GOVERNMENT OF INDIA

METEOROLOGICAL DEPARTMENT

THE INDIA WEATHER REVIEW

FOR THE YEAR

1914

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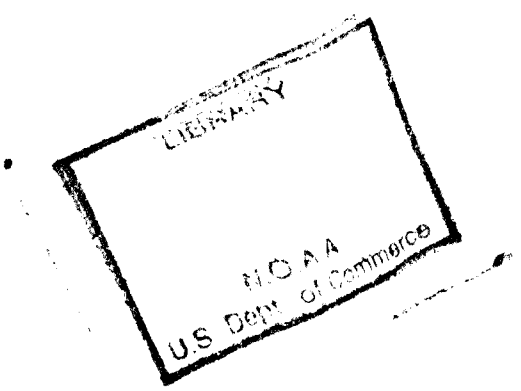
Director General of Observatories.



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GOVERNMENT OF INDIA

METEOROLOGICAL DEPARTMENT.

MONTHLY WEATHER REVIEW

PUBLISHED BY ORDER OF

THE GOVERNMENT OF INDIA.

CALCUTTA, JANUARY, 1914.

INTRODUCTION.

THIS review of the weather in India during the month of January, 1914, is based on observations taken daily at 8 hrs. at 218 stations, and on additional observations taken at 10 hrs. and 16 hrs. at 15 stations. In the rainfall summary have been utilized the data furnished by the meteorological observatories, and such rainfall statements of the month as had been published by the Provincial Governments up to the date of the preparation of the review.

The brief notes on solar, seismic and magnetic disturbances are supplied by the chief observatories in the Indian area.

In the remaining monthly reviews of the present year the brief statements of the methods of recording and tabulating the data for each of the elements of observation, given in the present number at the commencement of each section, will not be repeated.

Summary of the chief features of the weather in India during the month.

2. Weather was unusually dry in January and was thus in marked contrast to that prevailing in December. The only precipitation of any importance occurred in Baluchistan, the North-West Frontier Province, Kashmir and the Punjab. There was no rain over the rest of the country, with the exception of a few thunderstorms in the south-east of the United Provinces and a few showers in Assam and south Madras. The number of disturbances which affected India during the month was equal to the average but their action was confined to north-west India and the distribution of rainfall suggests that their paths lay further to the north than usual.

The sky was less cloudy and temperature was considerably higher than usual in north-west India, but over the rest of the country the cloud proportion was above normal notwithstanding the deficiency in rainfall.

Barometric pressure was remarkably high, the mean of all the observing stations in the plains being ·079″ in excess of the normal.

Solar, seismic and magnetic disturbances.

KODAIKANAL OBSERVATORY.

3. *Solar Observations.*—The sun was examined for spots and faculæ on all the days of the month. Prominences were not observed on one day and on two other days they were observed in poor weather.

Sunspots.—Spot No. 2044, first seen on December 30th of last year, was visible until the 6th January 1914 when, much reduced in size, it was carried round the west limb. A small spot was recorded at latitude —24° on the 5th but was not visible on the subsequent days. The average daily number of spots was 0·29.

Prominences.—38 large, 1 metallic and 2 eruptive prominences were recorded during the month. The highest was observed on the 11th at latitude — 33° east and was 150″ high.

Magnetic disturbances.—Moderate disturbances were recorded from the 4th to 6th and from the 11th to 15th.

Seismic records.

$\phi = 10^\circ 13' 50''$; $\lambda = 77^\circ 28' 00''$; $h = 2{,}343$ m. Subsoil Rock.

Apparatus.—Milne's Horizontal Pendulum Seismograph.

TABLE 1.

	V	To	C	$\frac{r}{To^2}$
AN:				
AE:	9·76	16·0	1	3·5
AZ:				

Date.	Phase.	Time, G. M. T.	Period (sec.).	Amplitude (u) An.	Ae.	Az.	Distance Δ (Km.)	Remarks.
		h. m. s.						
1914 Jan. 12th	eP	9 46 42	...	...	...	...	...	
	eL	9 56 54	...	...	...	...	...	
	M	10 02 36	...	...	50	...	...	
	F	10 20 30	...	...	...	...	...	
„ 15th	eP	20 03 12	...	...	...	...	...	Widening of line.
	F	20 39 18	...	...	...	...	...	
„ 20th	eP	12 22 18	...	...	...	...	...	
	iL	12 48 00	...	...	...	...	...	
	M	12 51 42	...	...	40	...	...	
	F	13 09 48	...	...	...	...	...	
„ 30th	eP	3 56 00	...	...	...	...	...	Paper changed at 16 h. 3m.
	iL	4 49 48	...	...	...	...	...	
	M^1	5 01 12	...	...	260	...	...	
	M^2	0 08 24	...	...	250	...	...	
	F	?	...	...	...	...	...	

T. ROYDS,
Offg. Director,
Kodaikanal and Madras Observatories.

BOMBAY OBSERVATORY.

Alibag magnetic record.

4. During the month of January 1914 the traces showed 13 calm days and 18 days of small disturbance.

The days of the month selected as quiet for the purposes of the Magnetic Survey of India are the 1st, 10th, 19th, 20th and 27th.

The following table represents the magnetic character of each day during the month.

TABLE 2.

Day.	Character.	Day.	Character.	Day.	Character.
1	C	12	S	23	S
2	S	13	S	24	C
3	S	14	C	25	C
4	S	15	S	26	C
5	S	16	S	27	C
6	S	17	S	28	S
7	S	18	S	29	C
8	S	19	C	30	C
9	C	20	C	31	C
10	C	21	S	...	...
11	S	22	S	...	...

C = calm; S = small; M = moderate; G = great; V. G. = very great.

The mean observed absolute values of the severa magnetic elements reduced to the mean monthly tabulations of the magnetograms, as also the ranges and the summed ranges of the horizontal force and the declination for the month are as follows:—

Easterly declination	0° 45′ 47″
Horizontal force	0·36889 C.G.S. unit.
Vertical force	0·16531 „ „
Inclination	24° 8′·3
Inclination (observed)	24° 8′·1
Horizontal force range	0·00028 C.G.S. unit.
Horizontal force summed range	0·00181 „ „
Declination range	1′·6
Declination summed range	7′·8

(NOTE.—Summed range means sum without regard to sign of the 24 ordinates of the diurnal inequality.)

Seismic records.

$\phi = 18^\circ\ 53'\ 45''$; $\lambda = 72^\circ\ 48'\ 56''$; h = 11 m. Subsoil Trap.

Apparatus.—Milne's Horizontal Pendulum Seismograph.

TABLE 3.

	V	To	ϵ	$\frac{r}{To^2}$
AN :				
AE :	9	18	1	
AZ :				

Date.	Phase.	Time, G. M. T.			Period (sec.)	Amplitude (u)			Distance Δ (Km.)	Remarks.
						An.	Ae.	Az.		
1914.		h.	m.	s.						
Jan. 12th	P	9	49	6	...	...	...	...	...	
	M	10	0	2	...	...	56	...	...	
	F	10	28	9	...	...	...	...	...	
„ 20th	P	12	7	2	...	...	...	...	...	
	M	12	49	5	...	...	122	...	...	
	F	13	17	8	...	...	...	...	...	
„ 30th	P	3	55	4	...	...	...	...	...	
	M	5	5	1	...	...	433	...	...	
	F	6	12	7	...	...	...	...	...	
„ 30th	P	8	49	5	...	...	...	...	...	
	M	9	6	6	...	...	22	...	...	
	F	9	39	9	...	...	...	...	...	

Thickening of line was noted on the following occasions :—

d. h. m.	d. h. m.	m.	d. h. m.	d. h. m.
3 11 3	6 19 27		16 22 46	27 13 2
3 19 50	15 20 10	to 12	21 8 42	

Only those thickenings which can be clearly distinguished are given. Thickenings mixed in tremors are omitted from the above list.

Sensibility to tilt 1·0 mm. of amplitude on the trace = 0·41".

N. A. F. MOOS,
Director,
Bombay & Alibag Observatories.

5. CALCUTTA (ALIPORE) OBSERVATORY.

Seismic records.

$\phi = 22^\circ\ 32'$ N $\lambda = 88^\circ\ 21'\ 0''$; E $h = 6{\cdot}4$ m. Subsoil.

Apparatus.—Milne's Horizontal Pendulum Seismograph.

TABLE 4.

	V	To	ϵ	$\frac{r}{To^2}$
AN :				
AE :	8·688	18	1	
AZ :				

Date.	Phase.	Time, G. M. T.			Period (sec.)	Amplitude (u)			Distance Δ (Km.)	Remarks.
						An.	Ae.	Az.		
1914.		h.	m.	s.						
Jan. 12th	P	9	43	53	...	...	...	...	...	
	L	9	48	58	...	...	...	...	...	
	M	9	52	1	...	...	403	...	...	
	F	10	38	16	...	...	...	...	...	
„ 20th	P	12	11	9	...	...	...	...	...	
	S	12	26	24	...	...	...	...	...	
	L	12	37	4	...	...	...	...	...	
	M	12	41	8	...	...	201	...	...	
	F	13	27	23	...	...	...	...	...	
„ 30th	P	3	39	48	...	...	...	...	...	
	L	4	55	55	...	...	...	...	...	
	M	5	3	32	...	...	1093*	...	...	*Measured from base line.
	F	6	54	43	...	...	...	...	...	
„ 30th	P	8	53	47	...	...	...	...	...	
	L	9	2	57	...	...	...	...	...	
	M	9	3	58	...	...	57	...	...	
	F	10	10	6	...	...	...	...	...	
„ 31st	P	13	28	12	...	...	...	...	...	
	L	13	35	19	...	...	...	...	...	
	M	13	35	50	...	...	57	...	...	
	F	13	55	39	...	...	...	...	...	

E. P. HARRISON,
Offg. Meteorologist, Calcutta.

6. SIMLA OBSERVATORY.

Seismic records.

$\phi = 31^\circ\ 6'\ 00''$; $\lambda = 77^\circ\ 11'\ 00''$; h = 2433·5 m. Subsoil Rock.

Apparatus.—Two Omori-Ewing Horizontal Pendulum Seismographs (Masses 50 Kg.)

TABLE 5.

	V	To	6	$\frac{r}{To^2}$
AN :	14	45	1	
AE :	14	45	1	
Az :				

Date.	Phase.	Time, G. M. T.	Period (sec.)	Amplitude (u). An.	Ae.	Az.	Distance Δ (Km.)	Remarks.
1914.		h. m. s.						
Jan. 4th	P	17 39 42	...	...	...	...	...	
	F	17 40 00	Very rapid.	...	...	...	...	Very slight local shock.
„ 5th	P	4 1 18	...	...	...	...	...	
	S	4 2 18	...	...	...	...	...	
	L	4 3 00	...	...	...	...	...	
	M	4 3 6	2	11	11	...	...	
	eF	4 11 00	...	...	...	...	...	
„ 8th	i	5 34 48	...	...	...	...	...	
	eF	5 45 00	Rapid.	...	...	...	...	
„ 12th	eP	9 42 00	...	...	...	...	...	
	eS	9 46 00	...	...	...	...	...	
	eL	9 51 30	...	...	...	...	...	
	eM	9 52 00	20	39	...	...	...	
	eF	10 18 00	...	...	...	...	...	
„ 15th	eP	20 14 00	...	...	...	...	...	
	eF	20 33 00	...	...	...	...	...	Very slight tremors.
Jan. 16th	eP	6 16 00	...	...	...	...	...	
	eF	6 23 00	...	...	...	...	...	Very slight tremors.
„ 30th	eP	3 56 00	...	...	...	...	...	
	M	4 1 48	22	200	121	...	...	
	eF	6 13 00	...	...	...	...	...	
„ 31st	eP	13 37 00	...	...	...	...	...	
	eF	13 50 00	...	...	...	...	...	Very slight tremors.

Following table contains a list of earthquakes that were reported : —

TABLE 6.

Place at which felt.	Date.	G. M. T. of earthquake.	Duration.	Intensity Rossi-Forel scale.	No. of shocks.
	Jan.	h. m.	sec.		
Mandalay . . .	3rd	10 10	3	6	6
Barjuli	4th	3 40	1	6	1
Salonah (Nowgong, Assam) .	4th	3 43	7	6	1
Drosh	5th	2 5	15	6	1
Multan	8th	5 39	2	6	3
Turbat-i-Haidari . . .	11th	0 4	5	6	3
Do.	24th	1 34	5	5	7
Jodhpur	27th	17 11	60	5	1

Solar radiation.—The following figures give the intensity of solar radiation, as measured at Simla by Angstrom's pyrheliometer. The values are corrected to local noon, and expressed in grammecalories per square centimetre per minute :—

Maximum	1·41
Minimum	1·32
Mean	1·37
Number of days of observation .	10

C. W. NORMAND

Imperial Meteorologist, Simla.

ROYAL ALFRED OBSERVATORY, MAURITIUS.

7. No information has been received.

Weather in the Indian Ocean.

8. From the observations it appears that the high pressure existing over the Indian area extended over the Indian Ocean. The air movement at Seychelles was slightly weaker, and the direction more northerly than usual. Rainfall was in defect at all stations.

TABLE 7.

	Mauritius.	Zanzibar.	Seychelles.
Departure from normal of mean pressure.	+·055	+·041	+·057

	Mauritius.	Zanzibar.	Seychelles.
Actual mean wind direction .	S 85° E	N 27° E	N 8° W
Normal mean wind direction .	S 86° E	N 28° E	N 39° W
Actual mean wind velocity (miles per diem).	167	130	82
Normal mean wind velocity (miles per diem).	194	137	107
Rainfall departure from normal.	—1·50	—0·53	—2·10

Depressions and cyclonic storms.

9. The cold weather depressions which affected the weather of northern India were not well marked and did not give much precipitation in the plains.

Most of the rainfall on the plains during the month fell on the 1st and 2nd, being caused by a depression which had appeared in north-west India at the close of December.

Subsequently four disturbances affected the Persian area and were transmitted eastwards but the distribution of rainfall in India indicates their paths were more northerly than usual. The first disturbance produced only a few light falls of snow in Kashmir on the 12th, while the second caused slight precipitation simultaneously in Baluchistan and Kashmir on the 15th, 16th and 17th The next disturbance was accompanied by precipitation along the western Himalayas on the 27th and 28th and in upper Assam on the 29th and 30th.

At the end of the month another depression had commenced to affect Baluchistan and the North-West Frontier Province, its centre on the morning of the 31st lying over the former area.

Pressure.

10. In most of the observing stations in India mercurial barometers on Fortin's principle of fiducial point adjustment, with tubes of 0·4″ bore throughout, are in use. These are on the whole preferable to the pattern of barometer on the Kew principle, still in use at some Indian stations, which has its scale divided to compensate for the change of level of the mercury in the cistern as the pressure alters.

The following list contains the names of all stations equipped with instruments of the latter class:—

Aden.	Fort Sandeman.	Negapatam.
Akyab.	Gangtok.	Noakhali.
Barisal.	Gorakhpur.	Nowgong.
Bhamo.	Gyantse.	Panjgur.
Bogra.	Jalpaiguri.	Rangoon.
Bushire.	Kalat.	Ratnagiri.
Cochin.	Mangalore.	Tavoy.
Cox's Bazar.	Midnapore.	Toungoo.
Cuddapah.	Minbu.	Victoria Point.
Dalbandin.	Monywa.	Yamethin.
Delhi.	Mymensingh.	Zanzibar.
Dinajpur.		

The instruments at the following stations are by various makers and of various kinds:—

Colombo.	Patiala.	Trincomalee.
Katmandu.	Pusa.	Trivandrum.
Kurnool.		

At Calcutta and Bombay the standards are Newman instruments on the Fortin principle, with adjustable scales and fiducial points, and tubes of large bore. Some portable Wild-Fuess standards for purposes of comparison during inspections are in use; the principle of these instruments allows of the determination at any time of changes that occur in their corrections caused by the access during transport of small quantities of air to the vacuum spaces above the mercury.

All instruments are compared at Calcutta before issue, and their corrections determined to the Calcutta standard, which is ·011″ higher than the Kew standard.

The barometers are in all cases situated in masonry buildings to protect them as much as possible from rapid changes of temperature.

Those heights above mean sea-level of the barometers of all stations given in Table B or Table A which have been obtained accurately by actual measurement are given in Roman figures. In the great majority of cases they have been referred to datum levels determined by the Great Trigonometrical Survey of India; of the remaining stations those heights which have been determined barometrically are printed in italics, and those which are only approximate are indicated by notes of interrogation.

The readings of the barometers are reduced to 32°F., and from 1st January 1905, have been corrected to constant gravity in all cases. They are reduced to sea-level in the cases of stations the elevations of which are accurately

known and are below 3,200 feet. Each reading is separately corrected and the means of the month are the means of the daily corrected readings.

In Table B (2), columns 4 to 11, under the general heading "Pressure, 8 hrs. in inches," are given for each station the 8 hrs. barometric data of the month, including—

(1) The mean 8 hrs. pressure reduced to 32°F., and its departure from the normal mean pressure (reduced to 32°F.) of the month.

(2) The mean 8 hrs. pressure corrected to sea-level and to constant gravity or to constant gravity only in cases of stations the elevations of which are above 3,200 feet.

(3) The highest and lowest pressures recorded during the month with their respective dates of occurrence.

(4) The total range of 8 hrs. pressure during the month.

In Table A, columns 4 to 9, under the general heading "Pressure," are given for all stations recording observations at 10 hrs. and 16 hrs.—

(1) The monthly means of the two hours of observation at 10 hrs. and 16 hrs. reduced to 32°F.

(2) The mean daily range.

(3) The mean of daily mean pressures reduced to 32°F. and its departure from the normal.

(4) The mean of daily mean pressures reduced to 32°F., and corrected to constant gravity and to sea-level, or to constant gravity only in cases of stations the elevations of which are above 3,200 feet.

The means of daily pressures have been obtained by taking the means of the 10 hrs. and 16 hrs. observations and applying corrections for each month, derived from the observations of the same or neighbouring stations, to give true daily means.

The distribution of the mean 8 hrs. pressure of the month is shown on two charts. The first chart (Plate I) gives the distribution of the mean pressure of the month reduced to sea-level and to constant gravity (that of lat. 45°) by means of isobars drawn for differences of pressure of 0·05 or $\frac{1}{20}$ of an inch. The second chart (Plate II) gives the departures from the normal of the actual mean 8 hrs. pressure reduced to 32°F.

The greater part of the normal 8 hrs. daily and monthly means of pressure utilized in the pressure section of the review have been deduced from the barometric observations of the whole of the twenty-two years' period 1878-99, and in all except 22 cases the periods employed equalled or exceeded ten years.

A small chart, No. 2 of Plate IV, gives the distribution of the monthly mean daily pressure corrected to standard gravity and to sea-level, and of the mean winds; it is in the same form as in the monthly charts which were issued with the annual reports on the meteorology of India previous to the year 1891. The data on which this chart is based will be found in Table A.

The monthly means employed in the determination of the departures of the mean actual from the mean normal pressures of the month given in Table A are derived from all the available trustworthy pressure data for each station. These normal means are given in the "Indian Meteorological Memoirs," Vol. XVII, pages 66 to 69.

The more important barometric changes and movements during the month are described in the statement of depressions and cyclonic storms of the month. The data that are chiefly used in that discussion are the 8 hrs. reduced observations and the departures derived from comparison of these observations with the normal daily 8 hrs. values.

In the month under review barometric pressure was remarkably high. In the plains it was nowhere less than 0·05″ above normal, while locally in Burma the excess amounted to 0·13″.

The vertical gradient was steeper than usual in north-east India and the Peninsula but in the hills of north-west and central India the pressure departures were even larger than on the neighbouring plains. At Dras and Skardu the average pressure was 0·15″ above normal.

TABLE 8.

DIVISION.	Departure from normal of mean 8 hrs. pressure.
	″
Burma	+·094
Assam	+·079
Bengal	+·081
Bihar and Orissa	+·082
United Provinces	+·080
Punjab	+·091
North-West Frontier Province	+·069
Sind	+·079
Rajputana	+·074
Bombay	+·062
Central India	+·071
Central Provinces	+·074
Hyderabad	+·077
Mysore	+·073
Madras	+·075

TABLE 9.

HILL STATION.	Departure from normal pressure. A	PLAIN STATION.	Departure from normal pressure. B	Departure of pressure difference B—A.
	″		″	″
Quetta	+·095	Jacobabad	+·086	—·009
Leh	+·130	Lahore	+·092	—·038
Murree	+·107	Peshawar	+·071	—·036
Simla	+·119	Ludhiana	+·099	—·020
Chakrata	+·116	Roorkee	+·096	—·020
Darjiling	+·055	Dhubri	+·084	+·029
Mount Abu	+·084	Deesa	+·066	—·018
Pachmarhi	+·086	Khandwa	+·074	—·012
Kodaikanal	+·037	Madura	+·081	+·044

Temperature.

11. The mean temperature data are given in Tables A and B under the heading "Temperature of air." In Table B they are based upon observations of the dry bulb thermometers recorded at 8 hrs., and of the maximum and minimum thermometers. In the preparation of the normal means of maximum and minimum temperature the same periods have been employed as for the normals of pressure, regarding which information has been given in the pressure section, page 6 of this review. Departures of the mean maximum and minimum temperatures from the corresponding normal means for the month are given in Table B. The monthly mean of the mean between maximum and minimum, as given in this table, differs from the true mean of the day by a small amount which varies from month to month.

It should be noted for the purposes of Table B that the mean temperature of the day really denotes the mean temperature of the 24 hours preceding 8 hrs. of the day in question, and that therefore the month for which the means are given in this table terminates at 8 hrs. of the last day of the month. In the case of Table A, however, the day or 24 hours period terminates at midnight (and not at 8 hrs. as in Table B) and the monthly means apply therefore to monthly periods ending at midnight of the last day of the month in question.

In Table A the mean of daily mean temperatures for each month is obtained by taking the mean of the maximum and minimum temperatures and applying a correction given on pages XV to XXI of Volume XVII of the "Indian Meteorological Memoirs." This correction was determined from the hourly observation data given in Volumes V, IX and X of the "Indian Meteorological Memoirs." The data at once furnish the necessary corrections for the stations at which these observations were recorded. At the remaining stations the corrections were determined from the values at the nearest stations with similar condition of exposure, etc., at which the hourly observations were recorded.

The departures from normal of the mean daily mean temperature of the month given in Table A have been obtained by a comparison of the actual means with normal means calculated in the same manner. The normal means derived from all the available trustworthy temperature data for each station are given in the "Indian Meteorological Memoirs," Volume XVII, pages 16 to 20.

The methods of exposing thermometers will be found fully described in the Hand-book of instructions to observers in India, or briefly in the Annual Report on the Meteorology of India for the year 1887, page 37. All thermometers in use have been verified by comparison with Kew standard thermometers at Calcutta and are re-standardised from time to time: all thermometer readings are corrected to their true values, and hence are strictly comparable.

The mean distribution of temperature in India in each month is exhibited by the help of three charts, which show the departures of the mean maximum, mean minimum and mean daily temperatures from their normal values for the month. These charts are Nos. 1 and 2 of Plate III and No. 1 of Plate IV. In them equal departures of temperature are indicated by lines, the lines being drawn for differences of 2 degrees of departure. A continuous line indicates that the temperature was in excess by the amount shown by the number given near the line, and a broken line that it was in defect by the amount indicated by the number similarly placed. The line of no departure separating areas of excessive from areas of deficient temperature, consists of a continuous and of a broken line placed parallel and near to each other, the broken line being on the side of deficient temperature, and the continuous line on that of excessive temperature. The departures of the temperature of the month from the normal at the hill-stations are given in figures with a positive or negative sign to indicate excess or defect; they are not taken into account when the lines are drawn.

Tables of normal mean maximum, mean minimum and mean of daily mean temperatures for each month and for the whole year are given in pages 1 to 10 and pages 16 to 20 of the "Indian Meteorological Memoirs," Volume XVII, and are based on the data for the twenty-two years, 1878 to 1899.

The mean maximum temperature of the month was in excess in Baluchistan, the United Provinces, Rajputana and Central India, but was approximately normal elsewhere.

The mean minimum temperature differed less than 3° from the normal everywhere except in the Punjab South-west and Rajputana East where the departures were +3·3 and +4·2 respectively.

TABLE 10.

Sub-division.	Actual temperature.					Departure from normal of		
	Mean maximum.	Mean minimum.	Monthly mean of mean between maximum and minimum.	Mean daily range of temperature.	Absolute range during month.	Maximum.	Minimum.	Daily range.
	°	°	°	°	°	°	°	°
1. Bay Islands	83·1	75·4	79·2	7·7	13·1	−1·5	+0·8	−2·3
2. Lower Burma	84·2	63·1	73·7	21·1	31·4	−1·9	−1·5	−0·4

Sub-division.	Actual temperature.					Departure from normal of		
	Mean maximum.	Mean minimum.	Monthly mean of mean between maximum and minimum.	Mean daily range of temperature.	Absolute range during month.	Maximum.	Minimum.	Daily range.
	°	°	°	°	°	°	°	°
3. Upper Burma	79·4	51·1	65·3	28·3	38·9	—2·7	—1·3	—1·4
4. Assam	73·3	50·8	62·0	22·4	30·1	—0·4	—0·3	—0·1
5. Bengal	77·4	54·2	65·8	23·2	32·6	+0·3	+0·4	—0·1
6. Orissa	81·2	57·0	69·1	24·2	35·1	—1·5	—0·7	—0·8
7. Chota Nagpur	78·6	50·7	64·6	27·9	37·9	+0·1	+0·1	0
8. Bihar	75·7	50·7	63·2	24·9	33·9	+1·1	0	+1·1
9. United Provinces, East	77·6	47·6	62·6	30·0	40·2	+4·0	—0·1	+4·1
10. Do. do., West	77·1	47·4	62·3	29·7	39·9	+4·7	+0·1	+4·6
11. Punjab, East and North	71·5	44·8	58·2	26·6	37·8	+3·5	+1·7	+1·8
12. Do., South-west	71·1	44·8	57·9	26·3	38·2	+2·5	+3·3	—0·8
13. Kashmir	40·4	20·1	30·3	20·3	36·8	+3·3	+2·1	+1·2
14. North-West Frontier Province	68·7	42·0	55·3	26·7	36·7	+2·3	+2·0	+0·3
15. Baluchistan	65·1	39·2	52·1	25·8	41·7	+6·4	+2·7	+3·7
16. Sind	77·2	53·4	65·3	23·9	35·6	+1·9	+2·8	—0·9
17. Rajputana, West	78·3	52·1	65·1	26·2	40·7	+4·2	+2·5	+1·7
18. Do., East	79·1	52·2	65·6	26·9	40·2	+3·9	+4·2	—0·3
19. Gujarat	85·0	56·6	70·8	28·4	37·5	+2·9	+0·8	+2·1
20. Central India, West	82·7	51·4	67·1	31·3	40·1	+4·3	+2·1	+2·2
21. Do., East	78·7	48·3	63·5	30·3	41·5	+3·6	+1·1	+2·5
22. Berar	85·9	58·2	72·1	27·7	38·5	+2·2	+1·8	+0·4
23. Central Provinces, West	83·7	52·9	68·3	30·8	42·4	+3·4	+1·1	+2·3
24. Do., East	82·6	52·8	67·7	29·7	41·1	+0·6	—0·1	+0·7
25. Konkan	86·4	67·6	77·0	18·8	26·3	+0·7	+0·5	+0·2
26. Bombay Deccan	85·5	56·3	70·9	29·2	38·7	+0·2	+1·2	—1·0
27. Hyderabad, North	84·7	56·9	70·8	27·8	37·1	+0·1	0	+0·1
28. Do., South	84·9	60·7	72·9	24·1	33·1	—1·0	0	—1·0
29. Mysore	82·4	57·8	70·1	24·6	31·9	0	—0·1	+0·1
30. Malabar	88·3	70·4	79·3	17·8	23·6	+0·8	+0·3	+0·5
31. Madras, South-east	84·6	67·2	75·9	17·3	24·1	—0·5	—0·1	—0·4
32. Do., Deccan	86·8	60·2	73·5	26·5	34·4	—1·5	—1·0	—0·5
33. Do., Coast, North	81·1	63·7	72·4	17·3	24·8	—0·6	—0·9	+0·3

TABLE II.

DIVISION.	DEPARTURE FROM NORMAL OF		
	Mean maximum temperature.	Mean minimum temperature.	Mean temperature.
	°	°	°
Burma	−2·2	−1·4	−1·8
Assam	−0·4	−0·3	−0·3
Bengal	+0·3	+0·4	+0·3
Bihar and Orissa	+0·1	−0·2	−0·1
United Provinces	+4·3	0	+2·2
Punjab	+3·2	+2·2	+2·7
North-West Frontier Province	+2·3	+2·0	+2·2
Sind	+1·9	+2·8	+2·3
Rajputana	+4·0	+3·5	+3·8
Bombay	+1·5	+0·9	+1·2
Central India	+3·9	+1·6	+2·8
Central Provinces	+2·6	+1·0	+1·8
Hyderabad	−0·6	0	−0·3
Mysore	0	−0·1	0
Madras	−0·4	−0·3	−0·4

Winds.

12. The 8 hrs. wind data, consisting of observations of the direction of the wind and of the air movement as registered by Robinson anemometers, are given in Table B under the heading "Wind direction," "Wind velocity" and "Wind steadiness." In these columns are shown the number of days the wind at 8 hrs. blew from each of eight points, the resultant direction of the wind, the mean hourly air movement and the steadiness. The wind resultant is calculated in all cases by the use of Lambert's formula, in which equal values are given to each wind observation irrespective of velocity. The mean wind directions are shown in Plate I by means of arrows in the usual manner.

The wind data for 10 hrs. and 16 hrs. are given in a similar form in Table A. Under the heading "Wind direction" are shown the number of times that each of eight wind directions was observed at the hours of record, and the direction of the resultant of winds of unit strength in these directions. The ratio of the magnitude of the resultant so obtained to that which it would have if the wind always blew from the same direction (*i.e.*, throughout the whole of the observations), is called the wind steadiness and is given as a percentage, with a table of normals, under the heading "Wind steadiness." The mean diurnal movement of the air at each station and the average monthly value are to be found under the heading "Wind velocity."

The mean wind directions of the month for stations recording at 10 hrs. and 16 hrs. are indicated in the small chart No. 2 of Plate IV by means of arrows flying with the wind. The lengths of the arrows are so proportioned as to indicate the comparative wind prevalence in the mean direction on a scale such that five-eighths of an inch would represent a wind blowing continuously throughout the month from the mean direction.

The figures of normal values for wind used in Tables A and B are computed from all available data previous to 1899, or in some cases 1902, and have been published in Volume XVII of the "Indian Meteorological Memoirs."

All anemometers used in India are compared before issue with the standard Beckley anemograph at Calcutta Observatory, and then have corrections assigned which are taken into account in the wind tables and Plate I of the review.

The wind was lighter and more variable than usual in Bengal, the United Provinces and the North-West Frontier Province. The steadiness was much above normal however in Assam, Hyderabad and Mysore.

There were large but irregular deviations from the mean wind direction over the whole of northern India.

TABLE 12.

DIVISION.	DEPARTURE FROM NORMAL OF	
	Hourly wind velocity.	Wind steadiness.
Burma	−0·2	+ 3
Assam	−0·5	+12
Bengal	−1·0	−15
Bihar and Orissa	−0·3	− 8
United Provinces	−0·7	−10
Punjab	−0·2	+ 8
North-West Frontier Province	−0·7	− 7
Sind	−0·7	+ 6
Rajputana	+0·4	+ 9
Bombay	−0·5	+ 3
Central India	−0·8	−16
Central Provinces	0	+ 8
Hyderabad	−0·4	+31
Mysore	+1·5	+19
Madras	+0·9	+ 9

Humidity and cloud.

13. The hygrometric data of the month registered at certain stations are given in Table A. In that table appear columns giving the means of the wet bulb readings at 10 hrs. and at 16 hrs., of the minimum wet bulb readings, of the vapour tension and humidity at the same hours, and also the mean of daily means of these elements and of its departure from the normal mean. The hygrometric data are taken from the tables accompanying "*The Indian Meteorologist's Vade Mecum*," which were computed by means of Regnault's modification of August's formula. The means of daily means are obtained by taking the means of the minimum, 10 hrs. and 16 hrs. observations, and reducing them to true means, by applying, in case of vapour tension, the corrections given on pages XXXVIII to XLII, and in case of humidity the corrections given on pages XLIV to XLVIII of Volume XVII of the "Indian Meteorological Memoirs." These corrections were determined from the hourly observation data given in Volumes V, IX and X of the "Indian Meteorological Memoirs." The normal values, which have been used for obtaining the departures, are the means calculated in the same way.

The distribution of humidity in each month in India is exhibited by means of two charts in Plate V. The first chart shows the departure from normal of 8 hrs. absolute humidity, and the second that of the relative humidity.

The proportion of cloud is estimated in tenths of the sky expanse, an overcast sky being denoted by 10 and a cloudless sky by 0. The monthly means in Table A are the arithmetical means of the cloud amounts at 10 hrs. and 16 hrs., and the normal means, with which the actual monthly means are compared, are derived from the available cloud data for the same hours.

The departure from normal of the mean distribution of cloud amount at 8 hrs in each month in India is shown in chart No. 1 of Plate VI, and the discussion of this and of the hygrometric features is based on the data given in Table B.

Normal values are deduced chiefly from ten or more years' records previous to 1899, but in some cases from observations extending from 1877 to 1902.

The air was appreciably drier than usual in the north of the Bombay Deccan and the central parts of the country but over Sind the mean vapour tension was above the average. There was less cloud than usual over north-west India, but elsewhere the cloud proportion was generally above normal. The excess was greatest in parts of Burma, the Central Provinces and Hyderabad.

TABLE 13.

Division.	Hygrometry; 8 hrs.				Cloud.	
	Mean humidity.	Departure from normal.	Mean vapour tension in inches of mercury	Departure from normal in inches of mercury.	Mean cloud amount at 8 hrs.	Departure from normal.
	%					
Burma	84	+ 1	·437	—·034	3·6	+1·9
Assam	95	0	·398	—·013	4·1	+0·1
Bengal	89	+ 3	·442	+·009	2·5	+1·2
Bihar and Orissa	82	+ 5	·386	+·007	2·8	+1·5
United Provinces	71	— 8	·283	—·029	1·7	—0·5
Punjab	79	+ 1	·269	+·017	2·9	—1·1
North-West Frontier Province.	81	+10	·243	+·039	3·4	—0·6
Sind	69	+ 6	·328	+·060	2·1	—1·0
Rajputana	52	— 7	·234	—·012	2·3	—0·8
Bombay	58	— 3	·363	—·022	2·1	+1·2
Central India	57	— 9	·254	—·024	1·7	+0·0
Central Provinces	52	—12	·272	—·056	2·5	+1·3
Hyderabad	58	— 4	·382	—·003	4·3	+2·4
Mysore	68	— 2	·418	—·041	2·8	+0·4
Madras	76	— 2	·586	—·031	3·2	+0·9

Rainfall.

14. Rainfall observations are made at about 2,000 stations in India. The time of observation is 8 hrs. The arinfall data for each province are tabulated in the office of the Meteorologist, Director of Land Records, or other officer in the province, and are published in the provincial gazettes.

The charts illustrating the distribution of rainfall in the month under discussion are based in part upon the rainfall data of the meteorological observatories throughout India, and in part upon the rainfall statements of the month published by the Local Governments.

Plate VII is based on all the rainfall data available at the time of publication and shows the normal average rainfall and the departure of the rainfall from the normal of the month in the 33 meteorological or rainfall divisions.

The distribution of the total number of rainy days in each month is exhibited in chart No. 2 of Plate VI, and is based entirely on the data furnished by the meteorological observatories. A "rainy day" is one on which 0·10 inch or more of rain is received within 24 hours.

The normal figures of rainfall, and of the number of "rainy days," in Table B are based on observations which extend in most cases over a period of 40 or 50 years ending in 1910.

Punjab South-west was the only sub-division in which the rainfall was above the normal. Over the rest of the country rainfall was more than fifty per cent. in defect except in Baluchistan and Rajputana West where the deficiency was only 10 and 43 per cent. A very large proportion of the country had no rainfall at all.

TABLE 14.

Sub-division.	Number of rainy days.		Rainfall.			
	Actual.	Normal.	Actual.	Normal.	Departure from normal.	Percentage departure from normal.
			"	"	"	
1. Bay Islands	0	1·1	0	0·65	—0·65	—100
2. Lower Burma	0	0·2	0·02	0·09	—0·07	— 78
3. Upper Burma	0	0·3	0·01	0·11	—0·10	— 91
4. Assam	0·8	1·9	0·26	0·75	—0·49	— 65
5. Bengal	0	0·9	0·01	0·44	—0·43	— 98
6. Orissa	0	0·9	0	0·51	—0·51	—100
7. Chota Nagpur	0	1·8	0	0·92	—0·92	—100
8. Bihar	0	1·2	0	0·59	—0·59	—100
9. United Provinces, East	0·2	1·5	0·05	0·69	—0·64	— 93
10. Do., West	0	2·0	0	0·95	—0·95	—100
11. Punjab, East and North	1·3	2·2	0·57	1·23	—0·66	— 54
12. Punjab, South-west	1·1	1·2	0·66	0·49	+0·17	+ 35
13. Kashmir	3·3	5·0	1·39	3·76	—2·37	— 63
14. North-West Frontier Province	1·4	2·6	0·61	1·50	—0·89	— 59
15. Baluchistan	2·2	2·7	1·14	1·26	—0·12	— 10
16. Sind	0	0·7	0	0·27	—0·27	—100
17. Rajputana, West	0·2	0·4	0·08	0·14	—0·06	— 43
18. Do., East	0	0·9	0	0·35	—0·35	—100
19. Gujarat	0	0·1	0	0·04	—0·04	—100
20. Central India, West	0	0·7	0	0·30	—0·30	—100
21. Do., East	0	1·1	0·01	0·51	—0·50	— 98
22. Berar	0	0·6	0	0·31	—0·31	—100
23. Central Provinces, West	0	1·0	0	0·48	—0·48	—100
24. Do., East	0	0·8	0	0·35	—0·35	—100
25. Konkan	0	0·2	0	0·10	—0·10	—100
26. Bombay Deccan	0	0·3	0	0·12	—0·12	—100
27. Hyderabad, North	0	0·3	0	0·12	—0·12	—100
28. Do., South	0	0·3	0	0·15	—0·15	—100
29. Mysore	0	0·2	0	0·11	—0·11	—100
30. Malabar	0	0·5	0	0·39	—0·39	—100
31. Madras, South-east	0·7	1·2	0·26	0·90	—0·64	— 71
32. Do., Deccan	0	0·2	0	0·17	—0·17	—100
33. Do., Coast, North	0·1	0·3	0·04	0·35	—0·31	— 89

TABLE 15.

DIVISION.	RAINFALL.			
	Actual.	Normal.	Departure from normal.	Percentage departure from normal.
	"	"	"	
Burma	0·01	0·10	—0·09	— 90
Assam	0·26	0·75	—0·49	— 65
Bengal	0·01	0·44	—0·43	— 98
Bihar and Orissa	0	0·65	—0·65	—100
United Provinces	0·03	0·81	—0·78	— 96
Punjab	0·59	1·05	—0·46	— 44
North-West Frontier Province	0·61	1·50	—0·89	— 59
Sind	0	0·27	—0·27	—100
Rajputana	0·03	0·29	—0·26	— 90
Bombay	0	0·09	—0·09	—100
Central India	0·01	0·40	—0·39	— 97
Central Provinces	0	0·38	—0·38	—100
Hyderabad	0	0·14	—0·14	—100
Mysore	0	0·11	—0·11	—100
Madras	0·14	0·60	—0·46	— 77
Mean of India	0·09	0·46	—0·37	— 80

Snowfall.

I.—PERSIA.

15. Snow is reported to have fallen at Tashkent on the 15th and at Meshed on the 30th. Unusually warm weather was experienced in Turkistan and north-east Persia during the first three weeks. There was heavy rain between Shiraz and Kazarun during the week ending on the 10th.

II.—AFGHANISTAN.

No information has been received.

III.—NORTH-WEST FRONTIER PROVINCE.

(*a*) *Wano.*—The following statement shows the character of snowfall in this region.

TABLE 16.

Locality.	Elevation.	Number of falls.	Total amount.	
	ft.		ft.	in.
Marwatti and Pirghal	11,000	3	1	6
Bosh and Dre Nashtar	11,000	2	1	1
Jani Mela	9,000	3	1	1
Kundighar	9,000	2	0	10
Kotkun	7,900	2	0	6

Accumulations existing on these peaks at the end of the month were believed to be about 12 inches in depth.

(*b*) *Tochi* ((North Waziristan).—A slight fall occurred on the hills on the night of the 30th.

(*c*) *Dera Ismail Khan.*—The character of the snowfall in this area is illustrated by the following statement :—

TABLE 17.

Name of peak.	Elevation.	Approximate fall during month.
		feet.
Takht-i-Suleman	11,070	5
Kharghoza	5,803	4
Ubashta	...	7
Zmaraighar	...	5
Naveteza	...	3

On the Ubashta the chief falls occurred on the 27th, 30th and 31st.

(*d*) *Kurram.*—Snow fell on six days (1st, 2nd, 16th, 18th, 28th and 31st) on the Sufed Koh and on three days (1st, 2nd and 31st) in Parachinar. At the end of the month about 1 foot of snow was said to be lying on the Paiwar Kotal.

(*e*) *Kohat.*—On the Samana range snowstorms occurred on the 1st, 18th, 19th and 28th giving about 1½ feet of snow altogether.

(*f*) *Hazara.*—The following statement indicates the character of snowfall in this area :—

TABLE 18.

Locality.	Elevation in feet.	Total amount of snowfall during the month.		Number of days on which snow fell.	Total depth of unmelted snowfall on 15th February 1914.	
		ft.	in.		ft.	in.
Narang	8,000	5	7	9	8	6
Paluderan	7,500	4	5	9	7	4
Kagan	7,000	3	6	9	3	10
Jared	5,000	0	10	4	1	9
Malkandi	4,500	0	6	2	0	6
Sundigali	7,000	2	0	2	6	3
Jachha	6,000	1	6	2	4	0
Dungagali	8,000	2	7	7	6	0
Tandiani	8,800	3	2	6	5	2

III.—KASHMIR.

The statement below shows the character of snowfall in this area :—

TABLE 19.

Locality.	Number of snowfalls recorded during the month.	Total snowfall.	REMARKS.
Srinagar . . .	7	About 5 inches.	
Skardu . . .	14	About 1 foot.	
Dras	18	Over 3 feet	At the end of the month, the unmelted residue in the grounds of the observatory measured about 4½ feet in depth.
Kargil and surrounding hills.	11	Over 2 feet in Kargil itself.	At the close of the month about 12 feet snow was still lying unmelted on the surrounding hills.
Leh	6	About 3 inches.	

IV.—PUNJAB.

(*a*) *Murree.*—No snow fell in Murree or on the hills adjacent to Kahuta.

(*b*) *Simla Hills.*—Snowstorms occurred on the hills near Kilba on two occasions, *viz.*, on the 1st and 28th. The total fall at a level of about 6,500 feet amounted to about ½ foot. The fall on the 28th descended to the bed of the river.

V.—UNITED PROVINCES.

Almora.—The total snowfall of the month was estimated at 17 feet in Malla Johar, 8 feet in Byans, 5½ feet in Chaudas, 4 feet in Malla Danpur and 3¼ feet in Malla Darma.

TABLE 20.

Name of pass or peak.	DEPTH OF ACCUMULATION AT THE END OF THE MONTH.	
	Reported.	Normal.
	feet.	feet.
Nuwe Pass	41	31
Pindari Peak	4	8½
Kaphini „	4	8
Kuntela „	4	8
Untadhura Pass	6	18½
Ralamdhura „	5	12
Melamdhura „	4	14½
Lipulekh „	8	17½
Lampia „	14	7½
Binkaru „	25	27½

SUMMARY.

16. According to available information the snowfall of the month in the mountain zone bordering upper India was on the whole appreciably below the normal; and the accumulations existing at the close of the month were distinctly less than usual.

C. W. NORMAND.

The lines of the above chart represent isobars or lines of equal barometric pressure, the numbers attached indicating the barometric pressure in inches and being drawn for differences of pressure of ·05 inch. The isobars in the Bay of Bengal are filled in by means of the shore observations, and by comparison with the normal distribution of pressure.

The mean 8 hrs. wind directions of the month are shewn by means of arrows flying with the wind, and are calculated by means of Lambert's formula applied to the winds as given in Table B of the 8 hrs. observations. The mean wind directions for the hill stations are indicated by broken arrows to distinguish them from the wind arrows for the plain stations. The mean velocity of the winds during the month is shewn by the following notation:—

Velocity of	0 to 2 miles per hour	...	one feather added to the wind arrow.
,, ,,	2 to 5 ,, ,, ,,	...	two feathers ,, ,, ,, ,,
,, ,,	5 to 10 ,, ,, ,,	...	three ,, ,, ,, ,, ,,
,, ,,	10 to 20 ,, ,, ,,	...	four ,, ,, ,, ,, ,,
	over 20 ,, ,, ,,	...	five ,, ,, ,, ,, ,,

Wind strengths are based on factor 2·2 for the standard type of Beckley Robinson anemograph, instead of 3·0 as used for this plate up to December 1911 inclusive.

The lines of the above chart represent isobars or lines of equal barometric pressure, the numbers attached indicating the barometric pressure in inches and being drawn for differences of pressure of ·05 inch. The isobars in the Bay of Bengal are filled in by means of the shore observations, and by comparison with the normal distribution of pressure.

The mean 8 hrs. wind directions of the month are shewn by means of arrows flying with the wind, and are calculated by means of Lambert's formula applied to the winds as given in Table B of the 8 hrs. observations. The mean wind directions for the hill stations are indicated by broken arrows to distinguish them from the wind arrows for the plain stations. The mean velocity of the winds during the month is shewn by the following notation:—

Velocity of	0 to 2	miles per hour	...	one	feather	added to the wind arrow.						
,,	,, 2 to 5	,,	,,	,,	...	two	feathers	,,	,,	,,	,,	
,,	,, 5 to 10	,,	,,	,,	...	three	,,	,,	,,	,,	,,	
,,	,, 10 to 20	,,	,,	,,	...	four	,,	,,	,,	,,	,,	
	over 20	,,	,,	,,	...	five	,,	,,	,,	,,	,,	

Wind strengths are based on factor 2·2 for the standard type of Beckley Robinson anemograph, instead of 3·0 as used for this plate up to December 1911 inclusive.

The chart shows the departure from normal of the mean during the month of 8 hrs. pressure by means of lines drawn for equal amounts of departure. The numbers are given in thousandths of an inch, 20 representing ·020″ or two hundredths of an inch, &c. Continuous lines indicate that the pressure was in excess by amounts indicated by the numbers attached to the lines, and broken or dotted lines that it was in defect by amounts indicated by the numbers attached to the lines. Two parallel lines near to each other, one continuous and the other broken or dotted, represent the line of no departure, the dotted line facing the area of deficient pressure or negative departures.

CHART SHEWING THE DEPARTURE FROM NORMAL
OF THE MONTHLY MEAN OF DAILY
MAXIMUM TEMPERATURE.

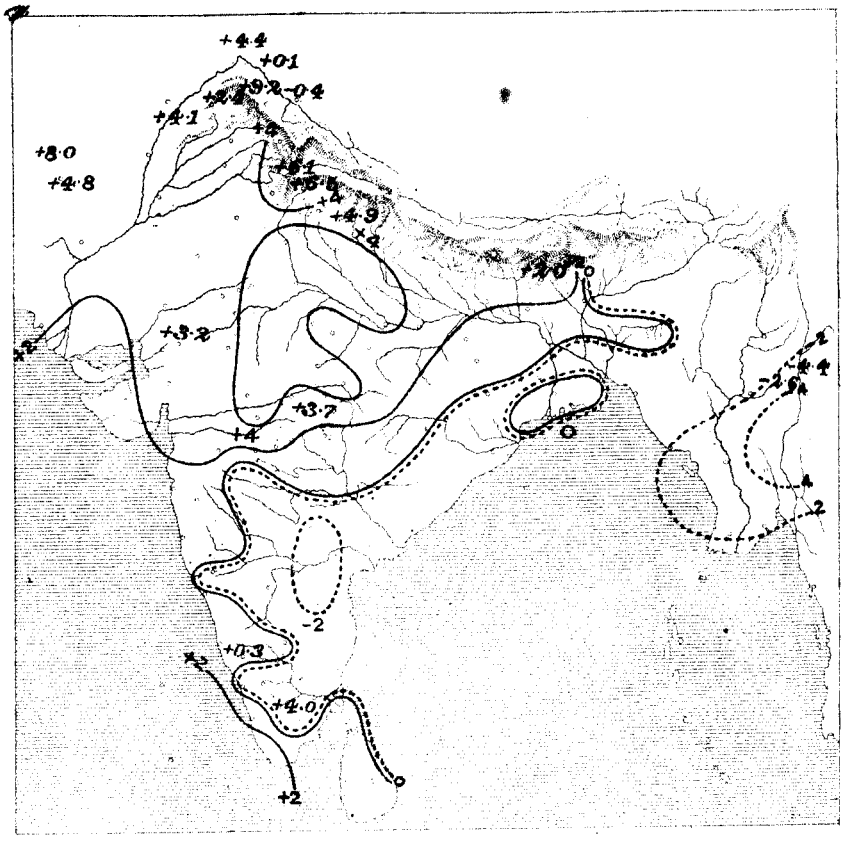

CHART SHEWING THE DEPARTURE FROM NORMAL
OF THE MONTHLY MEAN OF DAILY
MINIMUM TEMPERATURE.

