0·3	+ 1·0	+ 0·7	+ 0·1	+ 0·9
Rainfall in inches	— 0·50	+ 0·36	— 0·39	+ 0·24	— 2·11	— 0·57	— 1·98	+ 8·68	+ 1·72	+ 0·18	— 2·71	— 4·66	— 1·24
Do. since January 1st	..	— 0·36	— 0·03	+ 0·21	— 1·91	— 2·48	— 4·46	+ 4·22	+ 5·94	+ 6·12	+ 3·41	— 1·24	..
General direction of wind	1-N.	1-N.	..	..	..	1-S.	1-S.	..	2-W.	..	1-N.	..	..
Daily velocity in miles	— 33	— 9	— 2	— 6	— 5	— 2	+ 4	— 28	— 19	— 13	— 1	— 22	— 12
Percentage of clear sky	— 1	— 4	— 2	— 9	+ 13	+ 3	+ 5	— 3	+ 2	+ 5	+ 2	+ 10	+ 2
Do. of bright sunshine	— 7	— 3	— 7	— 5	+ 8	— 9	+ 5	— 3	— 4	+ 1	— 4	+ 2	— 2

+ means *above* and — *below* the average.

From the Acting Government Astronomer, dated 30th May 1895, No. 125.

ORDER—dated 8th June 1895, No. 457, Public.

Recorded.

(True Extract.)

Chief Secretary.

To the Government Astronomer.
Editors' Table.

ENDORSEMENT—dated 8th June 1895, No. 458, Public.

Copy to the Government of India, Revenue and Agricultural Department.

J. F. PRICE,
Chief Secretary.

Exd. A. Baitt.

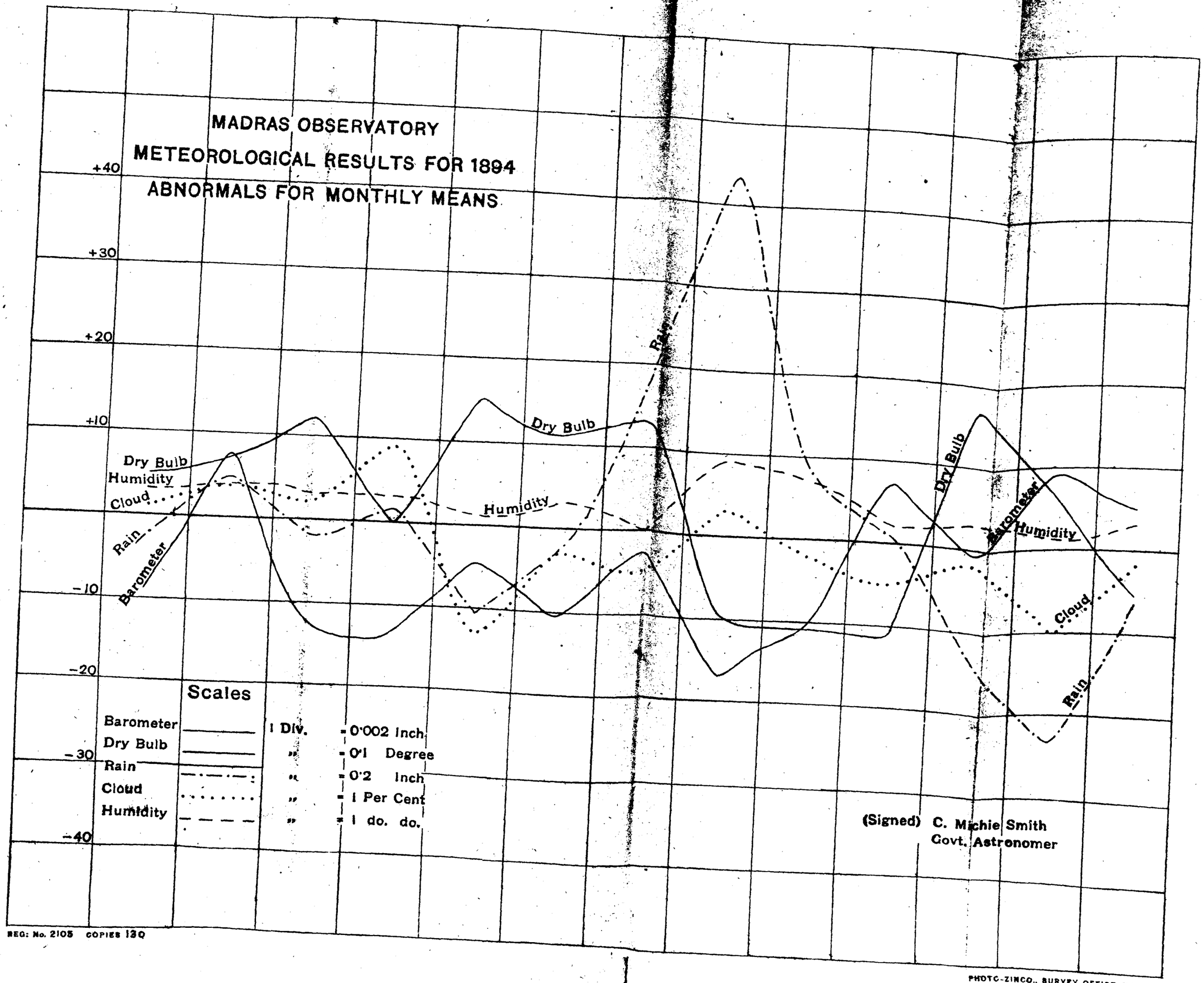

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PHOTO-ZINCO., SURVEY OFFICE, MADRAS.

1895

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C. Michie Smith
Government Astronomer.