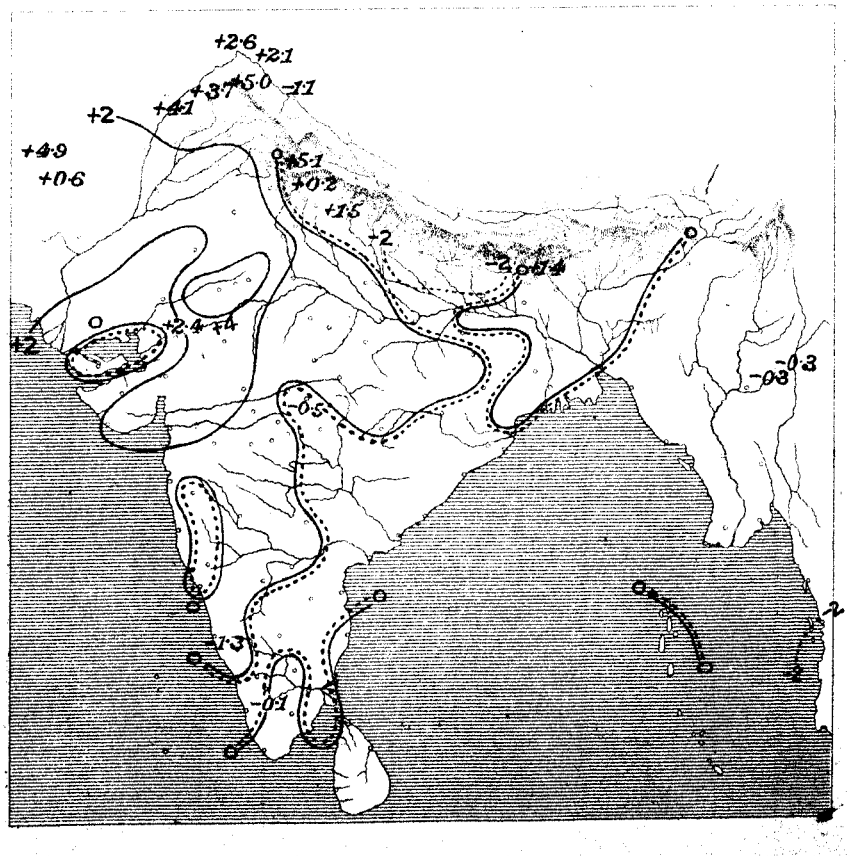

CHART SHEWING THE DEPARTURE FROM NORMAL
OF THE MONTHLY MEAN OF DAILY
MEAN TEMPERATURE.

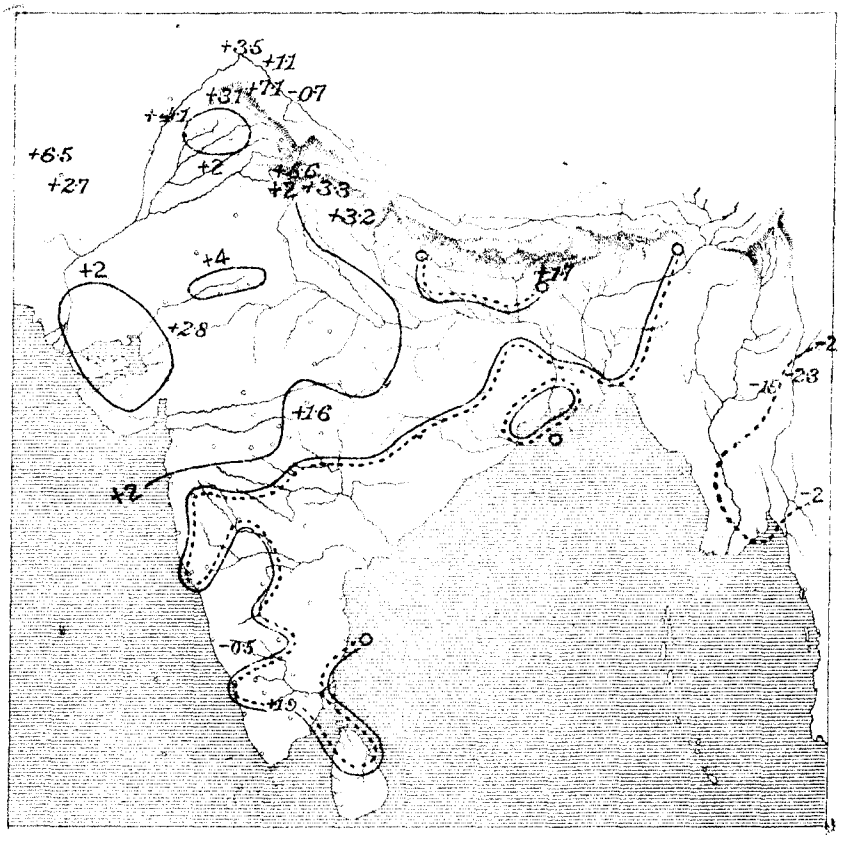

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CHART SHEWING THE DEPARTURE FROM NORMAL
OF THE MONTHLY MEAN OF ABSOLUTE
HUMIDITY AT 8 HRS.

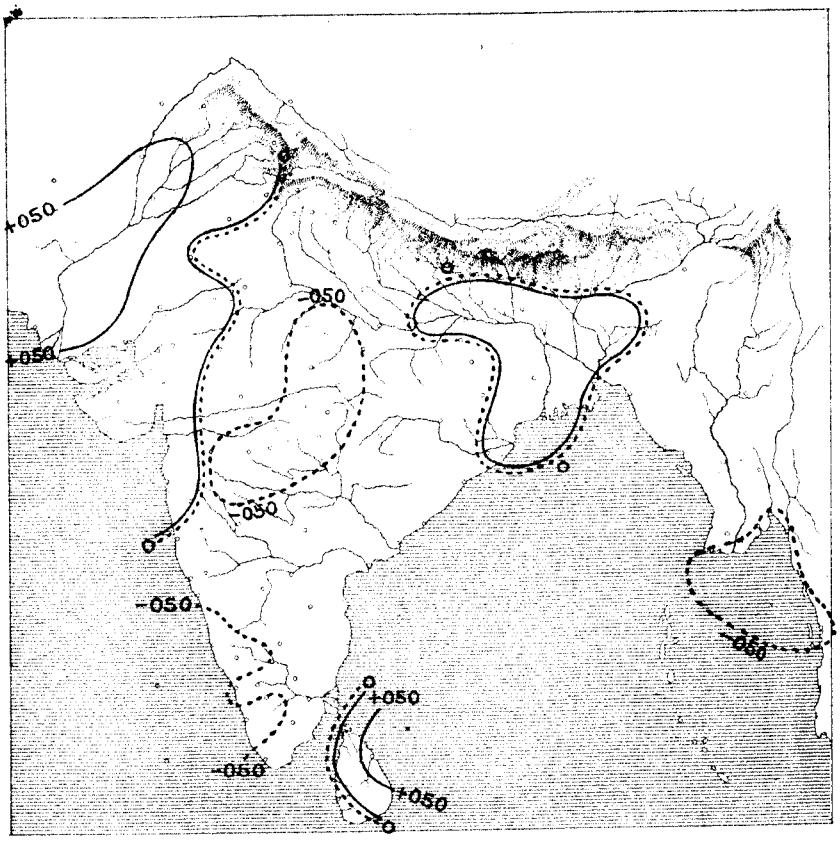


CHART SHEWING THE DEPARTURE FROM NORMAL
OF THE MONTHLY MEAN OF RELATIVE
HUMIDITY AT 8 HRS.

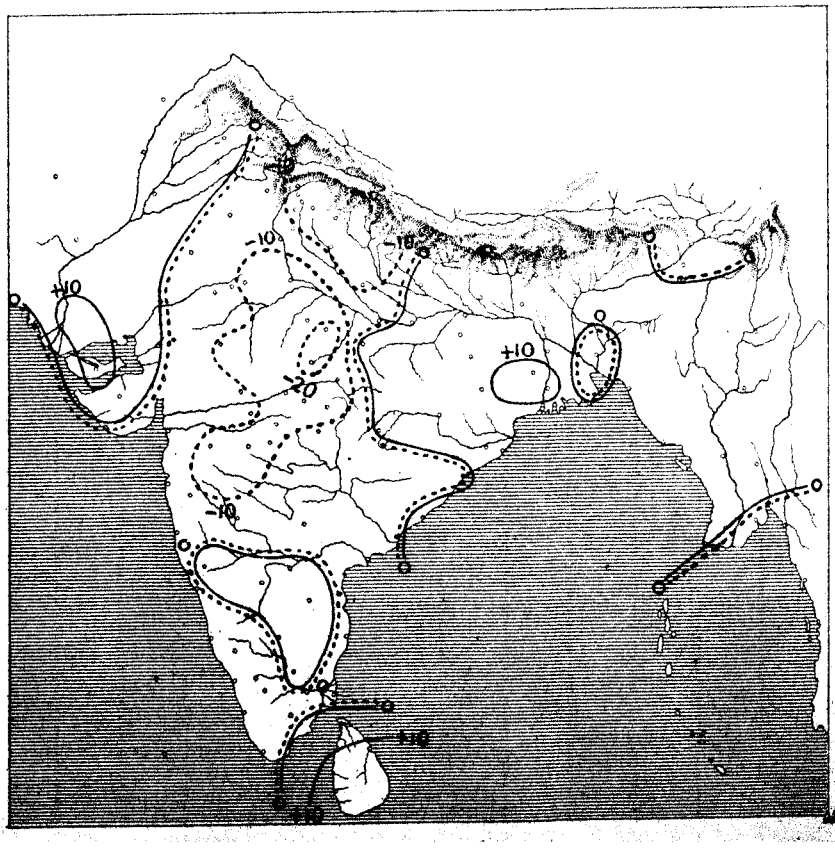


CHART SHEWING THE DEPARTURE FROM NORMAL OF THE MONTHLY MEAN OF CLOUD AMOUNT AT 8 HRS.

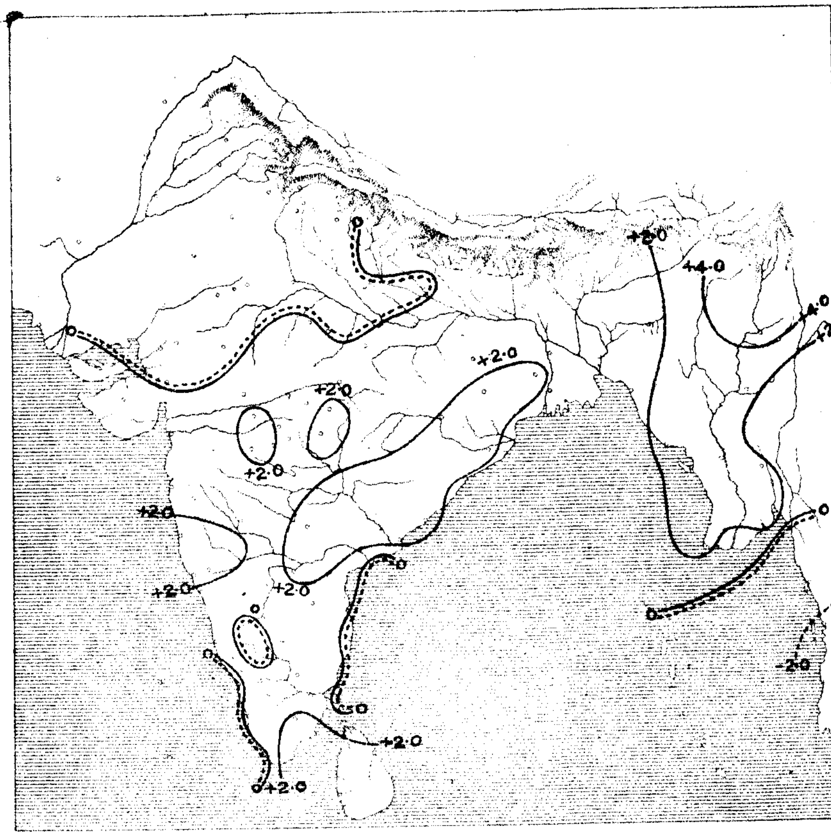
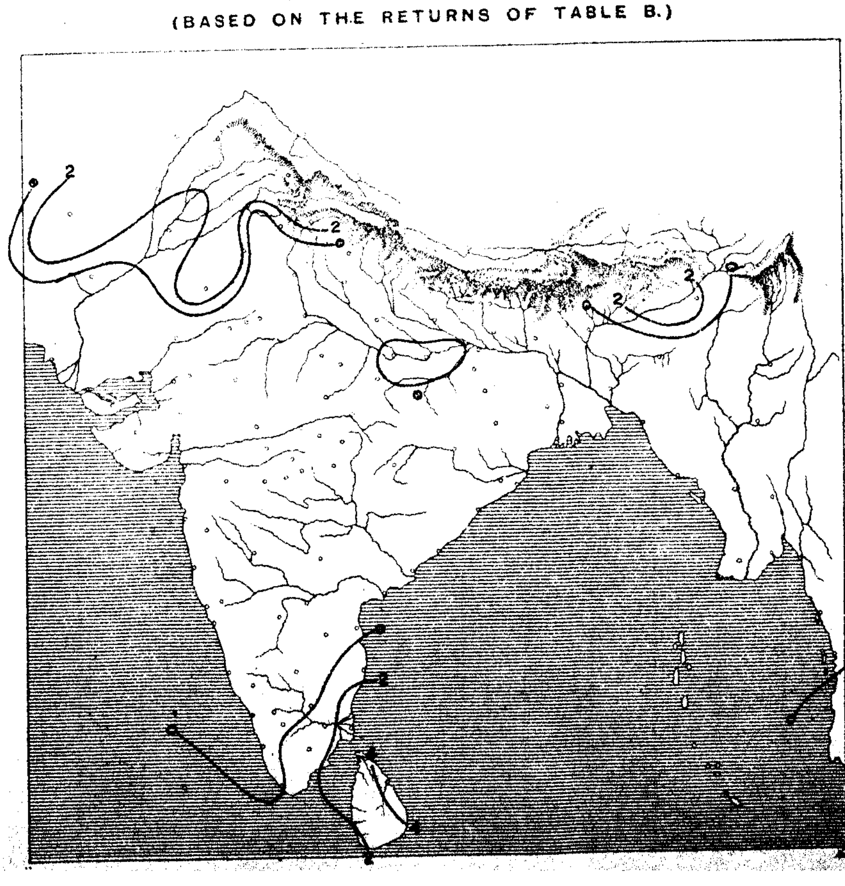


CHART SHEWING THE TOTAL NUMBER OF DAYS IN THE MONTH ON WHICH RAINFALL EQUALLED OR EXCEEDED 0·10 INCH.

(BASED ON THE RETURNS OF TABLE B.)



LITHO. BY S.E.M.

The country is divided into 33 areas as shewn in the list below. The numbers in that list correspond with the red numbers on the chart, and serve to identify the areas. The numbers in brackets on the chart give the average over the divisions of the normal monthly rainfall, the numbers above these give the departures from normal of the average actual rainfall over the divisions.

1. Bay Islands
2. Lower Burma
3. Upper Burma
4. Assam
5. Bengal
6. Orissa
7. Chota Nagpur
8. Bihar
9. United Provinces, East
10. United Provinces, West
11. Punjab, East and North
12. Do., Southwest
13. Kashmir
14. Northwest Frontier Province
15. Baluchistan
16. Sind
17. Rajputana, West
18. Rajputana, East
19. Gujarat
20. Central India, West
21. Do., East
22. Berar
23. Central Provinces, West
24. Do., East
25. Konkan
26. Bombay, Deccan
27. Hyderabad, North
28. Hyderabad, South
29. Mysore
30. Malabar
31. Madras, Southeast
32. Madras, Deccan
33. Madras Coast, North

GOVERNMENT OF INDIA.

METEOROLOGICAL DEPARTMENT.

MONTHLY WEATHER REVIEW

PUBLISHED BY ORDER OF

THE GOVERNMENT OF INDIA.

CALCUTTA, FEBRUARY, 1914.

INTRODUCTION.

THIS review of the weather in India during the month of February, 1914, is based on observations taken daily at 8 hrs. at 218 stations, and on additional observations taken at 10 hrs. and 16 hrs. at 14 stations. In the rainfall summary the data furnished by the meteorological observatories, and such rainfall statements of the month as had been published by the Provincial Governments up to the date of the preparation of the review, have been utilized.

The brief notes on solar, seismic and magnetic disturbances are supplied by the chief observatories.

For a statement of the methods adopted in recording and tabulating the data, for each of the elements of observation, reference should be made to the introductory portion of the review for January.

Summary of the chief features of the weather in India during the month.

2. During the month several depressions of the cold weather type were transmitted into India from the highlands to the west of the Indus, and two of these gave rise to widespread rain in northern India.

The total precipitation of the month was well above the normal in Assam, Bengal, Orissa, the Punjab, Kashmir, the North-West Frontier Province, Baluchistan, Sind and Berar, the excess amounting to over 3″ in Kashmir, and about 2″ in Assam, the North-West Frontier Province and Baluchistan. Over the rest of the country the month's fall was either normal or in defect, but except in the case of the Bay Islands the deficiency was nowhere greater than half an inch.

Scarcely any rain fell in the greater part of the Peninsula throughout the month.

In most divisions the amount of cloud was above the average. The air was considerably drier than usual in Rajputana, Central India and the Central Provinces. Day temperature was slightly lower than usual in Baluchistan, Sind and the North-West Frontier Province, and about the average elsewhere. Night temperature did not depart by more than 3° in any of the sub-divisions

Barometric pressure averaged over the plains was ·024″ in excess of the normal.

Solar, seismic and magnetic disturbances.

KODAIKANAL OBSERVATORY.

3. *Solar Observations.*—The weather was fine throughout the month and observations of the sun were made on all the days.

Sunspots.—Two groups of spots were seen during the month. One of them was first observed as a scattered train of dots to the west of the central meridian on the 2nd. The Cline was greatly disturbed near the spot on that day and the two subsequent days when the group consolidated to some extent. It began to decay later on and there was only a single dot on the 7th when it disappeared at the west limb. The other group was observed on the 27th in a high latitude south. This

consisted of two small dots which were only visible on one day. The heliographic positions of the spots were :—

Spot No.	Latitude.	Longitude.
2047	—13	178
2048	—26	196

Prominences.—Fifty-two large prominences were recorded during the month. The highest was 180″ and was recorded on the 6th at latitude —37° west.

Magnetic disturbances.—Only small disturbances were recorded on the 15th and 22nd.

TABLE 1.

Seismic records.

$\phi = 10° 13' 50''$ $\lambda = 77° 28' 00''$ $h = 2343$ m. Subsoil Rock.

Apparatus.—Milne's Horizontal Pendulum Seismograph.

	V	To	ϵ	$\frac{r}{To^2}$
AN :				
AE :	9·76	16·0	1	3·2
AZ :				

Date.	Phase.	Time, G. M. T.	Period (Sec.)	Amplitude (u) An.	Ae.	Az.	Distance Δ (Km.)	Remarks.
1914.		h. m. s.						
Feb. 4th	e P	21 02 48	...	...	...	...	...	Widening of line.
	F	22 16 12	...	...	...	...	...	
„ 6th	i P	12 50 30	...	...	...	...	...	
	i L	12 53 36	...	...	...	...	...	
	M	12 58 42	...	...	350	...	...	
	F	13 11 54	...	...	...	...	...	
„ 13th	e P	1 47 24	...	...	...	...	...	Widening of line.
	F	2 10 18	...	...	...	...	...	
„ 22nd	e P	23 20 54	...	...	...	...	...	
	e L	23 31 00	...	...	...	...	...	
	M	23 33 36	...	...	40	...	...	
	F	23 53 48	...	...	...	...	...	

J. EVERSHED,
Director,
Kodaikanal and Madras Observatories.

BOMBAY OBSERVATORY.

Alibag magnetic record.

4. During the month of February 1914 the trac showed 12 calm days, and 16 days of small disturbance.

The days of the month selected as quiet for t purposes of the Magnetic Survey of India are the 1 11th, 12th, 20th and 27th.

The following table represents the magnetic charact of each day during the month.

TABLE 2.

Day.	Character.	Day.	Character.	Day.	Character.	Day.	Charact
1	C	8	C	15	S	22	S
2	S	9	S	16	S	23	S
3	S	10	C	17	S	24	S
4	S	11	C	18	S	25	C
5	S	12	C	19	C	26	C
6	S	13	S	20	C	27	C
7	S	14	C	21	C	28	S

C=calm ; S=small ; M=moderate ; G=great ; V. G.=ve great.

The mean observed absolute values of the seve r magnetic elements reduced to the mean monthly tabu l tions of the magnetograms, as also the ranges and t l summed ranges of the horizontal force and declination a as follow :—

Easterly declination . . .	0° 45′ 24.″
Horizontal force . . .	0·36886 C. G. S. unit.
Vertical force	0·16537 C. G. S. unit.
Inclination	24° 8′·9.
Inclination (observed) . .	24° 7′·8.
Horizontal force range . .	0·00035 C. G. S. unit.
Horizontal force summed range .	0·00211 C. G. S. unit.
Declination range . . .	2′·0.
Declination summed range .	7′·8.

(NOTE.—Summed range means sum without regard to sign of 24 or nates of the diurnal inequality).

Seismic records.

$\phi = 18^\circ\ 53'\ 45''$; $\lambda = 72^\circ\ 48'\ 56''$; $h = 11$ m. Subsoil Trap.

Apparatus.—Milne's Horizontal Pendulum Seismograph.

TABLE 3.

	V	To	ϵ	$\frac{r}{To^2}$
AN :				
AE :	9	18	1	
AZ :				

Date.	Phase.	Time, G. M. T.	Period (sec.)	Amplitude (u) An.	Ae.	Az.	Distance Δ (Km.)	Remarks.
		h. m. s.						
1914								
Feb. 6th	P	11 45 30	...	...	...	...	...	
	M	11 51 24	...	...	111	...	...	
	F	12 5 42	...	...	...	...	...	
„ 22nd	P	...	...	...	...	...	...	Beginning mixed in tremors.
	M	21 34 24	...	...	44	...	...	
	F	...	...	...	...	...	...	End mixed in tremors.
„ 26th	P	5 17 48	...	...	...	...	...	
	M	6 23 42	...	...	89	...	...	
	F	6 47 48	...	...	...	...	...	

Thickening of line was noted on the following occasions :—

D. H. M. D. H. M. D. H. M.
2 7 16; 3 9 38; 14 20 29;

Sensibility to tilt = 1·0 mm. of amplitude on the trace = 0·41″

N. A. F. MOOS,
Director,
Bombay and Alibag Observatories.

5. CALCUTTA (ALIPORE) OBSERVATORY.

Seismic records.

$\phi = 22^\circ\ 32'\ 0''$; $\lambda = 88^\circ\ 21'\ 0''$; $h = 6{\cdot}4$ m. Subsoil.

Apparatus.—Milne's Horizontal Pendulum Seismograph.

TABLE 4.

	V	To	ϵ	$\frac{r}{To^2}$
AN :				
AE :	8·688	18	1	...
AZ :				

Date.	Phase.	Time, G. M. T.	Period (sec.)	Amplitude (u) An.	Ae.	Az.	Distance Δ (Km.)	Remarks.
		h. m. s.						
1914								
Feb. 3rd	P	11 49 13	...	...	...	...	...	Thickening of line.
	F	11 56 50	...	...	...	...	...	
„ 6th	P	11 42 9	...	...	...	...	...	
	L	11 47 14	...	...	...	...	...	
	M	11 56 23	...	...	86	...	...	
	F	12 16 43	...	...	...	...	...	
„ 22nd	P	21 27 30	...	...	...	...	...	
	L	21 28 31	...	...	...	...	...	
	M	21 40 44	...	...	115	...	...	
	F	21 55 59	...	...	...	...	...	
„ 26th	P	5 19 13	...	...	...	...	...	
	L	5 25 19	...	...	...	...	...	
	M	6 32 23	...	...	115	...	...	
	F	7 0 49	...	...	...	...	...	

E. P. HARRISON,
Offg. Meteorologist, Calcutta.

6. SIMLA OBSERVATORY.

Seismic records.

$\phi = 31^\circ\ 6'\ 0''$; $\lambda = 77^\circ\ 11'\ 0''$; $h = 2433{\cdot}5$ m. Subsoil Rock.

Apparatus.—Two Omori Ewing Horizontal Pendulum Seismographs (masses 50 kg.).

TABLE 5.

	V	To	ϵ	$\frac{r}{To^2}$
AN :	14	45	1	...
AE :	14	45	1	...
Az :				

Date.	Phase.	Time, G. M. T.			Period (sec.)	Amplitude (u). An.	Ae.	Az.	Distance Δ (Km.)	Remarks.
1914		h.	m.	s.						
Feb. 2nd	P	9	2	6	...	...	...	...	...	
	e F	9	10	0	...	...	...	...	...	Very slight tremors.
„ 6th	P	11	44	18	...	...	...	...	...	
	S	11	45	48	...	...	...	...	...	
	L	11	46	18	...	...	...	...	...	
	M	11	46	30	2·5	39	21	...	...	
	e F	12	19	0	...	...	...	...	...	
„ 6th	P	18	5	36	...	...	...	...	...	
	e F	18	10	c	Very rapid	...	...	...	...	Very slight local shock.
„ 12th	P	10	12	6	...	...	...	...	...	
	S	10	13	6	...	...	...	...	...	
	L	10	13	30	...	...	...	...	...	
	M	10	13	36	1·5	11	4	...	...	
	e F	10	22	0	...	...	...	...	...	
„ 20th	P	15	49	18	...	...	...	...	...	
	M	15	49	24	Very rapid	57	39	...	...	Slight local shock.
	F	15	51	18	...	...	...	...	...	
„ 22nd	e P	21	27	0	...	...	...	...	...	
	e F	21	45	0	...	...	...	...	...	Very slight tremors.
1914		h.	m.	s.						
Feb. 24th	i	15	45	42	...	...	...	...	...	
	e F	15	56	0	...	...	...	...	...	
„ 26th	P	5	18	6	...	...	...	...	...	
	S	5	27	54	...	...	...	...	...	
	L	5	39	24	...	...	...	...	...	
	M	6	22	6	24	18	7	...	...	
	e F	6	47	0	...	...	...	...	...	

Following table contains a list of earthquakes that were reported :—

TABLE 6.

Place at which felt.	Date.	G. M. T. of earthquake.		Duration.	Intensity Rossi-Forel scale.	No. of shocks.
	Feb.	h.	m	sec.		
Turbat-i-Haidari . . .	2nd	8	19	3	6	1
„ . . .	2nd	9	4	1	3	1
Dalbandin . . .	6th	12	14	...	...	3
Kabul	6th	17	24	...	...	1
Drosh	6th	18	5	25	6	1
Meshed	8th	0	15	5	4	5
Shillong	8th	22	48	2	5	2
„	8th	22	52	1	4	1
Khushab	11th	22	0	2	3	Continuous shocks.
„	12th	10	0	2	4	„
Cherat	12th	10	17	5	5	2
„	13th	0	40	5	5	3
Shillong	17th	4	46	1	3	1
„	18th	0	7	1	3	1

Solar radiation.—The following figures give the intensity of solar radiation, as measured at Simla by Angstrom's pyrheliometer. The values are corrected to local noon, and expressed in grammecalories per square centimetre per minute :—

Maximum	1·48
Minimum	1·37
Mean	1·43
Number of days of observation . . .	3

C. W. NORMAND,
Imperial Meteorologist, Simla.

ROYAL ALFRED OBSERVATORY, MAURITIUS.

7. No information has been received.

Weather in the Indian Ocean.

8. Pressure was about as high at Zanzibar and Seychelles as in India. The wind movement was below its average strength at both the recording stations in the equatorial belt, and at Seychelles it blew more directly from the north than usual. But little rain fell at Zanzibar, and even at Seychelles the month's recorded amount was 21 per cent. short of the normal.

TABLE 7.

	Mauritius.	Zanzibar.	Seychelles.
Departure from normal of mean pressure.	+·013	+·034	+·036
Actual mean wind direction	S 82° E	N 21° E	N 9° W
Normal mean wind direction	S 83° E	N 27° E	N 21 W
Actual mean wind velocity (miles per diem).	121	96	72
Normal mean wind velocity (miles per diem).	162	118	107
Rainfall departure from normal	—2·54	—2·36	—2·70

Depressions and cyclonic storms.

9. Five depressions in all affected the Indian weather during the month under review, the first from the 1st to the 4th, the second on the 5th and 6th, the third between the 12th and 18th, the fourth from the 20th to the 22nd, and the fifth from the 27th to the 4th of March. All of these were of extra-Indian origin, having advanced from the plateau beyond the north-west frontier of India.

The third disturbance of the series was remarkably deep, the barometer in the central area standing about a third of an inch below the normal height. Widespread rain occurred in northern India during its passage and also in connection with the last disturbance of the month, but in the case of the other three disturbances the precipitation was confined almost entirely to the extreme north.

Pressure.

10. On the mean of the whole of February barometric pressure in the plains was above the normal, though not to the same extent as in January.

TABLE 8.

Month.	Departure from normal of barometric pressure over the plains of India as a whole.
	"
January	+·079
February	+·024

As temperature over the greater part of the country was higher than usual the high pressure conditions were not traceable directly to the abnormalities of temperature as recorded in the lowest stratum of the atmosphere.

TABLE 9.

Division.	Departure from normal of	
	Pressure.	Temperature.
	"	°
Burma	+·041	—0·5
Assam	+·029	+0·8
Bengal	+·018	+1·5
Bihar and Orissa	+·015	+1·2
United Provinces	+·016	+1·3
Punjab	+·025	—1·3
North-West Frontier Province	+·002	—2·3
Sind	+·031	—2·4
Rajputana	+·013	—0·1
Bombay	+·023	—0·2
Central India	+·013	+1·0
Central Provinces	+·015	+1·6
Hyderabad	+·033	+1·7
Mysore	+·035	+1·5
Madras	+·033	+0·3

The vertical gradient was steeper than usual in north-east India, the Sind-Baluchistan region and the south of the Peninsula, and was nearly normal elsewhere.

TABLE 10.

Hill station.	Departure from normal pressure. A.	Plain station.	Departure from normal pressure. B.	Departure of pressure difference. B—A.
	"		"	°
Quetta	+·009	Jacobabad	+·030	+·021
Leh	+·028	Lahore	+·019	—·009
Murree	+·010	Peshawar	+·008	—·002
Simla	+·034	Ludhiana	+·033	—·001
Chakrata	+·032	Roorkee	+·041	+·009
Darjiling	—·006	Dhubri	+·025	+·031
Mount Abu	+·012	Deesa	+·023	+·011
Pachmarhi	+·023	Khandwa	+·023	0
Kodaikanal	+·012	Madura	+·039	+·027

Temperature.

11. Day temperature was in defect by 5½° in Baluchistan, by 4° in the North-West Frontier Province and Sind, and by 3° in the Punjab South-west; but in all the other sub-divisions the departures were less than 2½° in magnitude. Minimum temperature was 3° below the average in Baluchistan, above the normal by a similar amount in Hyderabad North, the Central Provinces East and Bengal, and was very nearly normal elsewhere.

Thus over by far the greater part of the cou temperature conditions of the month did not differ to great extent from the average.

A cool wave of slight intensity advanced ac northern India into Burma in the rear of the third dis bance of the month.

TABLE 11.

Sub-division.	Actual temperature.					Departure from normal o		
	Mean maximum.	Mean minimum.	Monthly mean of mean between maximum and minimum.	Mean daily range of temperature.	Absolute range during month.	Maximum.	Minimum.	D ra
	°	°	°	°	°	°	°	
1. Bay Islands	84·7	73·8	79·2	10·9	16·5	—1·7	—1·4	—
2. Lower Burma	88·5	66·2	77·3	22·4	31·3	—0·1	—0·6	+
3. Upper Burma	86·4	56·4	71·4	30·0	43·2	—0·9	—0·6	—
4. Assam	75·8	56·3	66·1	19·5	30·6	—0·6	+2·0	—
5. Bengal	81·9	60·6	71·2	21·3	36·2	+0·4	+2·6	—
6. Orissa	87·4	64·2	75·9	23·2	37·1	+0·1	+0·5	—
7. Chota Nagpur	84·5	57·0	70·7	27·5	46·2	+2·3	+2·3	
8. Bihar	80·2	55·3	67·8	24·8	39·4	+1·0	+1·5	—
9. United Provinces, East	80·5	52·4	66·4	28·1	44·7	+2·2	+0·6	+
10. Ditto, West	78·4	51·8	65·1	26·6	43·2	+1·5	+0·7	+
11. Punjab, East and North	70·1	46·6	58·3	23·4	38·7	—2·3	0	—
12. Do., South-west	68·7	44·9	56·8	23·8	39·5	—3·1	—0·6	—
13. Kashmir	40·1	20·5	30·3	19·6	36·7	+0·2	+1·2	—
14. North-West Frontier Province	65·0	43·2	54·1	21·8	41·7	—4·1	—0·5	—
15. Baluchistan	57·0	37·5	47·2	19·5	42·0	—5·5	—3·0	—
16. Sind	74·9	53·6	64·2	21·4	37·6	—3·9	—0·9	—
17. Rajputana, West	76·3	51·1	63·7	25·2	42·9	—1·2	—0·3	—
18. Rajputana, East	78·3	52·6	65·5	25·7	43·3	+0·1	+0·3	—
19. Gujarat	83·2	57·3	70·2	25·8	41·1	—2·0	—0·9	—
20. Central India, West	81·7	52·9	67·3	28·7	46·9	—0·6	+0·8	—
21. Do., East	82·1	53·3	67·7	28·8	49·3	+2·2	+1·7	+
22. Berar	89·7	61·7	75·7	28·0	44·5	+1·1	+1·5	—
23. Central Provinces, West	86·6	57·6	72·1	29·0	46·9	+1·5	+1·8	—
24. Ditto, East	89·0	60·6	74·8	28·4	44·1	+1·2	+2·7	—
25. Konkan	84·6	69·0	76·8	15·6	23·6	—0·5	+0·4	—
26. Bombay Deccan	91·2	60·0	75·6	31·2	44·1	+0·9	+1·1	—
27. Hyderabad, North	91·3	63·2	77·3	28·1	40·2	+2·1	+3·1	—

Sub-division.	Actual temperature. Mean maximum.	Mean minimum.	Monthly mean of mean between maximum and minimum.	Mean daily range of temperature.	Absolute range during month.	Departure from normal of Maximum.	Minimum.	Daily range.
	°	°	°	°	°	°	°	°
28. Hyderabad South	93·1	66·8	80·0	26·3	36·0	+1·1	+1·3	−0·2
29. Mysore	89·4	62·7	76·0	26·7	37·5	+1·9	+1·2	+0·7
30. Malabar	88·0	73·5	80·8	14·5	21·2	−0·3	+0·9	−1·2
31. Madras, South-east	89·6	69·0	79·3	20·6	31·5	+0·2	+0·3	−0·1
32. Do., Deccan	95·2	66·3	80·8	28·8	40·8	+1·1	+1·6	−0·5
33. Do. Coast, North	86·9	68·3	77·6	18·6	29·0	+0·5	−0·6	+1·1

TABLE 12.

Division.	Departure from normal of Mean maximum temperature.	Mean minimum temperature.	Mean temperature.
	°	°	°
Burma	−0·4	−0·6	−0·5
Assam	−0·6	+2·0	+0·8
Bengal	+0·4	+2·6	+1·5
Bihar and Orissa	+1·0	+1·4	+1·2
United Provinces	+1·9	+0·7	+1·3
Punjab	−2·5	−0·2	−1·3
North-West Frontier Province	−4·1	−0·5	−2·3

Division.	Departure from normal of Mean maximum temperature.	Mean minimum temperature.	Mean temperature.
	°	°	°
Sind	−3·9	−0·9	−2·4
Rajputana	−0·4	+0·1	−0·1
Bombay	−0·6	+0·1	−0·2
Central India	+0·8	+1·2	+1·0
Central Provinces	+1·3	+1·9	+1·6
Hyderabad	+1·6	+1·9	+1·7
Mysore	+1·9	+1·2	+1·5
Madras	+0·3	+0·4	+0·3

Winds.

12. (*a*) The rate of air movement was distinctly greater than usual in Rajputana and the Central Provinces, and was low in Burma, Bengal, the United Provinces, and the North-West Frontier Province.

(*b*) The degree of steadiness was very high in Assam, the Punjab, Sind and Rajputana, and was low in Bengal, Bihar and Orissa, the United Provinces, Central India and Mysore.

(*c*) In several parts of northern India the direction of movement was very abnormal. Thus on the coast between Puri and Saugor Island the actual direction was from between south-west and west, the normal being about north-west, while in the interior of Bengal the normal westerly element in the direction was almost entirely absent. The following data for representative stations illustrate these features:

TABLE 13.

Stations.	Wind direction. Actual.	Normal.
	°	°
Hukitala (False Point)	S 47 W	N 57 W
Saugor Island	S 37 W	N 3 W
Narayanganj	S 18 E	N 27 W
Bogra	N 62 E	N 27 W
Dinajpur	N 50 E	N 83 W
Purnea	S 76 E	S 64 W

These deflections were apparently due to the fact that two of the disturbances which affected the weather in the month were transmitted as well-defined depressions across north-east India.

At Darjiling the opposite deflection occurred, the actual wind direction being due west instead of south-east which is normally the case.

The direction of air motion was unusual also in Central India and the eastern and central parts of the United Provinces.

TABLE 14.

STATIONS.	WIND DIRECTION.	
	Actual.	Normal.
	°	°
Benares	S 4 E	S 52 W
Lucknow	S 5 E	N 74 W
Sutna	S 30 W	N 30 W
Nowgong	S 36 W	N 85 W
Indore	N 30 E	N 29 W

TABLE 15.

DIVISION.	DEPARTURE FROM NOR OF	
	Hourly wind velocity.	Wir steadin
Burma	−0·5	—
Assam	0	+2
Bengal	−0·6	−1
Bihar and Orissa	+0·1	—
United Provinces	−0·4	—
Punjab	+0·3	+
North-West Frontier Province	−0·5	+
Sind	−0·2	+
Rajputana	+0·7	+
Bombay	−0·2	—
Central India	−0·1	—
Central Provinces	+0·8	—
Hyderabad	0	0
Mysore	+0·1	−1
Madras	+0·5	—

Humidity and cloud.

13. Humidity, both absolute and relative, was in defect in the United Provinces, Rajputana, Central India and the Central Provinces, and was higher than usual in Bengal. In Baluchistan, the North-West Frontier Province and the western half of the Punjab, although the vapour pressure was normal, the percentage of saturation was nevertheless in excess in virtue of the lowness of temperature.

Except in Mysore, the Coromandel coast districts, Assam, Rajputana and a few places elsewhere the sky was more cloudy than usual in all parts of the country.

TABLE 16.

DIVISION.	HYGROMETRY, 8 HRS.				CLOUD.	
	Mean humidity.	Departure from normal.	Mean vapour tension in inches of mercury.	Departure from normal in inches of mercury.	Mean cloud amount at 8 hrs.	Departure from normal.
	%					
Burma	79	− 1	·540	−·026	2·8	+0·9
Assam	91	0	·472	+·021	4·1	−0·2
Bengal	86	+ 4	·546	+·053	3·5	+1·2
Bihar and Orissa	73	+ 2	·461	+·018	2·6	+0·6

DIVISION.	HYGROMETRY. 8 HRS.				CLOUD.	
	Mean humidity.	Departure from normal.	Mean vapour tension in inches of mercury.	Departure from normal in inches of mercury.	Mean cloud amount at 8 hrs.	Dep tu fro norm
	%					
United Provinces	64	− 7	·310	−·028	3·3	+0
Punjab	78	+ 3	·286	0	4·5	+0
North-West Frontier Province.	79	+ 6	·257	+·001	4·7	+0
Sind	67	+ 4	·378	+·009	3·7	+1·
Rajputana	44	− 9	·208	−·055	3·1	6
Bombay	60	+ 1	·411	+·004	2·1	+0
Central India	48	−13	·261	−·060	2·5	+0
Central Provinces	43	−12	·285	−·055	2·1	+0
Hyderabad	50	− 4	·408	−·016	2·3	+0
Mysore	61	− 3	·454	−·018	1·6	−0·
Madras	75	− 2	·660	−·017	2·3	+0·

Rainfall.

14. For the month as a whole there was an excess of precipitation over nearly the whole area extending from Baluchistan to Assam; the only sub-divisions which faile to obtain their proper share were Rajputana, the Unite

Provinces and Chota Nagpur, but in the last named area alone did the deficiency amount to half an inch. The fall was very heavy for the time of year in Baluchistan, Sind, the North-West Frontier Province, the Punjab South-west, Bengal and Assam, which received two to three times their normal quantity. In Central India, the Central Provinces excluding Berar, and the Peninsula the weather was even drier than usual.

TABLE 17.

Sub-division.	Number of rainy days,		Rainfall,			
	Actual.	Normal.	Actual.	Normal.	Departure from normal.	Percentage departure from normal.
			"	"	"	
1. Bay Islands	0	0·9	0	0·59	—0·59	—100
2. Lower Burma	0·1	0·4	0·09	0·28	—0·19	— 68
3. Upper do.	0·4	0·4	0·15	0·16	—0·01	— 6
4. Assam	4·4	3·1	3·22	1·27	+1·95	+154
5. Bengal	2·7	1·6	2·12	0·92	+1·20	+130
6. Orissa	2·0	1·5	1·34	0·91	+0·43	+ 47
7. Chota Nagpur	1·7	2·5	0·85	1·37	—0·52	— 38
8. Bihar	1·9	1·6	0·84	0·73	+0·11	+ 15
9. United Provinces, East	1·7	1·3	0·54	0·55	—0·01	— 2
10. Do. West	1·5	1·7	0·63	0·90	—0·27	— 30
11. Punjab, East and North	0·3	2·1	1·40	1·07	+0·33	+ 31
12. Punjab, South-west	2·9	1·4	1·33	0·57	+0·76	+133
13. Kashmir	8·7	4·9	6·54	3·33	+3·21	+ 96
14. North-West Frontier Province	5·4	3·0	3·34	1·38	+1·96	+142
15 Baluchistan	5·2	3·3	3·47	1·46	+2·01	+138
16. Sind	1·3	0·9	0·80	0·32	+0·48	+150
17. Rajputana, West	0·3	0·7	0·08	0·34	—0·26	— 76
18. Do. East	0·1	0·8	0·03	0·33	—0·30	— 91
19. Gujarat	0·3	0·3	0·15	0·12	+0·03	+ 25
20. Central India, West	0·2	0·7	0·05	0·29	—0·24	— 83
21. Do. East	1·3	1·3	0·23	0·65	—0·42	— 65
22. Berar	1·3	0·6	0·55	0·30	+0·25	+ 83
23. Central Provinces, West	0·7	1·2	0·33	0·57	—0·24	— 42
24. Do. East	1·0	1·3	0·40	0·77	—0·37	— 48
25. Konkan	0·1	0·1	0·03	0·03	0	0
26. Bombay Deccan	0·1	0·2	0·02	0·08	—0·06	— 75
27. Hyderabad, North	0·4	0·4	0·20	0·17	+0·03	+ 18
28. Do. South	0	0·5	0	0·21	—0·21	—100
29. Mysore	0·1	0·2	0·03	0·11	—0·08	— 73
30. Malabar	0	0·3	0	0·20	—0·20	—100
31. Madras, South-east	0·2	0·8	0·08	0·53	—0·45	— 85
32. Do. Deccan	0	0	0	0·09	—0·09	—100
33. Do. Coast, North	0·3	0·5	0·21	0·39	—0·81	— 46

TABLE 18.

DIVISION.	RAINFALL.			
	Actual.	Normal.	Departure from normal.	Percentage departure from normal.
	"	"	"	
Burma	0·13	0·20	—0·07	— 35
Assam	3·23	1·27	+1·95	+154
Bengal	2·12	0·92	+1·20	+130
Bihar and Orissa	0·96	0·92	+0·04	+ 4
United Provinces	0·59	0·71	—0·12	— 17
Punjab	1·38	0·94	+0·44	+ 47
North-West Frontier Province	3·34	1·38	+1·96	+142
Sind	0·80	0·32	+0·48	+130
Rajputana	0·05	0·33	—0·28	— 8
Bombay	0·06	0·08	—0·02	— 2
Central India	0·08	0·47	—0·39	— 8
Central Provinces	0·42	0·57	—0·15	— 26
Hyderabad	0·09	0·19	—0·10	— 53
Mysore	0·03	0·11	—0·08	— 33
Madras	0·10	0·41	—0·31	— 76
Mean of India	0·62	0·52	+0·10	+ 19

Snowfall.

I.—AFGHANISTAN.

15. In Kabul 1½ feet snow fell on the 3rd, 2 feet on the 13th and about 1 inch on the 14th.

II.—NORTH-WEST FRONTIER PROVINCE.

(a) Wano.—The following statement shows the character of snowfall in this area :

TABLE 19.

Locality.	Elevation.	Number of falls.	Total depth of snowfall.	
	Feet.		Feet.	Inches.
Marwatti and Pirghal	11,000	5	2	10
Bosh and Dre Nashtar	11,000	2	1	6
Jani Mela	9,000	5	2	2
Kundighar	9,000	4	1	9
Spera	10,000	2	1	3
Kotkun	7,900	3	0	10
Karkana	9,000	1	0	5
Naboti	9,000	1	0	5
Wana plains	5,000	1	0	1

At the end of the month the unmelted residue of snow on the higher passes was about 2½ feet in depth.

(b) Tochi (North Waziristan.)—Light snow fell on the hills on the 2nd and heavy snow on the 13th—14th.

(c) Dera Ismail Khan.—The following is a statement of the snowfall recorded in this area :

TABLE 20.

Name of peak.	Height.	Total snowfall.	Depth of unmelted residue existing at the end of the month.
		Feet.	
Takht-i-Suleman	11,070	6	1½ feet
Khargoza	5,803	6	1½ "
Ubashta	...	6	1½ "
Zmaraighar	...	6	2 "
Naveteza	...	3	1 foot

On the first three peaks the heaviest fall occurred on the 13th of the month.

(d) Kurram.—There were altogether twelve falls on the Sufed Koh and five of these extended to the level of Parachinar. On the 28th snow to a depth of 3 feet was said to be lying on the Paiwar Kotal.

(e) Kohat.—There were altogether thirteen falls on the Samana range ; the total fall amounted to 23 feet (?).

(f) Drosh.—The character of the snowfall in this locality is indicated by the statement below :—

TABLE 21.

Date of fall.	Depth. In Drosh.	Depth. On the surrounding hills.	Remarks.
		Feet Inches.	
1st . .	...	0 5	By the end of the month snow had disappeared entirely from open situations in Drosh; the depth of accumulations on the hills not known.
2nd . .	...	0 2	
3rd . .	1½ inches	0 10	
4th . .	⅛ „	0 1½	
7th . .	¼ „	0 2	
14th . .	6 „	3 0	
15th . .	7½ „	5 0	
16th . .	¾ „	0 3	
17th . .	½ „	0 2½	
21st . .	⅛ „	0 ½	
22nd . .	4¾ „	2 0	
23rd . .	½ „	0 4	

(g) Hazara.—The following statement shows the character of snowfall in this district :

TABLE 22.

Locality.	Total depth of snowfall during the month.	Number of days on which snow fell.	Reported depth of accumulations existing on the 15th March 1914.
	Feet Inches.		Feet Inches.
Narang . . .	16 0	15	7 5
Paluderan . . .	11 11	15	5 3
Kagan . . .	8 7	15	2 0
Jared . . .	5 0	15	0 0
Malkandi . . .	2 7½	15	0 0
Sundigali . . .	18 2	18	6 0
Jachha . . .	13 8	18	4 0
Dungagali . .	11 7	17	4 3
Tandiani . . .	12 6	18	7 3

The storm of the 16th—18th was exceptionally heavy and gave snow down to a level of about 3,000 feet.

III.—KASHMIR.

The statement below shows the character of snowfall in this area :

TABLE 23.

Locality.	Number of days on which snow fell.	Aggregate amount of snowfall.	Remarks.
Srinagar . . .	10	About 4 feet.	
Dras . . .	16	About 3 feet .	The accumulations existing at the end of the month were about 9 feet deep.
Skardu . . .	10	Nearly 1 foot.	
Kargil and the surrounding hills.	9	In Kargil itself the total fall amounted to about 1½ feet in depth.	At the end of the month the unmelted residue on the hills, was said to be about 15 feet in depth.
Leh . . .	6	3 inches.	

IV.—PUNJAB.

(a) Murree.—At Murree snow fell on four days to a total depth of 8 feet. At Kahuta there was only one slight fall.

(b) Rawalpindi.—Snow to a depth of about 1 foot fell on the 3rd in the villages of Malpur, Nurpur, Shahan, Mandla, Shahdara, Bangial and Jhan Bangial. It melted away in about two days. A storm on the 17th gave about 1½ feet of snow in the villages of Saidpur, Ratta Hotar and Kakina; it disappeared in about a week.

(c) Kilba—(Simla Hills).—Snow-storms occurred on the 2nd, 3rd, 7th, 8th, 13th to 18th, 21st, 22nd and 28th. The snow line descended to the level of the river bed. The total quantity measured at a level of about 6,500 feet amounted to about 6½ feet. The falls were apparently general. The accumulations existing at the end of the month at a height of about 12,000 feet were said to be about 8 feet in depth.

V.—UNITED PROVINCES.

(a) Garhwal.—Snow fell on the hills in this district on the 3rd, 6th, 7th and the 13th to 18th. The falls of the 13th to 18th were heavy and descended to a level of about 4,500 feet.

(b) Almora.—The aggregate snowfall of the month was estimated at 15 feet in Malla Darma, 12 feet in Malla Danpur, 11 feet in Byans, 9 feet in Chaudas, 7½ feet in Malla Johar and 5 inches in Almora itself.