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	Inches.	Inches.	°	°	°	°	°	°	Inches.	Cents.	°	°	Miles.	Points.	Inches.	No.	Cents.	Hours.	
January	29·977	0·106	75·4	85·1	66·7	18·4	70·2		0·671	76	139·8	63·2	112	N. E.	0·39	1	62	8·0	
February	·979	·114	77·3	86·7	68·1	18·6	72·2		·725	77	140·3	65·2	114	E. by N.	1·14	2	72	9·7	
March	·883	·125	81·4	90·9	73·0	17·9	75·7		·812	76	143·4	70·2	149	S. E.	..	..	75	8·9	
April	·799	·133	84·2	93·6	77·8	16·3	78·2		·983	76	143·9	75·7	180	S. E. by S.	0·86	5	68	9·0	
May	·734	·129	88·5	101·1	81·7	19·4	80·0		·911	68	147·9	80·6	209	S. by E.	0·00	..	75	9·9	April 18 thunder-storm with hail 9 P.M. to mid-night.
June	·661	·122	87·8	101·1	81·5	19·6	78·4		·846	65	144·0	80·0	218	S. S. W.	1·54	8	39	5·9	
July	·719	·116	86·1	97·3	79·4	17·9	77·0		·806	65	141·3	78·4	202	S. W. by S.	1·89	10	34	5·1	
August	·713	·111	82·2	92·3	76·0	16·3	77·1		·865	79	137·2	74·9	146	S. W. by S.	13·24	21	80	4·9	
September	·751	·124	82·1	90·8	76·1	14·7	77·1		·864	79	139·1	74·6	137	S. W.	6·41	13	39	5·0	
October	·817	·119	81·5	89·8	75·5	14·4	76·8		·859	80	142·3	73·9	106	S. E.	11·18	14	47	6·6	
November	·955	·106	77·5	84·7	72·0	12·7	73·5		·773	82	138·3	70·3	161	N. E. by N.	10·50	19	43	5·9	
December	·991	·107	76·4	84·6	70·0	14·6	71·7		·717	78	144·0	66·5	158	N. N. E.	0·63	6	58	7·5	
Annual	29·832	0·118	81·7	91·5	74·8	16·7	75·7	..	0·811	76	141·8	72·8	158	S. E.	47·78	99	58	7·2	

Extreme Monthly Meteorological Records at the Madras Observatory in 1894.

Month.	Barometer. Highest.		Barometer. Lowest.		Barometer. Range.	Dry Bulb Thermometer. Highest.		Dry Bulb Thermometer. Lowest.		Dry Bulb Thermometer. Range.	Wet Bulb. Lowest.		Sun Th. in Vacuo. Highest.		Grass Therm. Lowest.		Wind. Highest.		Wind. Lowest.		Rain. Greatest Fall.	
	Inches.	Day.	Inches.	Day.	Inches.	°	Day.	°	Day.	°	Cents.	Day.	°	Day.	°	Day.	Miles.	Day.	Miles.	Day.	Inches.	Day.
January	30·091	22	29·871	4	0·220	91·2	30	60·6	31	30·6	Not recorded.		147·2	28	56·5	31	209	18	32	28	0·39	12
February	30·093	12	29·817	24	·276	89·2	22	62·5	17	26·7			150·3	21	58·6	17	175	3	·55	17	1·12	8
March	30·040	14	29·704	5	·336	98·3	25	68·4	1	29·9			148·7	16	61·9	21	232	6	95	30	..	..
April	29·960	6	29·681	29	·279	103·6	29	78·5	20	25·1			152·2	8	72·0	20	276	18	119	15	0·48	10
May	29·851	4	29·510	31	·341	109·4	31	77·1	1	32·3			153·0	23	74·6	1	270	25	138	2	..	..
June	29·798	9	29·544	1	·249	109·7	1	78·3	12	31·4			155·6	2	76·2	12	262	15	147	6	1·19	6
July	29·818	31	29·578	19	·240	104·2	1	73·3	17	30·9			155·7	1	72·0	17	280	22	124	11	0·66	26
August	29·837	27	29·565	7	·272	97·1	4	70·8	28	26·3			153·4	25	71·2	28	211	14	80	26	2·19	30
September	29·887	12	29·629	9	·258	96·0	30	72·2	4	23·8			158·4	6	71·0	4	215	28	85	1	2·69	7
October	29·936	29	29·711	1	·225	96·8	7	70·5	31	26·3			155·6	7	70·8	31	193	1	63	29	3·01	20
November	30·108	17	29·713	3	·390	88·0	9	66·1	2	21·9			150·2	6	68·9	2	295	23	43	4	3·68	10
December	30·120	23	29·811	12	·309	87·1	15	64·7	31	22·4			150·9	11	69·3	30	264	23	74	14	0·40	19

APPENDIX II.

Madras Observatory Meteorological Observations.—Abnormals for monthly Means.

1894	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
1	2	3	4	5	6	7	8	9	10	11	12	13	14
Reduced atmospheric pressure	— 0·018	+ 0·015	— 0·026	— 0·027	— 0·009	— 0·021	— 0·005	— 0·034	— 0·022	— 0·028	+ 0·033	+ 0·012	— 0·011
Temperature of air	+ 0·5	+ 0·7	+ 1·2	..	+ 1·5	+ 1·1	+ 1·3	— 1·0	— 1·1	+ 0·7	— 0·1	+ 0·9	+ 0·5
Do. of evaporation	+ 1·1	+ 1·6	+ 1·8	+ 0·7	+ 1·6	+ 1·7	+ 1·1	+ 1·0	+ 0·9	+ 1·2	+ 0·7	+ 1·2	+ 1·3
Percentage of humidity	+ 3	+ 4	+ 3	+ 3	+ 1	+ 3	..	+ 9	+ 7	+ 2	+ 3	+ 1	+ 3
Greatest solar heat in vacuo	+ 1·7	+ 0·8	+ 2·9	+ 2·2	+ 5·4	+ 4·2	+ 4·4	— 2·1	— 1·2	+ 5·8	+ 4·8	+ 10·4	+ 3·3
Maximum in shade	+ 1·7	+ 0·8	+ 1·8	+ 0·9	+ 3·4	+ 3·1	+ 1·7	— 1·2	— 2·0	+ 1·1	+ 0·2	+ 1·9	+ 1·1
Minimum do.	— 1·0	— 0·1	+ 0·7	..	+ 0·8	+ 0·9	+ 0·7	— 1·4	— 1·1	+ 0·1	— 0·4	— 0·1	— 0·1
Do. grass	+ 0·1	+ 1·4	+ 1·6	+ 1·4	+ 1·7	+ 1·4	+ 1·7	— 0·4	— 0·3	+ 1·0	+ 0·7	+ 0·1	+ 0·9
Rainfall in inches	— 0·50	+ 0·86	— 0·39	+ 0·24	— 2·11	— 0·57	— 1·98	+ 8·68	+ 1·72	+ 0·18	— 2·71	— 4·66	— 1·24
Do. since January 1st	..	— 0·36	— 0·03	+ 0·21	— 1·91	— 2·48	— 4·46	+ 4·22	+ 5·94	+ 6·12	+ 3·41	— 1·24	..
General direction of wind	1-N.	1-N.	..	..	..	1-S.	1-S.	..	2-W.	..	1-N.	..	..
Daily velocity in miles	— 33	— 9	— 2	— 6	— 5	— 2	+ 4	— 28	— 19	— 13	— 1	— 22	— 12
Percentage of clear sky	— 1	— 4	— 2	— 9	+ 13	+ 3	+ 5	— 3	+ 2	+ 5	+ 2	+ 10	+ 2
Do. of bright sunshine	— 7	— 3	— 7	— 5	+ 8	— 9	+ 5	— 3	— 4	+ 1	— 4	+ 2	— 2

+ means *above* and — *below* the average.

1 abstract

THE OBSERVATORY,
NUNGUMBAUKUM,

No. 112

Madras, 13th May 1895.

FROM

THE GOVERNMENT ASTRONOMER,
Madras.

To

The Honble Mr. J. F. Price,
Chief Secretary to Governme

SIR,

I have the honor to forward herew
3 Copies of the Annual Administrat
Report of the Madras Observatory. Copies of
diagram referred to in para 6 have not y
been received but I have thought it b
to forward the report without waiting for
them.

I have the honor to be,
Sir,
Your Most Obedient Hum

C. Michie Smith

Govt. Astronomer.

No 1554 Pul fo 437-38 16-6-95 ml

Public Department.

48

From

N

Order 8th June 1895 No. 457

The Govt. Astronomer
Madras.

Recorded.

8/6/95.

Govt. astron-r Dept 25/6/95

Editor's Table.
Copy given 22/6

No: 112 Encl. 3

Encl No. 458

Copy to the G. of I.
Rev: & Agri: Dept.

Dated 13 May 1895

Encl.
Reply No.
Encls-1
To S.C. & Encls

CHIEF SECRETARY
15 MAY 1895
GOVERNMENT OF MADRAS

Subject

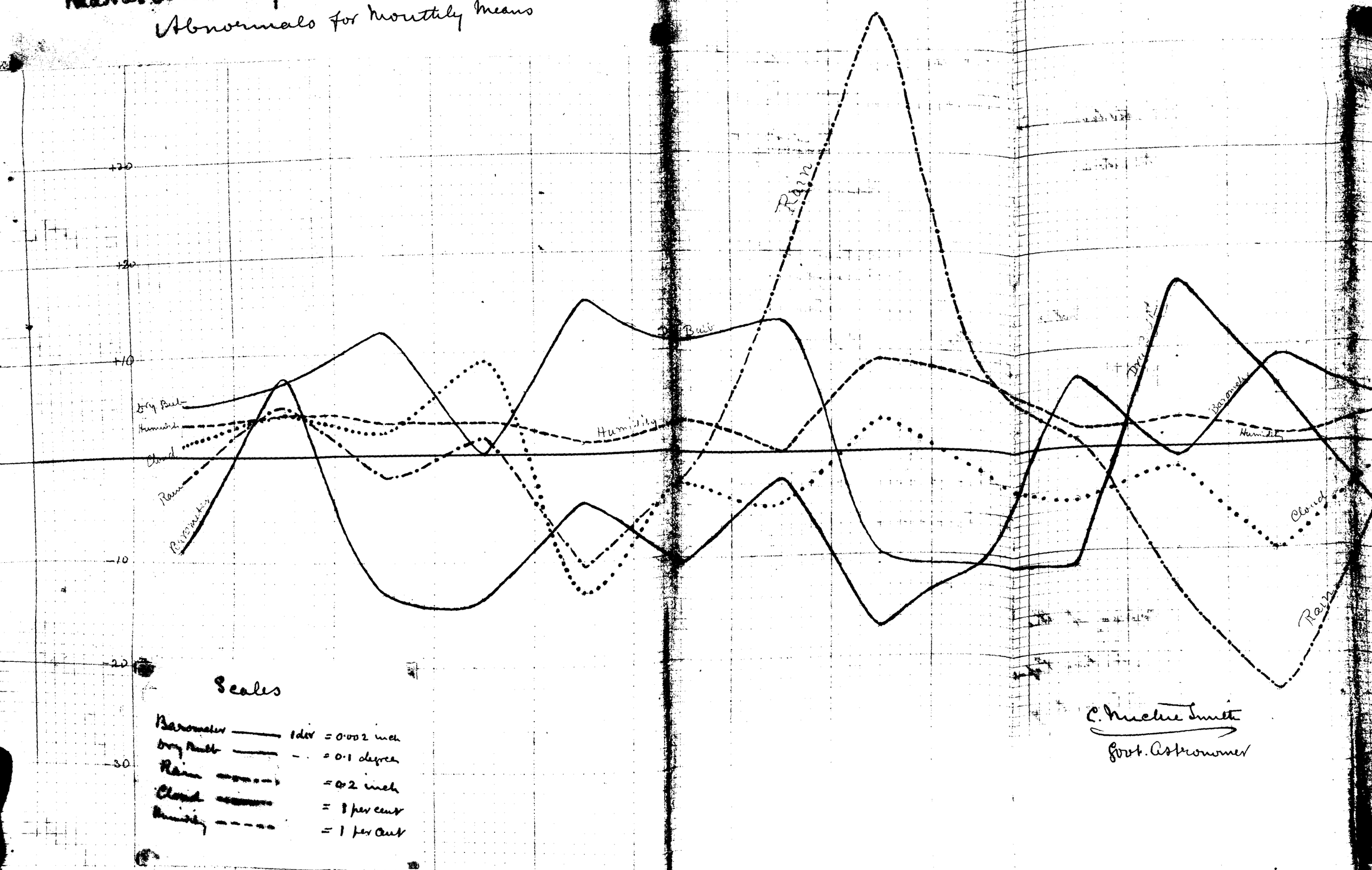
Forwarding copies of the Annual Administration Report of the Madras Observatory

To answer

Note. One week fort-to. prac. not due no.