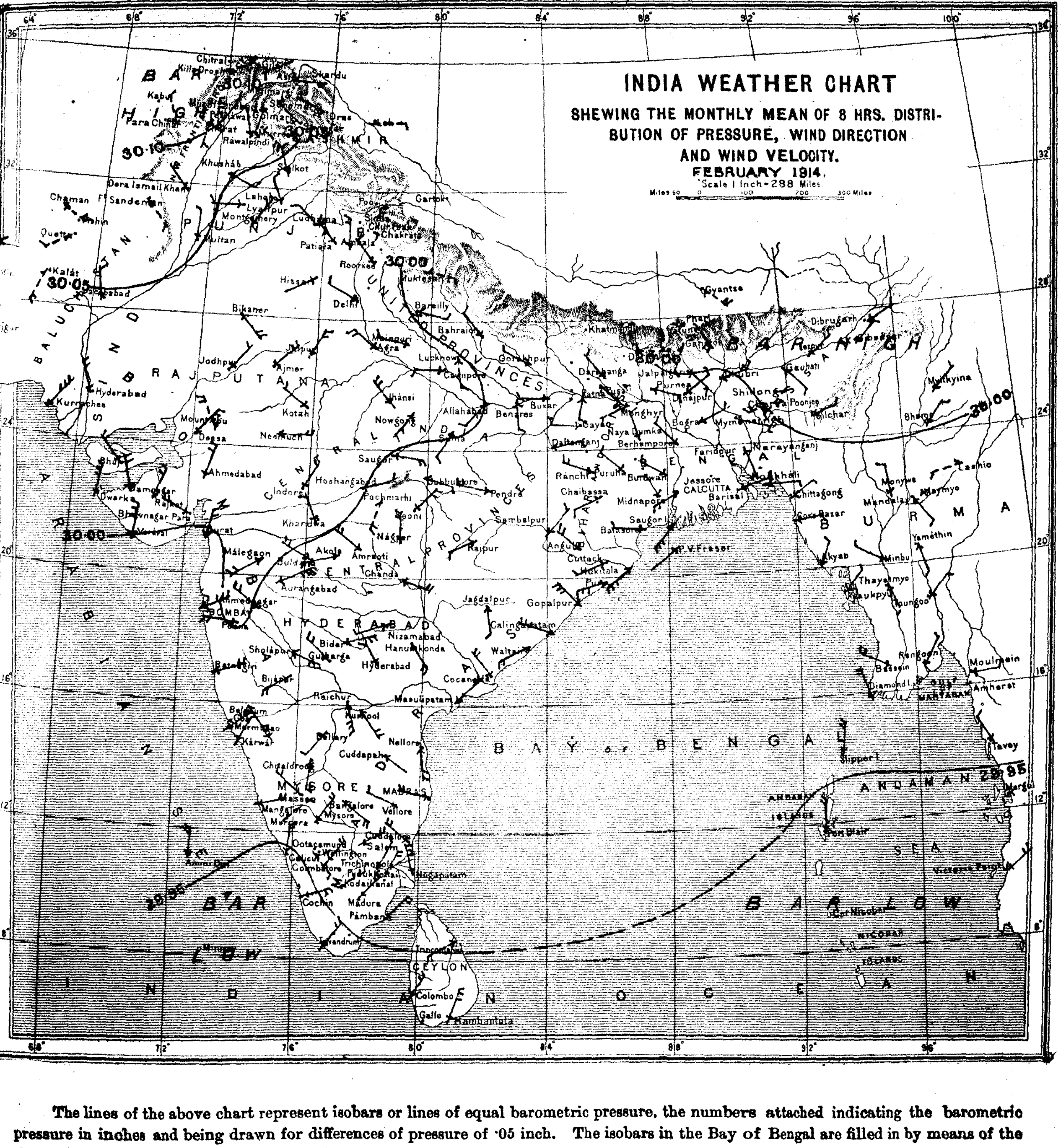
TABLE 24.

Name of pass or peak.		DEPTH OF ACCUMULATION AT THE END OF THE MONTH.		
		Reported.		Normal.
		Feet	Inches.	Feet.
Nuwe	Pass	48	0	35
Pindari	Peak	12	0	8½
Kaphini	,,	12	0	8½
Kuntela	,,	12	0	8½
Bagodiyar		1	0	...
Lipulekh	Pass	16	0	19
Lampia	,,	20	0	21½
Binkaru	,,	21	0	37½

SUMMARY.

16. So far as can be judged the snowfall of the month in the mountain zone bordering upper India was on the whole in excess of the normal. Snow is reported to have fallen down to remarkably low levels in a part of the Rawalpindi district.

HEM RAJ.



The lines of the above chart represent isobars or lines of equal barometric pressure, the numbers attached indicating the barometric pressure in inches and being drawn for differences of pressure of ·05 inch. The isobars in the Bay of Bengal are filled in by means of the shore observations, and by comparison with the normal distribution of pressure.

The mean 8 hrs. wind directions of the month are shewn by means of arrows flying with the wind, and are calculated by means of Lambert's formula applied to the winds as given in Table B of the 8 hrs. observations. The mean wind directions for the hill stations are indicated by broken arrows to distinguish them from the wind arrows for the plain stations. The mean velocity of the winds during the month is shewn by the following notation:—

Velocity of	0 to 2	miles per hour	...	one feather added to the wind arrow.
,, ,,	2 to 5	,, ,, ,,	...	two feathers ,, ,, ,, ,,
,, ,,	5 to 10	,, ,, ,,	...	three ,, ,, ,, ,, ,,
,, ,,	10 to 20	,, ,, ,,	...	four ,, ,, ,, ,, ,,
	over 20	,, ,, ,,	...	five ,, ,, ,, ,, ,,

Wind strengths are based on factor 2·2 for the standard type of Beckley Robinson anemograph, instead of 3·0 as used for this plate

LITHO. BY S.B.M.

The chart shows the departure from normal of the mean during the month of 8 hrs. pressure by means of lines drawn for equal amounts of departure. The numbers are given in thousandths of an inch, 20 representing ·020″ or two hundredths of an inch, &c. Continuous lines indicate that the pressure was in excess by amounts indicated by the numbers attached to the lines, and broken or dotted lines that it was in defect by amounts indicated by the numbers attached to the lines. Two parallel lines near to each other, one continuous and the other broken or dotted, represent the line of no departure, the dotted line facing the area of deficient pressure or negative departures.

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CHART SHEWING THE DEPARTURE FROM NORMAL
OF THE MONTHLY MEAN OF DAILY
MAXIMUM TEMPERATURE.

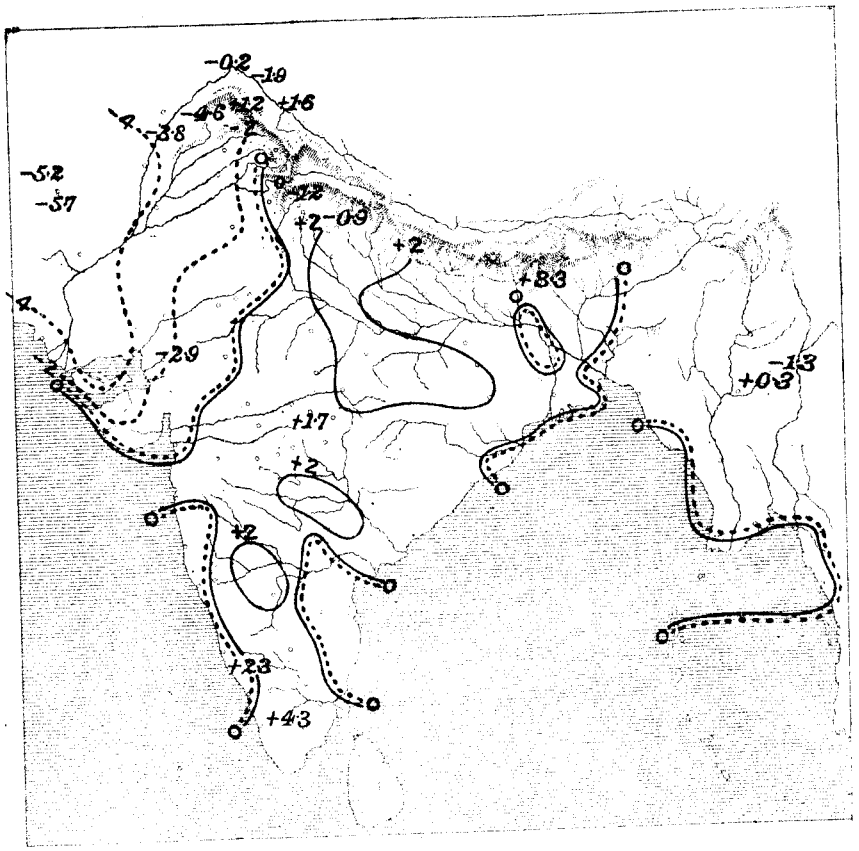


CHART SHEWING THE DEPARTURE FROM NORMAL
OF THE MONTHLY MEAN OF DAILY
MINIMUM TEMPERATURE.

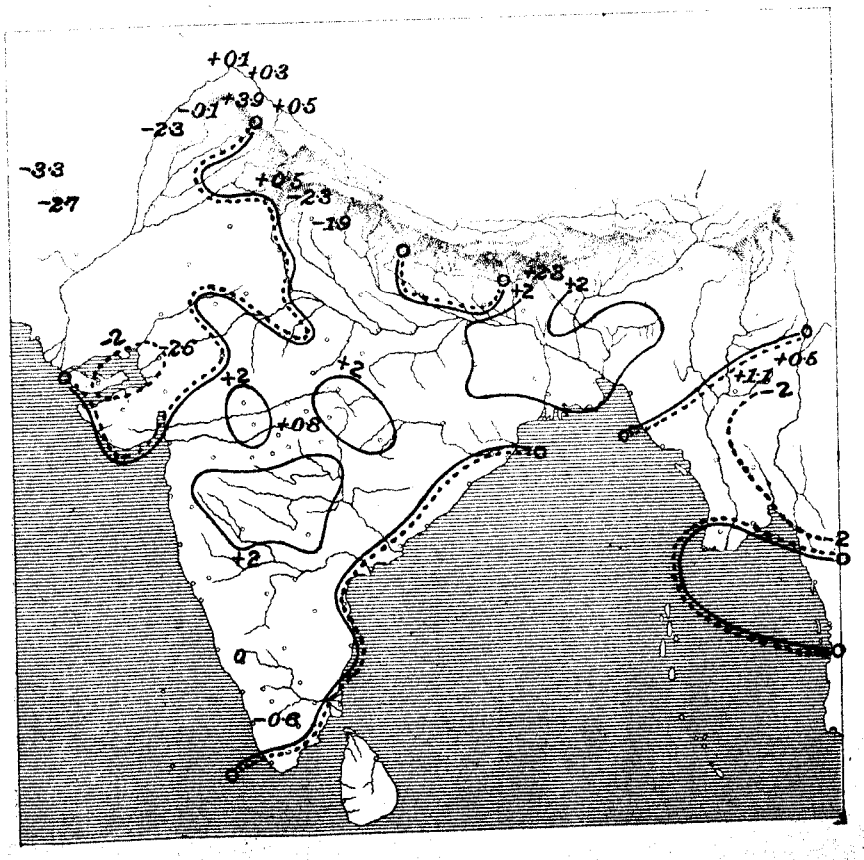


CHART SHEWING THE DEPARTURE FROM NORMAL
OF THE MONTHLY MEAN OF DAILY
MEAN TEMPERATURE.

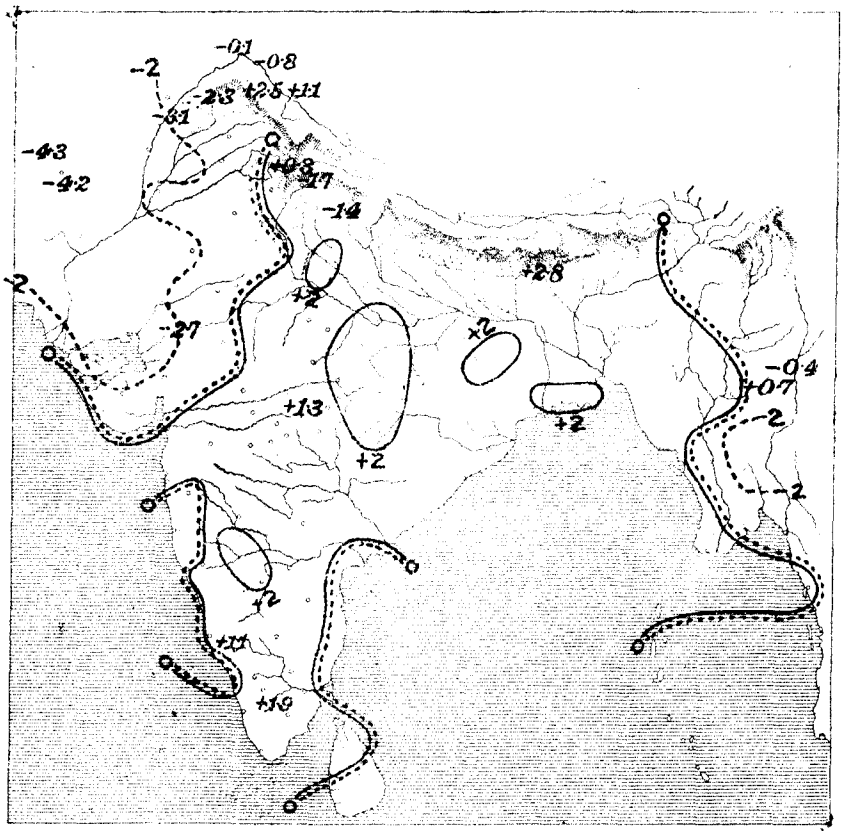


CHART SHEWING THE DEPARTURE FROM NORMAL
OF THE MONTHLY MEAN OF ABSOLUTE
HUMIDITY AT 8 HRS.

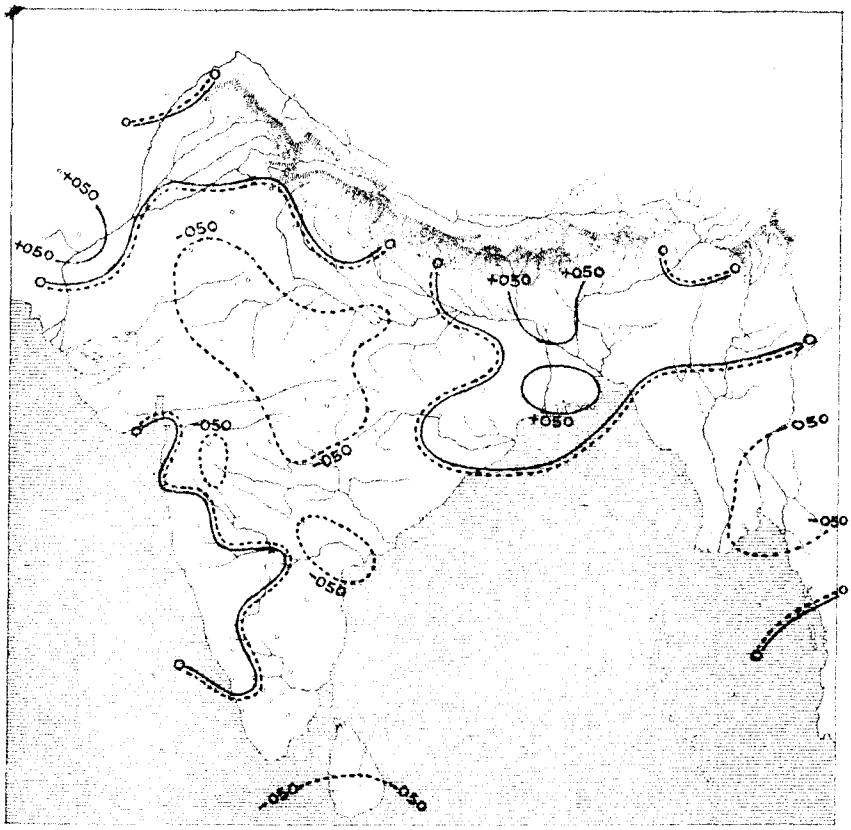


CHART SHEWING THE DEPARTURE FROM NORMAL
OF THE MONTHLY MEAN OF RELATIVE
HUMIDITY AT 8 HRS.

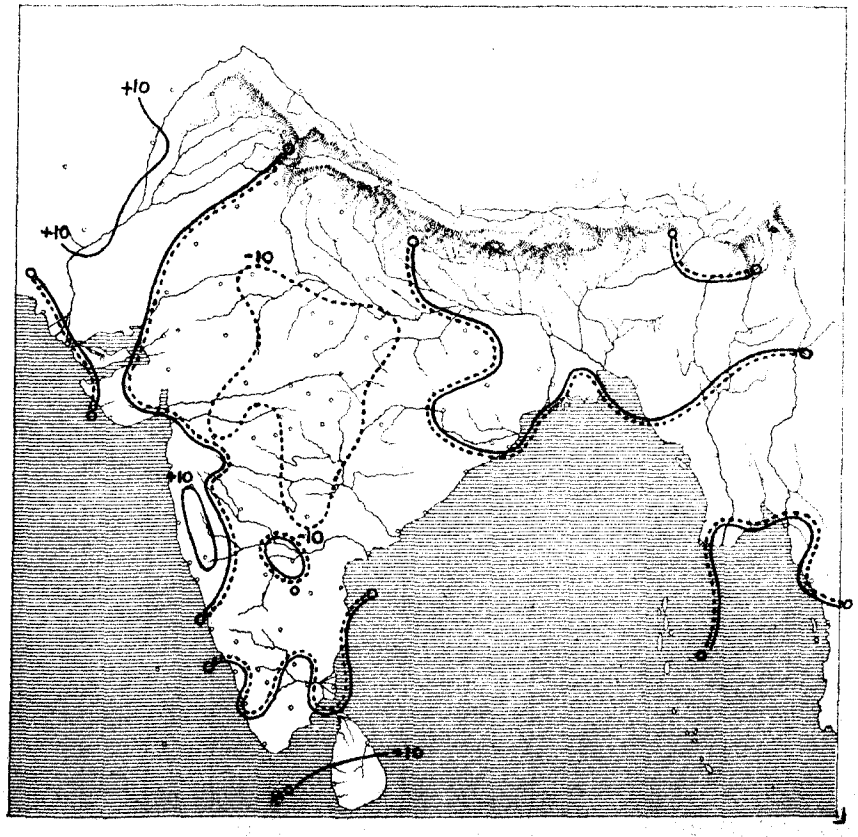


CHART SHEWING THE DEPARTURE FROM NORMAL
OF THE MONTHLY MEAN OF CLOUD
AMOUNT AT 8 HRS.

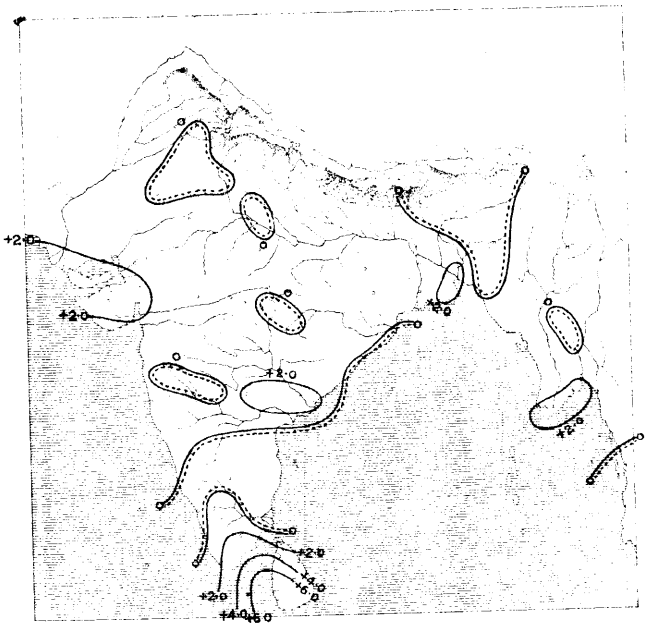
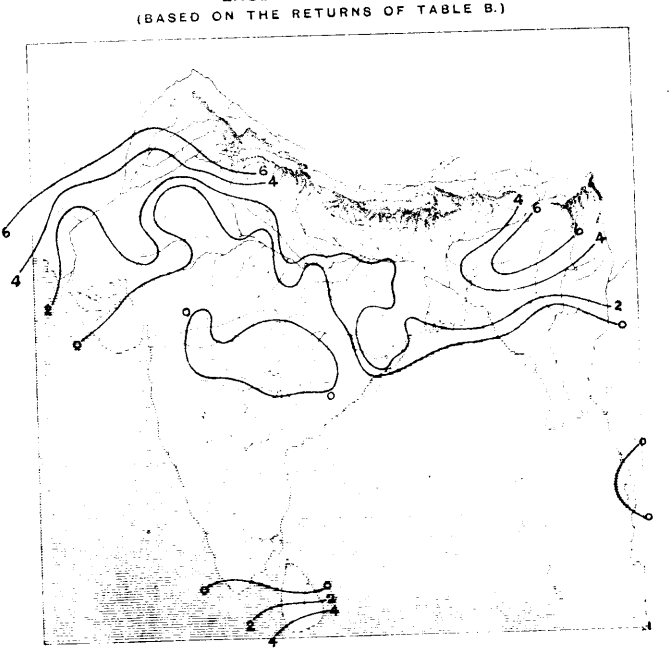
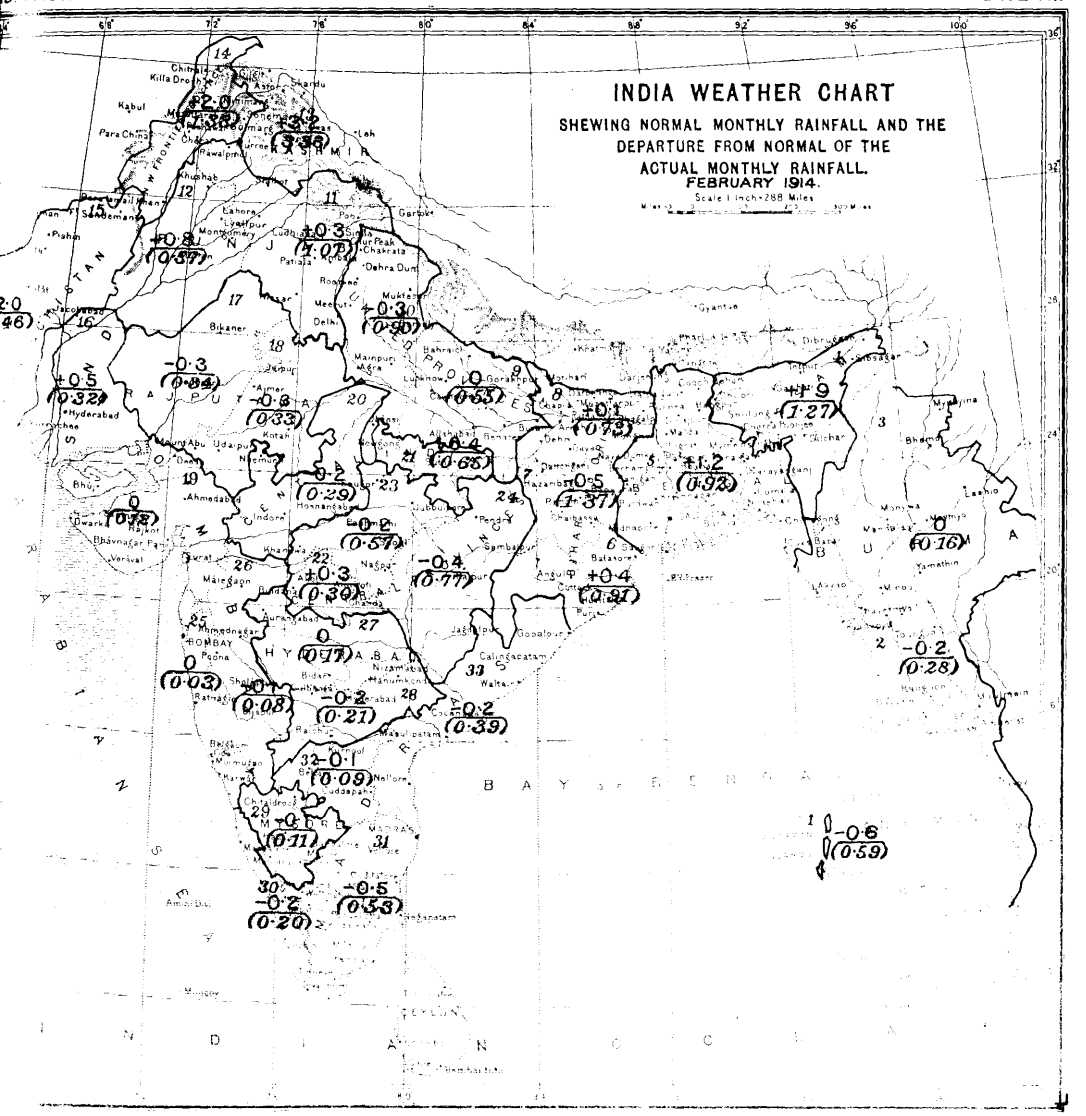


CHART SHEWING THE TOTAL NUMBER OF DAYS IN THE
MONTH ON WHICH RAINFALL EQUALLED OR
EXCEEDED 0·10 INCH.
(BASED ON THE RETURNS OF TABLE B.)





he country is divided into 33 areas as shown in the list below. The numbers in that list correspond with the red numbers on the chart, ve to identify the areas. The numbers in brackets on the chart give the average over the divisions of the normal monthly rainfall, mbers above these give the departures from normal of the average actual rainfall over the divisions.

- Islands
- er Burma
- er Burma
- am
- gal
- a
- s. Nagpur
- r
- ed Provinces, East

10. United Provinces, West
11. Punjab, East and North
12. Do., Southwest
13. Kashmir
14. Northwest Frontier Province
15. Baluchistan
16. Sind
17. Rajputana, West
18. Rajputana, East
19. Gujarat
20. Central India, West
21. Do., East
22. Berar
23. Central Provinces, West
24. Do., East
25. Konkan
26. Bombay, Deccan
27. Hyderabad, North
28. Hyderabad, South
29. Mysore
30. Malabar
31. Madras, Southwest
32. Madras, Deccan
33. Madras Coast, North

GOVERNMENT OF INDIA

METEOROLOGICAL DEPARTMENT.

MONTHLY WEATHER REVIEW

PUBLISHED BY ORDER OF

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INTRODUCTION.

THIS review of the weather in India during the month of March, 1914, is based on observations taken daily at 8 hrs. at 215 stations, and on additional observations taken at 10 hrs. and 16 hrs. at 15 stations. In the rainfall summary have been utilized the data furnished by the meteorological observatories, and such rainfall statements of the month as had been published by the Provincial Governments up to the date of the preparation of the review.

The brief notes on solar, seismic and magnetic disturbances are supplied by the chief observatories in the Indian area.

For a statement of the methods adopted in recording and tabulating the data, for each of the elements of observation, reference should be made to the introductory portion of the review for January.

Summary of the chief features of the weather in India during the month.

2. Weather was even less disturbed than usual and accordingly the aggregate rainfall of the month was more or less in defect of the normal in most parts of the country; the only exceptions were Chota Nagpur, the United Provinces, the Punjab South-west, Kashmir, Central India and the Central Provinces.

There was less cloud than usual except in Burma, Bihar and Orissa and the United Provinces, and humidity was generally somewhat below the average. Temperature was lower than usual over almost the whole of northern and central India, due in large measure to two well marked cold waves which entered India during the month.

Barometric pressure in the plains was higher than usual by ·025″.

Solar, seismic and magnetic disturbances.

KODAIKANAL OBSERVATORY.

3. *Solar Observations.*—The sun was examined for spots and faculæ on all the days during the month. Prominences could not be observed on one day owing to clouds.

Sunspots.—Six new spot groups were recorded during the month. One of these observed from the 15th to the 18th inclusive was situated in the exceptionally high latitude of +45°. Another, remarkable for its large size and great activity came round the east limb on the last day of the month. The daily average number of spots was 0·4. The distribution in latitude of the spot was as follows:—

TABLE 1.

—	0—9	10—19	20—29	30—39	40—49
North . . .	...	1	1	...	1
South . . .	...	1	1	1	...

Prominences.—67 large prominences were recorded during the month. The highest was observed on the 5th at latitude +32 E and was 145″ high.

Magnetic disturbance.—Only small disturbances were recorded during the month. They were on the following dates 1st, 6th and 18th to 25th.

Seismic records.

$\phi = 10° 13' 50''$; $\lambda = 77° 28' 00''$; $h = 2{,}343$ m. Subsoil Rock.

Apparatus.—Milne's Horizontal Pendulum Seismograph.

TABLE 2.

	V	To	G	$\frac{r}{To^2}$
AN:				
AE:		16·1	1	3·3
AZ:				

Date.	Phase.	Time, G. M. T.	Period (sec.)	Amplitude (u) An.	Ae.	Az.	Distance Δ (Km.)	Remarks.
1914 Mar. 2nd	e P	h. m. s. 0 41 18	...	...	...	...	...	Widening of line.
	F	1 12 00	...	...	...	...	...	
„ 2nd	e P	1 30 30	...	...	...	...	...	Widening of line.
	F	1 53 36	...	...	...	...	...	
„ 6th	e P	19 49 0	...	...	...	...	...	Widening of line.
	F	20 23 18	...	...	...	...	...	
„ 6th	e P	20 49 48	...	...	...	...	...	
	L	20 51 30	...	...	...	...	...	
	M	20 58 42	...	...	50	...	...	
	F	20 59 42	...	...	...	...	...	
„ 14th	e P	20 19 30	...	...	...	...	...	
	e L	20 26 54	...	...	...	...	...	
	M	20 44 36	...	...	50	...	...	
	F	21 24 24	...	...	...	...	...	
„ 27th	e P	1 40 6	...	...	...	...	...	
	e L	1 42 24	...	...	...	...	...	
	M	1 49 30	...	...	20	...	...	
	F	2 00 6	...	...	...	...	...	
1914. Mar. 28th	i P	h. m. s. 10 53 48	...	...	...	...	...	
	e L	10 57 42	...	...	...	...	...	
	M	11 8 24	...	...	60	...	...	
	F	11 36 6	...	...	...	...	...	
„ 30th	i P	1 2 54	...	...	...	...	...	
	i L	1 12 54	...	...	...	...	...	
	M	1 25 30	...	...	70	...	...	
	F	.....	...	...	...	...	...	Several shock
„ 30th	P	.....	...	...	...	...	...	
	e L	2 1 6	...	...	...	...	...	
	M	2 38 0	...	...	60	...	...	
	F	3 24 24	...	...	...	...	...	

T. ROYDS,
for Director,
Kodaikanal and Madras Observatorie

BOMBAY OBSERVATORY.

Alibag magnetic record.

4. During the month of March 1914 the traces showe 11 calm days and 20 days of small disturbance.

The days of the month selected as quiet for the purpose of the Magnetic Survey of India are the 8th, 9th, 13th 22nd and 29th.

The following table represents the magnetic characte of each day during the month.

TABLE 3.

Day.	Character.	Day.	Character.	Day.	Character.
1	S	12	S	23	C
2	S	13	C	24	C
3	S	14	S	25	S
4	S	15	S	26	S
5	S	16	S	27	S
6	S	17	C	28	S
7	S	18	S	29	C
8	C	19	S	30	C
9	C	20	S	31	C
10	S	21	C	...	...
11	S	22	C	...	...

C = calm; S = small; M = moderate; G = great; V. G. = very great.

The mean observed absolute values of the several magnetic elements reduced to the mean monthly tabulations of the magnetograms, as also the ranges and the summed ranges of the horizontal force and the declination for the month are as follows :—

Easterly declination	0° 45′ 16″
Horizontal force	0·36883 C.G.S. unit.
Vertical force	0·16554 „ „
Inclination	24° 10′·3
Inclination (observed)	24° 8′·2
Horizontal force range	0·00038 C.G.S. unit.
Horizontal force summed range	0·00241 „ „
Declination range	2′·3
Declination summed range	7′·8

(NOTE.—Summed range means sum without regard to sign of ordinate of diurnal inequality.)

Seismic records.

$\phi = 18° 53′ 45″$; $\lambda = 72° 48′ 56″$; $h = 11$ m. Subsoil trap.

Apparatus.—Milne's Horizontal Pendulum Seismograph.

TABLE 4.

	V	To	ϵ	r/To²
AN :				
AE :	9	18	1	
AZ :				

Date.	Phase.	Time, G. M. T.	Period (sec.)	Amplitude (μ) An.	Ae.	Az.	Distance Δ (Km.)	Remarks.
1914.		h. m. s.						
March 6th	P	19 23 42	...	...	...	...	...	
	M	19 50 0	...	...	67	...	...	
	F	20 35 36	...	...	...	...	...	
„ 6th	P	20 45 54	...	...	...	...	...	
	M	21 3 48	...	...	44	...	...	
	F	21 29 48	...	...	...	..	...	
Mar. 14th	e P	20 18 54	...	...	...	...	...	
	M	20 34 54	...	...	100	...	...	
	F	...	...	...	...	...	...	End mixed in tremors.
„ 18th	P	4 42 42	...	...	...	...	...	
	M	5 12 36	...	...	156	...	...	
	F	5 40 54	...	...	...	...	...	
„ 18th	P	6 56 0	...	...	...	...	...	
	M	7 9 36	...	...	67	...	...	
	F	7 54 48	...	...	...	...	...	
„ 27th	P	1 36 54	...	...	...	...	...	
	M	1 46 0	...	...	56	...	...	
	F	2 5 6	...	...	...	...	...	
„ 28th	P	10 50 12	...	...	...	...	...	
	M	11 6 0	...	...	144	...	...	
	F	11 41 6	...	...	...	...	...	
„ 30th	P	...	...	...	...	...	...	Beginning mixed in tremors.
	M	2 45 30	...	...	56	...	...	
	F	...	...	...	...	...	...	End mixed in tremors.

Thickening of line was noted on the following occasions :—

d. h. m. m.	d. h. m.	d. h. m.	d. h. m. m.
2 11 39	22 10 6	22 10 9	23 12 22 to 25
28 13 29 to 33	31 13 59		

Sensibility to tilt 1·0 mm. of amplitude on the trace = 0′·41″ ; from 1st to 16th ; 0′·52″ from 17th to 23rd and 0′·50 from 24th to 31st March 1914.

N. A. F. MOOS,
Director,
Bombay & Alibag Observatories.

5. CALCUTTA (ALIPORE) OBSERVATORY.

Seismic records.

Ø=22° 32′ N λ=88° 21′ 0″; E h=6·4 m. Subsoil.

Apparatus.—Milne's Horizontal Pendulum Seismograph.

TABLE 5.

	V	To	ϵ	r/To²
AN:				
AE:	8·688	18	1	
AZ:				

Date.	Phase.	Time, G. M. T.	Period (sec.)	Amplitude (u) An.	Amplitude (u) Ae.	Amplitude (u) Az.	Distance △ (Km.)	Remarks.
1914.		h. m. s.						
Mar. 6th	P	19 38 7	...	...	...	...	...	
	L	19 40 9	...	...	...	...	...	
	M	19 42 11	...	...	115	...	...	
	C	21 1 26	...	...	86	...	...	
	F	21 27 53	...	...	...	...	...	
,, 14th	P	20 8 10	...	...	...	...	...	
	L	20 14 15	...	...	...	...	...	
	M	20 27 29	...	..	144	...	...	
	C	20 35 34	...	...	115	..	...	
	F	21 26 55	...	...	...	...	...	
Mar. 18th	P	4 40 16	...	...	...	...	...	
	L	4 56 32	...	...	...	...	...	
	M	4 58 34	...	...	288	...	...	
	C	5 8 45	...	...	201	...	...	
	F	5 56 31	...	...	...	...	...	
,, 18th	P	6 44 18	...	...	...	...	...	
	L	6 53 27	...	...	...	...	...	
	M	6 55 29	...	...	144	...	...	
	F	7 46 19	...	...	...	...	...	
,, 28th	P	10 32 23	...	...	...	...	...	
	S	10 46 6	...	..	...	...	...	
	L	10 47 38	...	...	...	...	...	
	M	10 50 41	...	...	?	...	...	As the boom moved throughout the trace the maximum amplitude cannot be measured.
	F	11 45 35	...	...	...	...	...	Driving clock did not work from 3 A. M. of 31st Mar. 1914 to the end of the month.

E. P. HARRISON,

Offg. Meteorologist, Calcutta.

6. SIMLA OBSERVATORY.

The Simla seismograph notes for March 1914 will appear in the next number of this review.

Following table contains a list of earthquakes that were reported: —

TABLE 6.

Place at which felt.	Date.	G. M. T. of earthquake.	Duration.	Intensity Rossi-Forel scale.	No. of shocks.
	Mar.	h. m.	sec.		
Salonah (Nowgong Assam)	11th	1 7	7	5	1
Rawalpindi	12th	9 57	2	5	1
Shillong	14th	13 55	1	5	1
Bushire	16th	17 10	5	4	1
Kyaukpyu	27th	15 25	4	5	1
Akyab	27th	15 35	5	6	1
Drosh	29th	19 42	30	5	1
Muktesar	31st	17 56	25	4	3
Drosh	31st	22 15	15	5	1

Solar radiation.—The following figures give the intensity of solar radiation, as measured at Simla by Angstrom's pyrheliometer. The values are corrected to local noon, and expressed in grammecalories per square centimetre per minute :—

Maximum	1·44
Minimum	1·34
Mean	1·40
Number of days of observation	8

C. W. NORMAND,

Imperial Meteorologist, Simla.

ROYAL ALFRED OBSERVATORY, MAURITIUS.

7. No information has been received.

Weather in the Indian Ocean.

8. The high pressure conditions in India extended southwards to the latitudes of Zanzibar and Seychelles, but not to Mauritius. Rainfall was unusually heavy at both the equatorial stations. Winds were light and unduly easterly at Zanzibar, while at Seychelles the wind was stronger and more westerly than usual.

TABLE 7.

	Mauritius.	Zanzibar.	Seychelles.
Departure from normal of mean pressure.	—·042	+·032	+·034

	Mauritius.	Zanzibar.	Seychelles.
Actual mean wind direction	S 62° E	S 56° E	N 30° W
Normal mean wind direction	S 82° E	S 27° E	N 17° W
Actual mean wind velocity (miles per diem).	143	79	100
Normal mean wind velocity (miles per diem).	165	94	86
Rainfall departure from normal.	—0·38	+2·55	+7·70

Depressions and cyclonic storms.

9. Several periods of unsettled weather were recorded in northern India, but only two of these were of importance. The first of the two extended from the 1st to the 4th and was connected with the advance of a depression of the cold weather type from Persia eastwards across northern India. Barometrically the depression was very ill-defined but it caused fairly general precipitation over the tract lying between Assam and the North-West Frontier Province (a mention of this depression has already been made in the review for February). The depression associated with the second disturbed period became visible over Mesopotamia on the 15th and thence advanced eastwards through Persia on the 16th and Baluchistan on the 17th into the Punjab on the 18th. At 8 hrs. of the 18th it was situated over the region around Montgomery and Multan and had a barometric depth of three-tenths of an inch. Apparently it moved north-eastwards during the day and broke up in the Simla hills where a strong gale of wind was felt. The precipitation associated with it was nearly general in the North-West Frontier Province and the western half of the Punjab, and local in Kashmir, the United Provinces, Bihar and north Bengal.

Pressure.

10. Barometric pressure was higher than usual over nearly the whole Indian region, the excess being slightly greater in the plains than at the level of the hill stations.

In part at least the high density of the air was attributable to the lowness of temperature.

TABLE 8.

DIVISION.	DEPARTURE FROM NORMAL OF	
	Pressure.	Temperature.
	"	°
Burma	+·018	—0·2
Assam	+·025	—0·5
Bengal	+·029	—0·6
Bihar and Orissa	+·032	—1·5
United Provinces	+·031	—1·6
Punjab	+·026	—2·8
North-West Frontier Province	—·002	—2·3
Sind	+·034	—2·0
Rajputana	+·014	—1·7
Bombay	+·029	—2·2
Central India	+·022	—1·6
Central Provinces	+·025	—1·9
Hyderabad	+·025	0
Mysore	+·029	+1·0
Madras	+·024	+0·5

TABLE 9.

HILL STATION.	Departure from normal pressure. A	PLAIN STATION.	Departure from normal pressure. B	Departure of pressure difference B—A.
	"		"	"
Quetta	+·016	Jacobabad	+·027	+·011
Leh	—·010	Lahore	+·023	+·033
Murree	—·004	Peshawar	+·003	+·007
Simla	0	Ludhiana	+·036	+·036
Chakrata	+·007	Roorkee	+·039	+·032
Darjiling	—·027	Dhubri	+·023	+·050
Mount Abu	+·012	Deesa	+·033	+·021
Pachmarhi	+·019	Khandwa	+·021	+·002
Kodaikanal	+·009	Madura	+·025	+·016

Temperature.

11. On the mean of the month no marked deviations from normal conditions occurred. The monthly values of minimum temperature were within about 2° of the average in all the sub-divisions, with the exception of Baluchistan (—4·5°), Gujarat and the Konkan (each —2·6°); while temperatures during the day time differed by more than 3° only in the Punjab East and North (—3·6°), the North-West Frontier Province (—3·3°), Baluchistan (—3·9°), Central India East (—3·4°) and Central Provinces West (—3·2°).

A cold wave appeared in Baluchistan on the 10th and advanced slowly eastwards to Upper Burma during the next seven days causing a moderate reduction of temperature. Its effect had passed away almost completely by the 17th, but on the following day another fall of temperature occurred in Baluchistan and extending eastwards across northern India had reached the confines of Bengal by the 22nd.

The greatest defect caused by this wave averaged 23 in Baluchistan, 10° in the North-West Frontier Province, 11° in Rajputana, and 10½° in the Punjab.

TABLE 10.

Sub-division.	Actual temperature.					Departure from normal of		
	Mean maximum.	Mean minimum.	Monthly mean of mean between maximum and minimum.	Mean daily range of temperature.	Absolute range during month.	Maximum.	Minimum.	Daily range.
	°	°	°	°	°	°	°	°
1. Bay Islands	88·1	75·5	81·8	12·5	25·3	−1·6	−1·1	−0·5
2. Lower Burma	90·8	71·6	81·2	19·2	28·4	−0·9	+0·1	−1·0
3. Upper Burma	94·0	65·1	79·5	28·9	40·2	−0·6	+0·7	−1·3
4. Assam	82·7	61·3	72·0	21·5	35·2	−0·9	−0·1	−0·8
5. Bengal	88·7	66·8	77·8	21·9	38·3	−0·8	−0·4	−0·4
6. Orissa	92·8	69·9	81·3	22·8	37·9	−1·4	−0·6	−0·8
7. Chota Nagpur	90·6	63·2	76·9	27·5	44·2	−1·1	−0·9	−0·2
8. Bihar	88·6	62·1	75·3	26·5	44·5	−2·2	−1·7	−0·5
9. United Provinces, East	88·5	60·3	74·4	28·3	47·8	−2·7	−0·7	−2·0
10. Do. do., West	87·2	59·7	73·4	27·5	46·8	−2·2	−0·9	−1·3
11. Punjab, East and North	82·0	55·3	68·6	26·7	46·4	−3·6	−2·2	−1·4
12. Do., South-west	80·7	54·1	67·4	26·6	48·0	−2·9	−2·2	−0·7
13. Kashmir	51·0	29·1	40·1	21·9	43·3	0	−1·2	+1·2
14. North-West Frontier Province	76·5	52·3	64·4	24·2	49·3	−3·3	−1·4	−1·9
15. Baluchistan	69·1	45·0	57·1	24·0	50·1	−3·9	−4·5	+0·6
16. Sind	86·5	62·3	74·4	24·3	47·8	−2·2	−1·7	−0·5
17. Rajputana, West	87·7	60·2	73·9	27·5	51·5	−2·0	−1·7	−0·3
18. Do., East	88·7	61·0	74·9	27·8	48·2	−1·8	−1·3	−0·5
19. Gujarat	89·8	62·9	76·3	26·9	48·6	−2·9	−2·6	−0·3
20. Central India, West	89·5	60·3	74·9	29·1	50·7	−2·5	−0·7	−1·8
21. Do., East	88·5	61·1	74·9	27·3	49·5	−3·4	+0·1	−3·5
22. Berar	95·2	67·1	81·1	28·1	47·6	−1·7	−0·9	−0·8

Sub-Division.	Actual temperature. Mean maximum.	Mean minimum.	Monthly mean of mean between maximum and minimum.	Mean daily range of temperature.	Absolute range during month.	Departure from normal of Maximum.	Minimum.	Daily range.
	°	°	°	°	°	°	°	°
23. Central Provinces, West	91·7	62·9	77·3	28·8	46·5	—3·2	—1·4	—1·8
24. Do., East	93·5	56·1	79·7	27·4	43·3	—2·5	—0·6	—1·9
25. Konkan	85·2	71·0	78·1	14·2	22·3	—1·9	—2·6	+0·7
26. Bombay Deccan	96·1	63·8	79·9	32·3	45·5	—0·8	—2·2	+1·4
27. Hyderabad, North	96·9	67·5	82·3	29·3	44·5	—0·1	+0·7	—0·8
28. Do., South	98·3	71·5	84·9	26·7	37·6	—0·1	—0·1	0
29. Mysore	93·5	66·9	80·3	26·6	33·4	+1·1	+0·9	+0·2
30. Malabar	89·3	76·5	82·9	12·8	18·3	—0·5	+0·8	—1·3
31. Madras, South-east	94·0	74·5	84·3	19·5	29·0	0	+2·0	—2·0
32. Do., Deccan	100·6	73·1	86·8	27·5	37·5	—0·4	+0·2	—0·6
33. Do., Coast, North	90·3	73·6	81·9	16·7	27·2	—0·5	+0·8	—1·3

TABLE 11.

Division.	Departure from normal of Mean maximum temperature.	Mean minimum temperature.	Mean temperature.
	°	°	°
Burma	—0·8	+0·3	—0·2
Assam	—0·9	—0·1	—0·5
Bengal	—0·8	—0·4	—0·6
Bihar and Orissa	—1·7	—1·2	—1·5
United Provinces	—2·5	—0·8	—1·6
Punjab	—3·3	—2·2	—2·8
North-West Frontier Province	—3·3	—1·4	—2·3

Division.	Departure from normal of Mean maximum temperature.	Mean minimum temperature.	Mean temperature.
	°	°	°
Sind	—2·2	—1·7	—2·0
Rajputana	—1·9	—1·4	—1·7
Bombay	—2·0	—2·5	—2·2
Central India	—2·9	—0·3	—1·6
Central Provinces	—2·7	—1·1	—1·9
Hyderabad	—0·1	+0·2	0
Mysore	+1·1	+0·9	+1·0
Madras	—0·3	+1·2	+0·25

Winds.

12. (*a*). The rate of air movement was higher than usual in Rajputana, the Central Provinces and Madras, below the average in Assam, Bengal and the North-West Frontier Province and nearly normal elsewhere.

(*b*). The degree of steadiness was unusually low in Burma, Bengal, the United Provinces, Central India an Hyderabad, and high in Assam, the Punjab, the Nort West Frontier Province, Rajputana and Bombay.

(*c*). At the level of Darjiling, where under ordinar conditions the prevailing direction is almost southeas

there was in the month under review a predominance of westerly winds.

TABLE 12.

DIVISION.	DEPARTURE FROM NORMAL OF	
	Hourly wind velocity.	Wind steadiness.
Burma	−0·4	−15
Assam	−0·9	+ 6
Bengal	−1·1	− 7
Bihar and Orissa	−0·1	+ 3
United Provinces	−0·2	−11
Punjab	+0·2	+ 6
North-West Frontier Province	−0·6	+ 7
Sind	−0·5	− 1
Rajputana	+0·9	+ 8
Bombay	−0·3	+ 6
Central India	−0·5	−20
Central Provinces	+0·8	− 1
Hyderabad	+0·5	−10
Mysore	−0·1	+ 2
Madras	+0·8	− 1

Humidity and cloud.

13. Deviations from normal of humidity and vapour tension were in general feebly marked and of little significance.

Skies were comparatively clear over the whole of India except in Chota Nagpur, Bihar, the east of Central India, the extreme north and south of Madras, Burma excluding the southern districts and a few places elsewhere. The greatest defect occurred in deltaic Bengal, Assam, Sind, Rajputana, Gujarat and Mysore.

TABLE 13.

DIVISION.	HYGROMETRY; 8 HRS.				CLOUD.	
	Mean humidity.	Departure from normal.	Mean vapour tension in inches of mercury.	Departure from normal in inches of mercury.	Mean cloud amount at 8 hrs.	Departure from normal.
	%					
Burma	73	+ 1	·637	−·004	3·2	+1·0
Assam	81	− 2	·527	−·014	3·0	−1·6
Bengal	77	− 1	·631	−·021	2·5	−0·6
Bihar and Orissa	60	− 1	·472	−·011	2·4	+0·3
United Provinces	52	− 1	·352	−·022	2·1	+0·2
Punjab	61	− 1	·323	−·038	0·9	−0·1
North-West Frontier Province.	69	+ 1	·345	−·016	3·2	−0·8
Sind	52	− 4	·380	−·038	1·2	−1·3
Rajputana	35	− 5	·242	−·065	1·6	−1·0
Bombay	58	+ 1	·475	−·036	0·9	−0·7
Central India	38	− 4	·292	−·033	1·4	−0·1
Central Provinces	41	− 1	·338	−·023	1·5	−0·1
Hyderabad	46	− 4	·441	0	1·4	−0·4
Mysore	59	− 5	·497	−·043	0·7	−0·9
Madras	73	− 1	·754	0	2·3	−0·1

Rainfall.

14. The total amounts of precipitation received in March were everywhere below the normal excepting in the rainfall divisions of Chota Nagpur, the United Provinces, the Punjab Southwest, Kashmir, Central India, Berar and the Central Provinces. The strongest positive departures occurred in the Central Provinces West (+1½″ or 357 per cent.) and Central India East (+0·9″ or 418 per cent.), while the defect was most marked in Assam where it averaged three-quarters of an inch.

TABLE 14.