WITH ORDER

Madras Observatory Meteorological Results for 1897-4
Abnormals for Monthly Means



C. Michie Smith
Govt. Astronomer

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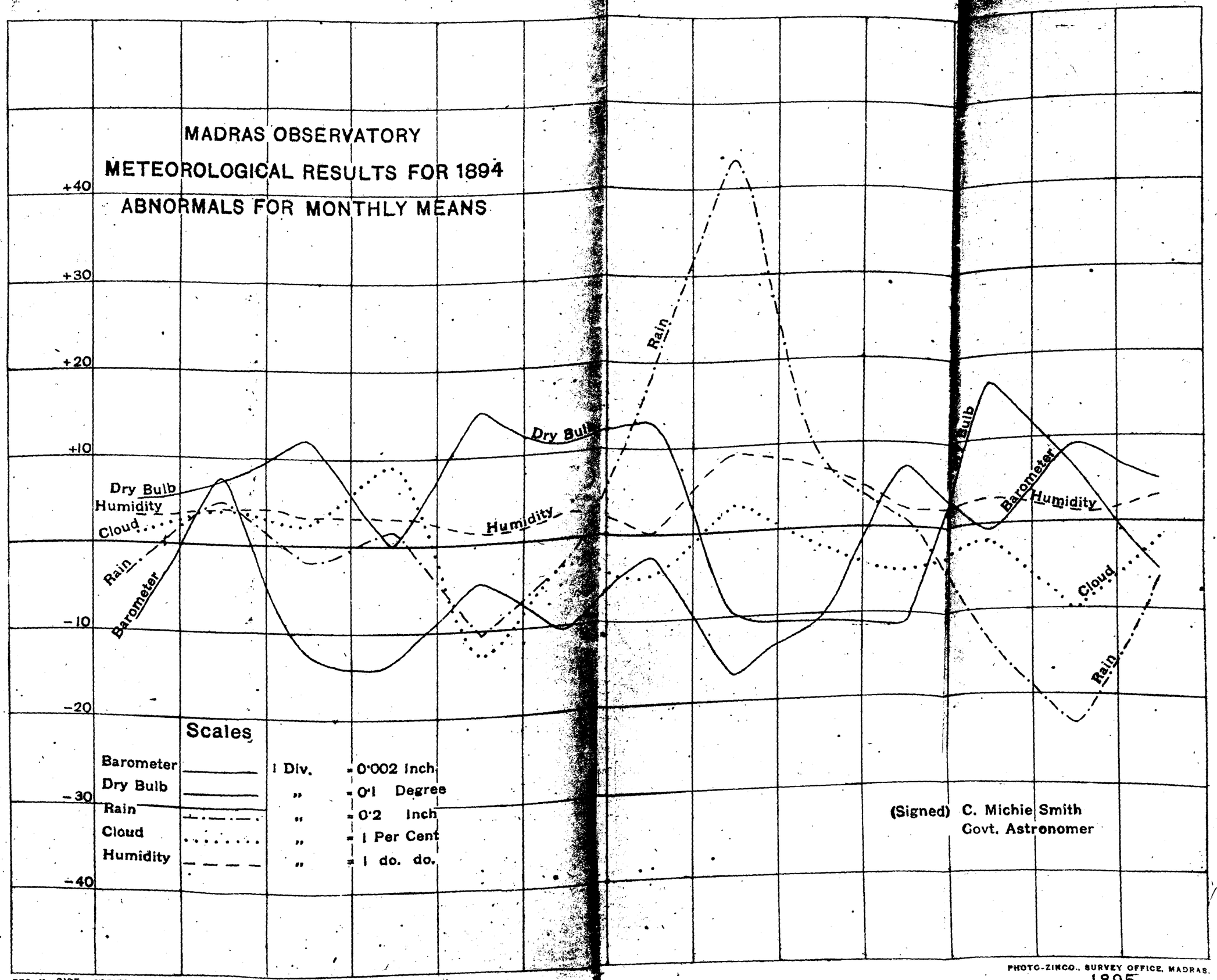
MADRAS