Sub-division.	Number of rainy days.		Rainfall.			
	Actual.	Normal.	Actual.	Normal.	Departure from normal.	Percentage departure from normal.
			"	"	"	
1. Bay Islands	0	0·7	0	0·48	—0·48	—100
2. Lower Burma	0·2	0·7	0·06	0·57	—0·51	— 89
3. Upper Burma	0·5	0·9	0·17	0·46	—0·29	— 63
4. Assam	3·8	6·4	3·09	3·84	—0·75	— 20
5. Bengal	1·6	2·4	1·01	1·57	—0·56	— 36
6. Orissa	1·1	1·9	0·49	1·13	—0·64	— 57
7. Chota Nagpur	2·1	1·8	0·97	0·84	+0·13	+ 15
8. Bihar	1·1	1·0	0·33	0·47	—0·14	— 30
9. United Provinces, East	1·8	0·7	0·76	0·30	+0·46	+153
10. Do., West	1·8	1·1	1·01	0·50	+0·51	+102
11. Punjab, East and North	1·7	1·7	0·65	0·81	—0·16	— 20
12. Punjab, South-west	1·9	1·5	0·57	0·54	+0·03	+ 6
13. Kashmir	6·2	5·8	3·93	3·90	+0·03	+ 1
14. North-West Frontier Province	3·6	3·8	1·71	1·92	—0·21	— 11
15. Baluchistan	2·4	3·3	0·78	1·30	—0·52	— 40
16. Sind	0	0·5	0·03	0·19	—0·16	— 84
17. Rajputana, West	0	0·4	0	0·12	—0·12	—100
18. Do., East	0·2	0·5	0·04	0·19	—0·15	— 79
19. Gujarat	0	0·1	0	0·04	—0·04	—100
20. Central India, West	0·4	0·3	0·17	0·12	+0·05	+ 42
21. Do., East	2·0	0·6	1·14	0·22	+0·92	+418
22. Berar	1·5	0·7	0·42	0·28	+0·14	+ 50
23. Central Provinces, West	0·3	0·9	1·92	0·42	+1·50	+357
24. Do., East	1·7	1·2	0·58	0·58	0	0
25. Konkan	0	0·1	0	0·06	—0·06	—100
26. Bombay Deccan	0	0·3	0·02	0·15	—0·13	— 87
27. Hyderabad, North	0·1	0·7	0·03	0·34	—0·31	— 91
28. Do., South	0·3	0·7	0·09	0·37	—0·28	— 76
29. Mysore	0·2	0·6	0·08	0·30	—0·22	— 73
30. Malabar	0·3	1·0	0·07	0·57	—0·50	— 88
31. Madras, South-east	0·4	0·8	0·16	0·54	—0·38	— 70
32. Do., Deccan	0	0·1	0·02	0·17	—0·15	— 88
33. Do., Coast, North	0·5	0·9	0·22	0·52	—0·30	— 58

TABLE 15.

DIVISION.	RAINFALL.			
	Actual.	Normal.	Departure from normal.	Percentage departure from normal.
	"	"	"	
ma	0·13	0·50	−0·37	− 74
am	3·09	3·84	−0·75	− 20
gal	1·01	1·57	−0·56	− 36
ar and Orissa	0·53	0·72	−0·19	− 26
ted Provinces	0·88	0·40	+0·48	+120
jab	0·63	0·74	−0·11	− 15
th-West Frontier Province	1·71	1·92	−0·21	− 11
Sind	0·03	0·19	−0·16	− 84
Rajputana	0·03	0·17	−0·14	− 82
Bombay	0·01	0·10	−0·09	− 90
Central India	0·66	0·17	+0·49	+288
Central Provinces	0·98	0·44	+0·54	+123
Hyderabad	0·06	0·36	−0·30	− 83
Mysore	0·08	0·30	−0·22	− 73
Madras	0·15	0·49	−0·34	− 69
Mean of India	0·52	0·61	−0·09	− 15

Snowfall.

I.—AFGHANISTAN.

15. In Kabul snow fell on the 9th, 10th and 19th to a al depth of about 7 inches.

II.—NORTH-WEST FRONTIER PROVINCE.

(*a*) *Wano.*—The statement below shows the character snowfall in this locality.

TABLE 16.

Locality.	Elevation.	Number of falls.	Total depth of snowfall.
	ft.		ft. in.
rwatti, Pirghal, Bosh and Dre Jashtar	11,000	2	0 11
ni Mela and Kundighar	9,000	2	0 8
ra	10,000	2	0 9
tkun	7,900	2	0 5

At the end of the month only about 3 inches of snow ll remained unmelted on the higher passes.

(*b*). *Kurram.*—Snow fell on the Sufed Koh on the , 4th, 5th and 7th; the snowline descending to the level the cantonment on the first occasion.

The unmelted accumulations on the Paiwar Kotal at end of the month were estimated at about 3 feet.

(*c*) *Kohat.*—No snow fell on the hills bordering this strict.

(*d*) *Drosh.*—The following table indicates the character of snowfall in this area:

TABLE 17.

Date of fall.	DEPTH.	
	In Drosh.	On the surrounding hills.
	ft. in.	ft. in.
1st	0 7	3 0
2nd	0 4	1
6th	...	0 ½
9th	...	0
17th	...	0
18th	...	0 6
19th	...	0 10
20th	...	0 3

The falls of the 1st and 2nd extended to the level of the observatory where a total of about 11 inches was recorded on the two days.

At the close of the month a great deal of snow still remained unmelted in shady situations.

(*e*) *Hazara.*—The following statement shows the character of snowfall in this district.

TABLE 18.

Locality.	Total depth of snowfall during the month.	Number of days on which snow fell.	Reported depth of accumulations existing on the 15th April 1914.
	ft. in.		ft. in.
Narang	8 2	9	3 5
Paluderan	5 0	9	2 6
Kagan	3 11	9	0 6
Jared	0 6½	7	0 0
Malkandi	0 1	2	0 0
Sundigali	4 11	7	0 0
Jachha	3 8	7	0 0
Dungagali	1 8	9	1 0
Tandiani	1 4	9	2 5

III.—KASHMIR.

The statement below shows the character of snowfall in this area :—

TABLE 19.

Locality.	Number of days on which snow fell.	Aggregate amount of snowfall.	REMARKS.
Srinagar	4	About 2 feet.	
Dras	13	About 2 feet	The accumulations existing at the end of the month were 4½ feet in Dras itself and more than 6 feet on the surrounding hills.
Skardu	5	3 inches.	
Kargil	9	Nearly 6 inches	At the end of the month the unmelted residue on the surrounding hills was more than 15 feet.
Leh	4	Nearly 1¾ inches.	

IV.—PUNJAB.

(*a*) *Murree.*—No snow fell in Murree or on the hills adjacent to Kahuta.

(*b*) *Kilba* (Simla Hills).—The character of the snowfall of the month is indicated in the following statement :—

TABLE 20.

Date of occurrence.	Elevation to which the snowline descended.	Amount recorded.
	Feet.	Feet. Inches.
1st	6,500	0 5
2nd	6,500	0 3
3rd	7,000	0 3
5th	7,000	0 3
6th	7,000	0 5
9th	8,000	0 4
10th	9,000	0 3
11th	8,000	0 5
12th	5,750	0 1
18th	8,000	0 2
19th	5,750	0 3
20th	7,000	0 3
21st	8,000	0 3

All the passes remained closed.

V.—UNITED PROVINCES.

(*a*) *Garhwal.*—Snowstorms were recorded on the 2nd, 3rd, 4th, 12th and 20th. The lowest altitude to which the snowline descended was 6,000 feet. On the whole the weather was dry.

(*b*) *Almora.*—The total snowfall received during the month was estimated at 12 feet in Malla Darma, 9⅓ feet in Chaudas, 7 feet in Byans, 6 feet in Malla Danpur and 3½ feet in Malla Johar.

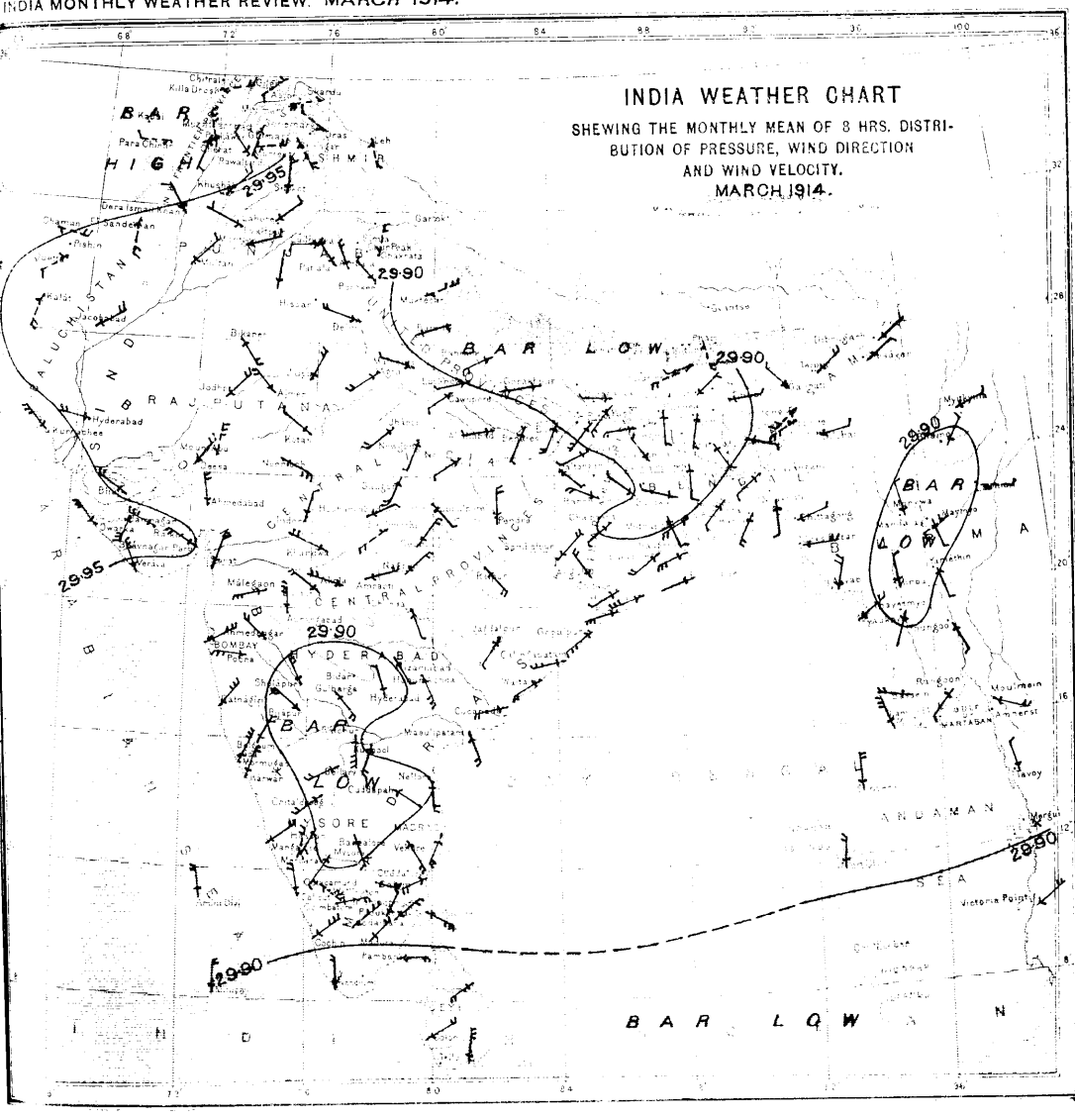
TABLE 21.

Name of pass or peak.	DEPTH OF ACCUMULATION AT THE END OF THE MONTH.	
	Reported.	Normal.
	Feet. Inches.	Feet.
Nuwe Pass	24 0	32
Lipulekh „	10 0	22½
Lampia „	16 0	22½
Bagodyar „	0 6	
Milamdhura „	1 0	9½
Pindari Peak	6 0	4½
Kaphini „	6 0	4½
Kuntela „	6 0	4½
Puwali	6 0	
Binkaru Pass	17 0	27½

SUMMARY.

16. On the whole the snowfall of the month on the mountain zone bordering upper India was either normal or in defect, and the unmelted residue of the accumulation was, so far as can be judged, less than usual in depth.

HEM RAJ.



The lines of the above chart represent isobars or lines of equal barometric pressure, the numbers attached indicating the barometric pressure in inches and being drawn for differences of pressure of ·05 inch. The isobars in the Bay of Bengal are filled in by means of the ship observations, and by comparison with the normal distribution of pressure.

The mean 8 hrs. wind directions of the month are shewn by means of arrows flying with the wind, and are calculated by means of Buchan's formula applied to the winds as given in Table B of the 8 hrs. observations. The mean wind directions for the hill stations are indicated by broken arrows to distinguish them from the wind arrows for the plain stations. The mean velocity of the winds during the month is shewn by the following notation:—

Velocity of	0 to 2 miles per hour	...	one feather attached to the wind arrow.
,,	2 to 5 ,, ,, ,,	...	two feathers ,, ,, ,, ,,
,,	5 to 10 ,, ,, ,,	...	three ,, ,, ,, ,,
,,	10 to 20 ,, ,, ,,	...	four ,, ,, ,, ,,
,,	over 20 ,, ,, ,,	...	five ,, ,, ,, ,,

Wind strengths are based on a factor 2·2 for the standard type of Beckley Robinson anemograph, instead of 3·0 as used for this plate to December 1911 inclusive.

The chart shows the departure from normal of the mean during the month of 8 hrs. pressure by means of lines drawn for equal amounts of departure. The numbers are given in thousandths of an inch, 20 representing ·020″ or two hundredths of an inch, &c. Continuous lines indicate that the pressure was in excess by amounts indicated by the numbers attached to the lines, and broken or dotted lines that it was in defect by amounts indicated by the numbers attached to the lines. Two parallel lines near to each other, one continuous and the other broken or dotted, represent the line of no departure, the dotted line facing the area of deficient pressure or negative departures.

CHART SHEWING THE DEPARTURE FROM NORMAL
OF THE MONTHLY MEAN OF DAILY
MAXIMUM TEMPERATURE.

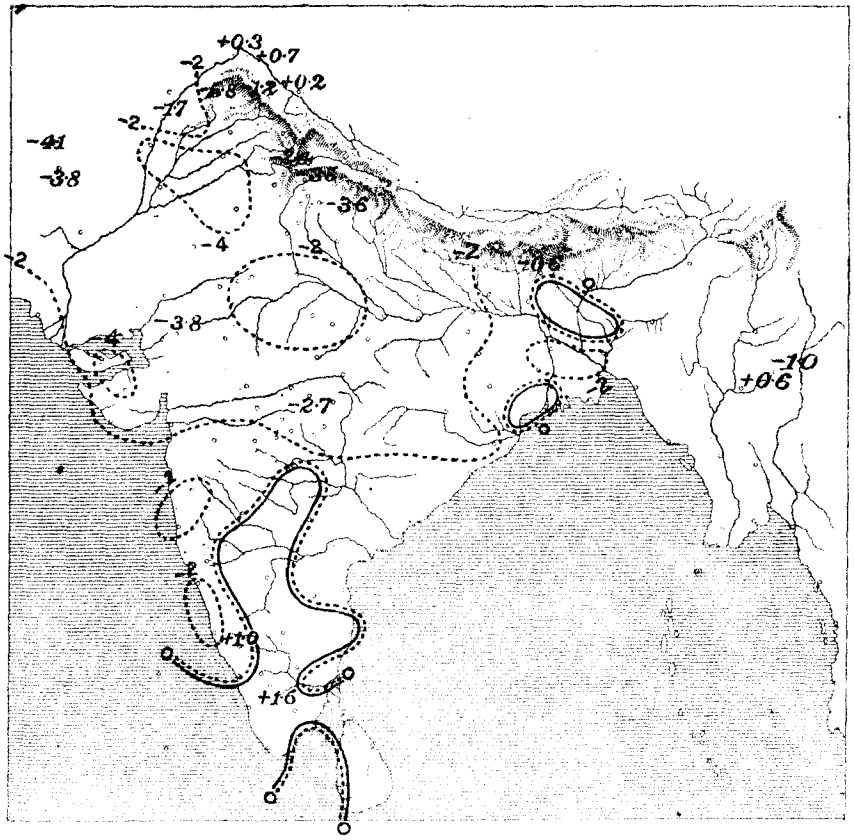


CHART SHEWING THE DEPARTURE FROM NORMAL
OF THE MONTHLY MEAN OF DAILY
MINIMUM TEMPERATURE.

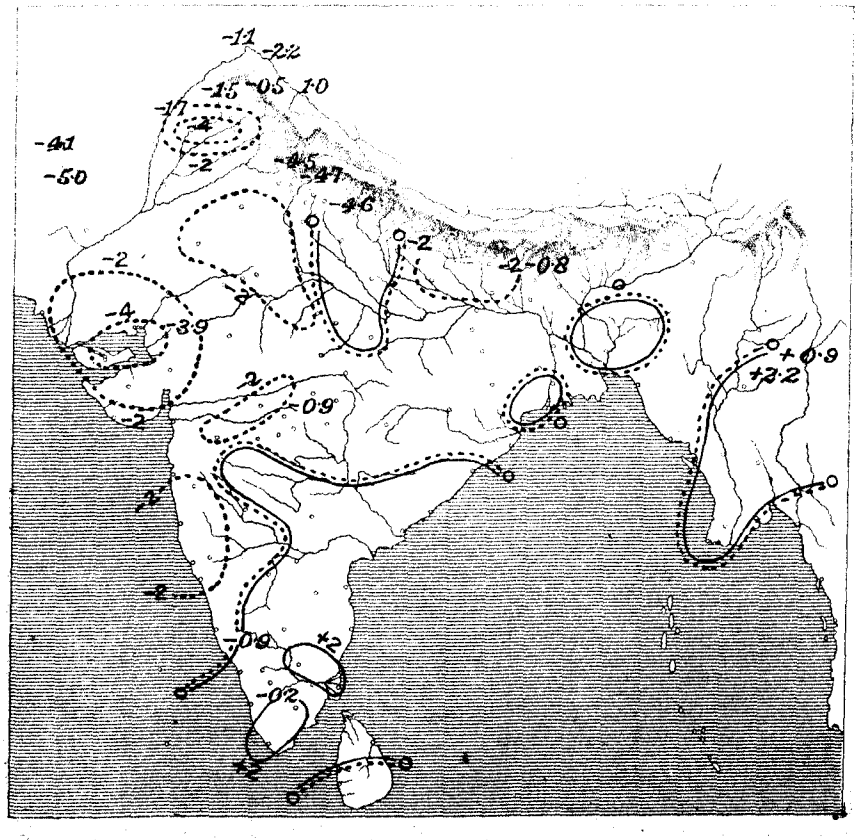


CHART SHEWING THE DEPARTURE FROM NORMAL
OF THE MONTHLY MEAN OF DAILY
MEAN TEMPERATURE.

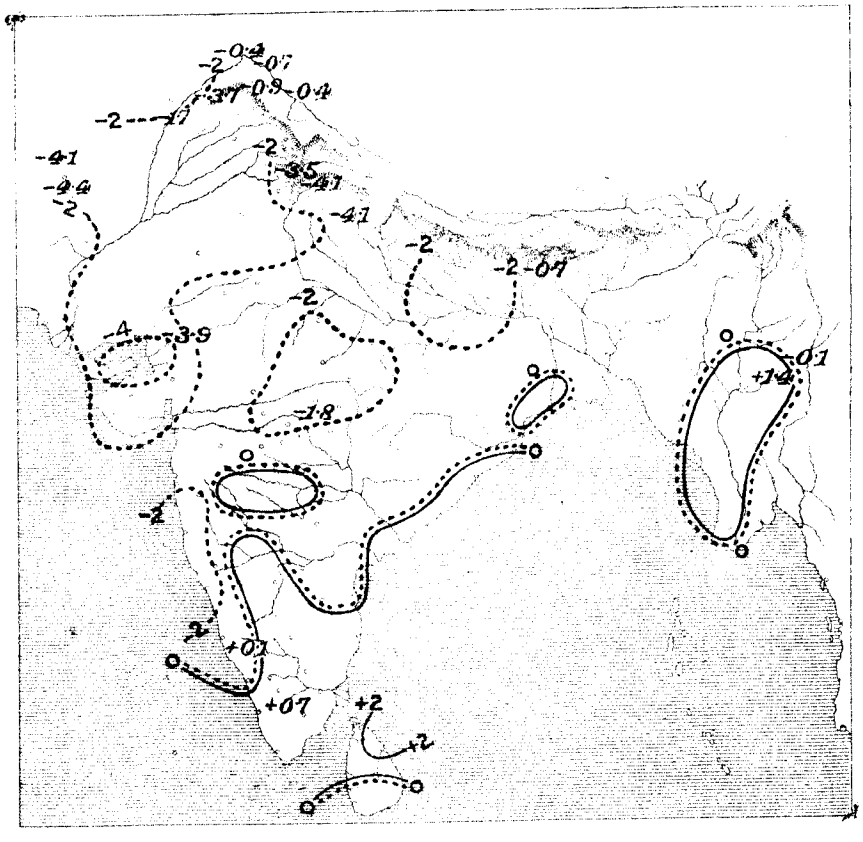


CHART SHEWING THE DEPARTURE FROM NORMAL
OF THE MONTHLY MEAN OF ABSOLUTE
HUMIDITY AT 8 HRS.

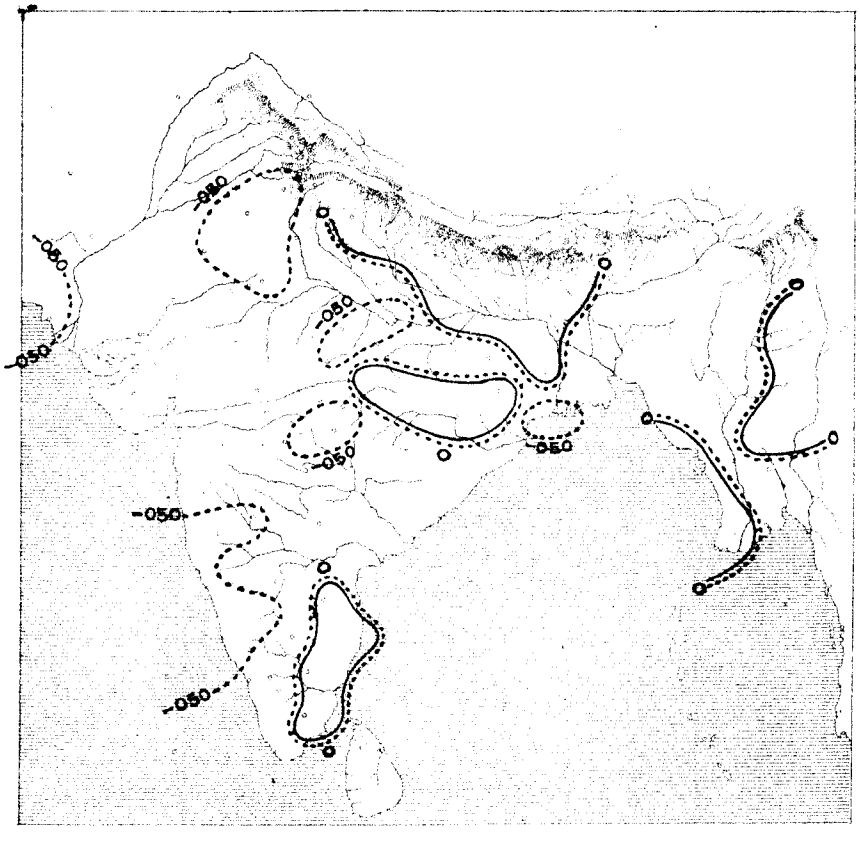


CHART SHEWING THE DEPARTURE FROM NORMAL
OF THE MONTHLY MEAN OF RELATIVE
HUMIDITY AT 8 HRS.

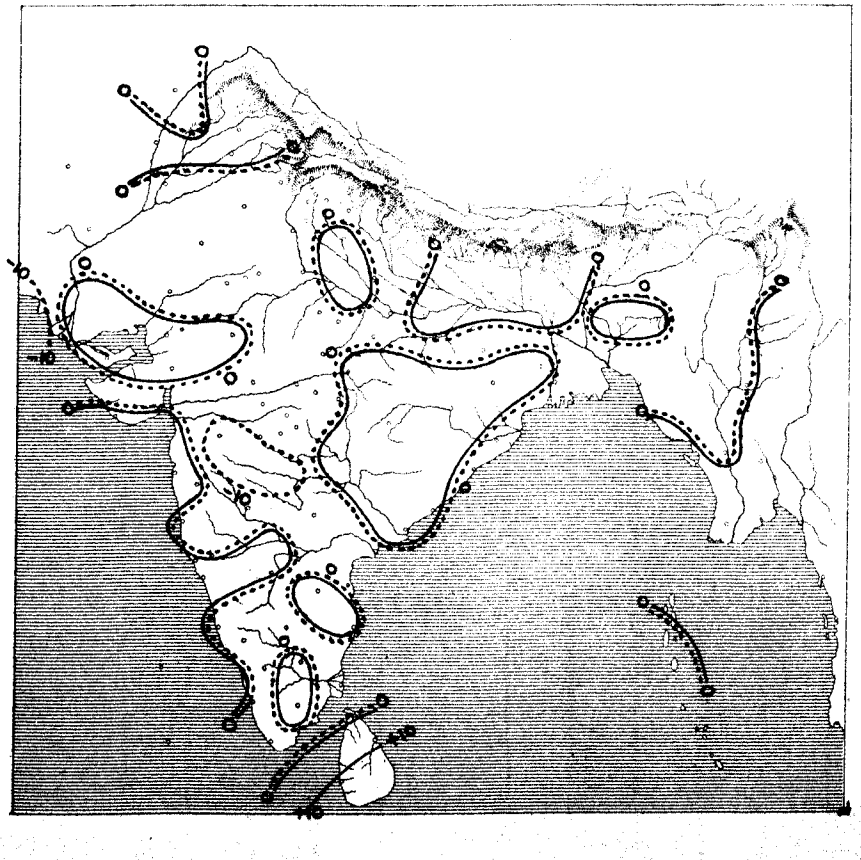


CHART SHEWING THE DEPARTURE FROM NORMAL
OF THE MONTHLY MEAN OF CLOUD
AMOUNT AT 8 HRS.

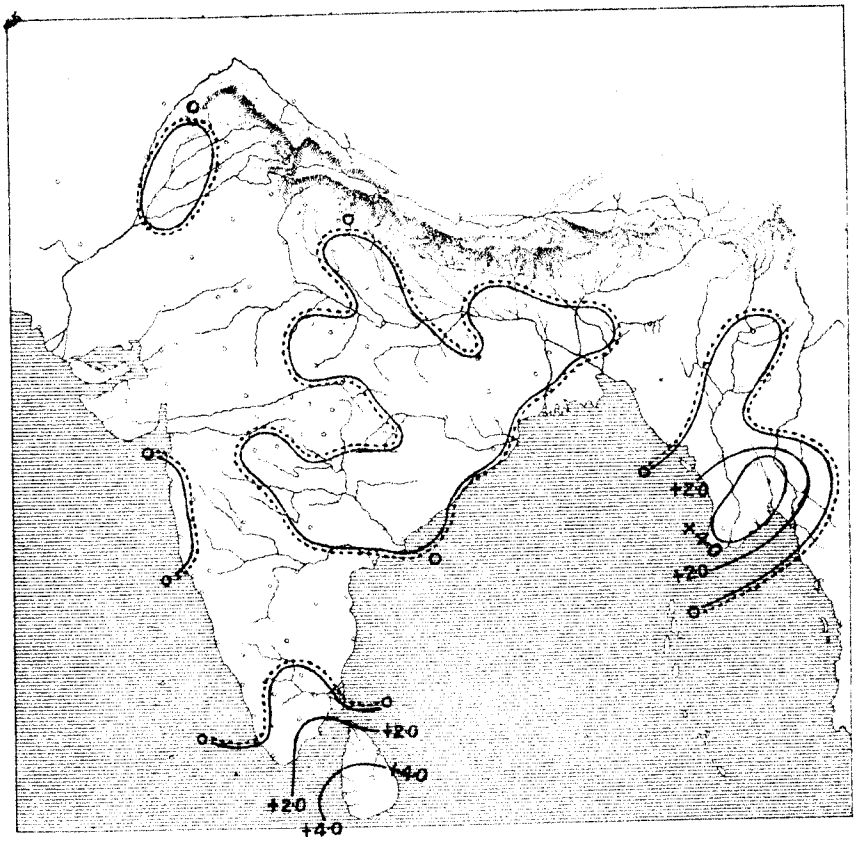
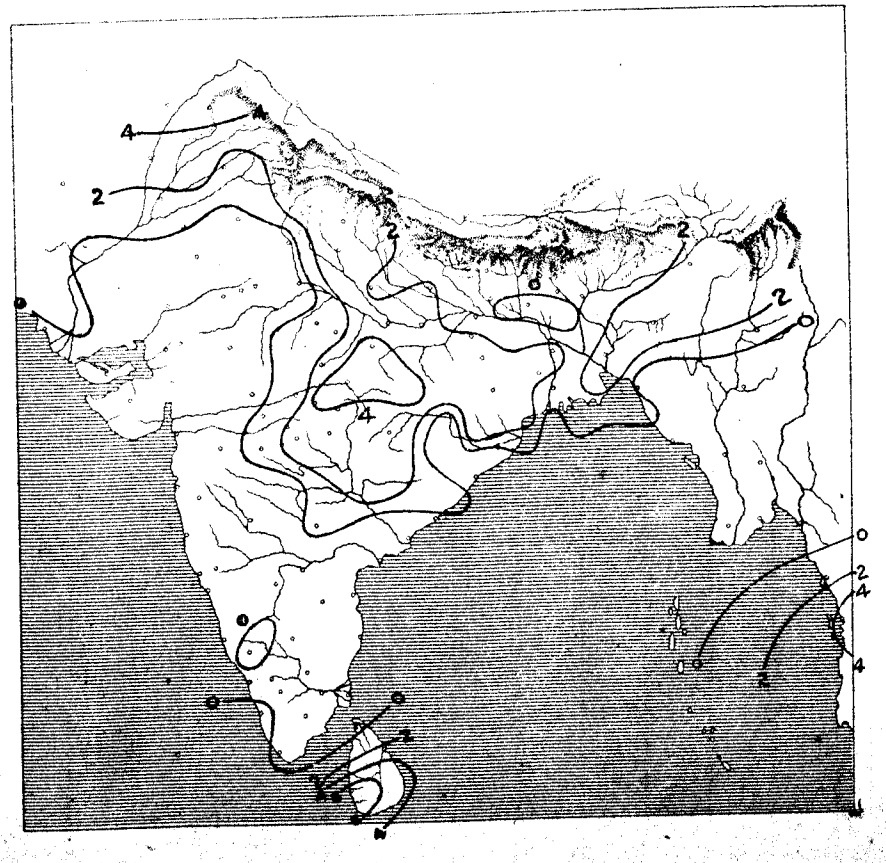
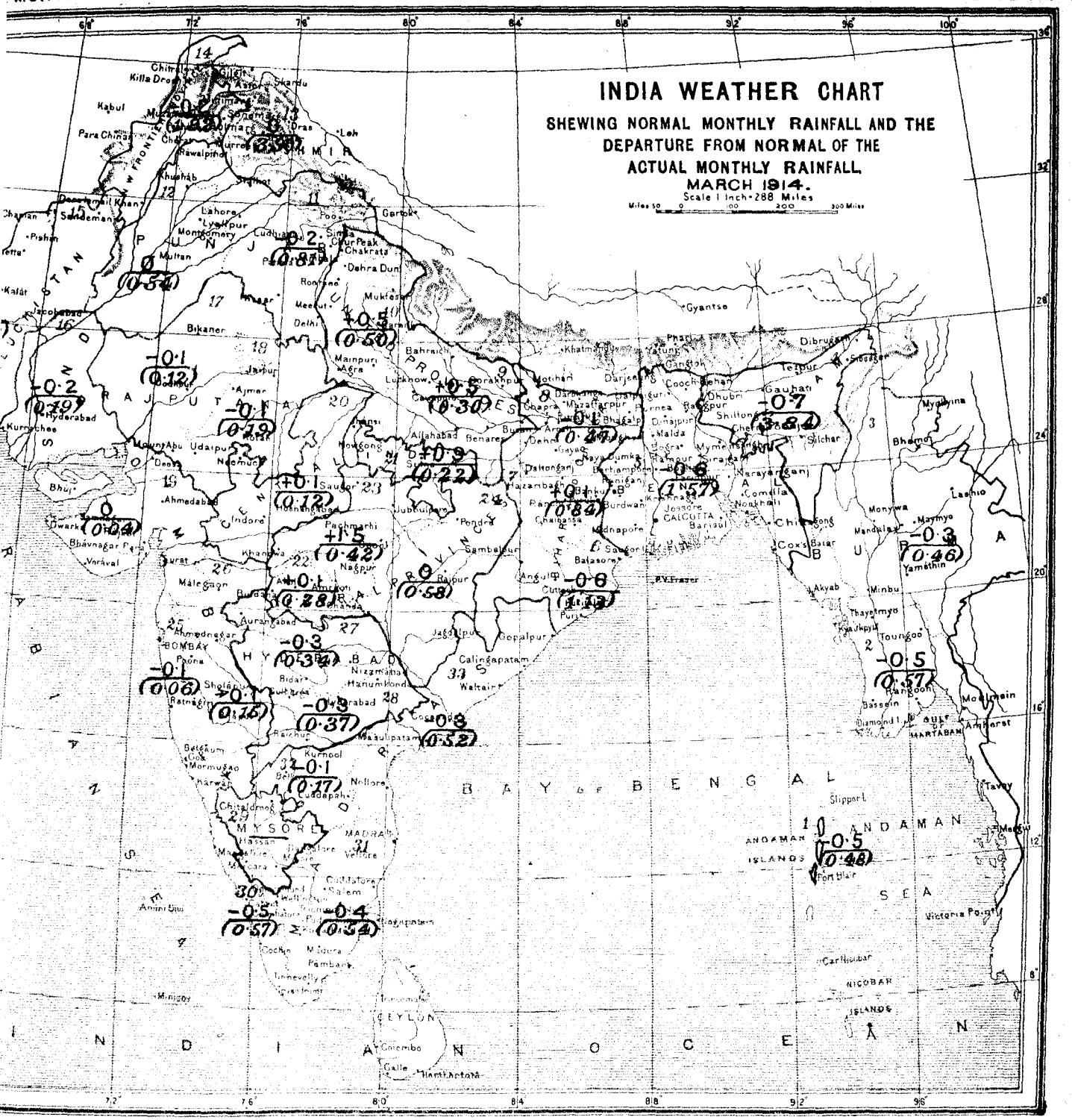


CHART SHEWING THE TOTAL NUMBER OF DAYS IN THE
MONTH ON WHICH RAINFALL EQUALLED OR
EXCEEDED 0·10 INCH.
(BASED ON THE RETURNS OF TABLE B.)





The country is divided into 33 areas as shewn in the list below. The numbers in that list correspond with the red numbers on the chart, serve to identify the areas. The numbers in brackets on the chart give the average over the divisions of the normal monthly rainfall, numbers above these give the departures from normal of the average actual rainfall over the divisions.

1. Bay Islands
2. Lower Burma
3. Upper Burma
4. Assam
5. Bengal
6. Orissa
7. Chota Nagpur
8. Bihar
9. United Provinces, East
10. United Provinces, West
11. Punjab, East and North
12. Do., Southwest
13. Kashmir
14. Northwest Frontier Province
15. Baluchistan
16. Sind
17. Rajputana, West
18. Rajputana, East
19. Gujarat
20. Central India, West
21. Do., East
22. Berar
23. Central Provinces, West
24. Do., East
25. Konkan
26. Bombay, Deccan
27. Hyderabad, North
28. Hyderabad, South
29. Mysore
30. Malabar
31. Madras, Southeast
32. Madras, Deccan
33. Madras Coast, North

GOVERNMENT OF INDIA.

METEOROLOGICAL DEPARTMENT.

MONTHLY WEATHER REVIEW

PUBLISHED BY ORDER OF

THE GOVERNMENT OF INDIA.

CALCUTTA, APRIL, 1914.

INTRODUCTION.

THIS review of the weather in India during the month of April, 1914, is based on observations taken daily at 8 hrs. at 218 stations, and on additional observations taken at 10 hrs. and 16 hrs. at 15 stations. In the rainfall summary have been utilized the data furnished by the meteorological observatories, and such rainfall statements of the month as had been published by the Provincial Governments up to the date of the preparation of the review. The brief notes on solar, seismic and magnetic disturbances are supplied by the chief observatories in the Indian area.

For a statement of the methods adopted in recording and tabulating the data, for each of the elements of observation, reference should be made to the introductory portion of the review for January.

Summary of the chief features of the weather in India during the month.

2. Meteorologically April was very abnormal. Several depressions of the cold weather type were transmitted eastwards from Persia, and two of these were attended with widespread rainfall over northern India. In north-east India and the extreme north the weather was unsettled almost uninterruptedly throughout the month. The effect of these unusual conditions was to hinder the proper development of hot weather actions, and in some parts of the Peninsula there was an almost entire absence of the usual thundershowers.

Precipitation of the month was heavier than usual in Bengal, Orissa, Bihar, the United Provinces, the Punjab, the North-West Frontier Province, Kashmir, Baluchistan, Rajputana West, Central India East, the Central Provinces and Madras Coast North; and was either normal or in defect in all the other sub-divisions, the most important deficit occurring in Malabar which obtained 0·1″, only 3 per cent. of its normal quantity.

The departures of other climatic elements were in fair agreement with the abnormal features of the rainfall distribution. Generally in the region of excessive precipitation in northern and central India temperature was lower, the air damper and cloud more abundant than usual; while in the Peninsula temperature and humidity were about the average and the cloud proportion in defect.

On the average of all the observing stations in the plains of India barometric pressure was ·047″ higher than usual.

Solar, seismic and magnetic disturbances.

KODAIKANAL OBSERVATORY.

3. *Solar Observations.*—Observations of the sun were made on all the days during the month.

Sunspots.—Seven new spot groups were recorded in April as against 6 in March and owing to the longer life of the spots, the daily average number has risen from 0·4 in March to 1·2 in April. There was only one day in the whole month when the sun was free from spots. Increased solar activity was also evident from the more frequent observation of displacement and reversal of the hydrogen lines in the neighbourhood of spots.

The distribution of the spots in latitude was as follows :—

TABLE 1.

	0°—10°	11°—20°	21°—30°	Mean.
North . . .	...	1	2	22°
South . . .	...	1	3	22°

Prominences.—Fifty-three large, one eruptive and two metallic prominences were recorded during the month. The eruptive and metallic prominences were observed on the 10th when the disturbed spot No. 2054 went round the west limb.

The highest prominence was observed on the 14th at latitude + 39° east and was 180″ in height.

Magnetic disturbances.—A "great" disturbance was recorded from the 6th to 8th. This was probably due to the active spot group No. 2054 which, when the disturbance began, extended from 4° to 14° on the western side of the sun's central meridian, its latitude being 28° north of the equator.

There was a "moderate" disturbance on the 16th.

TABLE 2.

Seismic records.

$\phi = 10° 13' 50''$; $\lambda = 77° 28' 00''$; $h = 2343$ m. Subsoil Rock.

Apparatus.—Milne's Horizontal Pendulum Seismograph.

	V	To	ϵ	$\frac{r}{To^2}$
AN :				
AE :	9·76	16·3	1	3·0
AZ :				

Date.	Phase.	Time, G. M. T.	Period (sec.)	Amplitude (u) An.	Ae.	Az.	Distance Δ (Km.)	Remarks.
1914		h. m. s.						
April 11th	eP	16 41 30	...	...	...	...	...	
	iL	16 52 00	...	...	...	...	...	
	M	17 24 00	...	...	140	...	...	
	F	19 19 24	...	...	...	...	...	
„ 20th	eP	14 55 54	...	...	...	...	...	
	eL	15 00 12	...	...	...	...	...	
	M	15 03 36	...	...	...	...	...	
	F	15 45 06	...	...	60	...	...	

T. ROYDS,
for *Director*,
Kodaikanal and Madras Observatories.

BOMBAY OBSERVATORY.

Alibag magnetic record.

4. During the month of April 1914 the traces showed 13 calm days, 16 days of small and one day of moderate disturbance.

The days of the month selected as quiet for the purposes of the Magnetic Survey of India are the 4th, 12th, 14th, 20th and 26th.

The following table represents the magnetic character of each day during the month :—

TABLE 3.

Day.	Character.	Day.	Character.	Day.	Character.	Day.	Character.
1	S	9	S	17	S	25	C
2	S	10	S	18	S	26	C
3	C	11	S	19	S	27	S
4	C	12	C	20	C	28	S
5	C	13	S	21	C	29	C
6	M	14	C	22	C	30	C
7	S	15	C	23	S		
8	S	16	S	24	S		

C=calm; S=small; M=moderate; G=great; V. G.=ve y great.

The mean observed absolute values of the several magnetic elements reduced to the mean monthly tabulations of the magnetograms as also the ranges and the summed ranges of the horizontal force and the declination for the month are as follow :—

Easterly declination . . .	0° 45′ 1″.
Horizontal force	0·36877 C. G. S. unit.
Vertical force	0·16560 C. G. S. unit.
Inclination	24° 11′·0.
Inclination (observed) . . .	24° 8′·6.
Horizontal force range . . .	0·00046 C. G. S. unit.
Horizontal force summed range .	0·00298 C. G. S. unit.
Declination range	3′·5.
Declination summed range . .	13′·4.

(NOTE.—Summed range means sum without regard to sign of 24 ordinates of the diurnal inequality.)

Seismic records.

$\phi = 18^\circ\ 53'\ 45''$; $\lambda = 72^\circ\ 48'\ 56''$; $h = 11$ m. Subsoil Trap.

Apparatus.—Milne's Horizontal Pendulum Seismograph.

TABLE 4.

	V	To	ϵ	$\frac{r}{To^2}$
AN :				
AE :	9	18	1	
AZ :				

Date.	Phase.	Time, G. M. T.	Period (sec.)	Amplitude (u) An.	Ae.	Az.	Distance Δ (Km.)	Remarks.
		h. m. s.						
1914								
Apl. 11th	P	16 53 43	...	...	...	...	...	
	M	17 42 45	...	...	133	...	...	
	F	18 34 23	...	...	...	...	...	
„ 20th	P	13 53 56	...	...	...	...	...	
	M	15 9 40	...	...	122	...	...	
	F	15 44 57	...	...	...	...	...	
„ 27th	P	2 21 57	...	...	...	...	...	
	M	2 27 48	...	...	22	...	...	
	F	2 38 53	...	...	...	...	...	

A small disturbance appears to have been marked by tremors at about
d. h. m.
30 22 23.

Thickening of line was noted on the following occasions :—

D. H. M. D. H. M. D. H. M.
7 6 25; 9 9 52 to 57; 15 6 0;
18 4 24; 19 5 22; 21 23 37 to 41.

Sensibility to tilt = 1·0 mm. of amplitude on the trace = 0·50″

N. A. F. MOOS,

Director,

Bombay and Alibag Observatories.

5. CALCUTTA (ALIPORE) OBSERVATORY.

Seismic records.

$\phi = 22^\circ\ 32'$ N.; $\lambda = 88^\circ\ 21'\ 0''$ E.; $h = 6{\cdot}4$ m. Subsoil.

Apparatus.—Milne's Horizontal Pendulum Seismograph.

TABLE 5.

	V	To	ϵ	$\frac{r}{To^2}$
AN :				
AE :	8·688	18	1	...
AZ :				

Date.	Phase.	Time, G. M. T.	Period (sec.)	Amplitude (u) An.	Ae.	Az.	Distance Δ (Km.)	Remarks.
1914		h. m. s.						
Apl. 28th	e	7 39 12	...	...	...	...	...	Thickening of line.
	F	12 20 24	...	...	...	...	...	

The driving clock of the Seismograph did not drive the paper and was under repair from 1st to 24th April 1914.

E. P. HARRISON,

Offg. Meteorologist, Calcutta.

SIMLA OBSERVATORY.

6. The Simla seismograph notes for April 1914 will appear in a future number of the review.

Following table contains a list of earthquakes that were reported :—

TABLE 6.

Place at which felt.	Date.	G. M. T. of earthquake.	Duration.	Intensity Rossi-Forel scale.	No. of shocks.
	Apl.	h. m.	sec.		
Mausehra (Hazara District) .	8th	0 30	30	6	1
Dras	8th	0 40	5	4	2
Srinagar	8th	0 52	3	5	1
Drosh	8th	1 0	15	4	1
Rawalpindi	25th	20 35	3	3	3
Campbellpore. . . .	25th	20 40	...	...	1
,, ...	27th	2 0	2	...	3
Jodhpur	30th	17 25	40	4	2
Muktesar	30th	22 15	30	4	1

Solar radiation.—The following figures give the intensity of solar radiation, as measured at Simla by Angstrom's pyrheliometer. The values are corrected to local noon, and expressed in grammecalories per square centimetre per minute :—

Maximum	1·47
Minimum	1·37
Mean	1 43
Number of days of observation . . .	9

C. W. HAMMOND,
Imperial Meteorologist, Simla.

ROYAL ALFRED OBSERVATORY, MAURITIUS.

7. No information has been received.

Weather in the Indian Ocean.

8. Pressure inclined to be high in the sub-equatorial region as represented by Zanzibar and Seychelles, and at the latter station rainfall was in great excess. Winds differed largely from the normal, both as regards direction and strength :—

TABLE 7.

	Mauritius.	Zanzibar.	Seychelles.
Departure from normal of mean pressure.	+·006	+·007	+·023
Actual mean wind direction .	S 63° E	S 4° E	N 14° W
Normal mean wind direction .	S 72° E	S 15° W	N 8° E
Actual mean wind velocity (miles per diem).	145	60	70
Normal mean wind velocity (miles per diem).	159	125	82
Rainfall departure from normal .	−2·20	−1·16	+5·23

Depressions and cyclonic storms.

9. Four depressions passed into India from the west, but only two of them exerted appreciable influence on the weather. The first of the two became visible as an area of low pressure to the west of Bushire on the 2nd and thence passed eastwards through Baluchistan and northern India into Burma where it disappeared on the 10th. Throughout it was a diffuse area of low pressure, but it gave nearly general rain over the tract stretching from Upper Burma to Baluchistan. The second depression of the month was even more diffuse ; it was shown chiefly by the occurrence of rainfall in Baluchistan on the 10th and 11th. It apparently travelled eastwards reaching central Burma on the 16th and was dissipated during the next day. The rainfall associated with it was comparatively light and occurred chiefly in Baluchistan, the North-West Frontier Province, the Punjab and north-east India.

Pressure.

10. The barometer stood higher than usual at all the recording stations in the plains. The excess was more than ·04″ in amount in all the divisions with the exception of the North-West Frontier Province, Rajputana, Gujarat,

Sind, Central India, the west of the Central Provinces, the Bombay Deccan and Hyderabad, and averaged as much as ·047″ over the plains as a whole.

In part at least the high density of the lower atmosphere was due to the lowness of temperature :—

TABLE 8.

Division.	Departure from normal of	
	Pressure.	Temperature.
	"	°
Burma	+·050	−2·0
Assam	+·081	−3·4
Bengal	+·069	−4·3
Bihar and Orissa	+·063	3·9
United Provinces	+·053	−2·3
Punjab	+·046	−3·3
North-West Frontier Province	+·020	−2·7
Sind	+·035	−0·7
Rajputana	+·033	−0·5
Bombay	+·039	−1·7
Central India	+·037	−0·9
Central Provinces	+·039	−2·7
Hyderabad	+·036	−0·9
Mysore	+·046	+0·5
Madras	+·053	−0·4

At the level of the hill stations the excess of pressure was appreciably less than in the plains, or in other words the vertical gradient was considerably above its normal intensity.

TABLE 9.

Hill station.	Departure from normal pressure. A.	Plain station.	Departure from normal pressure. B.	Departure of pressure difference. B—A.
	"		"	"
Quetta	+·015	Jacobabad	+·029	+·014
Leh	+·005	Lahore	+·054	+·049
Murree	+·018	Peshawar	+·022	+·004
Simla	+·017	Ludhiana	+·050	+·033
Chakrata	+·016	Roorkee	+·055	+·039
Darjiling	—·011	Dhubri	+·082	+·093
Mount Abu	+·024	Deesa	+·032	+·008
Pachmarhi	+·027	Khandwa	+·028	+·001
Kodaikanal	+·021	Madura	+·065	+·044

One of the more noteworthy features of the meteorology of India during the past ten months has been the persistence of high pressures in the plains.

TABLE 10.

Month.	Departure from normal of mean 8 hrs. pressure in the plains of India.
	"
June 1913	+·010
July "	+·012
August "	+·002
September "	+·020
October "	+·020
November "	+·038
December "	+·019
January 1914	+·079
February "	+·024
March "	+·025
April "	+·047

Temperature.

11. Except in the south of the Peninsula, Sind, Rajputana East and Central India temperature, both by day and night, was more or less below the normal everywhere in the Indian plains. The defect was appreciable only in Upper Burma, north-east India, the Punjab, the North-West Frontier Province and the east of the Central Provinces and occurred more in the day than in the night temperature.

Temperature was rather low also at the Himalayan stations and in Baluchistan, but in Kashmir the defect was apparent only at Leh and Srinagar, a slight excess having been recorded at Gilgit and Skardu.

The Kashmir data thus indicate that the disturbed conditions responsible for the low temperatures recorded over the greater part of the country did not extend in any marked degree into the Afghan region or Central Asia.

A spell of abnormally cool weather was experienced over northern India from the 7th to the 19th; and the lowness was, as is usually the case during periods of precipitation, more marked in the day than in the night temperature, the maximum at times being upwards of 20° below the normal in several places. In recent years similar temperature conditions were recorded in April in 1905, 1907, 1909 and 1912.

TABLE 11.

Sub-division.	Actual temperature.					Departure from normal of		
	Mean maximum.	Mean minimum.	Monthly mean of mean between maximum and minimum.	Mean daily range of temperature.	Absolute range during month.	Maximum.	Minimum.	Daily range.
	°	°	°	°	°	°	°	°
1. Bay Islands	90·1	78·3	84·3	11·8	17·5	—0·9	—1·0	+0·1
2. Lower Burma	92·2	75·0	83·6	17·2	26·3	—1·6	—0·9	—0·7
3. Upper Burma	95·2	70·1	82·7	25·2	39·1	—3·3	—2·5	—0·8
4. Assam	82·1	65·3	73·7	16·8	30·4	—3·7	—3·1	—0·6
5. Bengal	89·5	70·4	79·9	19·1	32·3	—4·9	—3·8	—1·1
6. Orissa	95·1	74·5	84·8	20·6	37·5	—4·4	—2·3	—2·1
7. Chota Nagpur	98·5	71·1	84·7	27·4	46·9	—3·1	—2·5	—0·6
8. Bihar	94·2	69·3	81·8	24·9	39·5	—5·8	—3·4	—2·4
9. United Provinces, East	98·8	69·9	84·3	28·9	47·9	—3·1	—1·7	—1·4
10. Do. West	98·5	69·8	84·4	28·7	50·9	—2·9	—1·0	—1·9
11. Punjab, East and North	92·1	64·7	78·4	27·4	51·0	—4·7	—1·8	—2·9
12. Do., South-west	92·7	65·7	79·2	27·0	54·4	—5·0	—1·5	—3·5
13. Kashmir	63·3	39·5	51·4	23·9	47·5	+0·9	—1·1	+2·0
14. North-West Frontier Province	86·5	62·3	74·4	24·3	52·0	—4·1	—1·2	—2·9
15. Baluchistan	82·2	56·8	69·5	25·5	53·6	—2·1	—2·3	+0·2
16. Sind	96·0	71·7	83·8	24·2	45·4	—1·4	0	—1·4
17. Rajputana, West	100·1	73·5	86·9	26·7	52·8	—1·1	—0·9	—0·2
18. Do., East	100·1	73·9	87·0	26·2	46·8	—1·1	+0·8	—1·9
19. Gujarat	96·0	72·0	83·9	24·0	38·3	—2·4	—0·7	—1·7
20. Central India, West	98·9	72·3	85·6	26·5	43·9	—1·6	+0·7	—2·3
21. Do. East	99·1	71·3	85·3	27·7	51·0	—3·5	—0·1	—3·4
22. Berar	101·3	75·0	88·2	26·4	42·8	—2·3	—0·5	—1·8
23. Central Provinces, West	99·4	72·3	85·9	27·1	45·5	—3·9	—1·1	—2·8
24. Do. East	96·5	71·8	84·2	24·7	44·7	—6·7	—2·7	—4·0
25. Konkan	87·9	75·7	81·8	12·2	19·9	—1·8	—2·6	+0·8
26. Bombay Deccan	99·3	69·7	84·5	29·7	44·3	—1·4	—1·8	+0·4
27. Hyderabad, North	100·9	73·8	87·3	27·1	42·8	—1·3	—0·9	—0·4
28. Do., South	101·1	76·4	88·7	24·7	38·9	—1·1	—0·5	—0·6
29. Mysore	94·7	69·3	82·0	25·5	35·3	+1·2	—0·2	+1·4
30. Malabar	90·5	78·4	84·4	12·1	18·2	—0·2	+0·9	—1·1
31. Madras, South-east	95·7	77·4	86·5	18·3	26·7	—0·8	+0·6	—1·4
32. Do. Deccan	103·2	78·0	90·6	25·2	37·5	—0·9	—0·6	—0·3
33. Do. Coast, North	92·1	76·3	84·3	15·9	26·7	—1·7	—1·4	—0·3

TABLE 12.

DIVISION.	DEPARTURE FROM NORMAL OF		
	Mean maximum temperature.	Mean minimum temperature.	Mean temperature.
	°	°	°
Burma	−2·3	−1·6	−2·0
Assam	−3·7	−3·1	−3·4
Bengal	−4·9	−3·8	−4·3
Bihar and Orissa	−4·8	−2·9	−3·9
United Provinces	−3·1	−1·5	−2·2
Punjab	−4·8	−1·7	−3·3
North-West Frontier Province	−4·1	−1·2	−2·7
Sind	−1·4	0	−0·7
Rajputana	−1·1	+0·1	−0·5
Bombay	−1·9	−1·5	−1·7
Central India	−2·8	+0·1	−1·4
Central Provinces	−4·1	−1·3	−2·7
Hyderabad	−1·1	−0·6	−0·9
Mysore	+1·2	−0·2	+0·5
Madras	−0·9	+0·1	−0·4

Winds.

12. *(a)* The air movement was appreciably weaker than usual in Burma, Bengal, the North-West Frontier Province, Sind, Central India and Hyderabad, above its normal strength in the Central Provinces and Madras and nearly normal elsewhere.

(b) The degree of steadiness was high in Assam, the United Provinces, the Punjab, Sind, the Central Provinces, Hyderabad, Mysore and Madras, and was low in Burma, Bengal, the North-West Frontier Province, Rajputana and Central India.

(c) There was an undue easterly element in the direction of wind in Baluchistan, the south-east of the United Provinces, and Bundelkhand.

TABLE 13.

DIVISION.	DEPARTURE FROM NORMAL OF	
	Hourly wind velocity.	Wind steadiness.
Burma	−0·5	−14
Assam	−0·1	+10
Bengal	−1·4	−12
Bihar and Orissa	−0·1	+ 1
United Provinces	−0·1	+ 7
Punjab	+0·2	+12
North-West Frontier Province	−0·9	− 3
Sind	−1·0	+ 6
Rajputana	+0·4	− 7
Bombay	−0·5	− 1
Central India	−0·7	− 7
Central Provinces	+0·6	+ 5
Hyderabad	−0·8	+ 5
Mysore	+0·1	+ 8
Madras	+0·7	+13

Humidity and cloud.

13. In most parts of the country the amount of vapour in the air was less than usual, but in virtue of the prevailing low temperatures the percentage of saturation was above the normal. In general the quantity of cloud also was low, the only marked exceptions being Baluchistan, the North-West Frontier Province, Central India, Bihar and Orissa, Bengal excluding the deltaic portion, and the greater part of Burma.

TABLE 14.

DIVISION.	HYGROMETRY, 8 HRS.				CLOUD.	
	Mean humidity.	Departure from normal.	Mean vapour tension in inches of mercury.	Departure from normal in inches of mercury.	Mean cloud amount at 8 hrs.	Departure from normal.
	%					
Burma . . .	71	− 2	·711	—·066	4·1	+0·7
Assam . .	85	+ 1	·619	—·076	5·7	+0·9
Bengal . . .	80	+ 2	·734	—·089	4·8	+0·7
Bihar and Orissa .	63	+ 4	·607	—·042	3·0	+0·8
United Provinces .	45	+ 4	·454	+·015	1·3	0
Punjab . . .	52	+ 6	·428	—·006	2·4	+0·1
North-West Frontier Province.	67	+ 9	·497	+·018	3·3	+0·5

DIVISION.	HYGROMETRY, 8 HRS.				CLOUD.	
	Mean humidity.	Departure from normal.	Mean vapour tension in inches of mercury.	Departure from normal in inches of mercury.	Mean cloud amount at 8 hrs.	Dep tu fro norn
	%					
Sind	62	+ 5	·625	+·050	1·6	—
Rajputana . . .	31	0	·349	—·053	1·5	—
Bombay . . .	62	+ 3	·631	—·018	1·7	—
Central India . .	37	+ 3	·412	+·021	1·9	+
Central Provinces .	41	+ 5	·434	+·008	2·0	
Hyderabad . . .	47	— 2	·534	—·026	2·0	—
Mysore . . .	64	— 6	·581	—·064	1·9	—
Madras . . .	71	— 2	·816	—·028	3·1	—

Rainfall.

14. Except in Assam, Chota Nagpur, Sind, Rajputana East, Gujarat and Central India West the rainfall of the month was above the normal in all parts of northern and central India, the excess amountin g to over 2″ in Bengal and to about 1¾″ in Kashmir and the North-West Frontier Province.

Over the Peninsula excluding the Madras C North the rainfall was below the normal, the de being most pronounced in Malabar where it averaged al 3″ or 97 per cent.

Over Burma the fall was normal in Lower Burma, in defect by 20 per cent. in Upper Burma.

TABLE 15.

SUB-DIVISION.	NUMBER OF RAINY DAYS.		RAINFALL.			
	Actual.	Normal.	Actual.	Normal.	Departure from normal.	Percen depart from n
			″	″	″	
1. Bay Islands	1·5	2·9	0·85	1·83	—0·98	—
2. Lower Burma	1·7	2·1	1·53	1·50	+0·03	+
3. Upper Burma	2·4	2·3	0·92	1·15	—0·23	—
4. Assam	13·5	12·0	8·54	9·39	—0·85	—
5. Bengal	7·9	4·3	5·34	3·10	+2·24	+
6. Orissa	4·3	2·8	2·13	1·68	+0·45	+
7. Chota Nagpur	1·8	1·9	0·80	0·95	—0·15	—
8. Bihar	2·4	1·3	1·27	0·65	+0·62	+
9. United Provinces, East	1·1	0·5	0·38	0·20	+0·18	+
10. Do. West	1·6	0·7	0·88	0·28	+0·60	+
11. Punjab, East and North	2·5	1·2	1·79	0·50	+1·29	+

Sub-division.	Number of rainy days.		Rainfall.			
	Actual.	Normal.	Actual.	Normal.	Departure from normal.	Percentage departure from normal.
			"	"	"	
12. Punjab, South-west	3·1	1·1	1·54	0·44	+1·10	+250
13. Kashmir	5·4	5·0	4·87	3·07	+1·80	+ 59
14. North-West Frontier Province	5·5	3·3	3·28	1·60	+1·68	+105
15. Baluchistan	2·1	1·5	0·71	0·52	+0·19	+ 37
16. Sind	0·1	0·3	0·04	0·11	—0·07	— 64
17. Rajputana, West	0·4	0·6	0·29	0·22	+0·07	+ 32
18. Do., East	0·3	0·5	0·15	0·22	—0·07	— 32
19. Gujarat	0	0·1	0·01	0·03	—0·02	— 67
20. Central India, West	0·2	0·4	0·07	0·15	—0·08	— 53
21. Do., East	1·2	0·7	0·58	0·36	+0·22	+ 61
22. Berar	1·1	0·7	0·45	0·25	+0·20	+ 80
23. Central Provinces, West	2·0	0·8	0·78	0·36	+0·42	+117
24. Do., East	5·1	1·9	2·19	0·98	+1·21	+123
25. Konkan	0·3	0·7	0·12	0·40	—0·28	— 70
26. Bombay Deccan	0·8	1·4	0·32	0·69	—0·37	— 54
27. Hyderabad, North	0·5	1·3	0·14	0·54	—0·40	— 74
28. Do., South	1·3	1·8	0·48	0·87	—0·39	— 45
29. Mysore	1·3	2·8	0·70	1·56	—0·86	— 55
30. Malabar	0·3	4·3	0·10	2·90	—2·80	— 97
31. Madras, South-east	2·0	2·3	1·42	1·51	—0·09	— 6
32. Do. Deccan	1·1	1·5	0·59	0·69	—0·10	— 14
33. Do. Coast, North	4·3	1·7	2·73	0·97	+1·76	+181

TABLE 16.

Division.	Rainfall.			
	Actual.	Normal.	Departure from normal.	Percentage departure from normal.
	"	"	"	
Burma	1·16	1·29	—0·13	— 10
Assam	8·54	9·39	—0·85	— 9
Bengal	5·34	3·10	+2·24	+ 72
Bihar and Orissa	1·40	0·98	+0·42	+ 43
United Provinces	0·61	0·24	+0·37	+154
Punjab	1·73	0·49	+1·24	+253
North-West Frontier Province	3·28	1·60	+1·68	+105
Sind	0·04	0·11	—0·07	— 64

Division.	Rainfall.			
	Actual.	Normal.	Departure from normal.	Percentage departure from normal.
	"	"	"	
Rajputana	0·20	0·22	—0·02	— 9
Bombay	0·18	0·41	—0·23	— 56
Central India	0·33	0·26	+0·07	+ 27
Central Provinces	1·23	0·57	+0·66	+116
Hyderabad	0·33	0·72	—0·39	— 54
Mysore	0·70	1·56	—0·86	— 55
Madras	1·59	1·38	+0·21	+ 15
Mean of India	1·42	1·15	+0·27	+ 23

Snowfall.

I.—AFGHANISTAN.

15. No information is available.

II.—NORTH-WEST FRONTIER PROVINCE.

Kohat.—No snow fell on the mountains bordering this district.

III.—KASHMIR.

The statement below shows the character of snowfall in this area :—

TABLE 17.

Locality.	Number of falls.	Amount.	REMARKS.
Hills around Kargil.	3	About 7 inches	At the end of the month about 4 feet snow still remained unmelted.
Dras . . .	3	About 8 inches	The unmelted residue in the grounds of the observatory measured from 2 to 3 inches in depth. Snow on surrounding hills melting fast; the Zojila expected to open for traffic in the first week of May.
Srinagar and surrounding hills.			No snowfall.
Skardu and the hills around.			No snowfall.

IV.—PUNJAB.

Kilba (Simla Hills).—On the ranges near Kilba snowstorms were recorded on the 5th, 6th, 7th, 13th and 14th. The total fall at an elevation of about 8,000 to 9,000 feet was estimated at 13 inches in depth. At the close of the month 3 feet of snow still remained unmelted on the Harang pass (height 12,000 feet), and the passes at or above 15,500 feet had not yet opened.

V.—UNITED PROVINCES.

(a) Garhwal.—There was a fall on the 2nd on the higher peaks in the north of the district. On the whole the weather was unusually mild.

(b) Almora.—The aggregate fall of the month amounted to 5 feet in Byans, 3½ feet in Malla Darma, about 2 feet in Chaudas, 1½ feet in Malla Johar and ¾ foot in Malla Danpur.

TABLE 18.

Name of pass or peak.	DEPTH OF ACCUMULATION AT THE END OF THE MONTH.		
	Reported.		Normal.
	Feet	Inches.	Feet.
Nuwe Pass	34	0	17
Pindari Peak	0	8	2
Kaphini ,, ...	0	8	2
Kuntela ,, ...	0	8	2
Untadhura Pass	1	8	10
Ralamdhura ,, ...	0	6	8
Milandhura ,, ...	0	3	6
Lipulekh ,, ...	7	0	10
Lampia ,, ...	12	0	11½
Binkaru ,, ...	15	0	20

VI.—EASTERN HIMALAYAS.

The Jalap La pass into Tibet was closed during the second fortnight by heavy snowfall. There were in all five falls in Gyantse and seven falls in Yatung.

SUMMARY.

16. *(a)* So far as can be judged from the scanty information available the snowfall of the month in the mountain zone bordering upper India was either normal or in defect.

(b) In parts of the eastern Himalayas the snowfall was apparently in excess of the normal.

HEM RAJ.

The lines of the above chart represent isobars or lines of equal barometric pressure, the numbers attached indicating the barometric pressure in inches and being drawn for differences of pressure of ·05 inch. The isobars in the Bay of Bengal are filled in by means of the shore observations, and by comparison with the normal distribution of pressure.

The mean 8 hrs. wind directions of the month are shewn by means of arrows flying with the wind, and are calculated by means of Lambert's formula applied to the winds as given in Table B of the 8 hrs. observations. The mean wind directions for the hill stations are indicated by broken arrows to distinguish them from the wind arrows for the plain stations. The mean velocity of the winds during the month is shewn by the following notation:—

Velocity of	0 to 2 miles per hour	...	one	feather added to the wind arrow.
,, ,,	2 to 5 ,, ,, ,,	...	two	feathers ,, ,, ,, ,,
,, ,,	5 to 10 ,, ,, ,,	...	three	,, ,, ,, ,, ,,
,, ,,	10 to 20 ,, ,, ,,	...	four	,, ,, ,, ,, ,,
	over 20 ,, ,, ,,	...	five	,, ,, ,, ,, ,,

Wind strengths are based on factor 2·2 for the standard type of Beckley Robinson anemograph, instead of 3·0 as used for this plate up to December 1911 inclusive.

The chart shows the departure from normal of the mean during the month of 8 hrs. pressure by means of lines drawn for equal amounts of departure. The numbers are given in thousandths of an inch, 20 representing ·020″ or two hundredths of an inch, &c. Continuous lines indicate that the pressure was in excess by amounts indicated by the numbers attached to the lines, and broken or dotted lines that it was in defect by amounts indicated by the numbers attached to the lines. Two parallel lines near to each other, one continuous and the other broken or dotted, represent the line of no departure, the dotted line facing the area of deficient pressure or negative departures.

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CHART SHEWING THE DEPARTURE FROM NORMAL
OF THE MONTHLY MEAN OF DAILY
MAXIMUM TEMPERATURE.

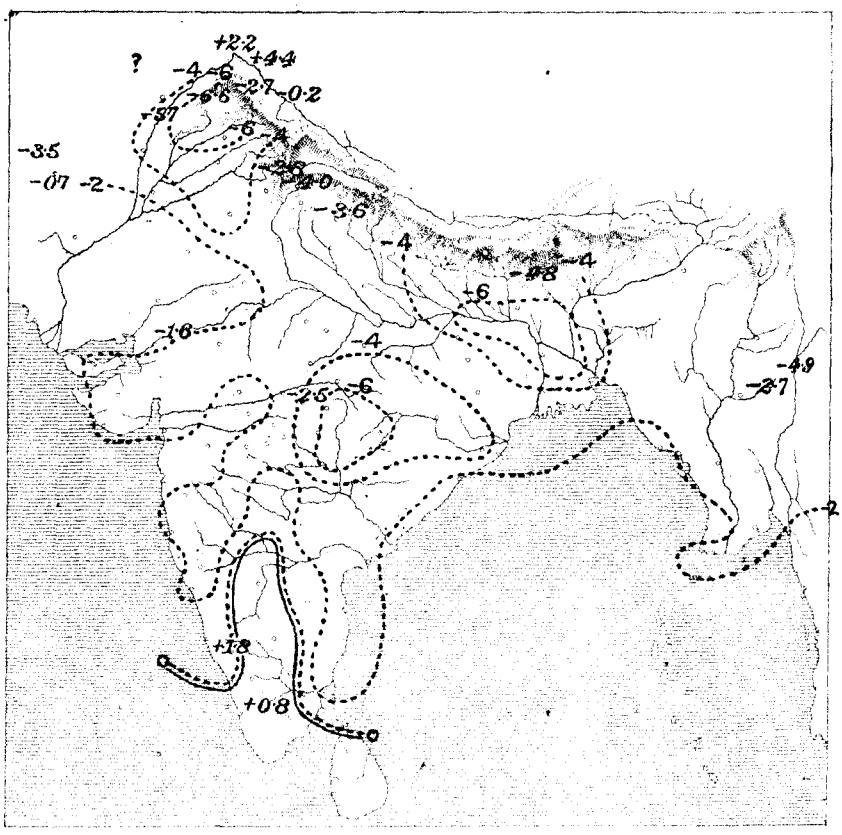


CHART SHEWING THE DEPARTURE FROM NORMAL
OF THE MONTHLY MEAN OF DAILY
MINIMUM TEMPERATURE.

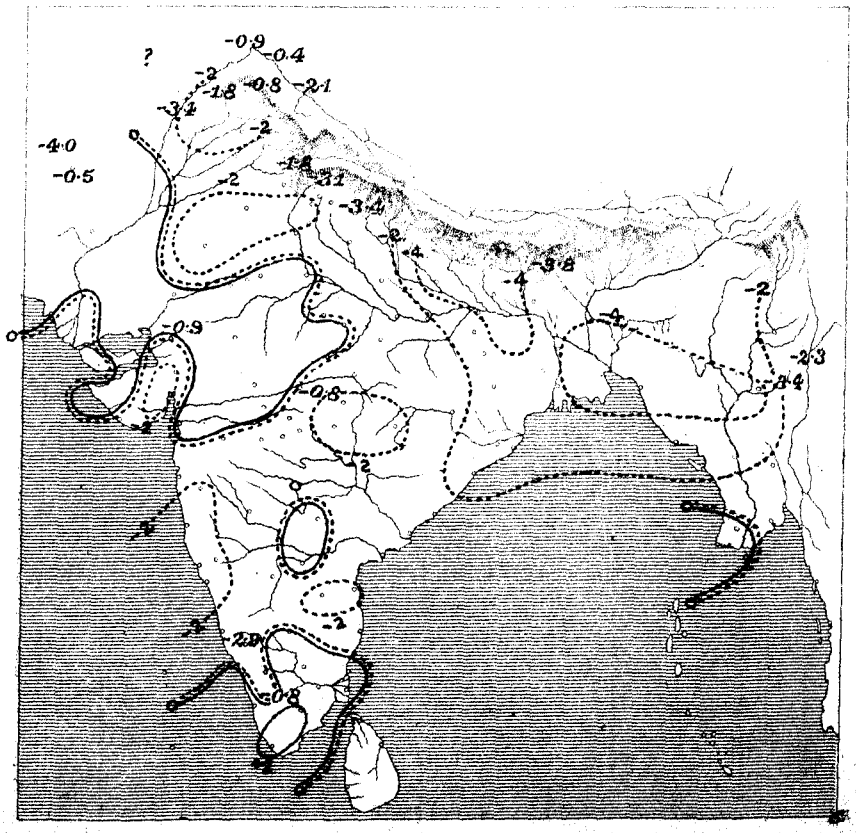


CHART SHEWING THE DEPARTURE FROM NORMAL
OF THE MONTHLY MEAN OF DAILY
MEAN TEMPERATURE.

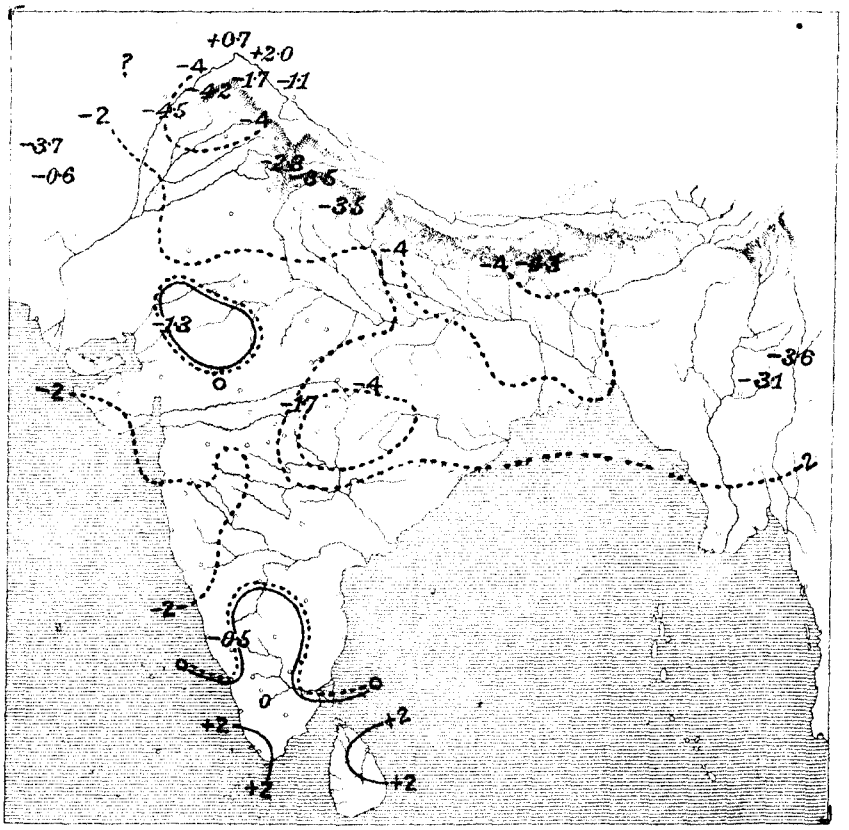


CHART SHEWING THE DEPARTURE FROM NORMAL
OF THE MONTHLY MEAN OF ABSOLUTE
HUMIDITY AT 8 HRS.

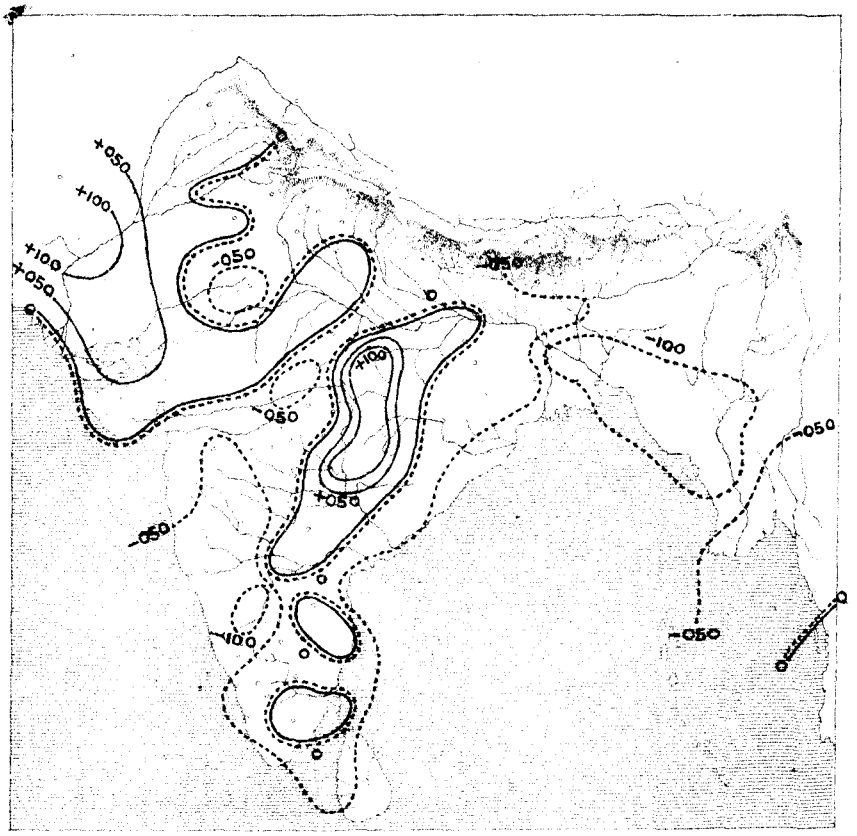


CHART SHEWING THE DEPARTURE FROM NORMAL
OF THE MONTHLY MEAN OF RELATIVE
HUMIDITY AT 8 HRS.

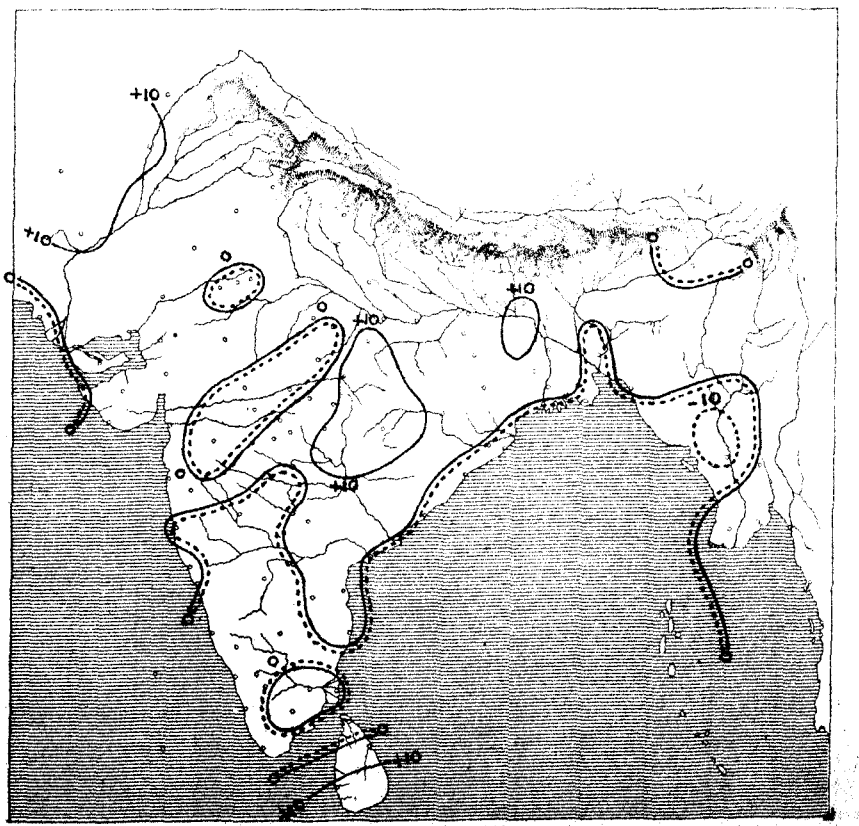


CHART SHEWING THE DEPARTURE FROM NORMAL
OF THE MONTHLY MEAN OF CLOUD
AMOUNT AT 8 HRS.

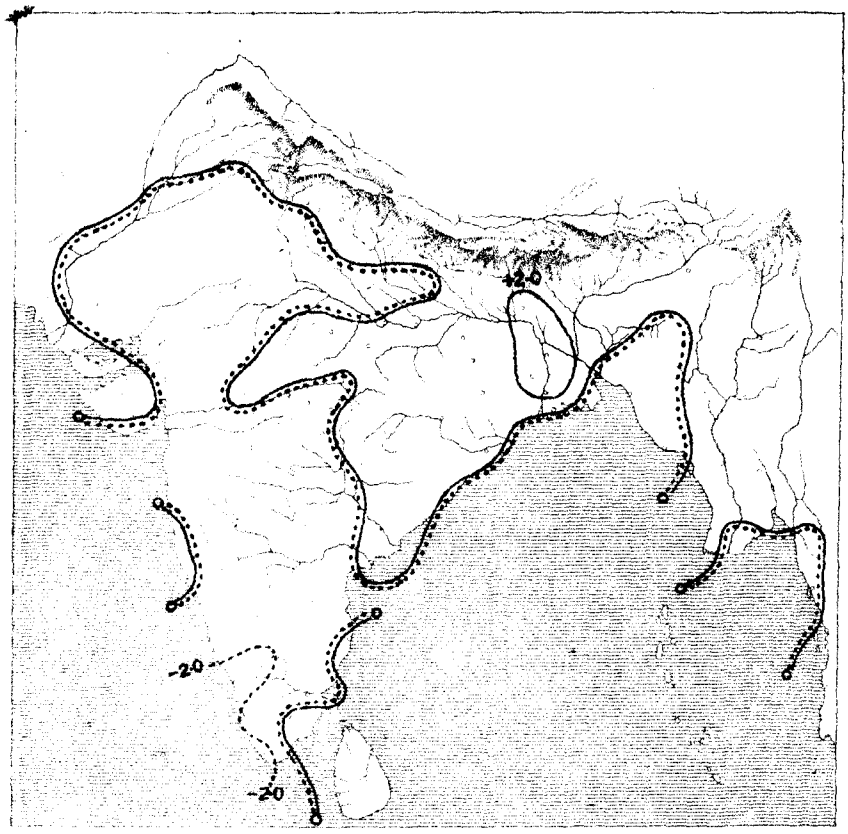
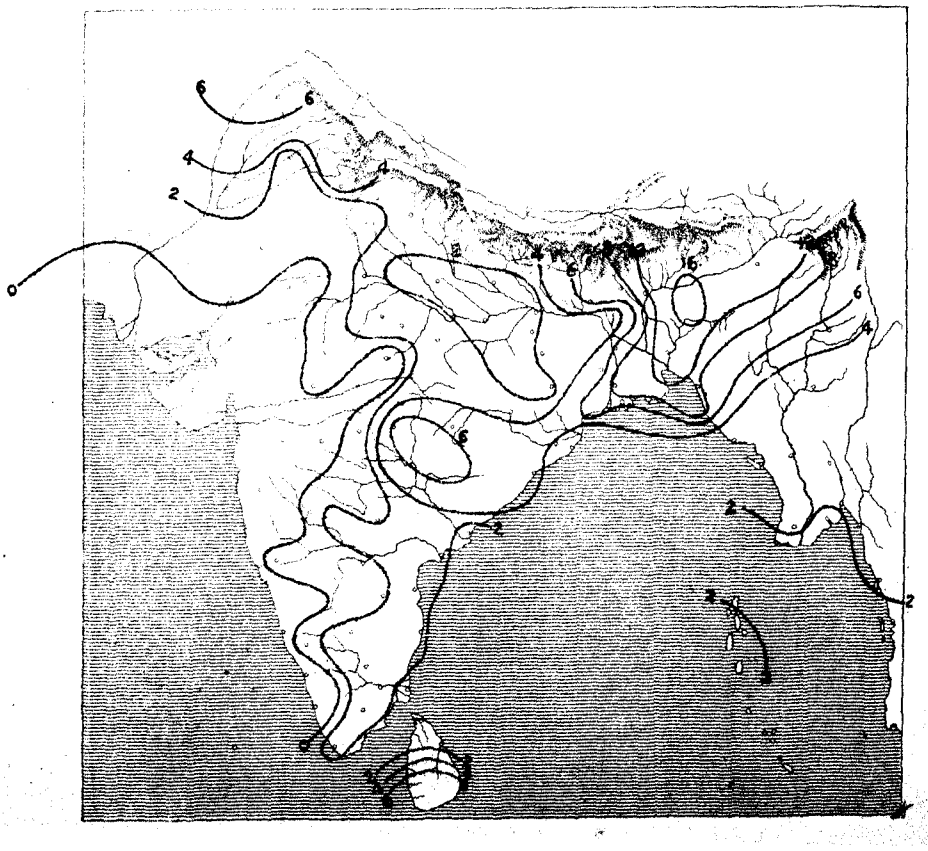
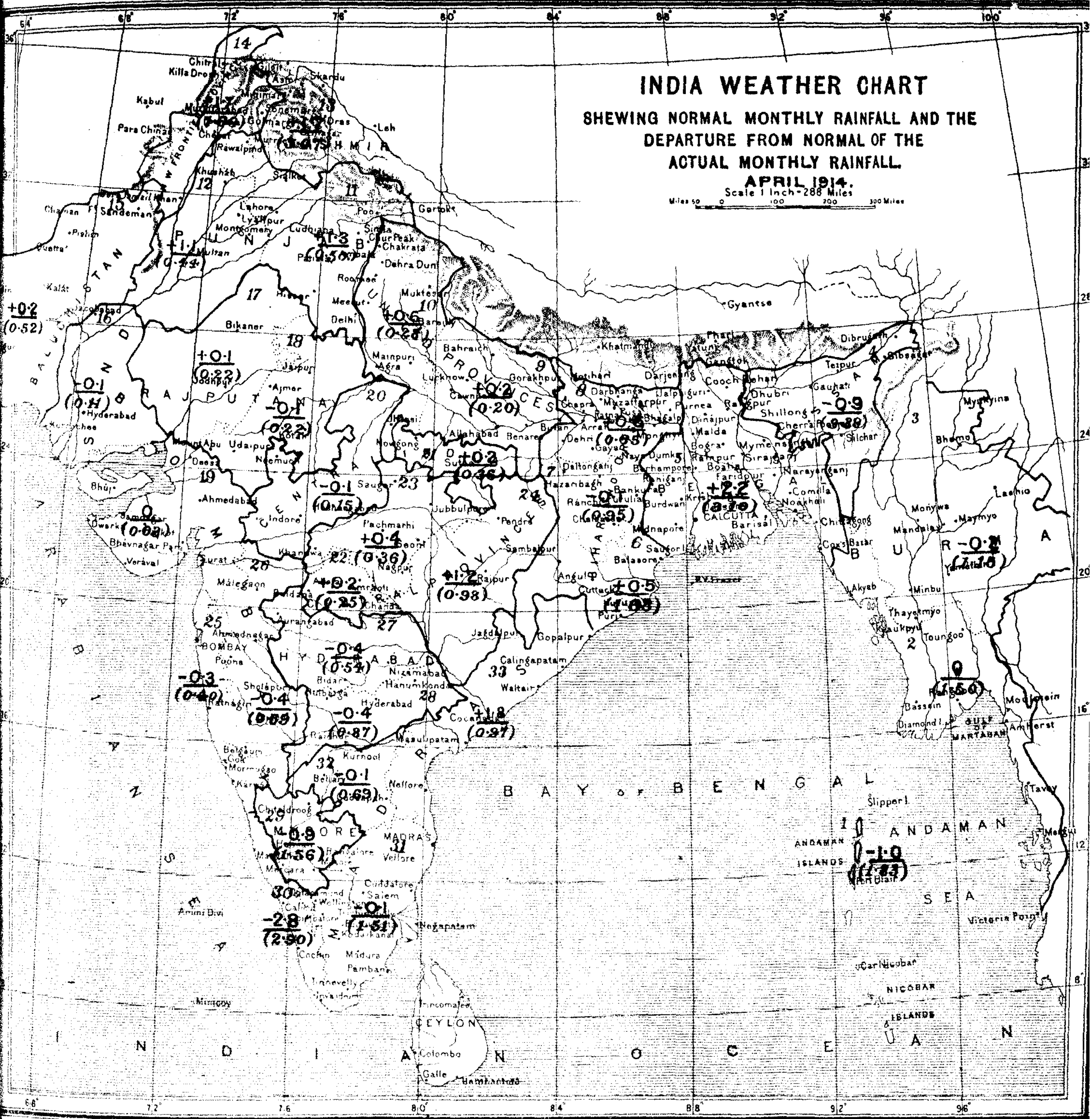


CHART SHEWING THE TOTAL NUMBER OF DAYS IN THE
MONTH ON WHICH RAINFALL EQUALLED OR
EXCEEDED 0·10 INCH.
(BASED ON THE RETURNS OF TABLE B.)





The country is divided into 33 areas as shewn in the list below. The numbers in that list correspond with the red numbers on the chart, and serve to identify the areas. The numbers in brackets on the chart give the average over the divisions of the normal monthly rainfall, the numbers above these give the departures from normal of the average actual rainfall over the divisions.

1. Bay Islands
2. Lower Burma
3. Upper Burma
4. Assam
5. Bengal
6. Orissa
7. Chota Nagpur
8. Bihar
9. United Provinces, East
10. United Provinces, West
11. Punjab, East and North
12. Do., Southwest
13. Kashmir
14. Northwest Frontier Province
15. Baluchistan
16. Sind
17. Rajputana, West
18. Rajputana, East
19. Gujarat
20. Central India, West
21. Do., East
22. Berar
23. Central Provinces, West
24. Do., East
25. Konkan
26. Bombay, Deccan
27. Hyderabad, North
28. Hyderabad, South
29. Mysore
30. Malabar
31. Madras, Southeast
32. Madras, Deccan
33. Madras Coast, North

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CALCUTTA, MAY, 1914.

INTRODUCTION.

THIS review of the weather in India during the month of May, 1914, is based on observations taken daily at 8 hrs. at 217 stations, and on additional observations taken at 10 hrs. and 16 hrs. at 15 stations. In the rainfall summary have been utilized the data furnished by the meteorological observatories, and such rainfall statements of the month as had been published by the Provincial Governments up to the date of the preparation of the review.

The brief notes on solar, seismic and magnetic disturbances are supplied by the chief observatories in the India area.

For a statement of the methods adopted in recording and tabulating the data, for each of the elements of observation, reference should be made to the introductory portion of the review for January.

Summary of the chief features of the weather in India during the month.

2. Meteorologically May was very abnormal. In northern India the weather was more or less unsettled throughout the month with the exception of the fourth week, and for a short period, from the 7th to the 10th, there was remarkably widespread rainfall over the tract lying between the North-West Frontier Province and Assam.

In the Peninsula, although thunderstorms were of occasional occurrence, there was on the Malabar coast an entire absence of the preliminary irruptions of monsoon winds and weather which are the customary forerunners of the permanent advance of the monsoon.

Weather was unusually quiet in the Arabian Sea but was abnormally disturbed in the Bay of Bengal where no less than three disturbances were recorded.

The precipitation of the month was very heavy for the time of year in Orissa, Chota Nagpur, the United Provinces, Central India, the Central Provinces East and Sind, where the amounts received were two to three times the normal; and it was more than 20 per cent. in excess also in Bengal, Bihar, the Punjab East and North, the North-West Frontier Province, Gujarat, Berar, the Central Provinces West, Hyderabad South and the Madras Coast North. Over the remainder of the country the month's fall was either about normal or below it, the deficit amounting to about 4″ in the Bay Islands, 3½″ in Malabar and 3 in Lower Burma.

In the hills there was an excess of 24 per cent. in Kashmir, and a defect of 81 per cent. in Baluchistan.

Of the climatic elements other than rainfall temperature and humidity were approximately normal in most parts of the country; the cloud proportion was decidedly low in Assam and Kashmir, and appreciably higher than usual in Bihar and Orissa, the United Provinces, Madras, Mysore, Central India and the Central Provinces.

Barometric pressure in the plains was ·03″ higher than usual.

Solar, seismic and magnetic disturbances.

KODAIKANAL OBSERVATORY.

3. *Solar Observations.*—Observations of the sun were made on all the days during the month.

Sunspots.—Seven new groups of spots all of which were small were recorded in May, being the same number as in April, but the daily average number fell to 0·6 as against 1·2 in April. The average life of a spot was 1·9

days. The distribution of the spot groups in latitude was as follows:—

TABLE 1.

	0-11	11-20	21-30	31-40	Mean latitude.	Extreme latitudes.
North . .	...	3	1	...	21°	18° and 26°
South . .	...	1	1	1	26°	19° and 35°

Prominences.—Fifty large prominences were recorded during the month. The highest was 130″ and was recorded on the 29th at latitude 39° west. There were no eruptive or metallic prominences observed during the month.

Magnetic disturbances.—"Moderate" disturbances were recorded on the 17th and 31st but on neither of these days were there any spots on the visible disc of the sun.

Seismic records.

$\phi = 10° 30' 50''$; $\lambda = 77° 28' 00''$; $h = 2343$ m. Subsoil rock.

Apparatus.—Milne's Horizontal Pendulum Seismograph.

TABLE 2.

	V	To	e	$\frac{r}{To^2}$
AN:				
AE:		16·6	1	3·2
AZ:				

Date.	Phase.	Time, G. M. T.			Period (sec.).	Amplitude (u)			Distance Δ (Km.)	Remarks.
						An.	Ae.	Az.		
1914		h.	m.	s.						
May 27-28	e P	8	35	24	...	...	...	...	...	
	L	8	38	42	...	...	...	...	...	
	M	8	39	12	...	...	50	...	...	
	F	8	59	12	...	...	...	...	...	
„ 26th	e P	1	12	0	...	...	...	...	...	Widening of line.
	F	1	38	42	...	...	...	...	...	
„ 26th	P		.....		...	...	...	...	...	No preliminary tremors.
	i L	2	52	18	...	...	...	...	...	
	M	2	53	18	...	...	70	...	...	
	F	3	2	48	...	...	...	...	...	
„ 26th	e P	14	23	6	...	...	...	...	...	
	i L	14	35	0	...	...	...	...	...	
	M 1	14	46	9	...	...	1070	...	...	
	M 2	14	59	36	...	...	1500	...	...	
	F	18	19	48	...	...	...	...	...	
1914		h.	m.	s.						
May 29th	e P	4	26	?	...	...	...	...	...	Instrument examined at 4·47.
	L		?		...	...	...	...	...	
	e M	5	1	48	...	...	850	...	...	
	F	6	46	12	...	...	...	...	...	

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Alibag magnetic record.

4. During the month of May 1914 the traces showed 19 calm days, and 12 days of small disturbance.

The days of the month selected as quiet for the purposes of the Magnetic Survey of India are the 4th, 10th, 14th, 20th and 30th.

The following table represents the magnetic character of each day during the month.

TABLE 3.

Day.	Character.	Day.	Character.	Day.	Character.	Day.	Character.
1	C	9	C	17	S	25	S
2	C	10	C	18	C	26	S
3	C	11	S	19	C	27	S
4	C	12	C	20	C	28	S
5	S	13	C	21	C	29	C
6	S	14	C	22	C	30	C
7	S	15	S	23	C	31	S
8	C	16	S	24	C	...	...

C = calm; S = small; M = moderate; G = great; V. G. = very great.

The mean observed absolute values of the several magnetic elements reduced to the mean monthly tabulations of the magnetograms, as also the ranges and the summed ranges of the horizontal force and the declination for the month are as follow:—

Easterly declination . . .	0° 44′ 30″
Horizontal force . . .	0·36887 C.G.S. unit.
Vertical force	0·16578 „ „
Inclination	24° 12″·0
Horizontal force range . .	0·00038 C.G.S. unit.
Horizontal force summed range .	0·00253 „ „
Declination range . . .	4′·2
Declination summed range . .	17′·5

(NOTE.—Summed range means sum without regard to sign of the successive diurnal inequality.)

Seismic records.

$\phi = 18^\circ\ 53'\ 36''$; $\lambda = 72^\circ\ 48'\ 56''$; $h = 11$ m. Subsoil trap.

Apparatus.—Milne's Horizontal Pendulum Seismograph.

TABLE 4.

	V	To	ϵ	$\frac{r}{To^2}$
AN :				
AE :	9	18	1	
AZ :				

Date.	Phase.	Time, G. M. T.	Period (sec.)	Amplitude (u) An.	Amplitude (u) Ae.	Amplitude (u) Az.	Distance Δ (Km.)	Remarks.
1914.		h. m. s.						
May 1st	P	6 8 17	...	...	...	...	...	
	M	6 22 47	...	...	22	...	...	
	F	6 39 56	...	...	...	...	...	
„ 21st	P	8 32 53	...	...	...	...	...	
	M	8 38 38	...	...	56	...	...	
	F	8 52 3	...	...	...	...	...	
„ 26th	P	2 54 49	...	...	...	...	...	
	M	2 56 47	...	...	33	...	...	
	F	3 8 15	...	...	...	...	...	
„ 28th	P	14 33 16	...	...	...	...	...	
	M	15 8 9	...	...	1011	...	...	
	F	...	...	...	...	...	...	End lost in shifting time.
„ 29th	P	4 54 22	...	...	...	...	...	
	M	5 6 46	...	...	200	...	...	
	F	6 36 55	...	...	...	...	...	

Thickening of line was noted on the following occasions :—

d. h. m.	d. h. m. h. m.	d. h. m.	d. h. m.
6 4 23	8 13 59	8 16 14	9 13 59
13 13 17	14 10 58 to 11 0	21 13 30	25 9 6
25 2 18			

Sensibility to tilt 1·6 mm. of amplitude on the trace = 0·50"

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5. CALCUTTA (ALIPORE) OBSERVATORY.

Seismic records.

$\phi = 22^\circ\ 32'$ N ; $\lambda = 88^\circ\ 21'\ 0''$ E ; $h = 6{\cdot}4$ m. Subsoil.

Apparatus.—Milne's Horizontal Pendulum Seismograph.

TABLE 5.

	V	To	ϵ	$\frac{r}{To^2}$
AN :				
AE :	8·688	18	1	
AZ :				

Date.	Phase.	Time, G. M. T.	Period (sec.)	Amplitude (u) An.	Amplitude (u) Ae.	Amplitude (u) Az.	Distance Δ (Km.)	Remarks
1914.		h. m. s.						
May 1st	P	4 14 38	...	...	...	...	...	
	L	4 38 0	...	...	...	...	...	
	M	5 37 58	...	...	144	...	...	
	F	7 12 30	...	...	...	...	...	
„ 21st	P	8 33 2	...	...	...	...	...	
	L	8 36 35	...	...	...	...	...	
	M	8 37 6	...	...	86	...	...	
	F	9 3 31	...	...	...	...	...	
„ 26th	P	14 31 28	...	...	...	...	...	
	L	4 36 33	...	...	...	...	...	

Date.	Phase.	Time, G. M. T.	Period (sec.)	Amplitude(u) An	Amplitude(u) Ae	Amplitude(u) Az.	Distance Δ (Km.)	Remarks.
1914.		h. m. s.						
May 26th	M	14 47 14	...	...	*	...	...	*The boom moved throughout the trace. Amplitude cannot be given. It again moved throughout the trace at 14 h. 53 m. 20 s.
	F	18 27 18	...	...	...	...	...	
„ 28th	P	8 20 24	...	...	...	...	...	
	L	8 43 47	...	...	...	...	...	
	M	8 45 50	...	...	86	...	...	(a) As the paper was changed after this the approximate time of F is given.
	F	9 8 43 (a)	...	...	...	...	...	
„ 29th	P	4 52 40	...	...	...	...	...	
	L	4 56 44	...	...	...	...	...	
	M	5 7 56	...	...	374	...	...	
	F	6 46 5	...	...	...	...	...	

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6. SIMLA OBSERVATORY.

The Simla seismograph notes for May 1914 will appear in a future number of this review.

Following table contains a list of earthquakes that were reported :—

TABLE 6.

Place at which felt.	Date.	G. M. T. of earthquake h.	G. M. T. of earthquake m.	Duration. Sec.	Intensity Rossi-Forel scale.	No. of shocks.
Sialkot	May 10th	21	33	3	5	2
Lahore	„ 10th	21	35	3	6	1
Shillong	„ 14th	4	0	1	5	1

Solar radiation.—The following figures give the intensity of solar radiation, as measured at Simla by Angstrom's pyrheliometer. The values are corrected to local noon, and expressed in grammecalories per square centimetre per minute :—

Maximum	1·46
Minimum	1·26
Mean	1·37
Number of days of observation . . .	6

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ROYAL ALFRED OBSERVATORY, MAURITIUS.

7. No information has been received.

Weather in the Indian Ocean.

8. Pressure was in excess at Zanzibar, nearly normal at Seychelles, and in defect by about ·01″ at Mauritius. Winds were very light and unsteady at Seychelles, while at Zanzibar, they blew more directly from the west than usual. Rainfall was 66 per cent. below the normal at Zanzibar, and in excess by 27 per cent. at Seychelles.

TABLE 7.

	Mauritius.	Zanzibar.	Seychelles.
Departure from normal of mean pressure.	—·007	+·020	—·005
Actual mean wind direction .	S 67° E	S 18° W	S 44° E
Normal mean wind direction .	S 64° E	S 7° W	S 43° E
Actual mean wind velocity (miles per diem).	168	145	75
Normal mean wind velocity (miles per diem).	158	142	120
Rainfall departure from normal .	−0·68	−7·58	+1·61

Depressions and cyclonic storms.