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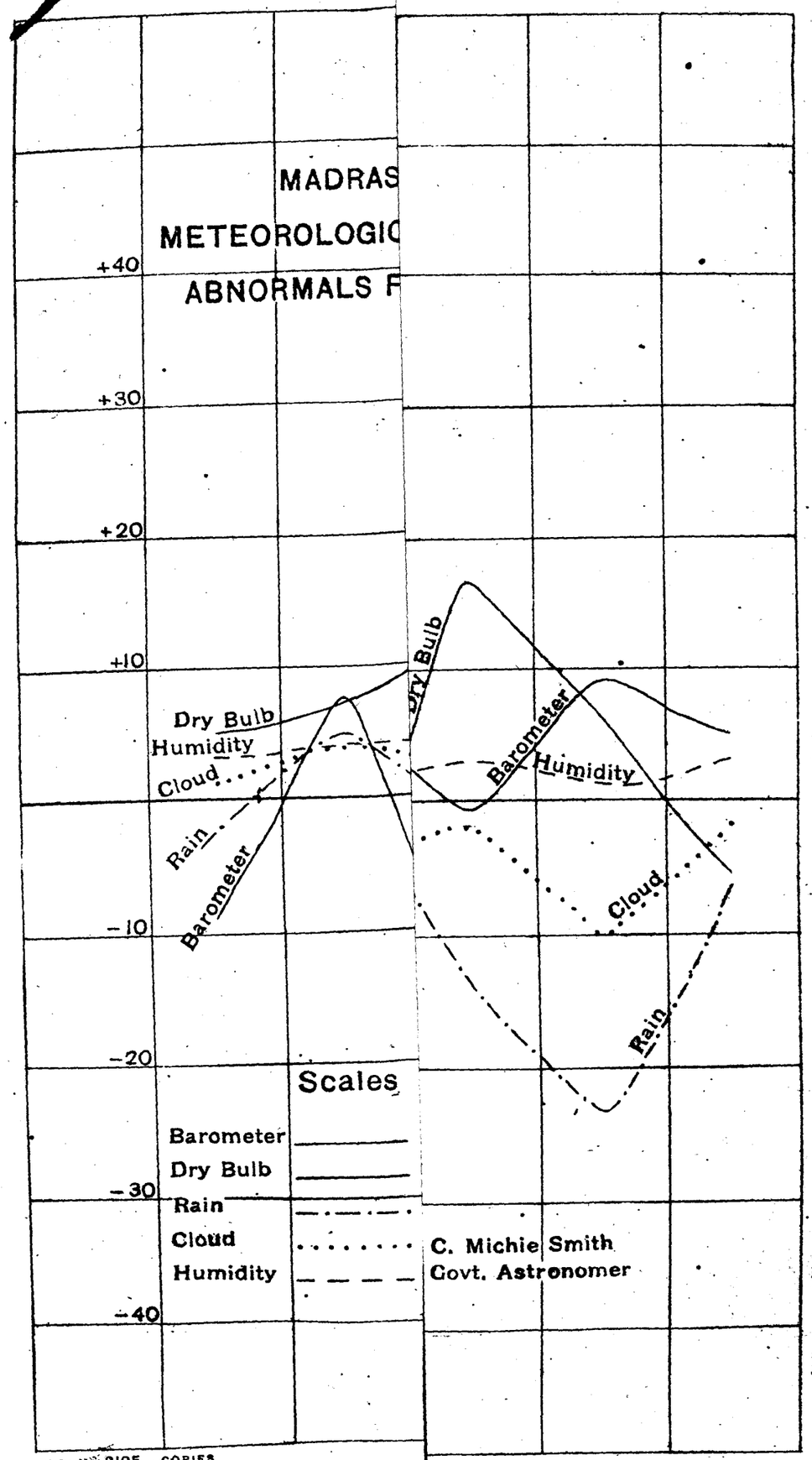

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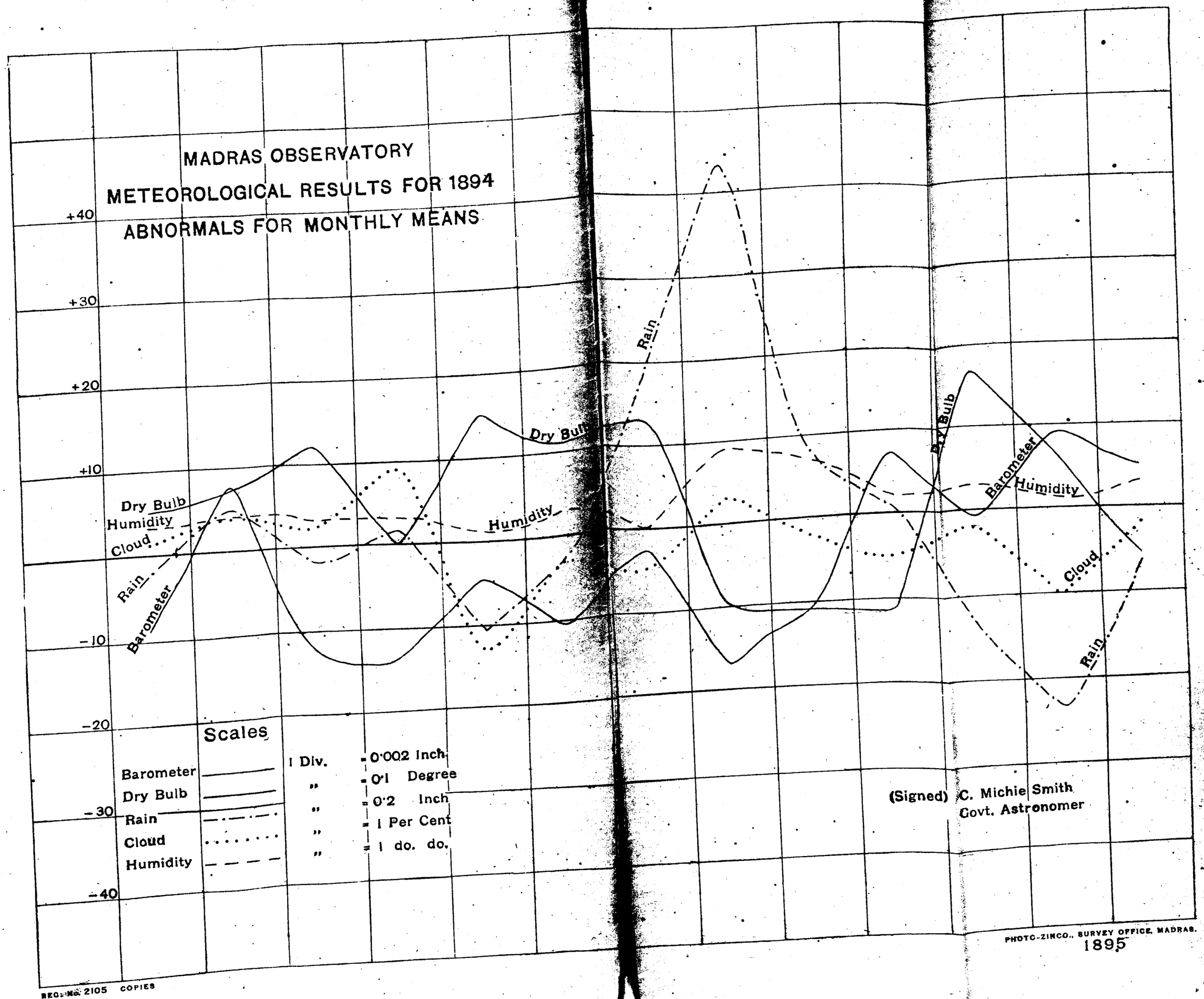
MADRAS OBSERVATORY
METEOROLOGICAL RESULTS FOR 1894
ABNORMALS FOR MONTHLY MEANS