9. Four disturbances occurred in the course of the month, one over north-west India and three over the Bay of Bengal. The first of the four was developed during the 7th in an area of high temperature overlying north Rajputana and the south of the Punjab, and filled up on the 10th without changing its position to an appreciable extent. Its barometric depth was slight, less than one-fifth of an inch throughout, but owing mainly to the prevalence during its existence of a moist easterly current in northern India it occasioned widespread precipitation in the western Himalayas and the adjacent submontane districts. Its dispersion on the 12th was followed by the formation of a cyclonic storm over the Bay of Bengal to the west of the Andamans. According to the imperfect marine information available at present this disturbance was initiated on the 12th by a temporary rush of monsoon winds up the

lay. It apparently intensified during the next two days nd travelling along a north-westerly path had by the orning of the 14th reached a position in about Lat. 16° N nd Long. 87° E. At 8 hours on the 15th the centre was ost probably in about Lat. 18° and Long. 86½°; it crossed he coast near Gopalpur at night, and on the morning f the 16th lay nearly midway between Gopalpur and ngul. As is usually the case when it is fed exclusively y the Bay current the storm recurved sharply to the east uring the day and moving rapidly in a north-easterly irection, had reached the neighbourhood of Berhampore y the morning of the 17th. It disappeared completely in he succeeding 24 hours. As far as can be ascertained rom the available data the storm was of considerable intensity on the 14th and 15th, but became greatly reduced on the 16th after its passage inland. The strongest winds caused by the disturbance were of force 9 or 10.

It was the cause of heavy rain in Orissa, Chota Nagpur, south Bihar, Bengal and Assam.

The third disturbance was probably generated in the neighbourhood of Diamond Island on the 23rd. It developed slightly and moving in a northerly direction parallel with the coast passed inland near Chittagong on the 27th. At no time during its existence it was of any great depth, and its influence on the winds and weather was but slight.

The fourth disturbance became noticeable first on the 31st. Its history will be given in the review for June.

Pressure.

10. The high pressure conditions which had characterised the period from June 1913 to April 1914, persisted also through May for which month the geographical mean of pressure recorded in the plains of India was ·030″ in excess of the normal. The excess was almost universal, and in north-west and central India was on the whole more marked at the level of the hill stations than in the adjacent plains.

Owing to the unequal distribution of the excess in northern and central India the position of the usual trough of low pressure was considerably more southerly than is ordinarily the case.

It is also noteworthy that in most parts of the country the high pressure coincided with a temperature above the average:—

TABLE 8.

DIVISION.	Departure from normal of mean 8 hrs. pressure.
	″
Burma	+·041
Assam	+·042
Bengal	+·049
Bihar and Orissa	+·051
United Provinces	+·054
Punjab	+·050
North-West Frontier Province	+·017
Sind	+·029
Rajputana	+·006
Bombay	+·015
Central India	+·025
Central Provinces	+·017
Hyderabad	+·003
Mysore	+·029
Madras	+·023

TABLE 9.

HILL STATION.	Departure from normal pressure. A.	PLAIN STATION.	Departure from normal pressure. B.	Departure of pressure difference B—A.
	″		″	″
Quetta	+·051	Jacobabad	+·021	—·030
Leh	+·055	Lahore	+·051	—·004
Murree	+·043	Peshawar	+·023	—·020
Simla	+·055	Ludhiana	+·059	+·004
Chakrata	+·061	Roorkee	+·066	+·005
Darjiling	+·006	Dhubri	+·042	+·036
Mount Abu	+·043	Deesa	+·017	—·026
Pachmarhi	+·030	Khandwa	+·012	—·018
Kodaikanal	+·020	Madura	+·037	+·017

Temperature.

11. The mean temperature of the month was approximately normal over almost the whole country, the greatest departure occurring in the region comprising Chota Nagpur and Orissa where a defect of about 4° was recorded.

The maps of maximum and minimum temperature present almost the same features. The departures both positive and negative on the maximum map are however more emphatic than those of minimum temperature.

In north-west India, the temperature conditions were more unsteady than usual. Thus during the first week weather was between 4° and 16° warmer than usual, in the second week a cold spell was experienced, and by the middle of the fourth week temperature had again become considerably higher than usual. At Multan and Bikaner the maximum recorded, surpassed the values previously reached, while on the afternoon of the 26th Jacobabad registered a reading of 126°, which is as high as any previously on record.

TABLE 10.

Sub-division.	Actual temperature.					Departure from normal of		
	Mean maximum.	Mean minimum.	Monthly mean of mean between maximum and minimum.	Mean daily range of temperature.	Absolute range during month.	Maximum.	Minimum.	Daily range.
	°	°	°	°	°	°	°	°
1. Bay Islands	88·3	79·3	83·8	9·1	21·4	−0·7	+0·3	−1·0
2. Lower Burma	90·8	76·9	83·9	13·9	23·7	+0·8	+0·3	+0·5
3. Upper Burma	94·2	74·9	84·5	19·2	34·1	−0·8	+0·2	−1·0
4. Assam	87·2	72·7	80·0	14·5	27·9	−0·3	+0·7	−1·0
5. Bengal	90·0	76·3	83·1	13·6	26·3	−2·4	+0·2	−2·6
6. Orissa	95·0	77·9	86·5	17·1	30·9	−5·7	−2·1	−3·6
7. Chota Nagpur	98·6	75·7	87·1	22·9	36·5	−6·1	−3·0	−3·1
8. Bihar	97·2	76·6	86·9	20·5	36·2	−2·5	−0·2	−2·4
9. United Provinces, East	101·6	77·5	89·6	24·1	41·6	−3·1	−1·2	−1·9
10. Do. do., West	104·8	79·0	91·9	25·8	45·5	−1·6	−0·2	−1·4
11. Punjab, East and North	102·2	74·7	88·4	27·5	52·8	−1·3	−0·3	−1·0
12. Do., South-west	105·5	76·8	91·1	28·7	56·9	−0·7	+0·1	−0·8
13. Kashmir	75·7	48·0	61·8	27·7	51·9	+2·2	−0·6	+2·8
14. North-West Frontier Province	103·2	72·3	87·8	30·9	54·7	+1·8	−0·1	+1·9
15. Baluchistan	94·4	64·7	79·5	29·7	52·9	+1·1	−1·3	+2·4
16. Sind	104·9	79·8	92·3	25·2	40·3	+2·3	+1·4	+0·9
17. Rajputana, West	111·1	82·9	97·0	28·1	47·2	+4·0	+1·3	+2·7
18. Do., East	108·4	83·7	96·0	24·7	42·8	+1·9	+2·4	−0·5
19. Gujarat	100·4	78·4	89·3	21·9	31·1	+0·5	+0·5	0
20. Central India, West	105·7	78·8	92·2	26·9	41·8	+2·3	+2·3	0
21. Do., East	105·3	80·3	92·8	25·0	43·5	−1·2	+0·7	−1·9
22. Berar	108·2	80·7	94·5	27·5	45·1	+0·5	+0·1	+0·4
23. Central Provinces, West	106·1	79·9	93·0	26·3	42·7	−0·2	+0·3	−0·5
24. Do., East	102·7	78·4	90·6	24·3	40·7	−2·3	−1·9	−0·4
25. Konkan	91·2	81·5	86·3	9·7	14·7	+0·8	+1·2	−0·4
26. Bombay Deccan	102·4	74·5	88·5	27·9	38·8	+2·3	+1·5	+0·8
27. Hyderabad, North	105·5	78·8	92·1	26·6	40·9	+1·1	+1·0	+0·1
28. Do., South	104·9	80·0	92·4	24·9	39·7	+0·7	+0·3	+0·4
29. Mysore	93·3	70·6	82·0	22·7	33·6	+2·1	+1·5	+0·6
30. Malabar	90·1	79·1	84·6	10·9	19·7	+0·8	+1·9	−1·1
31. Madras, South-east	99·6	79·9	89·7	19·7	30·3	+1·2	+1·3	−0·1
32. Do., Deccan	104·8	80·0	92·4	24·8	39·4	+0·9	+0·5	0
33. Do., Coast, North	95·5	80·4	87·9	15·1	28·9	−1·7	−0·8	−0·9

TABLE II.

DIVISION.	DEPARTURE FROM NORMAL OF		
	Mean maximum temperature.	Mean minimum temperature.	Mean temperature.
	°	°	°
Burma	+0·2	+0·2	+0·2
Assam	—0·3	+0·7	+0·2
Bengal	—2·4	+0·2	—1·1
Bihar and Orissa	—4·3	—1·3	—2·8
United Provinces	—2·1	—0·7	—1·5
Punjab	—1·1	—0·2	—0·7
North-West Frontier Province	+1·8	—0·1	+0·9
Sind	+2·3	+1·4	+1·9
Rajputana	+2·7	+1·9	+2·3
Bombay	+1·2	+1·0	+1·1
Central India	+0·5	+1·5	+1·0
Central Provinces	—0·5	—0·2	—0·3
Hyderabad	+0·9	+0·5	+0·7
Mysore	+2·1	+1·5	+1·8
Madras	+0·4	+0·9	+0·7

Winds.

12 (*a*) The air movement was somewhat lighter than usual generally in northern and central India, and was very slightly above its normal intensity in the Peninsula.

(*b*) The degree of steadiness was markedly high in Assam, the United Provinces, the Punjab and the North-West Frontier Province, and was very low in Bengal, Bihar and Orissa, Rajputana, Central India and the Central Provinces.

(*c*) Owing to the abnormal position of the trough referred to in the section on pressure the direction of movement was very unusual over the tract of country lying between Gaya and Multan.

On the whole the direction of movement over north-west India was fairly normal and did not indicate the existence of any abnormal snowfall influence.

TABLE 12.

STATION.	WIND DIRECTION.	
	Actual.	Normal.
	°	°
Multan	N 29 E	S 12 E
Sirsa	N	S 39 W
Jaipur	N 2 E	S 88 W
Delhi	S 83 E	S 73 W
Agra	S 66 E	S 49 W
Mainpuri	S 49 E	N 84 W
Jhansi	S 16 W	N 70 W
Nowgong	N 61 E	N 82 W
Cawnpore	S 48 E	S 56 W
Sutna	S 23 E	N 73 W
Allahabad	N 80 E	N 2 E
Lucknow	S 66 E	N 72 E
Gaya	S 58 E	S 78 W

TABLE 13.

DIVISION.	DEPARTURE FROM NORMAL OF	
	Hourly wind velocity.	Wind steadiness.
	"	°
Burma	—0·2	— 7
Assam	—0·6	+ 7
Bengal	—1·8	—17
Bihar and Orissa	—0·7	—11
United Provinces	—0·2	+20
Punjab	—0·1	+21
North-West Frontier Province	—0·5	+ 8
Sind	—3·0	— 4
Rajputana	+0·4	—28
Bombay	—0·3	0
Central India	—0·3	—14
Central Provinces	+0·4	—16
Hyderabad	+0·5	— 4
Mysore	+1·2	— 5
Madras	+0·3	+ 5

Humidity and cloud.

13. Absolute humidity was in excess over the greater part of the country, but areas in which the vapour tension was less than usual occurred in Burma, east Assam, deltaic Bengal, the Punjab, Rajputana, the western districts of Central India and of the Central Provinces, Khandesh, south-east Madras and the western half of Hyderabad.

The distribution of relative humidity corresponded rather closely with that of absolute humidity.

There was more cloud than usual except in north-west India, north Bengal, Assam, the northern parts of the Bombay Deccan and a few places elsewhere.

TABLE 14.

DIVISION.	HYGROMETRY; 8 HRS.				CLOUD.	
	Mean humidity.	Departure from normal.	Mean vapour tension in inches of mercury.	Departure from normal in inches of mercury.	Mean cloud amount at 8 hrs.	Departure from normal.
	%					
Burma	80	— 2	·844	—·019	6·4	+0·4
Assam	86	— 3	·815	+·001	5·1	—2·9
Bengal	84	+ 2	·900	—·005	5·8	+0·3
Bihar and Orissa	72	+ 6	·802	+·015	4·7	+1·5
United Provinces	52	+ 5	·642	+·057	2·1	+
Punjab	43	+ 1	·520	—·012	1·4	—
North-West Frontier Province.	46	+ 1	·547	+·002	1·1	—
Sind	62	+ 2	·815	+·086	1·2	—
Rajputana	32	— 7	·472	—·123	0·8	—
Bombay	66	+ 1	·783	+·032	3·1	+
Central India	44	+ 3	·563	—·045	2·3	+
Central Provinces	40	+ 1	·516	—·022	2·5	+
Hyderabad	49	0	·596	+·016	3·8	+
Mysore	72	— 2	·654	—·005	5·7	+
Madras	71	+ 1	·865	+·010	5·2	+

Rainfall.

14. The total amount received during the month was everywhere above the average except in the rainfall divisions of the Bay Islands, Lower Burma, Assam, Baluchistan, Rajputana West, the Konkan, the Bombay Deccan, Hyderabad North, Mysore, Malabar and Madras South-east. The excess ranged between 109 and 224 per c in Orissa, Chota Nagpur, the United Provinces, S Central India and the Central Provinces East; while region of greatest proportional defect in the plains incl the Konkan and Malabar.

TABLE 15.

SUB-DIVISION.	NUMBER OF RAINY DAYS.		RAINFALL.			
	Actual.	Normal.	Actual.	Normal.	Departure from normal.	Percen depar from no
			"	"	"	
1. Bay Islands	13·5	13·9	8·95	13·07	—4·12	— 3
2. Lower Burma	12·7	12·9	10·01	13·02	—3·01	— 2
3. Upper Burma	8·7	7·8	6·56	5·76	+0·80	+ 1
4. Assam	11·8	14·3	10·87	11·90	—1·03	—
5. Bengal	8·8	9·0	10·31	7·80	+2·51	+ 3
6. Orissa	8·0	4·5	7·72	2·84	+4·88	+17
7. Chota Nagpur	6·1	3·3	5·14	1·83	+3·31	+18
8. Bihar	4·3	3·2	3·96	2·26	+1·70	+ 7

Sub-division.	Number of rainy days.		Rainfall.			
	Actual.	Normal.	Actual.	Normal.	Departure from normal.	Percentage departure from normal.
			"	"	"	
9. United Provinces, East	2·9	1·2	1·79	0·62	+1·17	+189
10. Do., West	3·0	1·3	1·35	0·59	+0·76	+129
11. Punjab, East and North	2·2	1·4	0·95	0·59	+0·36	+ 61
12. Punjab, South-west	0·9	0·8	0·43	0·39	+0·04	+ 10
13. Kashmir	4·6	3·8	2·62	2·12	+0·50	+ 24
14. North-West Frontier Province	3·2	1·8	1·39	0·93	+0·46	+ 49
15. Baluchistan	0·1	0·5	0·04	0·21	—0·17	— 81
16. Sind	0·4	0·2	0·23	0·11	+0·12	+109
17. Rajputana, West	0·4	0·5	0·16	0·22	—0·06	— 27
18. Do., East	0·9	0·9	0·39	0·37	+0·02	+ 5
19. Gujarat	0·4	0·3	0·27	0·17	+0·10	+ 59
20. Central India, West	1·2	0·6	0·62	0·21	+0·41	+195
21. Do., East	1·7	0·6	0·68	0·21	+0·47	+224
22. Berar	2·0	0·9	0·73	0·42	+0·31	+ 74
23. Central Provinces, West	1·4	0·9	0·53	0·36	+0·17	+ 47
24. Do., East	2·5	1·2	1·34	0·54	+0·80	+148
25. Konkan	0·6	1·7	0·31	1·40	—1·09	— 78
26. Bombay Deccan	1·8	2·3	0·95	1·29	—0·34	— 26
27. Hyderabad, North	1·2	1·4	0·42	0·65	—0·23	— 35
28. Do., South	2·0	1·9	1·21	0·86	+0·35	+ 41
29. Mysore	4·1	5·6	2·47	3·61	—1·14	— 32
30. Malabar	6·9	7·7	3·56	7·18	—3·62	— 50
31. Madras, South-east	3·1	3·9	1·91	2·66	—0·75	— 28
32. Do., Deccan	3·1	2·8	1·75	1·59	+0·16	+ 10
33. Do., Coast, North	4·4	3·0	3·67	2·03	+1·64	+ 81

TABLE 16.

Division.	Rainfall.			
	Actual.	Normal.	Departure from normal.	Percentage departure from normal.
	"	"	"	
Burma	7·91	8·61	—0·70	— 8
Assam	10·87	11·90	—1·03	— 9
Bengal	10·31	7·80	+2·51	+ 32
Bihar and Orissa	5·26	2·30	+2·96	+129
United Provinces	1·58	0·60	+0·98	+163
Punjab	0·82	0·54	+0·28	+ 52
North-West Frontier Province	1·39	0·93	+0·46	+ 49

Division.	Rainfall.			
	Actual.	Normal.	Departure from normal.	Percentage departure from normal.
	"	"	"	
Sind	0·23	0·11	+0·12	+109
Rajputana	0·32	0·32	0	0
Bombay	0·61	0·95	—0·34	— 36
Central India	0·64	0·21	+0·43	+205
Central Provinces	0·90	0·45	+0·45	+100
Hyderabad	0·85	0·76	+0·09	+ 12
Mysore	2·47	3·61	—1·14	— 32
Madras	2·56	2·76	—0·20	— 7
Mean of India	2·99	2·65	+0·34	+ 13

Snowfall.

I.—AFGHANISTAN.

15. No information is forthcoming.

II.—NORTH-WEST FRONTIER PROVINCE.

(*a*) *Wano.*—No snow fell in south Waziristan, and the weather there was unusually warm.

(*b*) *Tochi* (North Waziristan).—There was no snowfall. A violent hailstorm occurred on the 9th devastating crops and killing over a thousand sheep and goats and fifty head of cattle before passing into the Bannu district.

(*c*) *Dera Ismail Khan.*—No snow fell.

(*d*) *Kurram.*—No snow fell and by the end of the month the passes had become clear of snow.

(*e*) *Kohat.*—No snow fell.

(*f*) *Drosh.*—Some snow fell on the higher ranges during the first half of the month.

(*g*) *Khyber.*—No snow fell.

(*h*) *Malakand.*—A little snow fell during the third week on the Lowarai hills.

(*i*) *Hazara.*—Snow varying from 3 to 9 inches in depth fell in the *Galis* and the Kagan valley down to 7,000 feet.

III.—KASHMIR.

The table below shows the character of snowfall in this area:—

TABLE 17.

Locality.	Number of falls and date of occurrence.	Total amount.	REMARKS.
Mountains around Srinagar	1 (10th May)	Light.	
Dras	4 (10th, 11th, 17th and 18th.)	About 5 inches.	
Hills surrounding Kargil	2 (9th and 15th.)	1 inch.	At the end of the month about 4 feet snow still remained unmelted.
Skardu	...	...	No snow fell.
Leh	Some light falls.	...	By the end of the month the snow-line had retreated to 15,000 feet.

IV.—PUNJAB.

(*a*) *Chamba.*—During the first half of the month snowfall was of almost daily occurrence on elevations above 10,500 feet. On May 11th the snowline came down to 9,100 feet where the fall was estimated at about 5″. It is reported that the passes at 14,000—15,000 remained closed until an unusually late date.

(*b*) *Kangra.*—The Assistant Commissioner has kindly furnished the following information: "In both Kulu and Saraj the weather was very disturbed from the 2nd to the 11th, there being during that time two distinct periods of heavy rain and snowfall with an interval of 3 days in the middle. The weather on the top of the Jalori range where I was in camp was most abnormally hot from 30th April to 2nd May when heavy warm rain fell for several hours. On the evening of the 6th there was a violent storm of wind in outer Saraj and in the Sutlej valley at Luri. From the 7th to 11th inclusive rain fell daily and the temperature grew colder and was finally on the 10th to 12th most abnormally cold. Snow fell on the 11th in outer Saraj down to 8,000 feet. At 10,000 feet on the Jalori there was a foot of new snow on the 11th. After that date normal conditions reasserted themselves and the weather has been practically cloudless and very hot ever since. The storm of the 7th to 11th occurred all over Kulu and Saraj. There are still heavy accumulations of snow on the Rotang pass. The winter has been severe in Lahaul and Spiti as well as in Kulu and Saraj."

(*c*) *Kilba* (Simla Hills).—On the ranges near Kilba snowstorms occurred on the 7th, 8th, 9th, 10th and 11th. The first fall descended to 7,500 feet, and the last to 9,000 feet. At the end of the month there was an accumulation of about 6 feet on the Rupan pass.

The fall of the 11th appears to have extended over a large area, for snow to a depth of about 3″ was recorded on that day at Narkanda (elevation 9,000 feet).

According to the Conservator of Forests the winter was exceptionally severe, and at the end of May snow lay in dense masses in the upper Dodrakwar region. The graziers had not taken their flocks to the upper Alpine pastures.

V.—UNITED PROVINCES.

(*a*) *Garhwal.*—Snow fell to a depth of about 2 feet on the peaks above 10,000 feet in elevation.

(*b*) *Almora.*—During the first twenty-four days snow fell to a total depth of about 10 feet in Byans, 3½ feet in Chaudas and Malla Darma, 1¼ feet in Malla Johar and 3 inches in Malla Danpur.

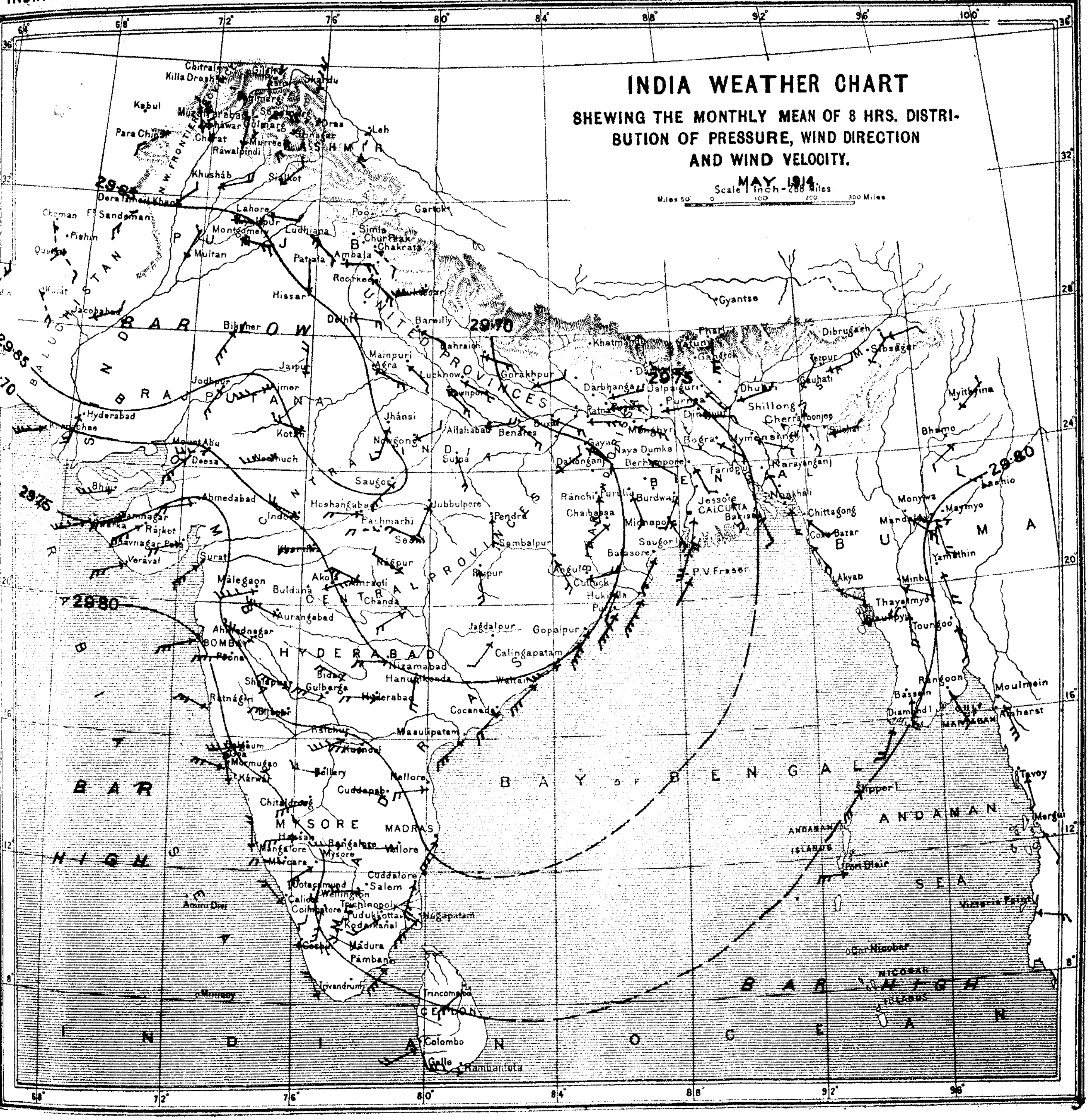
TABLE 18.

Name of pass or peak.	DEPTH OF ACCUMULATION IN THE LAST WEEK OF MAY.			
	Reported.		Normal.	
	Feet.	Inches.	Feet.	Inches.
Nuwe pass	24	0	17	10
Pindari peak	0	3	1	0
Kaphini ,,	0	3	1	0
Kuntela ,,	0	3	1	0
Untadhura	1	3	9	6
Ralamdhura	1	3	6	3
Milamdhura	0	3	7	6
Lipulekh pass	7	0	8	7
Lampia ,,	14	0	10	4
Binkaru ,,	10	0	22	0

SUMMARY.

16. Heavy snow fell in the Punjab Himalayas down to very low levels during the first eleven days of May, but in other parts of the mountain zone bordering upper India the snowfall of the month was either up to the average or even considerably below it. But little direct information is available in regard to the depth of the unmelted residue of winter accumulations. It seems however probable that the accumulations existing in the beginning of June were in slight defect in the North-West Frontier Province, Kashmir and the United Provinces, roughly normal in Baluchistan and Afghanistan, in slight excess in north-east India, and in very large excess in the Punjab.

HEM RAJ.



The lines of the above chart represent isobars or lines of equal barometric pressure, the numbers attached indicating the barometric pressure in inches and being drawn for differences of pressure of ·05 inch. The isobars in the Bay of Bengal are filled in by means of the shore observations, and by comparison with the normal distribution of pressure.

The mean 8 hrs. wind directions of the month are shewn by means of arrows flying with the wind, and are calculated by means of Lambert's formula applied to the winds as given in Table B of the 8 hrs. observations. The mean wind directions for the hill stations are indicated by broken arrows to distinguish them from the wind arrows for the plain stations. The mean velocity of the winds during the month is shewn by the following notation:—

Velocity of	0 to 2 miles per hour	...	one feather added to the wind arrow.
,, ,,	2 to 5 ,, ,, ,,	...	two feathers ,, ,, ,, ,,
,, ,,	5 to 10 ,, ,, ,,	...	three ,, ,, ,, ,, ,,
,, ,,	10 to 20 ,, ,, ,,	...	four ,, ,, ,, ,, ,,
	over 20 ,, ,, ,,	...	five ,, ,, ,, ,, ,,

Wind strengths are based on factor 2·2 for the standard type of Beckley Robinson anemograph, instead of 3·0 as used for this plate up to December 1911 inclusive.

The chart shows the departure from normal of the mean during the month of 8 hrs. pressure by means of lines drawn for equal amounts of departure. The numbers are given in thousandths of an inch, 20 representing ·020″ or two hundredths of an inch, &c. Continuous lines indicate that the pressure was in excess by amounts indicated by the numbers attached to the lines, and broken or dotted lines that it was in defect by amounts indicated by the numbers attached to the lines. Two parallel lines near to each other, one continuous and the other broken or dotted, represent the line of no departure, the dotted line facing the area of deficient pressure or negative departures.

CHART SHEWING THE DEPARTURE FROM NORMAL
OF THE MONTHLY MEAN OF DAILY
MAXIMUM TEMPERATURE.

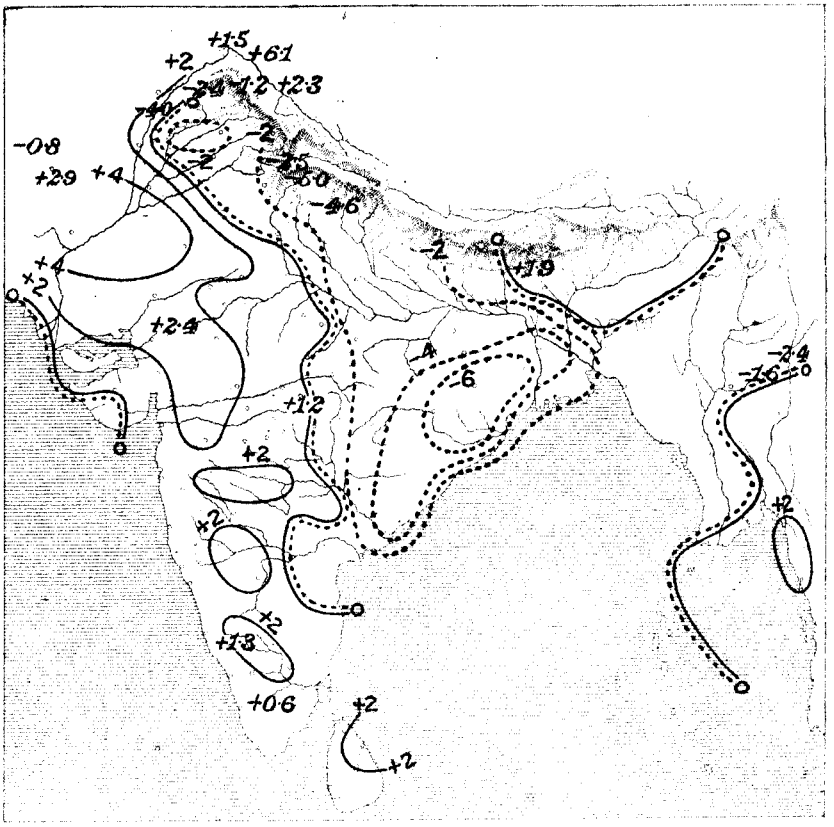


CHART SHEWING THE DEPARTURE FROM NORMAL
OF THE MONTHLY MEAN OF DAILY
MINIMUM TEMPERATURE.

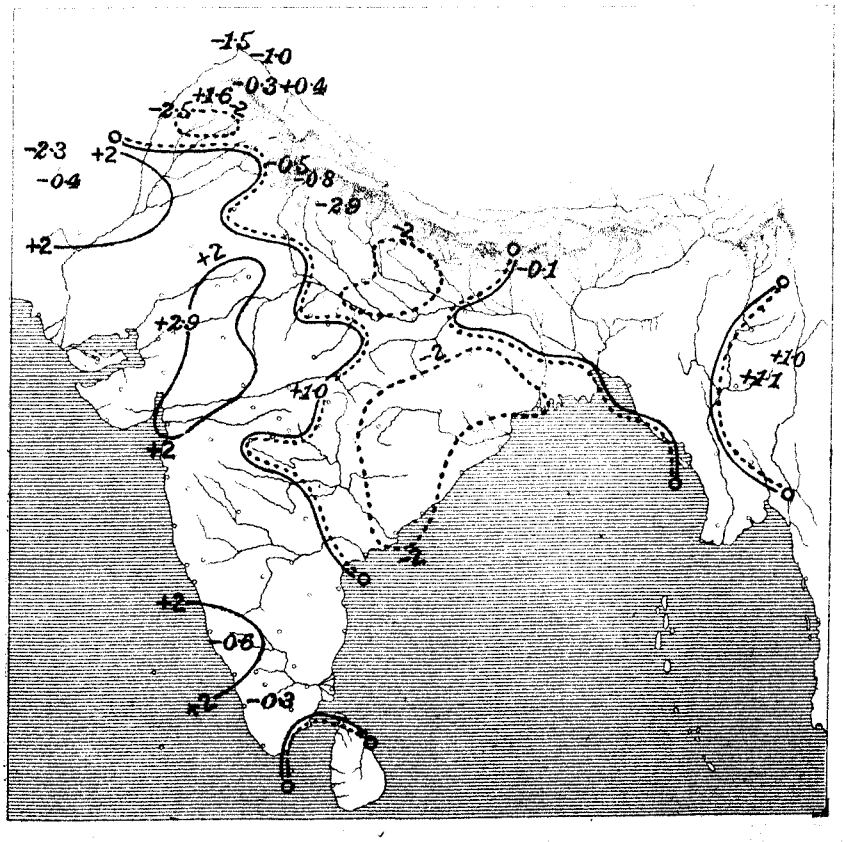


CHART SHEWING THE DEPARTURE FROM NORMAL
OF THE MONTHLY MEAN OF DAILY
MEAN TEMPERATURE.

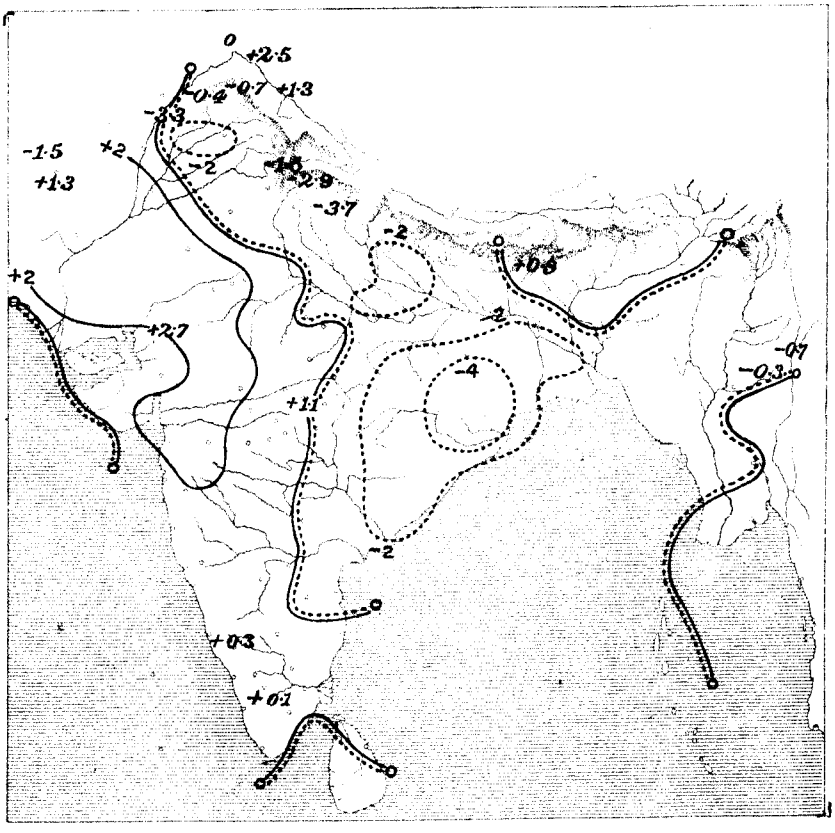


CHART SHEWING THE DEPARTURE FROM NORMAL
OF THE MONTHLY MEAN OF ABSOLUTE
HUMIDITY AT 8 HRS.

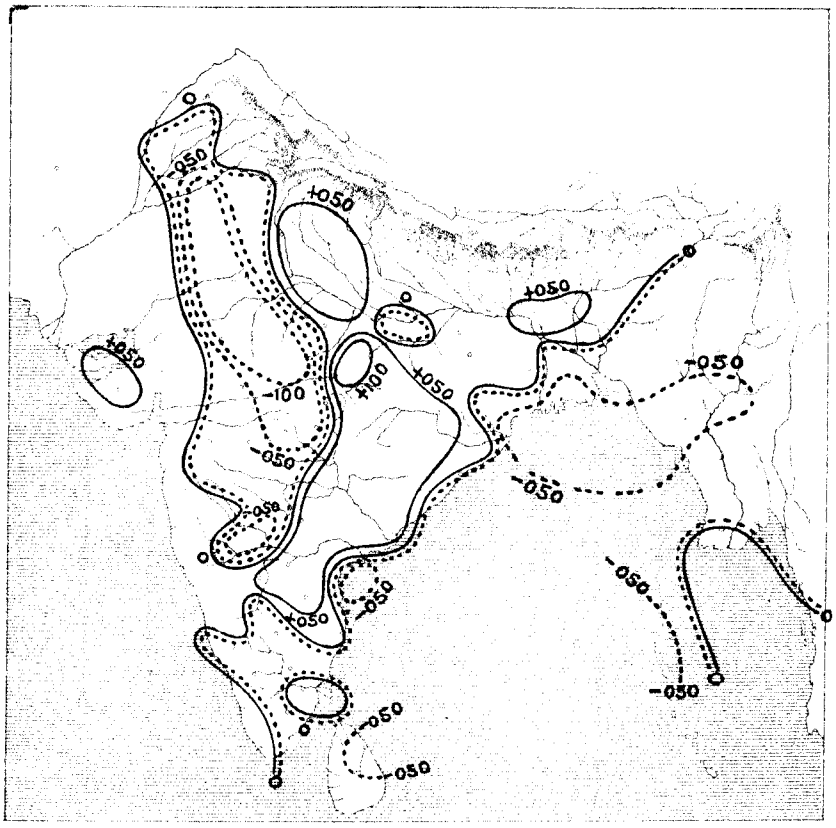


CHART SHEWING THE DEPARTURE FROM NORMAL
OF THE MONTHLY MEAN OF RELATIVE
HUMIDITY AT 8 HRS.

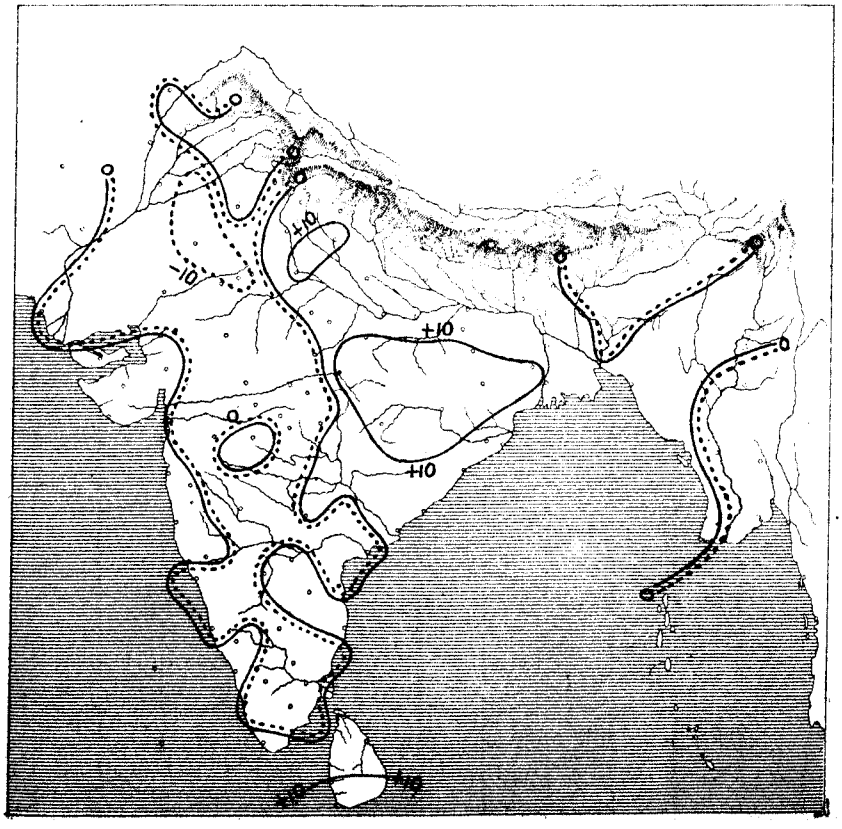


CHART SHEWING THE DEPARTURE FROM NORMAL
OF THE MONTHLY MEAN OF CLOUD
AMOUNT AT 8 HRS.

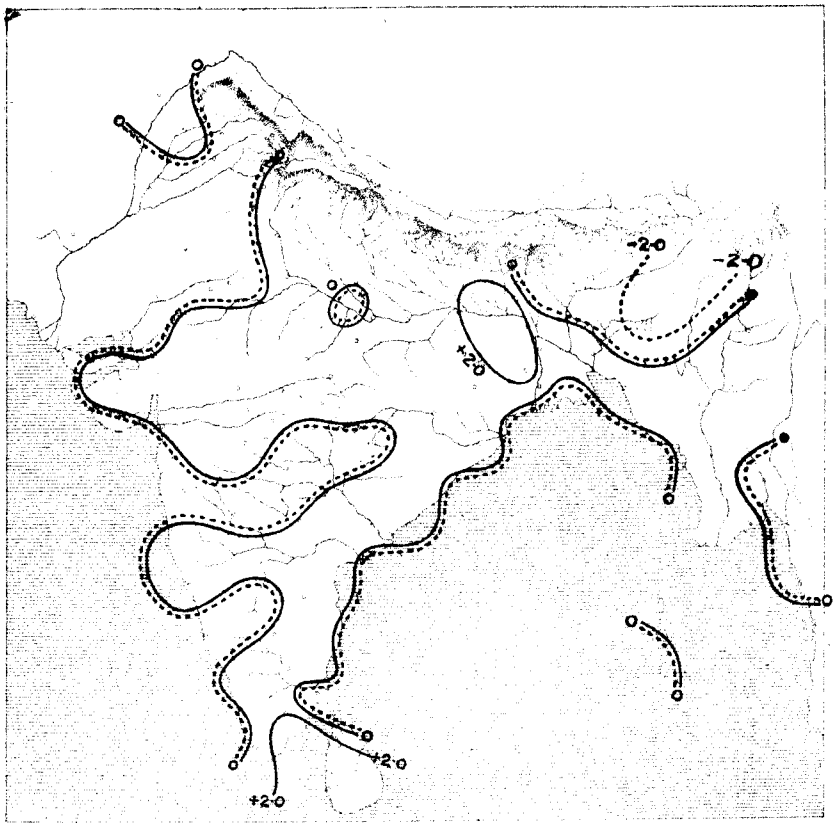
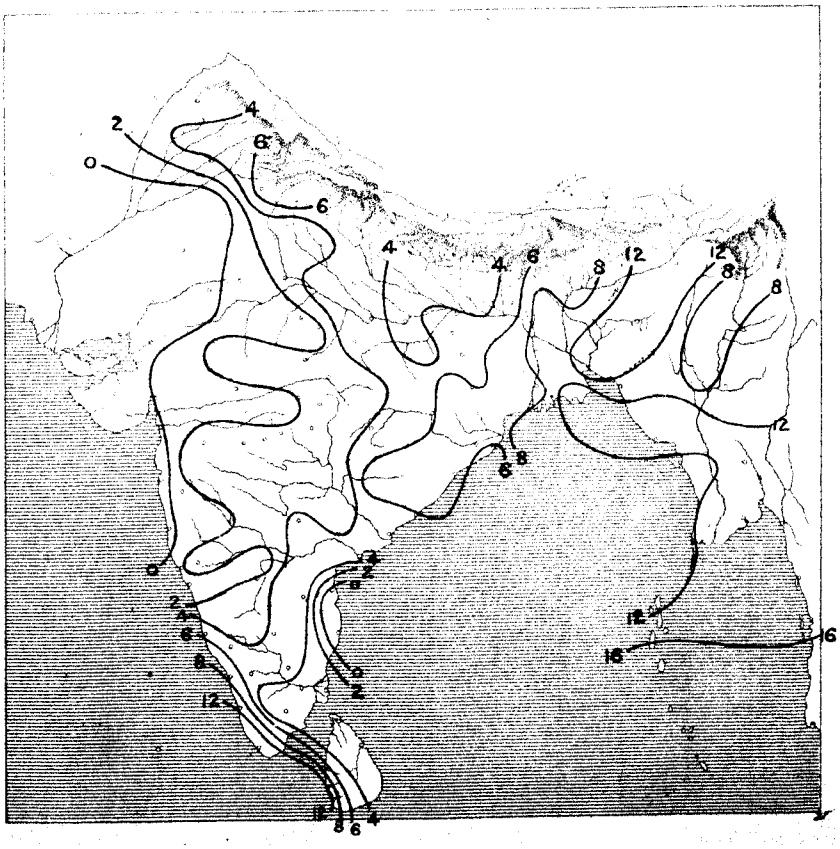
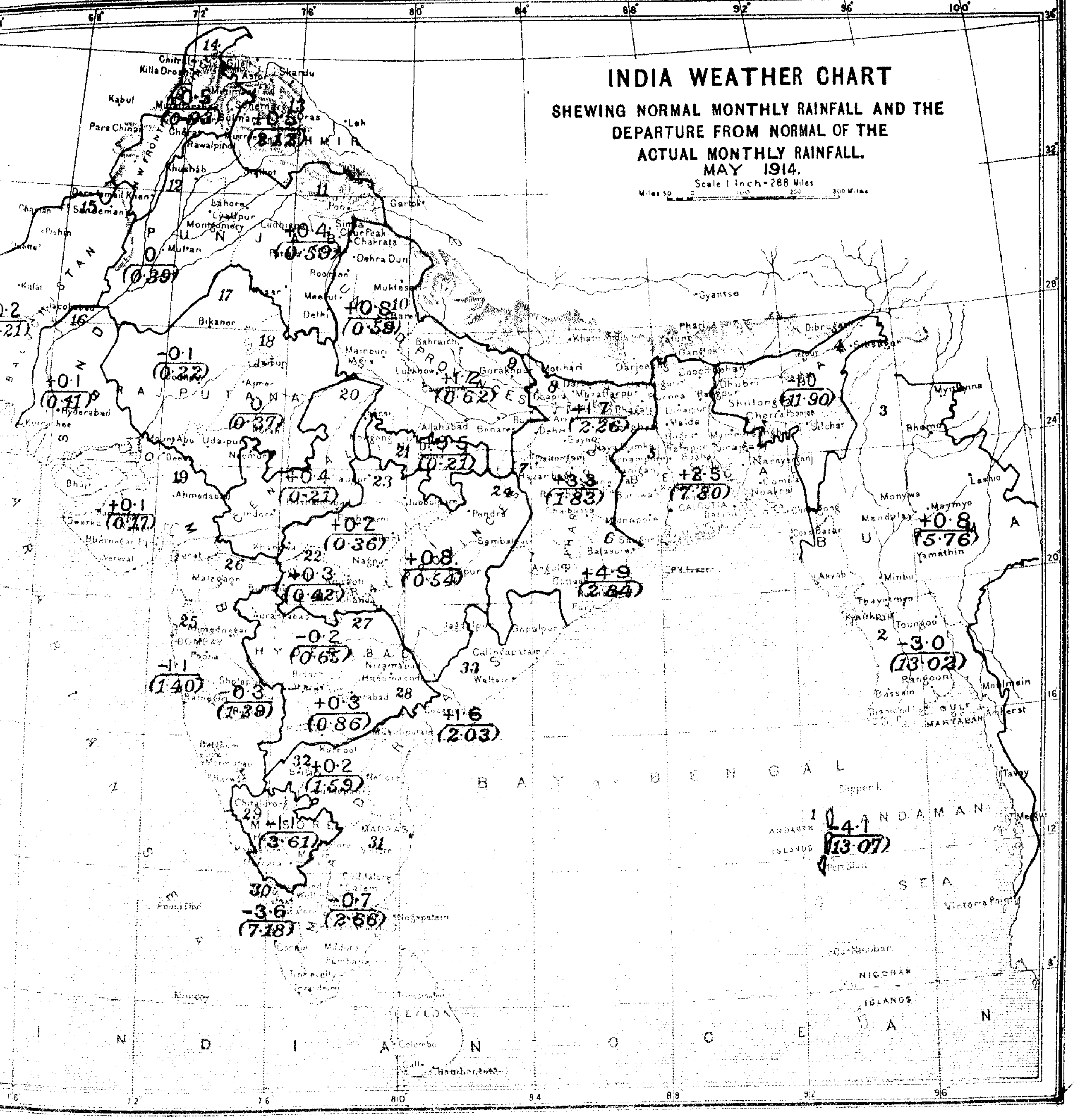


CHART SHEWING THE TOTAL NUMBER OF DAYS IN THE
MONTH ON WHICH RAINFALL EQUALLED OR
EXCEEDED 0·10 INCH
(BASED ON THE RETURNS OF TABLE B.)





The country is divided into 33 areas as shewn in the list below. The numbers in that list correspond with the red numbers on the chart, nd serve to identify the areas. The numbers in brackets on the chart give the average over the divisions of the normal monthly rainfall, he numbers above these give the departures from normal of the average actual rainfall over the divisions.

Bay Islands
Lower Burma
Upper Burma
Assam
Bengal
Orissa
Chota Nagpur
Bihar
United Provinces, East
10. United Provinces, West
11. Punjab, East and North
12. Do., Southwest
13. Kashmir
14. Northwest Frontier Province
15. Baluchistan
16. Sind
17. Rajputana, West
18. Rajputana, East
19. Gujarat
20. Central India, West
21. Do., East
22. Berar
23. Central Provinces, West
24. Do., East
25. Konkan
26. Bombay, Deccan
27. Hyderabad, North
28. Hyderabad, South
29. Mysore
30. Malabar
31. Madras, Southeast
32. Madras, Deccan
33. Madras Coast, North

GOVERNMENT OF INDIA.

METEOROLOGICAL DEPARTMENT.

MONTHLY WEATHER REVIEW

PUBLISHED BY ORDER OF

THE GOVERNMENT OF INDIA.

CALCUTTA, JUNE, 1914.

INTRODUCTION.

THIS review of the weather in India during the month of June, 1914, is based on observations taken daily at 8 hrs. at 218 stations, and on additional observations taken at 10 hrs. and 16 hrs. at 14 stations. In the rainfall summary have been utilized the data furnished by the meteorological observatories, and such rainfall statements of the month as had been published by the Provincial Governments up to the date of the preparation of the review. The brief notes on solar, seismic and magnetic disturbances are supplied by the chief observatories in the Indian area.

For a statement of the methods adopted in recording and tabulating the data, for each of the elements of observation, reference should be made to the introductory portion of the review for January.

Summary of the chief features of the weather in India during the month.