(Signed) C. Michie Smith
Govt. Astronomer

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To
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No. 125

THE OBSERVATORY,
NUNGUMBAUKUM,
Madras, 28 May 1895.

2 Headings

FROM

THE Ag. GOVERNMENT ASTRONOMER,
Madras.

TO

The Hon'ble Mr. J. F. Price,
Chief Secretary to Government.

SIR,

In reply to your telegram of the 28th instant, I have the honor of forwarding herewith three copies of the diagrams referred to in the letter of this office dated 18th May 1895, No. 112.

I have the honor &c.
Sir,
Your most Obedient Servant
R. H. Jones
Ag. Govt. Astronomer.

189 5

From

J. H. Cook, Esq.,
Dy. Superintendent, Madras Survey,
In charge, Central Office,
Madras.

To

The Superintendent,
Government Press,
Madras

Dated 20
Despatched
Received } June

No. 2019

Enclosure one packet
one original

Reference :—Your docketts
No. 1017 dated 11 June 1895
871 dated 29 May 1895.

Has the honor to forward 130 copies
of the following:—

Diagram pattern
& Madras office
Meteorological
for 1894—

2. The original is also returned.

RM 21/6

Dy. Superintendent, Madras Survey
In charge, Central Office.

CURRENT No. 1735

Public Department.

From

The Ag. Govt. Astronomer
Madras.

CHIEF SECRETARY
1 JUN 1895
GOVERNMENT OF MADRAS

Dated 8th May 1895
Recd
Ans } 1 June.

Forwarding three copies of the diagram referred to in his letter dated 13th May 1895, No. 112.

Diagram not rec'd from Sec
Proof for approval

GOVERNMENT OF MADRAS.

PUBLIC DEPARTMENT.

READ—the following papers:—

From the Government Astronomer, dated 13th May 1895, No. 112.

ABSTRACT.—Forwarding three copies of the annual administration report of the Madras Observatory.

ENCLOSURE.

ADMINISTRATION REPORT OF THE MADRAS OBSERVATORY FOR THE YEAR 1894.

Buildings and Instruments.—The buildings were put into a thorough state of repair towards the close of the year and are now in good condition with the exception of the small dome, which is worn out, and the transit shutter which, owing to faulty construction, never remains water-tight for more than a few weeks at a time. The instruments have been maintained in good order throughout the year. A 6-inch equatoreal telescope by Messrs. Cooke and Sons fitted, with a powerful spectroscope, was received from Poona at the beginning of the year. It is intended for use at the Kodáikánal Solar Physics Observatory, but it was considered advisable to unpack it and to set it up so that it might be properly examined. This has been done so far as possible, but it was found to be too large to be completely put together in the only room available for it.

2. *Time Service.*—The time service has been maintained as in former years. The time-gun at Fort St. George was fired correctly on 709 occasions, giving a percentage of success of 97·1. The semaphore at the Post-office was not dropped from April 13 to April 19 as the mast which carries it was being shifted from the old to the new Port Office. It was dropped on every other day of the year, and on only two occasions did it fail at 1 P.M. The 4 P.M. time-roll which is transmitted all over India failed on three occasions.

The following table shows all the failures and the reason for them so far as can be ascertained :—

Date.		Signal.	Fault.	Cause.
1894.				
January	8.	8 P.M. gun	Failed	Tube broke.
	24.	Noon gun	Do.	Do.
February	6.	4 P.M. roll	Do.	Pegs wrongly placed.
	18.	8 P.M. gun	Do.	Tube broke.
March	2.	Semaphore	Failed 1 P.M., dropped 2 P.M.	Unknown.
	12	4 P.M. roll	Failed	Do.
	14.	8 P.M. gun	Do.	Lanyard broke.
	31.	Do.	Do.	Telegraph line broken.
April	1.	Do.	Do.	Tube bad
	7.	Noon gun	Do.	Tube broke.
	13–19.	Semaphore	Not dropped	Semaphore being shifted to new office.
	17.	Noon gun	Failed	Broken telegraph line in contact with gun line.
June	1,	8 P.M. gun	Do.	Loose binding screw (?)
	19	Do.	Do.	Unknown.
July	3.	4 P.M. roll	Do.	Do.
	25.	8 P.M. gun	Fired 15 minutes too soon	Firing weight broke from holder.
	29.	Semaphore	Failed 1 P.M., dropped 2 P.M	Line broken.
August	2.	8 P.M. gun	Failed	Tube broke.
September	28.	Noon gun	Do.	Do.
October	1.	Do.	Do.	Do.
	3.	Do.	Do.	Do.
	4.	8 P.M. gun	Do.	Missed fire.
	5.	Noon gun	Do.	Do.
	6.	Do.	Do.	Tube bad.
	8.	Do.	Do.	Missed fire. Tube slipped out of vent.
November	10.	8 P.M. gun	Do.	Tube broke.
	13.	Do.	Do.	Gunner late.

This table shows that, as regards the failures in the gun, only one can be ascribed to any fault at the Observatory, two were due to faults in the telegraph line, while at least fourteen were due either to bad friction tubes or careless fixing of the tubes in the gun. This number of failures is far in excess of what might reasonably be expected and is largely due to the use of old or inferior friction tubes. The six failures between October 1 and October 8 were ascribed by the Officer Commanding Royal Artillery, Fort St. George, to bad tubes, but it is at least an unfortunate coincidence that at the beginning of that month the gunner in charge of the time gun had been changed without communicating with the Government Astronomer or giving him any opportunity of instructing the new gunner in his duties. During the year steps were taken towards the introduction of a scheme for sending time signals daily along both the lines of railway leading from Madras. It is proposed that the signals so sent shall be made available for the use of towns near the line of railway as well as for setting the clocks at the stations on the lines. The scheme was originally started in compliance with a request made by the Station Staff Officer in Bangalore that the Government Astronomer would undertake to fire the daily time gun there. Unfortunately, after all arrangements had been made, the military authorities intimated that they were satisfied with the existing system and the inhabitants of Bangalore have to put up with a so-called *time* gun which is fired at any time within five or ten minutes of the true time.

3. *Observations.*—Observations have again been sacrificed to reduction and publication of old observations. Observations were, however, made of the two solar eclipses of April 6 and September 29 and the results were communicated to the Royal Astronomical Society. The variable star Z Herculis was observed on five nights and the results were communicated to the *Astronomische Nachrichten.* A large number of readings of the meridian circle have also been taken for the determination of the errors of graduation. These errors have never been determined and it is impossible to complete the reduction of the Meridian Circle Observations till this has been done.

4. *Reduction and publication of old observations.*—Volume VII. of the Madras Meridian Circle Observations was completed and issued during the year, and volume VIII. was completed and copies were received from the Press a few days before the close of the year. The revision of the volumes already published for the errors arising from

the causes explained in last report was also completed and the *errata* were printed and ready for distribution along with volume VIII. Considerable progress was also made with the reduction of the observations of circumpolar stars (amounting to nearly 3,000) for the determination of the latitude of the Observatory. Tables of the mean daily meteorological results for the wet and dry bulb, the dry maximum and minimum, the solar maximum, and the grass minimum thermometers, for the amount of humidity and cloud and for the wind direction and velocity were prepared and printed.

5. *The Library.*—During the year 254 volumes and pamphlets were presented to the library. This includes a valuable contribution of 67 volumes from the library of Great Trigonometrical Survey at Dehra Dun.

6. *Meteorological.*—The meteorological registers were maintained as in former years and the chief features of the year's meteorology are shown in the appended tables and diagram.

The mean barometer was above the normal in February, November, and December, and below the normal during the rest of the year. The highest reading (reduced daily mean) was 30·120 on December 23, and the lowest 29·510 on May 31.

The temperature of the air was normal in April, below normal in August, September, and November and above normal during the rest of the year. The greatest excess was 1°·5 in May. The two hottest days of the year were May 31 and June 1, on both of which temperatures above 109° were registered. The lowest temperature recorded was 60°·6 on January 31.

The percentage of humidity was above the normal in every month of the year except July when it was normal. The driest day was June 13 with only 31 per cent. of saturation.

The rainfall was above normal in February, April, August, September, and October, and below during the rest of the year. The most remarkable features were the great excess (8·68 inches) in August and the defect (4·66) in December. The monsoon rainfall from October 15 to December 31 was 21·14 inches against an average of 27·6 inches, but the fall for the whole year was in defect by only 1·24 inches. The heaviest fall in any day was 3·58 inches on November 4. On September 7, 2 inches of rain fell in 25 minutes.

The general direction of the wind differed little from the normal except in September when it was two points more westerly than usual. The daily velocity was below normal in all months except July, the defect being greatest in January, August, and December. The highest wind velocity for any day was only 295 miles (November 23).

The amount of cloud was above average in January, February, March, April, and August and below during the rest of the year.

There were 2,616 hours of bright sunshine during the year.

MADRAS,
13th May 1894.

(Signed) C. MICHIE SMITH,
Government Astronomer.

Statement

APPENDIX I.

Mean Monthly and Annual Meteorological Results at the Madras Observatory in 1894.

Month.	Barometer. Reduced to 32°F.	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.		Rain. Amount.	Rain. Days.	Clear Sky.	Bright Sunshine.	Remarks.
	INCHES.	INCHES.	°	°	°	°	°	°	INCHES.	CENTS.	°	°	MILES.	POINTS.	POINTS.	INCHES.	NO.	CENTS.	HOURS.	
January ..	29·977	0·106	75·4	85·1	66·7	18·4	70·2	..	0·671	76	139·8	63·2	112	4	N. E.	0·39	1	62	8·0	
February ..	·979	·114	77·3	86·7	68·1	18·6	72·2	..	·725	77	140·3	65·2	114	7	E. by N.	1·14	2	79	9·7	
March ..	·883	·125	81·4	90·9	73·0	17·9	75·7	..	·812	76	143·4	70·2	149	12	S. E.	..	..	75	8·9	
April	·799	·133	84·2	93·6	77·3	16·3	78·2	..	·883	76	143·9	75·7	180	13	S. E. by S.	0·86	5	63	9·0	April 18 thunder-storm with hail 9 P.M. to mid-night.
May	·724	·129	88·5	101·1	81·7	19·4	80·0	..	·911	68	147·9	80·6	209	15	S. by E.	0·00	..	75	9·9	
June	·681	·122	87·8	101·1	81·5	19·6	78·4	..	·845	65	144·0	80·0	218	18	S. S. W.	1·54	8	39	5·9	
July	·719	·115	86·1	97·3	79·4	17·9	77·0	..	·806	65	141·3	78·4	202	19	S. W. by S.	1·89	10	34	5·1	
August ..	·713	·111	82·2	92·3	76·0	16·3	77·1	..	·865	79	137·2	74·9	146	19	S. W. by S.	13·24	21	30	4·9	
September ..	·751	·124	82·1	90·8	76·1	14·7	77·1	..	·864	79	139·1	74·6	137	20	S. W.	6·41	13	39	5·0	
October ..	·817	·119	81·5	89·8	75·5	14·4	76·8	..	·859	80	142·3	73·9	106	12	S. E	11·18	14	47	6·6	
November ..	·955	·105	77·5	84·7	72·0	12·7	73·5	..	·773	82	138·3	70·3	161	3	N. E. by N.	10·50	19	43	5·9	
December ..	·991	·107	76·4	84·6	70·0	14·6	71·7	..	·717	78	144·0	66·5	158	2	N. N. E.	0·63	6	58	7·5	
Annual ..	29·832	0·118	81·7	91·5	74·3	16·7	75·7	..	0·811	75	141·8	72·8	158	12	S. E.	47·78	99	53	7·2	

Extreme Monthly Meteorological Records at the Madras Observatory in 1894.