2. The Arabian Sea monsoon appeared on the west coast of the Peninsula on the 4th June but did not penetrate freely inland until about the 23rd. In north-east India a strong burst of rainfall occurred about the middle of June, but it was not till the end of the month that the Bay current established itself there. Accordingly the total rainfall of June was deficient in all the larger provinces with the exception of Burma, Bombay, Hyderabad, the Central Provinces, Sind, Rajputana and the North-West Frontier Province; in the last two areas the fall was in part at least caused by unseasonal disturbances of the cold weather type.

Temperature was nearly normal, except in Kashmir and Baluchistan where it was higher than usual. There was decidedly less cloud than usual in north-east India, the United Provinces, Rajputana, Hyderabad and Mysore, and in the last named area as well as in Assam and the United Provinces humidity was also appreciably in defect.

Barometric pressure averaged over the whole of the plains of India was ·015″ in excess of the normal.

Solar, seismic and magnetic disturbances.

KODAIKANAL OBSERVATORY.

3. *Solar Observations.*—The sun was examined for spots and faculæ on all the days during the month except on the 6th when the sky was cloudy. Prominences could not be observed on 6 days.

Sun spots.—Four new groups of spots were recorded in June as against 7 in May. However, the daily average number rose slightly to 0·8 as the average life of a spot had risen from 1·9 days in May to 6·0 days in June. All the spots were small except No. 2070 which grew to a moderate size and was visible on the sun from the 12th to 22nd. On several days its spectrum indicated disturbance. Spot No. 2069 was considerably disturbed on the 9th. The spots

continue to favour high latitudes and their distribution was as follows :—

TABLE 1.

...	0—10	11—20	21—30	31—40	Mean latitude.	Extreme latitudes.
North . .	...	...	1	...	28°	28°
South . .	...	1	1	1	24·3°	16° & 35°

Prominences.—Thirty-five large prominences were recorded during the month as against 50 in May. The highest photographed on the 11th, at latitude 40° E. reached 180″. No eruptive or metallic prominences were observed.

Magnetic disturbances.—"Moderate" disturbances were recorded on the following dates :—

1st, 19th to 21st and 25th to 30th.

Seismic records.

$\phi = 10°\ 13'\ 50''$; $\lambda = 77°\ 28'\ 00''$; $h = 2343$ m. *Subsoil* Rock.

Apparatus.—Milne's Horizontal Pendulum Seismograph.

TABLE 2.

	V	To	ϵ	$\frac{r}{To^2}$
AN:				
AE:		16·4	1	2·9
AZ:				

Date.	Phase.	Time G. M. T.	Period (Sec.)	Amplitude (u). AN.	AE.	AZ.	Distance Δ (Km.)	Remarks.
1914.		h. m. s.						
June 20th	e P	7 43 36	...	...	...	...	...	
	i L	8 9 6	...	...	...	...	...	
	M	8 23 36	...	...	270	...	...	
	F	9 59 42	...	...	...	...	...	
„ 20th	e P	11 20 18	...	...	...	...	...	
	e L	11 23 18	...	...	...	...	...	
	M	11 26 54	...	...	50	...	...	
	F	11 54 6	...	..	...	...	...	
June 25th	i L	19 12 42	...	...	...	...	...	No P.T.
	M	19 25 12	...	...	900	...	...	
	F	?	...	...	...	...	...	End lo in a tremor
„ 26th	e P	5 14 48	...	...	...	...	...	
	e L	5 38 36	...	...	...	...	...	
	M	5 53 48	...	...	150	...	...	
	F	?	...	...	...	...	...	
„ 26th	P	?	...	...	...	...	...	
	e L	6 52 0	...	...	...	...	...	
	M	6 56 36	...	...	40	...	...	
	F	7 15 24	...	...	...	...	...	

T. ROYDS,
for *Director*,

Kodaikanal and Madras Observatories

BOMBAY OBSERVATORY

Alibag magnetic record.

4. During the month of June 1914 the traces showed 13 calm days, 16 days of small and 1 day of moderate disturbance.

The days of the month selected as quiet for the purpose of the Magnetic Survey of India are the 5th, 11th, 14th 18th and 24th.

The following table represents the magnetic character on each day during the month.

TABLE 3.

Day.	Character.	Day.	Character.	Day.	Character.	Day.	Character.
1	M	9	S	17	C	25	S
2	S	10	C	18	C	26	S
3	S	11	C	19	S	27	S
4	C	12	C	20	S	28	S
5	C	13	C	21	S	29	S
6	S	14	C	22	C	30	S
7	S	15	S	23	C	...	...
8	S	16	C	24	C	...	...

C = calm ; S = small ; M = moderate ; G = Great ; V. G. = very great.

The mean observed absolute values of the several magnetic elements reduced to the mean monthly tabulations of the magnetograms, as also the ranges and the summed ranges of the horizontal force and declination for the month are as follow :—

Easterly declination . . .	0° 44′ 23″
Horizontal force	0·36885 C.G.S. unit.
Vertical force	0·16581 „ „
Inclination	24° 12′·3
Horizontal force range . . .	0·00039 C.G.S. unit.
Horizontal force summed range .	0·00273 „ „
Declination range . . .	4′·4
Declination summed range . .	19′·1

(NOTE.—Summed range means sum without regard to sign of the 24 ordinates of the diurnal inequality.)

Seismic records.

$\phi = 18° 53′ 36″$; $\lambda = 72° 48′ 56″$; $h = 11$ m. *Subsoil* Trap.

Apparatus.—Milne's Horizontal Pendulum Seismograph.

TABLE 4.

	V	To	ϵ	$\frac{r}{To^2}$
AN :				
AE :	9	18	1	
AZ :				

Date.	Phase.	Time, G. M. T.	Period (Sec.)	Amplitude (u) An.	Ae.	Az.	Distance Δ (Km.)	Remarks.
1914		h. m. s.						
June 20th	P	7 38 56	...	...	...	...	...	
	M	8 30 52	...	...	67	...	...	
	F	9 8 11	...	...	...	...	...	
„ 25th	P	19 13 13	...	...	...	...	...	
	M	19 29 51	...	...	844	...	...	
	F	20 51 1	...	...	...	...	...	

Thickening of line was noted on the following occasions :—

D. H. M. D. H. M. D. H. M. D. H. M. D. H. M.
3 7 55; 6 10 3; 23 13 19; 24 7 28; 28 23 33;

Sensibility to tilt 1·0 mm. of amplitude on the trace = 0·50″ from 1st to 26th and 0·48″ from 29th to 30th June 1914.

N. A. F. MOOS,
Director,
Bombay and Alibag Observatories.

5. CALCUTTA (ALIPORE) OBSERVATORY.

Seismic records.

$\phi = 22° 32′$ N ; $\lambda = 88° 21′ 0″$; E $h = 6·4$ m. *Subsoil* Alluvial.

Apparatus.—Milne's Horizontal Pendulum Seismograph.

TABLE 5.

	V	To	ϵ	$\frac{r}{To^2}$
AN :				
AE :	8·688	18	1	
AZ :				

Date.	Phase.	Time, G. M. T.	Period (Sec.)	Amplitude (u). An.	Ae.	Az.	Distance Δ (Km.)	Remarks.
1914.		h. m. s.						
June 20th	P	7 25 44	...	...	..	...	...	
	S	7 42 30	...	...	...	...	...	
	L	8 6 27	..	...	...	...	...	
	M	8 12 2	...	...	201	...	...	
	F	10 5 30	...	..	...	...	...	
„ 25th	L	19 11 53	...	...	...	...	...	
	M	19 22 3	...	...	*	...	...	* As the boom moved throughout the trace several times its amplitude cannot be given.
	F	—(a)	...	...	...	...	...	(a) end in morning air tremors.
„ 26th	P	5 13 13	...	...	...	...	...	
	M	5 49 51	...	..	57	...	..	
	F	6 57 0	...	...	...	...	...	

E. P. HARRISON,
Offg. Meteorologist, Calcutta.

6. SIMLA OBSERVATORY.

The Simla seismograph notes will appear in a future number of the review.

Following table contains a list of earthquakes that were reported :—

TABLE 6.

Place at which felt.	Date.	G. M. T. of earthquake.	Duration.	Intensity Rossi-Forel scale.	No. of shocks.
	June.	h. m.	Sec.		
Khandwa . . .	1st	7 20	1	3	1
Tobat (Meshed) . .	8th	10 30	2	6	1
Simla	12th	1 14	2	4	1
Gulmarg (Kashmir) .	21st	19 1	8	5	1
Srinagar . . .	22nd	6 40	4	5	1
Jodhpur . . .	28th	17 33	10	4	1
Drosh	29th	3 15	20	4	1

Solar radiation.—The following figures give the intensity of solar radiation, as measured at Simla by Angstrom's pyrheliometer. The values are corrected to local noon, and expressed in grammecalories per square centimetre per minute :—

Maximum	1·29
Minimum	1·05
Mean	1·15
Number of days of observation .	3

C. W. NORMAND,
Imperial Meteorologist, Simla.

7. ROYAL ALFRED OBSERVATORY, MAURITIUS.

No information has been received.

Weather in the Indian Ocean.

8. In the west of the equatorial belt as represented by Zanzibar and Seychelles pressure was somewhat low. Winds were normal as regards velocity in both places, but at Seychelles their direction was considerably more easterly than usual. Rainfall was in defect. In the open sea, according to the scanty information available winds were very unsteady during the first half of the month and remarkably steady and strong thereafter.

In the south of the Indian Ocean pressure was very nearly normal.

TABLE 7.

——	Mauritius	Zanzibar.	Seychelles.
Departure from normal of mean pressure	—·006	—·022	—·010
Actual mean wind direction . .	S 63° E	S 16°W	S 50° E
Normal mean wind direction . .	S 63° E	S 13° W	S 27° E
Actual mean wind velocity (miles per diem.)	200	153	183
Normal mean wind velocity (miles per diem.)	174	154	188
Rainfall departure from normal . .	+2·85	—0·91	—0·59

Depression and cyclonic storms.

9. During the month under review two storms were developed over the Bay of Bengal, but in the Arabian Sea, although low pressure conditions appeared on two occasions, there is no evidence that a storm actually formed.

The first of the two storms was in course of formation over the north of the Bay of Bengal at the close of the previous month. It underwent a rapid development on the 1st, and on the morning of the 2nd had a definite centre in about Lat. 18½° and Long. 88¾° where the barometer stood nearly two-fifths of an inch below the normal. According to the available marine information the disturbance deepened still further during the day and travelled roughly in an east by north direction over a distance of about 250 miles. No ships were involved in the central area, but judging from the coast observations it is very probable that barometric pressure there was at least three-fourths of an inch in defect of the normal. The storm crossed the coast apparently between Akyab and Kyaukpyu during the afternoon and was soon after broken up by the Arakan Yoma.

The greatest strength of the winds actually recorded in the storm area was 10 (Beaufort scale), but it is almost certain that the storm was a severe disturbance, and may

ave been a true cyclone with a calm centre. It was particularly noteworthy for its unusual easterly course.

The second storm in the Bay originated off the coast of Orissa on the 22nd and 23rd in front of the permanent advance of the monsoon. It crossed inland between Puri and Gopalpur in the afternoon on the 24th and marching westwards along a line joining Gopalpur and Hyderabad Sind) disappeared over Baluchistan on the 30th. Barometrically it was feeble — the defect of pressure in the centre at no time exceeding three-tenths of an inch, but it was the cause of very heavy rain to the south of its track, and more especially in Hyderabad.

In the Arabian Sea low pressure conditions prevailed off the Konkan coast from the 13th to the 15th and off the Kathiawar coast from the 21st to the 23rd, but they failed to develop.

Pressure.

10. The barometer stood below its normal height in Lower Burma and in the coast districts of the Peninsula between Cocanada and Dwarka, but in nearly all other parts of the country atmospheric pressure was greater than usual.

The excess was most pronounced in the Indo-Gangetic plain where it ranged between ·03″ and ·05″.

TABLE 8.

DIVISION.	Departure from normal of mean 8 hrs. pressure.
	″
Burma	−·006
Assam	+·015
Bengal	+·029
Bihar and Orissa	+·033
United Provinces	+·032
Punjab	+·035
North-West Frontier Province	+·007
Sind	+·021
Rajputana	+·015
Bombay	−·002
Central India	+·023
Central Provinces	+·016
Hyderabad	+·001
Mysore	+·014
Madras	+·005

The vertical distribution was characterized by much irregularity, but was on the whole very nearly normal.

TABLE 9.

HILL STATION.	Departure from normal pressure. A	PLAIN STATION.	Departure from normal pressure. B	Departure of pressure difference. B—A
	″		″	″
Quetta	+·025	Jacobabad	+·030	+·005
Leh	+·035	Lahore	+·041	+·006
Murree	+·027	Peshawar	+·009	−·018
Simla	+·047	Ludhiana	+·050	+·003
Chakrata	+·057	Roorkee	+·040	−·017
Darjiling	0	Dhubri	+·019	+·019
Mount Abu	+·024	Deesa	+·008	−·016
Pachmarhi	+·025	Khandwa	+·009	−·016
Kodaikanal	+·003	Madura	+·018	+·015

Temperature.

11. Temperature, both by day and night, was appreciably above the average in Kashmir and Baluchistan and by day alone in Mysore, but elsewhere the temperature conditions of the month differed little from the normal.

Temperature was below normal to a remarkable extent over the greater part of northern and central India from the 4th to the 9th, but was higher than usual in north-west and central India from the 13th to the 16th, and in the Punjab and the United Provinces from the 26th to the end of the month. At Peshawar a maximum temperature was recorded on the 16th of 120°, which is the highest on record for that station.

TABLE 10.

SUB-DIVISION.	ACTUAL TEMPERATURE.					DEPARTURE FROM NORMAL OF		
	Mean maximum.	Mean minimum.	Monthly mean of mean between maximum and minimum.	Mean daily range of temperature.	Absolute range during month.	Maximum	Minimum.	Daily range.
	°	°	°	°	°	°	°	°
1. Bay Islands	85·0	77·9	81·5	7·1	15·3	—0·4	+0·2	—0·6
2. Lower Burma	85·2	75·4	80·3	9·8	19·4	—0·7	—0·2	—0·5
3. Upper Burma	88·9	75·3	82·1	13·6	24·9	—2·1	—0·2	—1·9
4. Assam	90·2	76·5	83·3	13·7	24·6	+1·6	+0·7	+0·9
5. Bengal	89·9	77·7	83·8	12·2	22·3	+0·6	—0·3	+0·9
6. Orissa	92·8	78·6	85·7	14·2	28·1	—0·9	—1·1	+0·2
7. Chota Nagpur	95·3	77·1	86·1	18·1	30·8	—0·9	—0·8	—0·1
8. Bihar	97·3	79·4	88·3	17·9	32·2	+1·5	0	+1·5
9. United Provinces, East	102·0	82·1	92·0	19·9	42·1	+2·3	+1·0	+1·3
10. Do. West	102·8	82·3	92·5	20·5	42·9	0	—0·3	+0·3
11. Punjab, East and North	102·9	81·1	92·0	21·9	46·0	—1·0	+0·5	—1·5
12. Do., South-west	107·2	83·6	95·4	23·6	43·7	—1·0	+1·1	—2·1
13. Kashmir	81·9	55·7	68·8	26·1	45·8	+4·5	+3·3	+1·2
14. North-West Frontier Province	107·3	80·5	93·9	26·8	45·1	+0·4	+1·3	—0·9
15. Baluchistan	100·5	73·8	87·1	26·7	42·1	+3·0	+3·9	—0·9
16. Sind	102·5	83·7	93·1	18·9	33·2	—0·1	+0·8	—0·9
17. Rajputana, West	103·7	81·9	92·8	21·8	42·1	—1·4	—0·8	—0·6
18. Do., East	102·1	81·3	91·9	20·8	41·1	+0·1	—0·4	+0·5
19. Gujarat	95·1	79·9	87·5	15·3	26·8	—0·5	—0·3	—0·2
20. Central India, West	96·1	75·1	85·7	20·9	36·9	—0·3	—1·1	+0·8
21. Do. East	101·1	81·9	91·5	19·1	38·9	+0·9	+0·2	+0·7
22. Berar	95·4	75·4	85·4	20·0	34·7	—0·1	—1·0	+0·9
23. Central Provinces, West	97·1	76·9	87·0	20·3	37·5	0	—1·1	+1·1
24. Do., East	95·3	76·9	86·1	18·5	34·7	—0·1	+0·1	—0·2
25. Konkan	87·4	78·1	82·8	9·3	18·7	+0·8	+0·4	+0·4
26. Bombay Deccan	91·7	72·5	82·1	19·2	33·1	+1·5	+0·3	+1·2
27. Hyderabad, North	94·2	74·1	84·1	20·1	38·1	+0·1	—0·1	+0·2
28. Do., South	95·5	76·3	85·9	19·2	37·3	+0·1	+0·7	—0·6
29. Mysore	87·2	68·1	77·7	19·1	30·2	+3·6	+0·5	+3·1
30. Malabar	85·2	75·5	80·3	9·7	18·1	+0·7	+1·4	—0·7
31. Madras, South-east	93·3	79·0	86·6	19·3	31·3	+2·1	+1·3	+0·8
32. Do. Deccan	98·4	77·9	88·2	20·5	32·4	+1·3	+0·2	+1·1
33. Do. Coast, North	95·2	80·3	87·8	14·9	29·7	+1·3	—0·1	+1·4

TABLE 11.

DIVISION.	DEPARTURE FROM NORMAL OF		
	Mean maximum temperature.	Mean minimum temperature.	Mean temperature.
	°	°	°
Burma	−1·2	−0·2	−0·7
Assam	+1·6	+0·7	+1·1
Bengal	+0·6	−0·3	+0·2
Bihar and Orissa	+0·4	−0·4	0
United Provinces	+1·6	+0·5	+1·1
Punjab	−1·0	+0·7	−0·1
North-West Frontier Province	+0·4	+1·3	+0·9
Sind	−0·1	+0·8	+0·4
Rajputana	−0·4	−0·5	−0·5
Bombay	+0·4	0	+0·2
Central India	+0·3	−0·5	−0·1
Central Provinces	0	−0·8	−0·4
Hyderabad	+0·1	+0·5	+0·3
Mysore	+3·6	+0·5	+2·0
Madras	+1·5	+0·8	+1·1

Winds.

12. (*a*) The air movement was lighter than usual in the greater part of northern and central India and also in Bombay: the weakness was most marked on the whole in Sind and Bengal where the recorded velocity of the wind was at least 35 per cent. below the normal.

(*b*) The degree of steadiness was very low in north-east India, Sind, Central India and the Central Provinces, and high in the United Provinces, the Punjab and the North-West Frontier Province.

(*c*) In the region defined by Benares, Allahabad, Cawnpore and Mainpuri the mean direction of air movement was very nearly due south, the normal being from between east and north-east. At the level of Darjiling and of Cherat the direction was west-south-west instead of east, which is normally the case.

TABLE 12.

DIVISION.	DEPARTURE FROM NORMAL OF	
	Hourly wind velocity.	Wind steadiness.
Burma	−0·3	− 4
Assam	−0·3	−11
Bengal	−1·7	−23
Bihar and Orissa	−0·5	−18
United Provinces	−0·6	+ 7
Punjab	+0·2	+ 5
North-West Frontier Province	−0·6	+ 5
Sind	−3·9	−14
Rajputana	−0·6	− 3
Bombay	−1·1	− 5
Central India	−1·5	−17
Central Provinces	−0·3	−16
Hyderabad	+1·2	− 4
Mysore	+0·8	+ 1
Madras	+0·2	+ 6

Humidity and cloud.

13. The air was slightly damper than usual in north-west India excluding Rajputana, but elsewhere humidity was either normal or in defect.

Except in Burma, Baluchistan and parts of the Punjab and of the North-West Frontier Province the quantity of cloud was in general below the normal. The defect was most marked in Assam.

TABLE 13.

DIVISION.	HYGROMETRY; 8 HRS.				CLOUD.	
	Mean humidity.	Departure from normal.	Mean vapour tension in inches of mercury.	Departure from normal in inches of mercury.	Mean cloud amount at 8 hrs.	Departure from normal.
	%					
Burma . .	89	+1	·874	—·013	8·0	+0·4
Assam . .	85	—7	·905	—·021	4·6	—3·2
Bengal . .	85	—3	·942	—·013	6·2	—1·2
Bihar and Orissa .	76	—3	·880	—·011	5·0	—0·9
United Provinces .	59	—8	·799	—·013	3·4	—1·4
Punjab . .	53	+1	·723	+·040	3·0	+0·
North-West Frontier Province.	53	+3	·735	+·041	1·9	+0·
Sind . . .	74	+4	1·017	+·075	3·4	0
Rajputana . .	56	0	·731	—·019	2·7	—1·
Bombay . .	78	+1	·852	+·011	6·3	—0·
Central India .	64	—1	·732	—·021	4·9	0
Central Provinces	68	+1	·735	—·004	5·0	—0·
Hyderabad . .	69	0	·698		5·9	—1·
Mysore . .	76	—5	·632	—·021	6·9	—0·
Madras . .	70	—2	·8 ·2	—·013	6·1	—0·

Rainfall.

14. The Arabian Sea monsoon set in on the west coast of the Peninsula on the 4th, only two days after the normal date, but it was not till the 14th that heavy rain occurred, such as customarily marks its appearance on that coast. Up to the end of the third week of the month it gave rain chiefly on the coast with only occasional incursions inland, but a storm from the Bay crossed the south Orissa coast on the 24th, and, passing across the north of the Peninsula into Sind, caused a full extension inland of the current, which gave heavy rain to the south of the storm's track. The rainfall was particularly heavy in Hyderabad, where falls of from 8 to 16 inches occurred in 24 hours.

In north-east India at the close of the second week of June heavy rain began to fall in Assam, and on the 15th extended over the northern half of Bengal and Bihar. On the 16th rainfall was nearly general in north-east India; but during the next seven days an area of low pressure at the head of the Bay gradually developed into the storm which crossed the south Orissa coast on the 24th, and during its development it had the effect of withdrawing rainfall from north-east India. Even after the storm had ceased to influence the winds in the Bay, rainfall continued very scanty i north-east India, and it was not until the end of the mont that the rains became fully established there.

The rainfall in Assam was very heavy from the 11th t 16th, particularly in the Khasia hills, and was the cause o destructive floods in the Sylhet district. During the fou days ending at eight hours on the 17th Cherrapunji record ed 88 inches of rain, of which 31 inches fell in one day.

The total rainfall of the month was more or less in exces in Burma, the whole of north-west India excluding th Punjab East and North, Central India West, Berar, the Bom bay Presidency, Hyderabad and on the north Madras coast and was in defect over the rest of the country. The record ed fall in Baluchistan was more than three times and in th North-West Frontier Province, Sind, Berar and Hyderaba North more than twice the normal amount for June. The area of largest deficiency comprised the tract of country extending from Assam to the west of the United Provinces, the defect amounting to 6 inches in Assam, 5½ inches in Benga and 4 inches in Chota Nagpur and Bihar.

TABLE 14.

SUB-DIVISION.	NUMBER OF RAINY DAYS.		RAINFALL.			
	Actual.	Normal.	Actual.	Normal.	Departure from normal.	Percentage departure from normal.
			"	"	"	
Bay Islands	17·5	19·1	15·76	17·63	—1·87	— 11
Lower Burma	22·5	22·5	32·37	25·94	+6·43	+ 25
Upper Burma	12·9	10·6	12·00	7·53	+4·47	+ 59
Assam	10·7	17·7	11·75	17·90	—6·15	— 34
Bengal	9·9	14·0	8·85	14·29	—5·44	— 38
Orissa	11·0	10·6	8·60	8·84	—0·24	— 3
Chota Nagpur	6·9	9·6	4·08	8·15	—4·07	— 50
Bihar	5·2	8·6	3·75	7·80	—4·05	— 52
United Provinces, East	2·6	5·4	1·40	4·84	—3·44	— 71
Do., West	4·3	4·8	2·41	4·03	—1·62	— 40
Punjab, East and North	3·4	2·9	2·05	2·18	—0·13	— 6
Punjab, South-west	1·9	1·5	1·18	0·80	+0·38	+ 47
Kashmir	4·5	3·8	3·27	2·14	+1·13	+ 53
North-West Frontier Province	2·6	1·7	2·04	0·92	+1·12	+122
Baluchistan	1·7	0·5	0·85	0·25	+0·60	+240
Sind	2·9	0·7	1·54	0·52	+1·02	+196
Rajputana, West	3·5	1·9	2·04	1·26	+0·78	+ 62
Do., East	5·4	3·7	3·34	2·48	+0·86	+ 35
Gujarat	9·1	5·3	9·27	4·78	+4·49	+ 94
Central India, West	8·0	5·7	5·14	4·72	+0·42	+ 9
Do., East	4·3	4·9	2·71	4·31	—1·60	— 37
Berar	10·8	8·0	11·37	5·67	+5·70	+101
Central Provinces, West	8·4	8·5	5·37	6·90	—1·53	— 22
Do., East	8·9	9·5	6·34	8·43	—2·09	— 25
Konkan	19·6	18·3	26·10	25·30	+0·80	+ 3
Bombay Deccan	7·5	8·0	5·93	5·16	+0·77	+ 15
Hyderabad, North	8·3	7·9	11·17	5·46	+5·71	+105
Do., South	8·3	6·9	7·17	4·24	+2·93	+ 69
Mysore	4·7	7·1	2·26	4·77	—2·51	— 53
Malabar	23·0	22·9	26·96	32·95	—5·99	— 18
Madras, South-east	2·7	2·9	1·38	1·53	—0·15	— 10
Do., Deccan	3·9	4·6	1·90	2·49	—0·59	— 24
Do., Coast, North	7·6	6·3	6·88	4·57	+2·31	+ 50

TABLE 15.

DIVISION.	RAINFALL.			
	Actual.	Normal.	Departure from normal.	Percentage departure from normal.
	"	"	"	
Burma	19·98	14·75	+5·23	+35
Assam	11·75	17·90	−6·15	−34
Bengal	8·85	14·29	−5·44	−38
Bihar and Orissa	5·11	8·15	−3·04	−37
United Provinces	1·88	4·45	−2·57	−58
Punjab	1·84	1·84	0	0
North-West Frontier Province	2·04	0·92	+1·12	+122
Sind	1·54	0·52	+1·02	+196
Rajputana	2·98	2·10	+0·88	+42
Bombay	10·63	8·65	+1·98	+23
Central India	3·92	4·51	−0·59	−13
Central Provinces	7·42	7·15	+0·27	+4
Hyderabad	9·17	4·79	+4·38	+91
Mysore	2·26	4·77	−2·51	−53
Madras	5·38	5·39	−0·01	0
Mean of India	7·20	7·04	+0·16	+2

Snowfall.

I.—AFGHANISTAN.

15. No snow fell in the region around Kabul.

II.—NORTH-WEST FRONTIER PROVINCE.

No snowfall is reported to have occurred beyond light falls on the 3rd and 4th in the Kagan valley (Hazara district) on elevations above 12,700 feet.

III.—KASHMIR.

According to the limited information available snow to a depth of about 5 inches fell on the mountains near Skardu, and there was also a light fall on the Affarwata mountains on June 10th. At the close of the month about 2 feet snow still remained unmelted on the higher hills around Kargil.

IV.—PUNJAB.

(*a*) *Chamba.*—But little snow fell even on the higher passes. The accumulations existing at the end of the month were however above the average owing mainly to the heavy fall in April and May.

(*b*) *Kilba* (*Simla Hills*).—On the hills near Kilba snowstorms were recorded on the 3rd, 4th, 5th and 10th; the last two falls descended to a level of about 10,000 feet. At the end of the month the unmelted residue of the winter accumulations on elevations of about 15,500 feet was estimated at about 4 feet.

V.—UNITED PROVINCES.

(*a*) *Garhwal.*—There were snowstorms on the 2nd and 27th on heights above 19,000 feet. A rapid melting of snow is said to have occurred in the beginning of the month.

(*b*) *Almora.*—The total quantity of snow received during the month was estimated at about 4½ feet in Malla Darma, 3½ feet in Byans, 1 foot in Chaudas and Malla Johar and nearly 1½ inches in Malla Danpur.

TABLE 16.

Name of pass or peak.	DEPTH OF ACCUMULATION AT THE END OF THE MONTH.		
	Reported.		Normal.
	Feet.	Inches.	Feet.
Nuwe Pass	10	0	16
Pindari Peak	0	3	½
Kaphini "	0	3	½
Kuntela "	0	3	½
Untadhura	1	6	7
Ralamdhura	0	3	5
Milamdhura	*Nil*		5
Lipulekh Pass	5	0	6
Lampia "	8	0	8½
Binkaru "	7	0	23

SUMMARY.

16. There was no widespread snowfall and the previous accumulations were melting fast. In the Punjab hills the unmelted residue of the accumulations was however unusually deep for the time of year in consequence mainly of the heavy fall of April and May.

HEM RAJ

The lines of the above chart represent isobars or lines of equal barometric pressure, the numbers attached indicating the barometric pressure in inches and being drawn for differences of pressure of ·05 inch. The isobars in the Bay of Bengal are filled in by means of the shore observations, and by comparison with the normal distribution of pressure.

The mean 8 hrs. wind directions of the month are shewn by means of arrows flying with the wind, and are calculated by means of Lambert's formula applied to the winds as given in Table B of the 8 hrs. observations. The mean wind directions for the hill stations are indicated by broken arrows to distinguish them from the wind arrows for the plain stations. The mean velocity of the winds during the month is shewn by the following notation:—

Velocity of	0	to	2	miles	per	hour	...	one	feather	added	to	the	wind arrow.
,,	,,	2	to	5	,,	,,	...	two	feathers	,,	,,	,,	,,
,,	,,	5	to	10	,,	,,	...	three	,,	,,	,,	,,	,,
,,	,,	10	to	20	,,	,,	...	four	,,	,,	,,	,,	,,
	over	20			,,	,,	...	five	,,	,,	,,	,,	,,

Wind strengths are based on factor 2·2 for the standard type of Beckley Robinson anemograph, instead of 3·0 as used for this plate up to December 1911 inclusive.

The chart shows the departure from normal of the mean during the month of 8 hrs. pressure by means of lines drawn for equal amounts of departure. The numbers are given in thousandths of an inch, 20 representing ·020″ or two hundredths of an inch, &c. Continuous lines indicate that the pressure was in excess by amounts indicated by the numbers attached to the lines, and broken or dotted lines that it was in defect by amounts indicated by the numbers attached to the lines. Two parallel lines near to each other, one continuous and the other broken or dotted, represent the line of no departure, the dotted line facing the area of deficient pressure or negative departures.

CHART SHEWING THE DEPARTURE FROM NORMAL
OF THE MONTHLY MEAN OF DAILY
MAXIMUM TEMPERATURE.

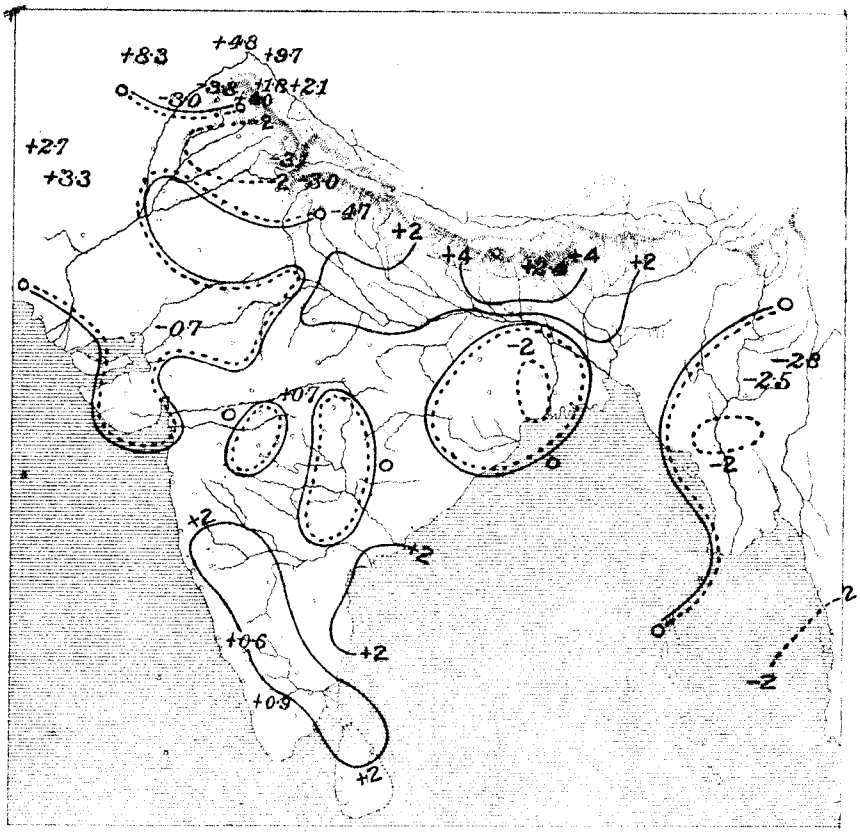


CHART SHEWING THE DEPARTURE FROM NORMAL
OF THE MONTHLY MEAN OF DAILY
MINIMUM TEMPERATURE.

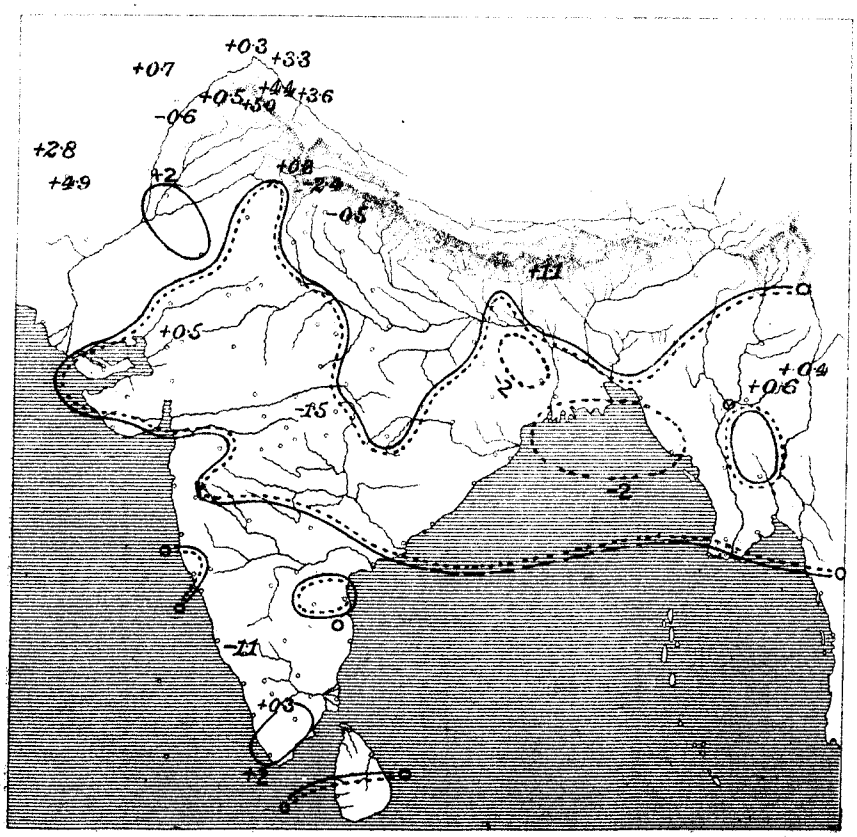


CHART SHEWING THE DEPARTURE FROM NORMAL
OF THE MONTHLY MEAN OF DAILY
MEAN TEMPERATURE.

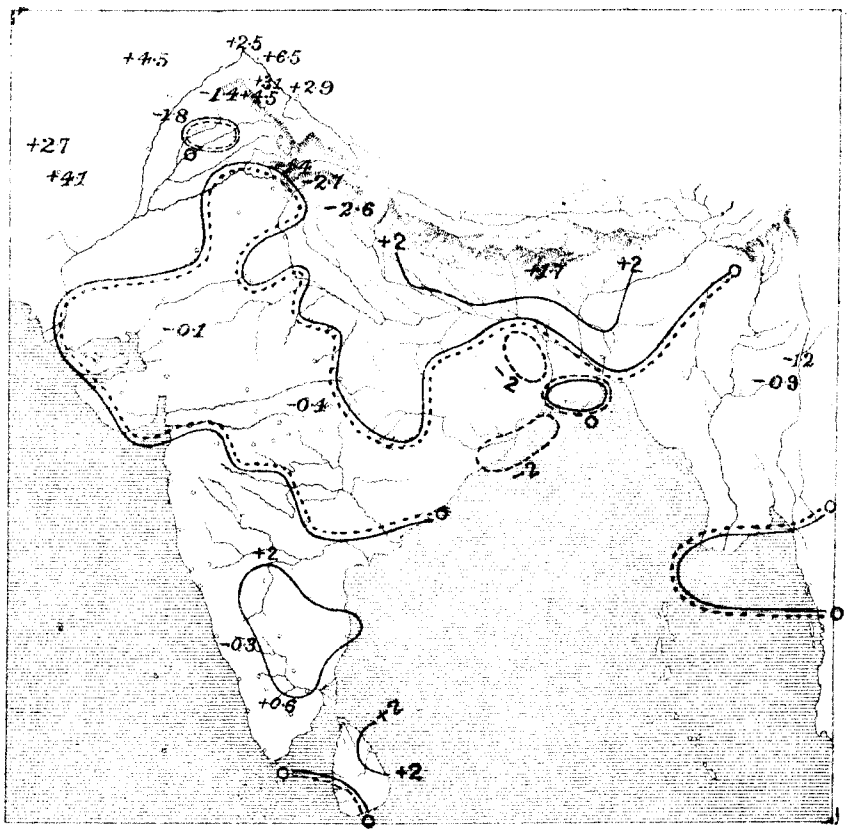


CHART SHEWING THE DEPARTURE FROM NORMAL
OF THE MONTHLY MEAN OF ABSOLUTE
HUMIDITY AT 8 HRS.

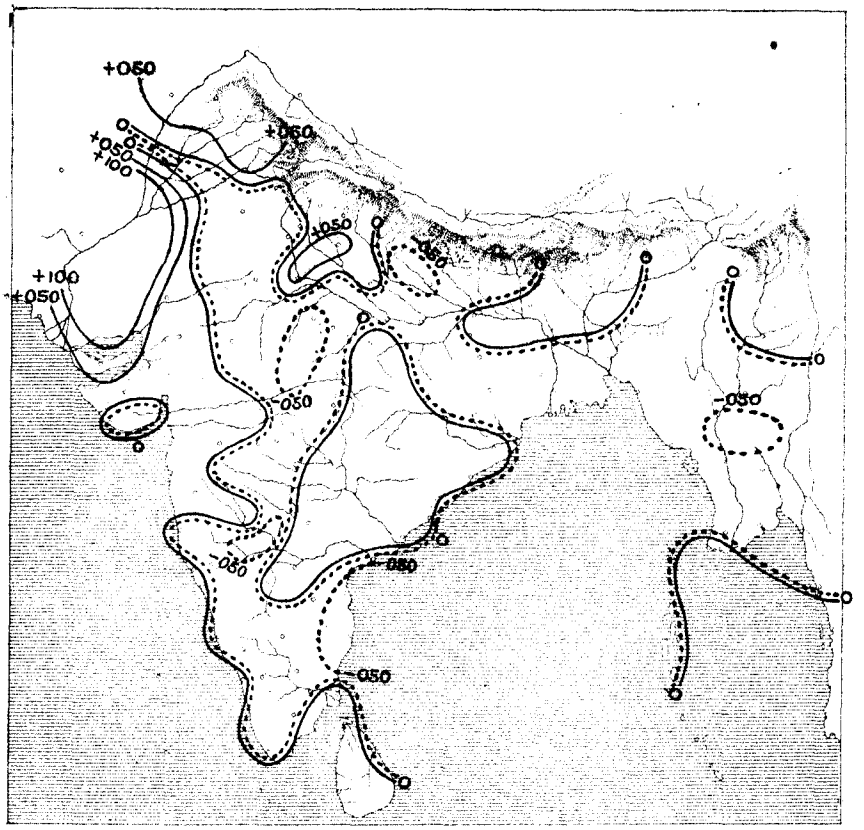


CHART SHEWING THE DEPARTURE FROM NORMAL
OF THE MONTHLY MEAN OF RELATIVE
HUMIDITY AT 8 HRS.

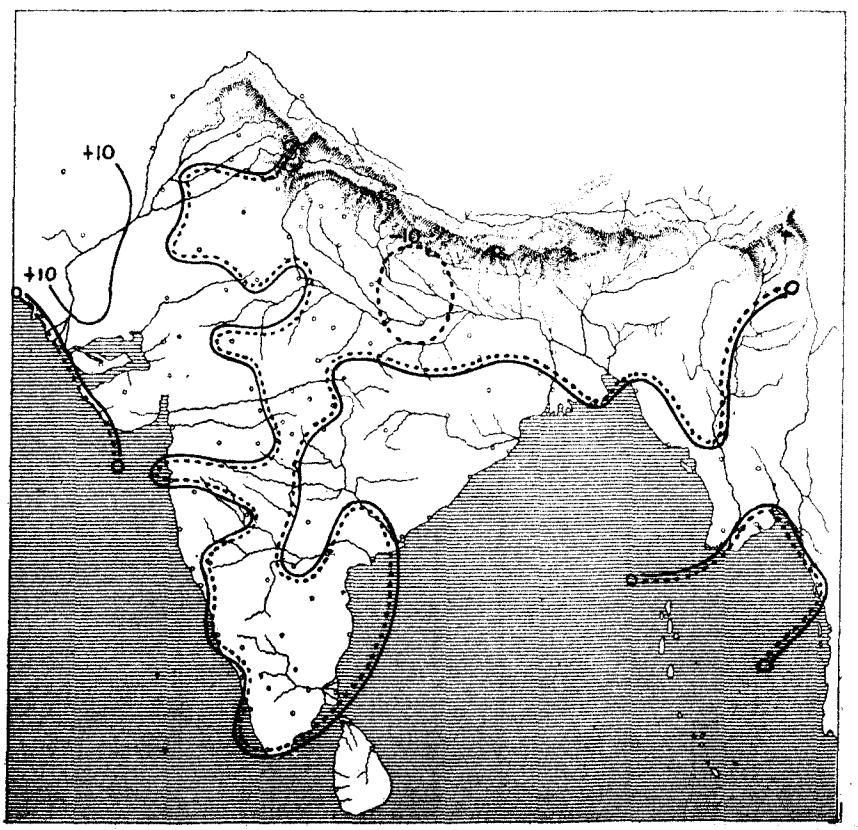


CHART SHEWING THE DEPARTURE FROM NORMAL
OF THE MONTHLY MEAN OF CLOUD
AMOUNT AT 8 HRS.

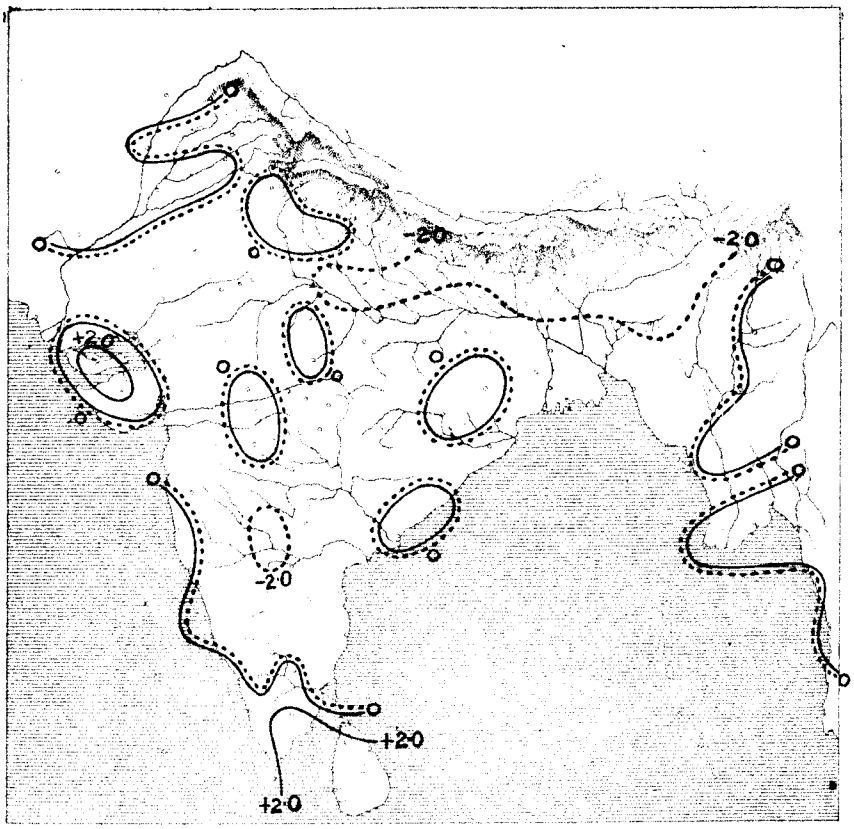
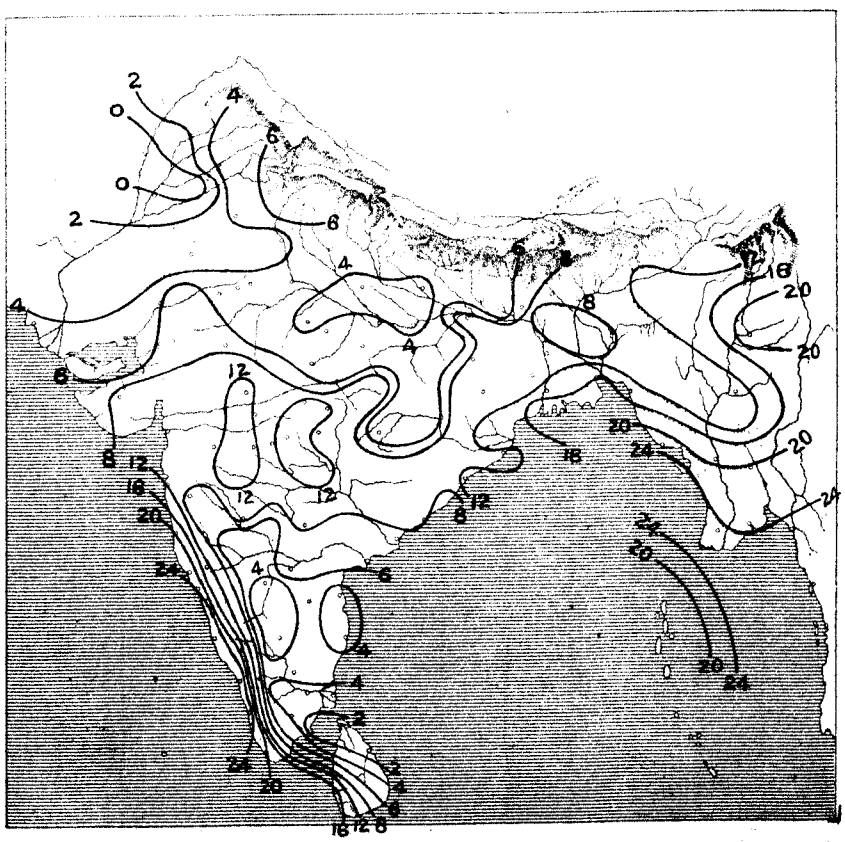
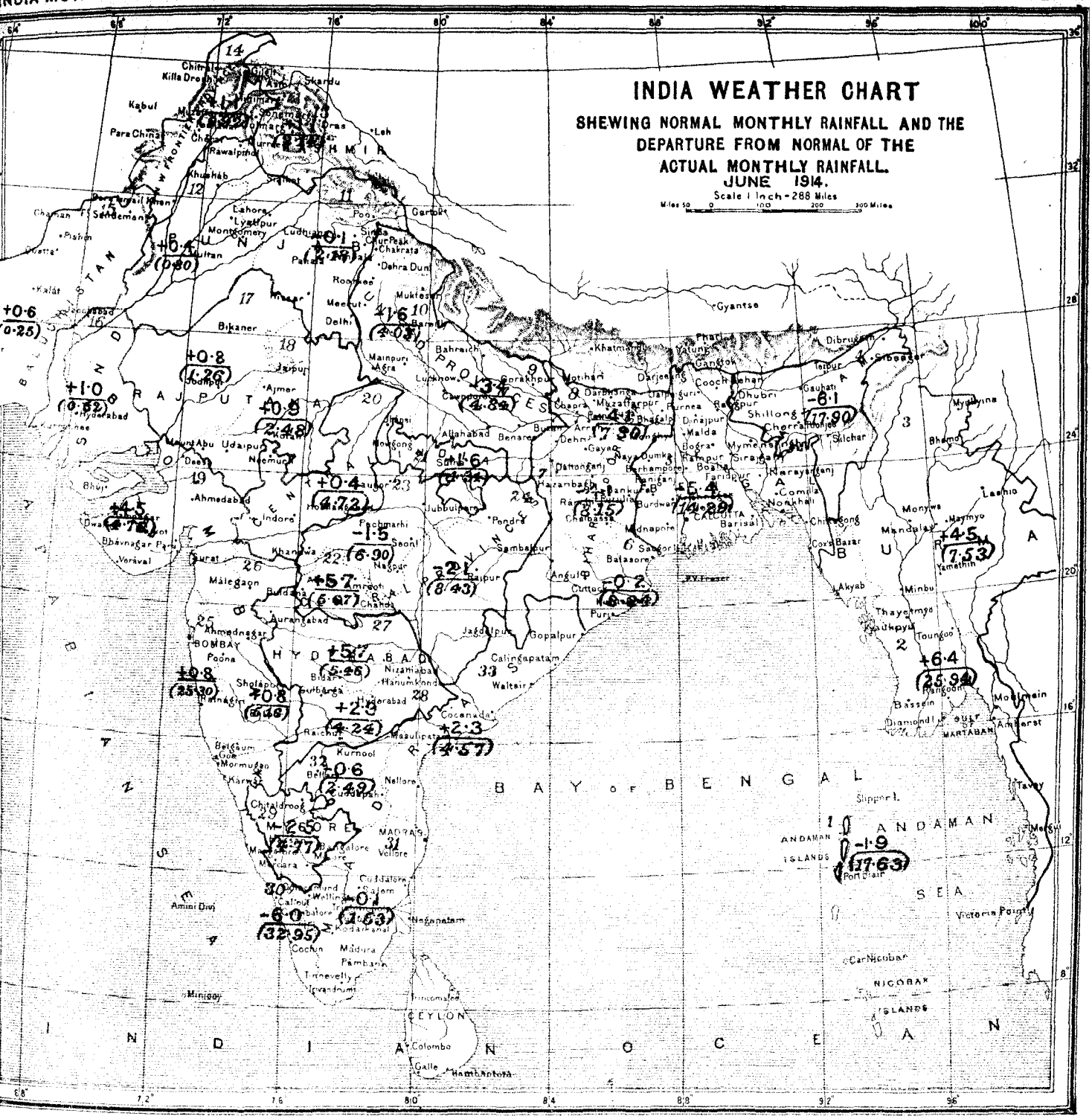


CHART SHEWING THE TOTAL NUMBER OF DAYS IN THE
MONTH ON WHICH RAINFALL EQUALLED OR
EXCEEDED 0·10 INCH.
(BASED ON THE RETURNS OF TABLE B.)