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.		CENTS.	DAY.	°	DAY.	°	DAY.	MILES.	DAY.	MILES.	DAY.	INCHES.	DAY.
January ..	30·091	22	29·871	4	0·220	91·2	30	60·6	31	Not recorded.	33	30	147·2	28	56·5	31	209	18	32	28	0·39	12
February ..	30·093	12	29·817	24	·276	89·2	22	62·5	17		53	16	150·3	21	58·6	17	175	3	55	17	1·12	3
March ..	30·040	14	29·704	5	·336	98·3	25	68·4	1		48	26	148·7	16	61·9	1	232	6	95	30	..	..
April	29·960	6	29·581	29	·379	103·6	29	73·5	20		42	30	152·2	8	72·0	20	276	18	119	15	0·48	10
May	29·851	4	29·510	31	·341	109·4	31	77·1	2		37	1	153·0	23	74·6	1	270	25	138	2	..	
June	29·793	9	29·544	1	·249	109·7	1	78·3	11		31	13	155·6	2	76·2	12	262	15	147	6	1·19	6
July	29·818	31	29·578	19	·240	104·2	1	73·3	17		41	24	155·7	1	72·0	17	280	22	124	11	0·66	26
August ..	29·837	27	29·565	7	·272	97·1	4	70·8	28		53	19	153·4	25	71·2	28	211	14	80	26	2·19	30
September ..	29·887	12	29·629	9	·258	96·0	30	72·2	4		47	28	158·4	6	71·0	4	215	28	85	1	2·89	7
October ..	29·936	29	29·711	1	·225	96·8	7	70·5	31		41	1	155·6	7	70·8	31	193	1	53	29	3·01	20
November ..	30·108	17	29·718	2	·290	88·0	9	66·1	2		59	2	150·2	6	63·9	2	295	23	43	4	3·58	10
December ..	30·120	23	29·811	12	·309	87·1	15	64·7	31		53	30	150·9	11	59·3	30	264	23	74	14	0·40	19

APPENDIX II.

Madras Observatory Meteorological Observations.—Abnormals for monthly Means.

1894	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
1	2	3	4	5	6	7	8	9	10	11	12	13	14
Reduced atmospheric pressure	— 0·018	+ 0·015	— 0·026	— 0·027	— 0·009	— 0·021	— 0·005	— 0·034	— 0·022	— 0·023	+ 0·033	+ 0·012	— 0·011
Temperature of air	+ 0·5	+ 0·7	+ 1·2	..	+ 1·5	+ 1·1	+ 1·3	— 1·0	— 1·1	+ 0·7	— 0·1	+ 0·9	+ 0·5
Do. of evaporation	+ 1·1	+ 1·6	+ 1·8	+ 0·7	+ 1·6	+ 1·7	+ 1·1	+ 1·0	+ 0·9	+ 1·2	+ 0·7	+ 1·2	+ 1·3
Percentage of humidity	+ 3	+ 4	+ 8	+ 3	+ 1	+ 3	..	+ 9	+ 7	+ 2	+ 3	+ 1	+ 3
Greatest solar heat in vacuo	+ 1·7	+ 0·3	+ 2·9	+ 2·2	+ 3·4	+ 4·2	+ 4·4	— 2·1	— 1·2	+ 5·8	+ 4·8	+ 10·4	+ 3·3
Maximum in shade	+ 1·7	+ 0·8	+ 1·8	+ 0·9	+ 3·4	+ 3·1	+ 1·7	— 1·2	— 2·0	+ 1·1	+ 0·2	+ 1·9	+ 1·1
Minimum do.	— 1·0	— 0·1	+ 0·7	..	+ 0·8	+ 0·9	+ 0·7	— 1·4	— 1·1	+ 0·1	— 0·4	— 0·1	— 0·1
Do. grass	+ 0·1	+ 1·4	+ 1·6	+ 1·4	+ 1·7	+ 1·4	+ 1·7	— 0·4	— 0·3	+ 1·0	+ 0·7	+ 0·1	+ 0·9
Rainfall in inches	— 0·50	+ 0·36	— 0·39	+ 0·24	— 2·11	— 0·57	— 1·98	+ 8·68	+ 1·72	+ 0·18	— 2·71	— 4·66	— 1·24
Do. since January 1st	..	— 0·36	— 0·03	+ 0·21	— 1·91	— 2·48	— 4·46	+ 4·22	+ 5·94	+ 6·12	+ 3·41	— 1·24	..
General direction of wind	1-N.	1-N.	..	..	..	1-S.	1-S.	..	2-W.	..	1-N.	..	..
Daily velocity in miles	— 33	— 9	— 2	— 6	— 5	— 2	+ 4	— 28	— 19	— 13	— 1	— 22	— 12
Percentage of clear sky	— 1	— 4	— 2	— 9	+ 13	+ 3	+ 5	— 3	+ 2	+ 5	+ 2	+ 10	+ 2
Do. of bright sunshine	— 7	— 3	— 7	— 5	+ 8	— 9	+ 5	— 3	— 4	+ 1	— 4	+ 2	— 2

+ means *above* and — *below* the average.

From the Acting Government Astronomer, dated 30th May 1895, No. 125.

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Madras Observatory.

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