The country is divided into 33 areas as shewn in the list below. The numbers in that list correspond with the red numbers on the chart, and serve to identify the areas. The numbers in brackets on the chart give the average over the divisions of the normal monthly rainfall, the numbers above these give the departures from normal of the average actual rainfall over the divisions.

1. Bay Islands
2. Lower Burma
3. Upper Burma
4. Assam
5. Bengal
6. Orissa
7. Chota Nagpur
8. Bihar
9. United Provinces, East
10. United Provinces, West
11. Punjab, East and North
12. Do., Southwest
13. Kashmir
14. Northwest Frontier Province
15. Baluchistan
16. Sind
17. Rajputana, West
18. Rajputana, East
19. Gujarat
20. Central India, West
21. Do., East
22. Berar
23. Central Provinces, West
24. Do., East
25. Konkan
26. Bombay, Deccan
27. Hyderabad, North
28. Hyderabad, South
29. Mysore
30. Malabar
31. Madras, Southeast
32. Madras, Deccan
33. Madras Coast, North

GOVERNMENT OF INDIA.

METEOROLOGICAL DEPARTMENT.

MONTHLY WEATHER REVIEW.

PUBLISHED BY ORDER OF

THE GOVERNMENT OF INDIA.

CALCUTTA, JULY, 1914.

INTRODUCTION.

THIS review of the weather in India during the month of July 1914 is based on observations taken daily at 8 hrs. at 219 stations, and on additional observations taken at 10 hrs. and 16 hrs. at 14 stations. In the rainfall summary have been utilized the data furnished by the meteorological observatories, and such rainfall statements of the month as had been published by the Provincial Governments up to the date of the preparation of the review.

The brief notes on solar, seismic and magnetic disturbances are supplied by the chief observatories in the Indian area.

For a statement of the methods adopted in recording and tabulating the data, for each of the elements of observation, reference should be made to the introductory portion of the review for January.

Summary of the chief features of the weather in India during the month.

2. The monsoon was very vigorous and gave abundant rain, particularly during the fourth week. The total rainfall of the month in the plains of India exceeded the normal by 3″ or 27 per cent. The excess was almost universal, the only divisions where it did not occur being Assam, Chota Nagpur, Bihar, Berar and Madras South-east.

In keeping with the excess of rainfall the air was somewhat damper and the sky more cloudy than usual in most parts of the country. Temperature departed to no great extent from the normal.

Barometric pressure in the plains averaged ·053″ below the normal.

Solar, seismic and magnetic disturbances.

KODAIKANAL OBSERVATORY.

3. *Solar Observations.*—The weather was not favourable for solar observations during the month. No observations could be made on 7 days and on 9 other days prominences could not be recorded.

Sun Spots.—Five new groups of spots were observed during the month as against 4 in June and 7 in May. The daily average number of spots fell to 0·5 and the average life of a spot to 2·8 days. All the spots were in high southern latitudes and none of them except No. 2073 lasted more than a day. The distribution of the spots in latitude was as follows:—

TABLE 1.

...	0—10	11—20	21—30	31—40	Mean latitude.	Extreme latitude.
North . .	...	...	...	...	...	...
South . .	...	1	2	2	27°	19° & 35°

Prominences.—Twenty-five large prominences were recorded during the month. The highest was a detached cloud overhanging the limb between latitude + 33° and + 41° E. at a height of 270″ and was photographed on the 6th. One eruptive and metallic prominence was observed on the 31st at latitude +20° W.

Magnetic Disturbances.—A "great" disturbance was recorded from the 5th to 7th and a "moderate" one from the 28th to 31st.

J. EVERSHED,
Director,
Kodaikanal and Madras Observatories.

Seismic records.

$\phi = 10° 13' 50''$; $\lambda = 77° 28' 00''$; $h = 2343$ m. Subsoil Rock.

Apparatus.—Milne's Horizontal Pendulum Seismograph.

TABLE 2.

	V	To	ϵ	$\frac{r}{To^2}$
AN:				
AE:	...	16·7	1	2·8
AZ:				

Date.	Phase.	Time G. M. T. h. m. s.	Period (Sec.)	Amplitude (u). An.	Ae.	Az.	Distance Δ (Km.)	Remarks.
1914. July 4th	e P	17 0 12	...	...	...	...	...	
	i L	17 1 48	...	...	...	...	...	
	M	17 10 24	...	...	60	...	...	
	F	17 35 36	...	...	...	...	...	
„ 4th	e P	22 47 24	...	...	...	...	...	Widening of line.
	F	23 39 12	...	...	...	...	...	
„ 6th	e P	6 52 6	...	...	...	...	...	
	e L	7 5 30	...	...	...	...	...	
	M	7 8 00	...	...	30	...	...	
	F	7 15 36	...	...	...	...	...	
„ 14th	e P	3 16 54	...	...	...	...	...	
	i L	3 22 42	...	...	...	...	...	
	M	3 30 48	...	...	270	...	...	
	F	4 23 36	...	...	...	...	...	
„ 17th	e P	7 33 6	...	...	...	...	...	
	e L	7 59 42	...	...	...	...	...	
	M	8 8 42	...	...	30	...	...	
July 17th	F	8 38 42	...	...	...	...	...	
„ 25th	e P	21 46 54	...	...	...	...	...	
	i L	21 51 30	...	...	...	...	...	
	M	21 54 6	...	...	170	...	...	
	F	22 17 42	...	...	...	...	...	

T. ROYDS,
Assistant Director.

BOMBAY OBSERVATORY.

Alibag magnetic record.

4. During the month of July 1914 the traces showed 11 calm days, 18 days of small, and 2 days of moderate disturbance.

The days of the month selected as quiet for the purposes of the Magnetic Survey of India are the 8th, 12th, 15th, 19th and 20th.

The following table represents the magnetic character of each day during the month :—

TABLE 3.

Day.	Character.	Day.	Character.	Day.	Character.	Day.	Character.
1	C	9	S	17	S	25	S
2	C	10	S	18	S	26	S
3	C	11	S	19	C	27	S
4	C	12	C	20	C	28	S
5	M	13	C	21	S	29	M
6	S	14	C	22	S	30	S
7	S	15	C	23	S	31	S
8	C	16	S	24	S	...	...

C.=calm; S.=small; M.=moderate; G.=great; V. G.=very great.

The mean observed absolute values of the several magnetic elements reduced to the mean monthly tabulations of the magnetograms, as also the ranges and the summed ranges of horizontal force and declination for the month are as follow :—

Easterly declination	0° 44′ 10″.
Horizontal force	0·36884 C.G.S. unit.
Vertical force	0·16585 C.G.S. „
Inclination	24° 12·6′.
Horizontal force range	0·00042 C.G.S. unit.
Horizontal force summed range	0·00284 C.G.S. „
Declination range	4′·5.
Declination summed range	20′·0.

(NOTE.—Summed range means sum without regard to sign of 24 ordinates of the diurnal inequality.)

Seismic records.

$\phi = 18° 53' 36''$; $\lambda = 72° 48' 56''$; $h = 11$ m. Subsoil Trap.

Apparatus.—Milne's Horizontal Pendulum Seismograph.

TABLE 4.

	V	To	ϵ	$\frac{r}{To^2}$
AN:				
AE:	9	18	1	
AZ:				

Date.	Phase.	Time G. M. T.	Period (Sec.)	Amplitude (u). An.	Ae.	Az.	Distance △ (Km.)	Remarks.
1914.		h. m. s.						
July 4th	P	17 58 3	...	...	...	...	...	
	M	18 5 19	...	...	33	...	...	
	F	18 35 52	...	...	...	...	...	
„ 5th	P	.....	...	...	...	...	...	Beginning mixed in tremors.
	M	0 19 1	...	...	44	...	...	
	F	.....	...	...	...	...	...	End mixed in tremors.
„ 14th	P	3 20 5	...	...	...	...	...	
	M	3 32 41	...	...	167	...	...	
	F	4 34 42	...	...	...	...	...	

Thickening of lines was noted on the following occasions:—

D. H. M. D. H. M. D. H. M. D. H. M. D. H. M. M.
2 4 30; 3 22 17; 5 18 6; 17 19 19; 17 19 22 to 26

D. H. M. M. D. H. M. M. D. H. M. D. H. M. D. H. M.
17 21 22 to 26; 25 9 20 to 22; 28 20 20; 29 3 8; 31 5 55.

Sensibility to tilt 1·0 mm of amplitude on the trace = 0·48″ on 1st; 0·49″ from 2nd to 21st and 0·41″ from 22nd to 27th. The instrument was under adjustment from 28th to 31st.

N. A. F. MOOS,

Director,

Bombay and Alibag Observatories.

5.—CALCUTTA (ALIPORE) OBSERVATORY.

Seismic records.

$\phi = 22° 32' N$; $\lambda = 88° 21' E$; $h = 6·4$ m. Subsoil Alluvial.

Apparatus.—Milne's Horizontal Pendulum Seismograph.

TABLE 5.

	V	To	ϵ	$\frac{r}{To^2}$
AN:				
AE:	8·688	18	1	
AZ:				

Date.	Phase.	Time G. M. T.	Period (Sec.)	Amplitude (u). An.	Ae.	Az.	Distance △ (Km.)	Remarks.
1914.		h. m. s.						
July 4th	P	17 38 11	...	...	...	...	...	
	S	17 57 30	...	...	...	...	...	
	L	18 1 34	...	...	...	...	...	
	M	18 3 36	...	...	144	...	...	
	C	18 12 46	...	...	115	...	...	
	F	18 45 18	...	...	...	...	...	
„ 5th	P	22 6 40	...	...	...	...	...	
	L	22 14 48	...	...	...	...	...	
	M	22 22 56	...	...	86	...	...	
	F	22 55 28	...	...	...	...	...	
„ 6th	P	6 48 21	...	...	...	...	...	
	M	6 56 59	...	...	57	...	...	
	F	7 11 45	...	...	...	...	...	
„ 14th	P	?*	...	...	...	...	...	
	L	3 21 55	...	...	...	...	...	
	M	3 37 10	...	...	201	...	...	
	F	4 30 3	...	...	...	...	...	
„ 17th	P	7 14 33	...	...	...	...	...	
	L	7 47 5	...	...	...	...	...	
	M	7 54 12	...	...	86	...	...	
	F	8 46 4	...	...	...	...	...	
„ 25th	P	21 52 55	...	...	...	...	...	
	M	22 10 44	...	...	57	...	...	
	F	22 34 7	...	...	...	...	...	

* Begins with air tremors.

E. P. HARRISON,

Offg. Meteorologist, Calcutta.

6. SIMLA OBSERVATORY.

The Simla seismograph notes will appear in a future number of the monthly Weather Review.

Following table contains a list of earthquakes that were reported. :—

TABLE 6.

Place at which felt.	Date.	G. M. T. of earthquake.	Duration.	Intensity Rossi-Forel scale.	No. of shocks.
		h. m.	Sec.		
Jodhpur	July 8th	18 4	25	4	1
Port Blair (Andaman Islands) .	„ 12th	6 25	3	4	1
„ .	„ 12th	17 25	5	4	1
Shillong	„ 16th	1 4	1	4	1
„	„ 16th	14 43	1	2	1
Sibsagar	„ 17th	16 47	35	7	2
Borjuli (Darrang District, Assam).	„ 17th	16 53	1	6	1
Dikom (Lakhimpur District, Assam).	July 17th	16 53	30	7	1
Doom Dooma (Lakhimpur District, Assam).	„ 17th	16 54	15	4	2
Akyab	„ 22nd	21 32	5	4	1
„	„ 23rd	0 10	5	4	1
Gulmarg	„ 24th	21 34	3	5	1
Simla	„ 27th	4 21	2	3	1
Drosh	„ 29th	18 15	20	6	2

Solar radiation.—No observations with the Angstrom's Pyrheliometer were possible during the month owing to overcast skies.

C. W. NORMAND,
Imperial Meteorologist, Simla.

ROYAL ALFRED OBSERVATORY, MAURITIUS.

7. No information has been received.

Weather in the Indian Ocean.

8. Pressure departed but little from the normal at Zanzibar, but at Mauritius and Seychelles the departure was marked and lay on the side favourable to the prospects of a good monsoon. Wind direction and strength had their normal values at Mauritius and Seychelles, but were rather unusual at Zanzibar. Rainfall was scanty at the equatorial stations and normal at Mauritius.

TABLE 7.

——	Mauritius.	Zanzibar.	Seychelles.
Departure from normal of mean pressure.	−·023	−·005	−·036
Actual mean wind direction . .	S 68° E	S 29° W	S 30° E
Normal mean wind direction . .	S 64° E	S 15° W	S 33° E
Actual mean wind velocity (miles per diem).	195	165	211
Normal mean wind velocity (miles per diem).	185	144	211
Rainfall departure from normal . .	+0·07	−2·56	−1·29

Depressions and cyclonic storms.

9. Two slight disturbances were recorded during the month. The first was generated over the Sandheads on the 1st, crossed inland sometime on the 2nd and travelling in a northwesterly direction was dissipated in the east of the United Provinces and the adjacent districts of Bihar on the 3th. Although feeble, it nevertheless caused heavy rain in Lower Bengal, parts of Bihar and the southeast of the United Provinces. The dissipation of the disturbance was followed on the 8th and 9th by the formation of another depression over the north of the Bay. The latter crossed the coast near Balasore on the 11th and travelling along a west-northwesterly track disappeared in the neighbourhood of Nowgong on the 13th. Barometrically it was shallow—the defect of pressure within it at no time exceeding a quarter of an inch—and it gave rise to only moderately heavy rain.

Between the 27th and the 29th there was a tendency to the formation of another disturbance off the coast, but it failed to develop.

Pressure.

10. The high pressures which had prevailed since June 1913 not only disappeared during the month under review but were replaced by a marked defect. The statement below illustrates the change :—

TABLE 8.

MONTH.		Departure from normal of mean pressure over the whole Indian plains.
		"
June	1913	+·010
July	"	+·012
August	"	+·002
September	"	+·020
October	"	+·020
November	"	+·038
December	"	+·019
January	1914	+·079
February	"	+·024
March	"	+·025
April	"	+·047
May	"	+·030
June	"	+·015
July	"	−·053

In the plains the deficiency was least in the extreme south of the Peninsula (·02″), and greatest in Orissa and the east of Central India (about ·075″). No connection existed between the low density of the atmosphere and the abnormalities of temperature as recorded on the earth's surface.

TABLE 9.

DIVISION.	DEPARTURE FROM NORMAL OF	
	Mean 8 hrs. pressure.	Mean temperature.
	"	°
Burma	−·049	−0·1
Assam	−·045	+1·0
Bengal	−·061	+0·2
Bihar and Orissa	−·067	−0·3
United Provinces	−·060	+0·1
Punjab	−·046	−2·1
North-West Frontier Province	−·067	−1·1
Sind	−·061	+0·1
Rajputana	−·057	−1·6
Bombay	−·048	−0·4
Central India	−·064	−0·5
Central Provinces	−·062	−0·2
Hyderabad	−·042	−0·5
Mysore	−·027	−0·2
Madras	−·034	+0·4

Pressure was in defect also at the level of the observing hill stations, although not to the same extent as in the adjoining plains.

TABLE 10.

HILL STATION.	Departure from normal pressure. A	PLAIN STATION.	Departure from normal pressure. B	Departure of pressure difference. B−A.
	"		"	"
Quetta	−·047	Jacobabad	−·064	−·017
Leh	−·019	Lahore	−·048	−·029
Murree	−·037	Peshawar	−·064	−·027
Simla	−·020	Ludhiana	−·045	−·025
Chakrata	−·019	Roorkee	−·042	−·023
Darjiling	−·090?	Dhubri	−·050	+·040?
Mount Abu	−·028	Deesa	−·044	−·016
Pachmarhi	−·046	Khandwa	−·050	−·004
Kodaikanal	−·017	Madura	−·013	+·004

Temperature.

11. Except in the Punjab where day temperature was in appreciable defect, temperature conditions of the month differed to no significant extent from the normal.

TABLE 11.

SUB-DIVISION.	ACTUAL TEMPERATURE.					DEPARTURE FROM NORMAL OF		
	Mean maximum.	Mean minimum.	Monthly mean of mean between maximum and minimum.	Mean daily range of temperature.	Absolute range during month.	Maximum.	Minimum.	Daily range.
	°	°	°	°	°	°	°	°
1. Bay Islands	84·1	77·1	80·6	6·9	12·8	−1·0	−0·4	−0·6
2. Lower Burma	83·6	75·1	79·4	8·5	17·0	−0·9	+0·1	−1·0
3. Upper Burma	89·3	76·4	82·9	12·9	21·1	−0·4	+0·8	−1·2
4. Assam	90·4	77·8	84·1	12·6	22·0	+1·3	+0·6	+0·7
5. Bengal	88·0	78·6	83·3	9·4	18·0	+0·1	+0·2	−0·1
6. Orissa	87·6	77·8	82·7	9·8	18·7	−0·9	−0·4	−0·5
7. Chota Nagpur	87·8	76·4	82·1	11·4	20·4	−1·3	+0·1	−1·4
8. Bihar	90·5	78·9	84·6	11·6	21·9	+0·3	−0·1	+0·4
9. United Provinces, East	90·9	79·5	85·2	11·4	24·1	−0·7	+0·1	−0·8
10. Do. do., West	92·7	79·9	86·3	12·8	30·0	+0·5	+0·8	−0·3
11. Punjab, East and North	93·4	79·3	86·5	14·1	33·3	−3·5	−0·1	−3·4
12. Do., South-west	98·5	81·9	90·2	16·7	33·7	−5·0	−0·5	−4·5
13. Kashmir	82·5	60·8	71·7	21·8	40·7	+1·2	+2·3	−1·1
14. North-West Frontier Province	100·1	81·8	90·9	18·3	37·9	−3·1	+0·9	−4·0
15. Baluchistan	100·7	73·8	87·2	26·9	42·4	+1·5	+0·8	+0·7
16. Sind	97·0	83·0	90·0	14·0	26·3	−1·3	+1·4	−2·7
17. Rajputana, West	97·7	80·1	88·9	17·5	29·1	−2·1	−1·8	−0·3
18. Do., East	90·6	78·9	84·8	11·7	28·5	−2·7	+0·1	−2·8
19. Gujarat	88·3	78·5	83·4	9·8	18·9	−1·3	+0·2	−1·5
20. Central India, West	84·6	73·9	79·3	10·7	21·3	−1·3	+0·5	−1·8
21. Do., East	87·7	77·3	82·6	10·4	25·0	−0·9	−0·2	−0·7
22. Berar	85·2	73·5	79·4	11·7	21·0	−1·2	+0·7	−1·9
23. Central Provinces, West	85·4	74·8	80·1	10·6	22·7	−0·7	+0·4	−1·1
24. Do., East	85·1	74·3	79·7	10·7	22·9	−0·7	+0·3	−1·0
25. Konkan	83·7	76·1	79·9	7·6	15·4	0	0	0
26. Bombay Deccan	83·2	71·1	77·1	12·2	23·1	−1·1	+0·4	−1·5
27. Hyderabad, North	85·1	71·8	78·5	13·4	25·0	−2·3	+0·3	−2·6
28. Do., South	88·1	73·7	80·9	14·5	26·7	−0·9	+0·5	−1·4
29. Mysore	79·9	67·1	73·5	12·7	23·5	−1·0	+0·6	−1·6
30. Malabar	82·6	74·2	78·4	8·4	15·2	−0·3	+0·8	−1·1
31. Madras, South-east	94·6	78·2	86·4	16·4	25·1	0	+1·4	−1·4
32. Do. Deccan	93·1	76·2	84·7	16·9	29·8	+0·6	+0·5	+0·1
33. Do. Coast, North	91·1	78·6	84·9	12·6	25·7	0	−0·3	+0·3

TABLE 12.

DIVISION.	DEPARTURE FROM NORMAL OF		
	Mean maximum temperature.	Mean minimum temperature.	Mean temperature.
	°	°	°
Burma	−0·7	+0·4	−0·1
Assam	+1·3	+0·6	+1·0
Bengal	+0·1	+0·2	+0·2
Bihar and Orissa	−0·4	−0·1	−0·3
United Provinces	−0·2	+0·4	+0·1
Punjab	−4·0	−0·3	−2·1
North-West Frontier Province	−3·1	+0·9	−1·1
Sind	−1·3	+1·4	+0·1
Rajputana	−2·5	−0·7	−1·6
Bombay	−0·9	+0·2	−0·4
Central India	−1·1	+0·1	−0·5
Central Provinces	−0·8	+0·4	−0·2
Hyderabad	−1·4	+0·4	−0·5
Mysore	−1·0	+0·6	−0·2
Madras	0	+0·8	+0·4

Winds.

12. (*a*) The air movement was weaker than usual in Bengal, the Indus valley, Bombay and Central India, and above its normal strength in the Punjab, Hyderabad, Mysore and Madras.

(*b*) The winds blew with more than their ordinary steadiness in Assam, the United Provinces, the Punjab, the North-West Frontier Province, Sind, Bombay and Hyderabad, but were rather unsteady in Bengal and Central India.

(*c*) In the United Provinces, owing to the displacement southwards of the axis of the trough of low pressure, the Bay monsoon, which is usually restricted to the submontane districts, prevailed as far south as the Jamna.

TABLE 13.

STATION.	WIND DIRECTION.	
	Actual.	Normal.
	°	°
Gaya	N.54 E	S 2 E
Benares	S 59 E	S 7 E
Allahabad	S 65 E	S 27 W
Cawnpore	S 70 E	S 1 E
Agra	S 87 E	S 24 W

(*d*) The mean wind direction of the month in Baluchistan contained an undue easterly element.

TABLE 14.

STATION.	WIND DIRECTION.	
	Actual	Normal.
	°	°
Quetta	S 21 E	S 6 W
Chaman	S 25 E	S 33 W
Kalat	S 15 E	S 21 W

TABLE 15.

DIVISION.	DEPARTURE FROM NORMAL OF	
	Hourly wind velocity.	Wind steadiness.
Burma	+0·1	+ 3
Assam	0	+25
Bengal	−1·2	− 6
Bihar and Orissa	+0·2	+ 3
United Provinces	−0·1	+18
Punjab	+0·5	+16
North-West Frontier Province	−0·5	+11
Sind	−1·1	+11
Rajputana	+0·5	+ 1
Bombay	−0·9	+ 9
Central India	−0·7	− 6
Central Provinces	+0·4	+ 7
Hyderabad	+2·3	+11
Mysore	+1·6	− 1
Madras	+1·1	+ 6

Humidity and cloud.

13. Humidity, both absolute and relative, was either about the average or above it except at a few stations in south-east Madras. The excess was on the whole most marked in the normally dry region of the Indus valley.

The cloud proportion was unusually high in Tenasserim, along the west coast of the Peninsula and in north-west and central India, and decidedly low in Assam and north Bengal.

TABLE 16.

DIVISION.	HYGROMETRY; 8 HRS.				CLOUD.	
	Mean humidity.	Departure from normal.	Mean vapour tension in inches of mercury.	Departure from normal in inches of mercury.	Mean cloud amount at 8 hrs.	Departure from normal.
	%					
Burma	90	+ 1	·881	+·002	8·1	+0·3
Assam	90	— 3	·957	+·015	6·8	—2·5
Bengal	90	0	·966	—·002	8·0	—0·4
Bihar and Orissa	88	+ 1	·938	+·013	7·9	+0·3
United Provinces	85	+ 2	·972	+·042	7·1	+0·2
Punjab	79	+ 8	·945	+·078	6·0	+1·7
North-West Frontier Province.	76	+10	·952	+·097	3·9	+1·1
Sind	81	+ 9	1·009	+·118	5·9	+0·6
Rajputana	75	+ 3	·834	—·006	7·0	+0·8
Bombay	86	+ 3	·862	+·027	8·9	+0·8
Central India	89	+ 5	·861	+·030	9·3	+1·9
Central Provinces	86	+ 2	·799	—·001	8·3	+0·4
Hyderabad	81	+ 3	·726	+·011	8·3	—0·2
Mysore	85	+ 2	·641	+·008	9·0	+0·3
Madras	75	— 1	·797	—·001	7·8	+0·5

Rainfall.

14. During the first week the monsoon was on the whole more vigorous than usual, but its activity was largely concentrated in Burma, northeast India, the United Provinces, the east of Central India, the Punjab and the west coast of the Peninsula. On the 8th a depression began to form over the head of the Bay and rainfall appeared over the Central Provinces. The disturbance crossed inland near Balasore on the 11th and travelled in a west-north-westerly direction to the neighbourhood of Nowgong, where it disappeared on the 13th. It gave heavy rain locally in the Central Provinces on the 11th and 12th, and its dispersion was followed immediately by a large expansion of the area of rainfall, which on the 15th included practically the whole country excepting the northwest.

Both monsoon currents were remarkably active and steady during the rest of the month and between the 23rd and 28th extended well into Baluchistan. At the end of the month signs of a temporary weakening of the Arabian Sea monsoon were apparent.

The total rainfall in the plains of India was in excess of the normal by 3″ or 27 per cent. It was also very well distributed, for Assam, Chota Nagpur, Bihar, Berar and Madras Southeast were the only rainfall divisions where the month's aggregate failed to reach the normal value. The rainfall was unusually abundant in the Bay Islands, the United Provinces East, the Punjab, the North-West Frontier Province, Rajputana East, Central India, the Central Provinces East, the Konkan, the Bombay Deccan, Hyderabad South and Mysore, where it was more than 30 per cent. above the normal. On the other hand Assam, Chota Nagpur and Berar were the only areas where the deficit was more than an inch in amount.

TABLE 17.

SUB-DIVISION.	NUMBER OF RAINY DAYS.		RAINFALL.			
	Actual.	Normal.	Actual.	Normal.	Departure from normal.	Percentage departure from normal
			"	"	"	
1. Bay Islands	21·0	18·6	21·82	14·79	+7·03	+ 48
2. Lower Burma	27·8	25·1	40·27	31·04	+9·23	+ 30
3. Upper Burma	11·1	9·7	6·91	6·51	+0·40	+ 6
4. Assam	17·6	18·9	15·20	17·96	—2·76	— 15
5. Bengal	19·0	16·9	16·55	15·61	+0·94	+ 6
6. Orissa	19·7	15·5	15·69	13·03	+2·69	+ 21

Sub-division.	Number of rainy days.		Rainfall.			
	Actual.	Normal.	Actual.	Normal.	Departure from normal.	Percentage departure from normal.
			"	"	"	
7. Chota Nagpur	17·3	15·9	11·29	13·26	−1·97	−15
8. Bihar	14·7	14·0	11·63	12·53	−0·90	− 7
9. United Provinces, East	15·4	12·5	16·42	11·66	+4·76	+ 41
10. Do., West	14·8	11·6	13·69	11·72	+1·97	+ 17
11 Punjab, East and North	11·7	6·8	12·40	6·30	+6·10	+ 97
12. Do., South-west	6·8	3·1	7·48	2·39	+5·09	+213
13. Kashmir	11·6	7·6	14·74	6·88	+7·86	+114
14. North-West Frontier Province	7·4	4·4	6·75	3·16	+3·59	+114
15. Baluchistan	3·5	1·4	2·81	0·87	+1·94	+223
16. Sind	3·4	2·7	2·74	2 55	+0·19	+ 7
17. Rajputana, West	6·7	4·9	5·03	3·86	+1·17	+ 30
18. Do., East	13·4	9·8	12·47	8·47	+4·00	+ 47
19. Gujarat	17·1	12·9	14·93	13·48	+1·45	+ 11
20. Central India, West	16·1	12·6	14·83	10·82	+4·01	+ 37
21. Do., East	20·2	12·6	20·95	12·05	+8·90	+ 74
22. Berar	14·6	12·2	8·04	9·42	−1·38	− 15
23 Central Provinces, West	17·5	15·1	16·07	14·02	+2·05	+ 15
24. Do., East	19·7	16·5	20·46	15·48	+4·98	+ 32
25. Konkan	29·7	26·4	57 53	40·39	+17·14	+ 42
26. Bombay Deccan	15·3	11·5	13·33	8·00	+5·33	+ 67
27. Hyderabad, North	14·4	12·0	10·03	8·09	+1·94	+ 24
28. Do., South	16·3	10·0	10·68	5·68	+5·00	+ 88
29. Mysore	12·0	9·7	10·92	7·15	+3·77	+ 53
30. Malabar	30·1	27·5	48·76	39·21	+9·55	+ 24
31. Madras, South-east	2·7	3·6	0 99	1·93	−0·94	− 49
32. Do. Deccan	8·7	6·2	3·38	3·07	+0·31	+ 10
33. Do. Coast, North	13·2	9·7	7·28	6·32	+0·96	+ 15

TABLE 18.

Division.	Rainfall.			
	Actual.	Normal.	Departure from normal.	Percentage departure from normal.
	"	"	"	
Burma	20·06	16·12	+3·94	+24
Assam	15·20	17·96	−2·76	−15
Bengal	16·55	15·61	+0·94	+6
Bihar and Orissa	12·54	12·84	−0·30	−2
United Provinces	15·13	11·69	+3·44	+29
Punjab	11·17	5·32	+5·80	+110
North-West Frontier Province	6·75	3·16	+3·59	+114

Division.	Rainfall.			
	Actual.	Normal.	Departure from normal.	Percentage departure from normal.
	"	"	"	
Sind	2·74	2·55	+0·19	+7
Rajputana	10·21	7·07	+3·14	+44
Bombay	21·77	15·58	+6·19	+40
Central India	17·89	11·43	+6·46	+57
Central Provinces	15·52	13·30	+2·22	+17
Hyderabad	10·11	6·78	+3·33	+49
Mysore	10·92	7·15	+3·77	+53
Madras	7·43	6·72	+0·71	+11
Mean of India	13·93	10·96	+2·97	+27

Snowfall.

I.—AFGHANISTAN.

15. In the region around Kabul no snow fell, and all the neighbouring hills with the exception of the Paghman were bare of snow.

II.—NORTH-WEST FRONTIER PROVINCE.

(*a*) *Kurram.*—No snow fell during the month, and the accumulations on the higher ranges did not exceed the normal.

(*b*) *Drosh.*—There was no snowfall during the month in Chitral, and the previous accumulations there were by no means of abnormal thickness.

(*c*) *Khyber Agency.*—No snow fell in this Agency, and at the end of the month the accumulations still lying unmelted on the Sufed Koh were of less than the average depth.

(*d*) *Malakand.*—No snow fell.

(*e*) *Hazara.*—Light falls were recorded in the Kagan valley on heights above 12,700 feet.

III.—KASHMIR.

No snowfall occurred on the mountains near Leh, Dras, Gulmarg, Kargil and Srinagar, but on the ranges around Skardu there were four falls resulting altogether in about seven inches of snow. At the close of the month the unmelted residue of the winter accumulations was of less than the usual thickness.

IV.—PUNJAB.

(*a*) *Chamba.*—Hardly any snow fell, but the accumulations of old snow remained above the average owing to the heavy fall of April and May.

(*b*) *Kangra.*—The Assistant Commissioner has kindly furnished the following information:—"Undoubtedly there were very heavy accumulations of snow this summer on the higher ranges in this sub-division. Up to the middle of July there were 4 feet of snow on the Rohtang and 6 feet on the Hamta passes. I went into Solang, Hamta and Jagat Sukh nullahs in June and July and found most unusual accumulations. Fresh snow fell at 13,000 and 14,000 feet on the 3rd of July. The very heavy rains that have since occurred have helped to remove the abnormal amount of accumulation and the Beas has almost throughout July been in high flood. In the upper Sainj valley an accumulation of fallen avalanche dammed up the stream which burst the obstruction about the 24th of July and inflicted much damage on life and property along the Sainj valley. The upper Beas was in most abnormal flood on August 4th above Nagar and also below. The Fajal came down in Spiti on the 4th in a manner suggesting the breaking of another snow dam.

(*c*) *Kilba* (*Simla Hills*).—No snow fell on the Kilba and Kailas ranges, and in the beginning of August no accumulations existed except in very shady situations and ravines.

V.—UNITED PROVINCES.

(*a*) *Garhwal.*—There was a fall on the higher peaks above 19,000 feet on the 11th.

(*b*) *Almora.*—During the first twenty-two days for which alone information is available the aggregate fall amounted to about 5 feet in Malla Darma, 4 feet in Byans and 6 inches in Malla Johar and Chaudas.

TABLE 19.

Name of pass or peak.		Depth of accumulation.		
		Reported.		Normal.
		Feet.	Inches.	Feet.
Nuwe	Pass	9	0	15
Pindari	Peak	0	3	½
Kaphini	„	0	3	½
Kuntela	„	0	3	½
Untadhura	„	0	3	7
Binkaru	Pass	5	0	13
Lipulekh	„	3	0	3½
Lampia	„	6	0	½

SUMMARY.

16. No widespread heavy snowfall occurred, and the unmelted residue of the winter accumulations existing at the end of the month was on the whole of less than the average depth, except locally in the Punjab Himalayas where it was greater than usual, owing to the heavy fall of April and May.

HEM RAJ.

The lines of the above chart represent isobars or lines of equal barometric pressure, the numbers attached indicating the barometric pressure in inches and being drawn for differences of pressure of ·05 inch. The isobars in the Bay of Bengal are filled in by means of the shore observations, and by comparison with the normal distribution of pressure.

The mean 8 hrs. wind directions of the month are shewn by means of arrows flying with the wind, and are calculated by means of Lambert's formula applied to the winds as given in Table B of the 8 hrs. observations. The mean wind directions for the hill stations are indicated by broken arrows to distinguish them from the wind arrows for the plain stations. The mean velocity of the winds during the month is shewn by the following notation:—

Velocity of	0	to	2	miles	per	hour	...	one	feather	added	to	the wind arrow.
,,	,,	2	to	5	,,	,,	...	two	feathers	,,	,,	,,
,,	,,	5	to	10	,,	,,	...	three	,,	,,	,,	,,
,,	,,	10	to	20	,,	,,	...	four	,,	,,	,,	,,
		over		20	,,	,,	...	five	,,	,,	,,	,,

Wind strengths are based on factor 2·2 for the standard type of Beckley Robinson anemograph, instead of 3·0 as used for this plate up to December 1911 inclusive.

The chart shows the departure from normal of the mean during the month of 8 hrs. pressure by means of lines drawn for equal amounts of departure. The numbers are given in thousandths of an inch, 20 representing ·020″ or two hundredths of an inch, &c. Continuous lines indicate that the pressure was in excess by amounts indicated by the numbers attached to the lines, and broken or dotted lines that it was in defect by amounts indicated by the numbers attached to the lines. Two parallel lines near to each other, one continuous and the other broken or dotted, represent the line of no departure, the dotted line facing the area of deficient pressure or negative departures.

CHART SHEWING THE DEPARTURE FROM NORMAL
OF THE MONTHLY MEAN OF DAILY
MAXIMUM TEMPERATURE.

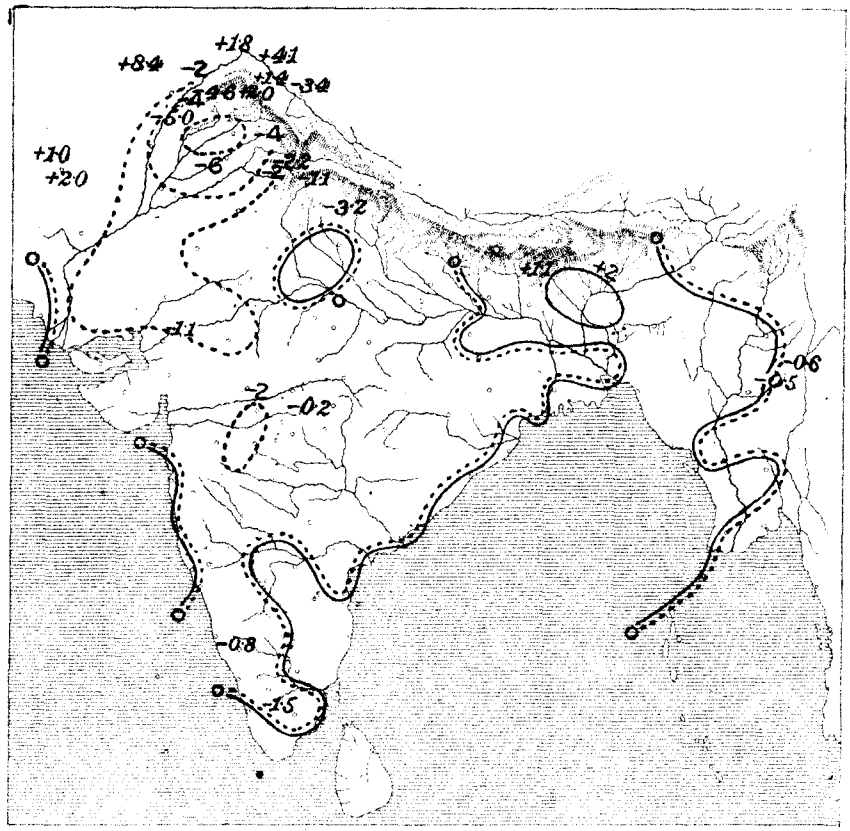


CHART SHEWING THE DEPARTURE FROM NORMAL
OF THE MONTHLY MEAN OF DAILY
MINIMUM TEMPERATURE.

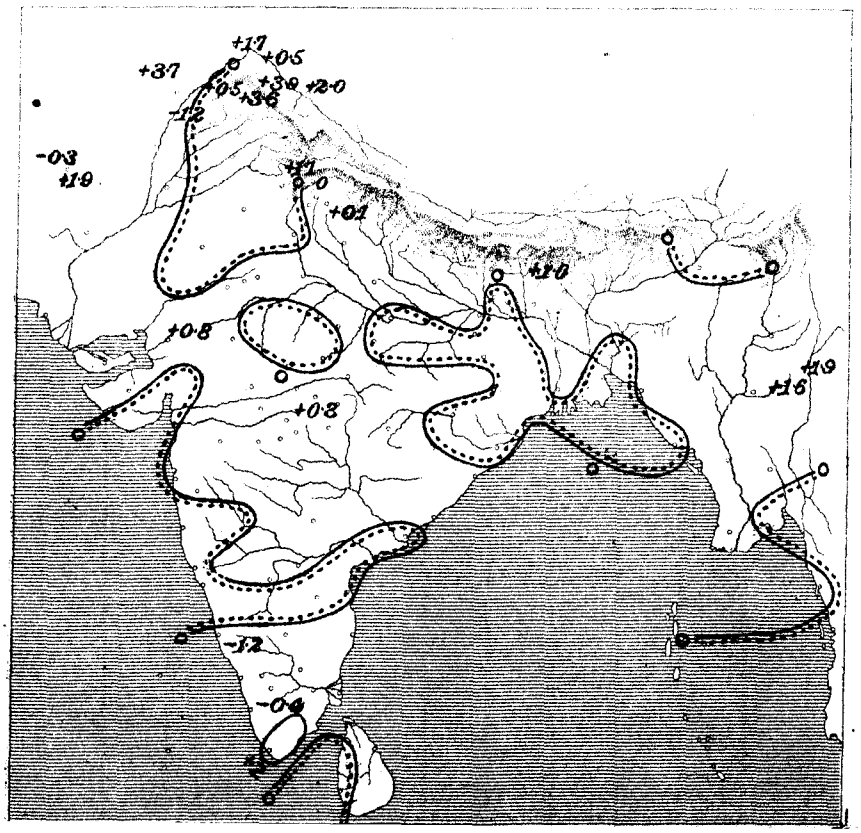


CHART SHEWING THE DEPARTURE FROM NORMAL
OF THE MONTHLY MEAN OF DAILY
MEAN TEMPERATURE.

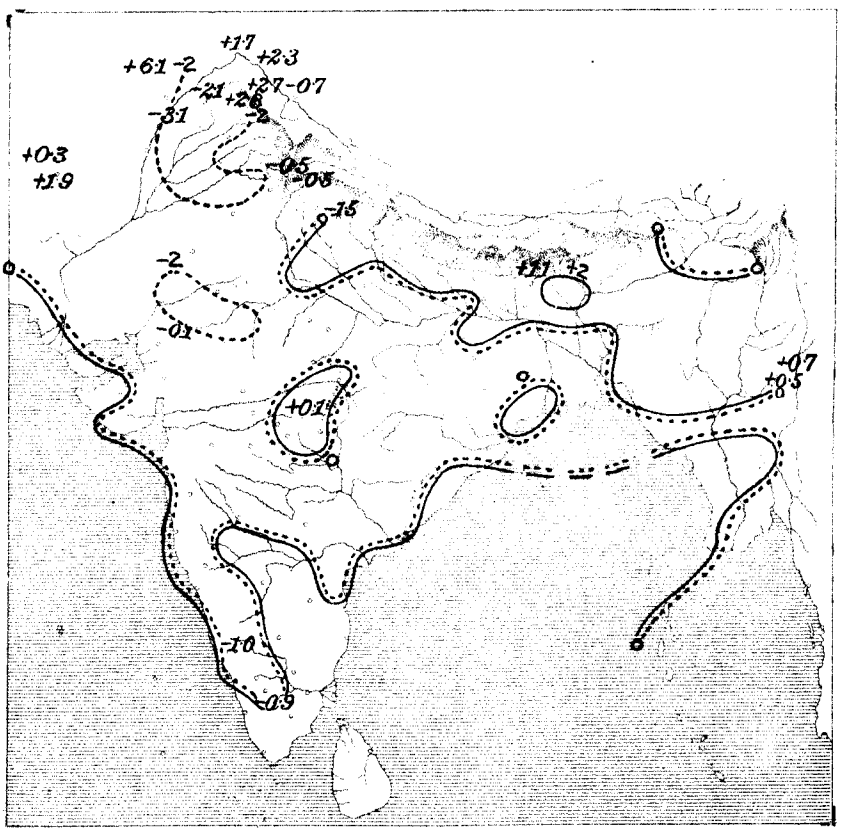


CHART SHEWING THE DEPARTURE FROM NORMAL
OF THE MONTHLY MEAN OF ABSOLUTE
HUMIDITY AT 8 HRS.

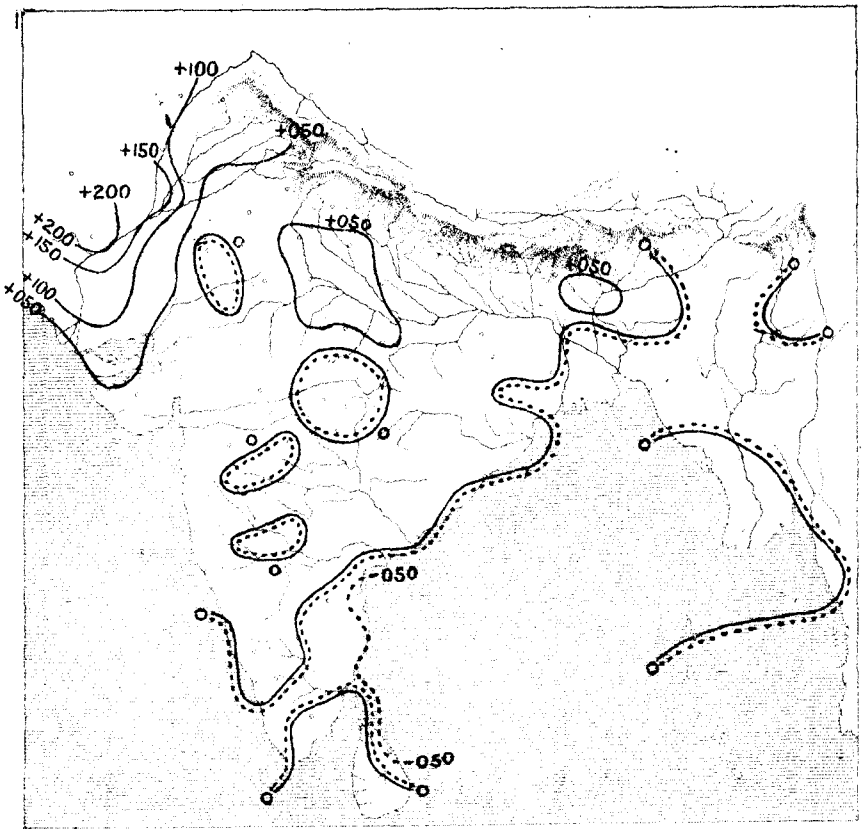


CHART SHEWING THE DEPARTURE FROM NORMAL
OF THE MONTHLY MEAN OF RELATIVE
HUMIDITY AT 8 HRS.

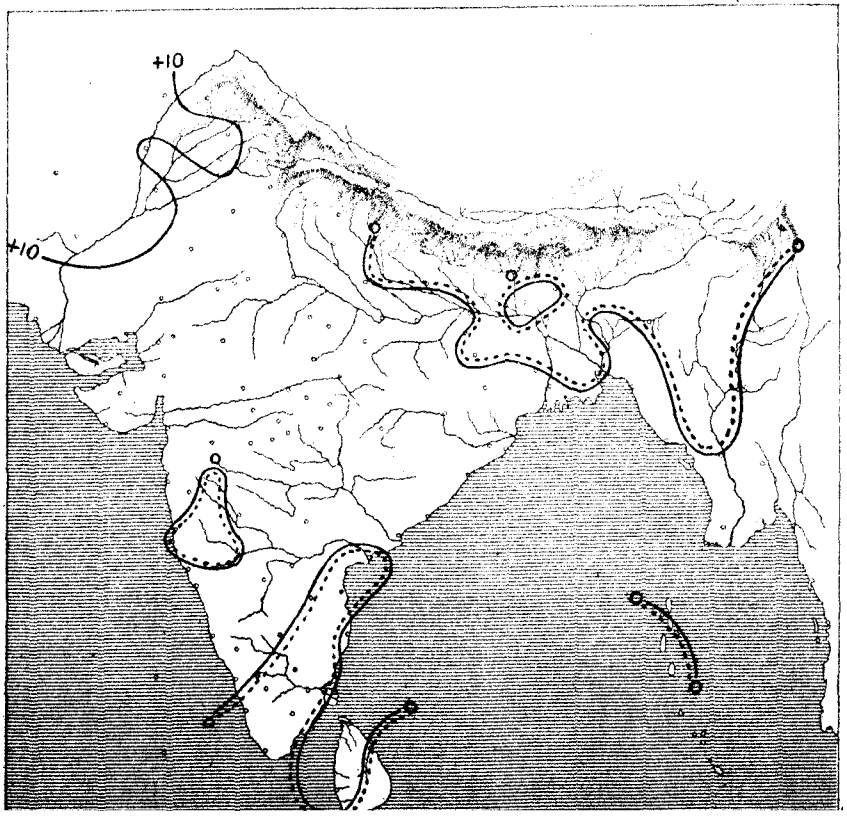


CHART SHEWING THE DEPARTURE FROM NORMAL
OF THE MONTHLY MEAN OF CLOUD
AMOUNT AT 8 HRS.

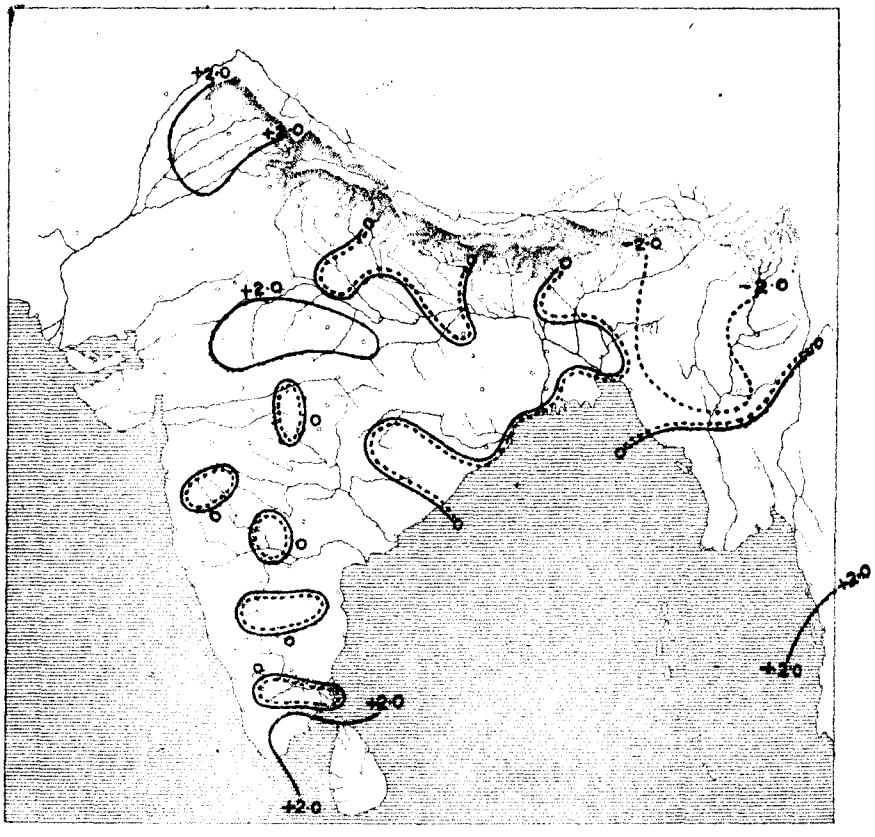
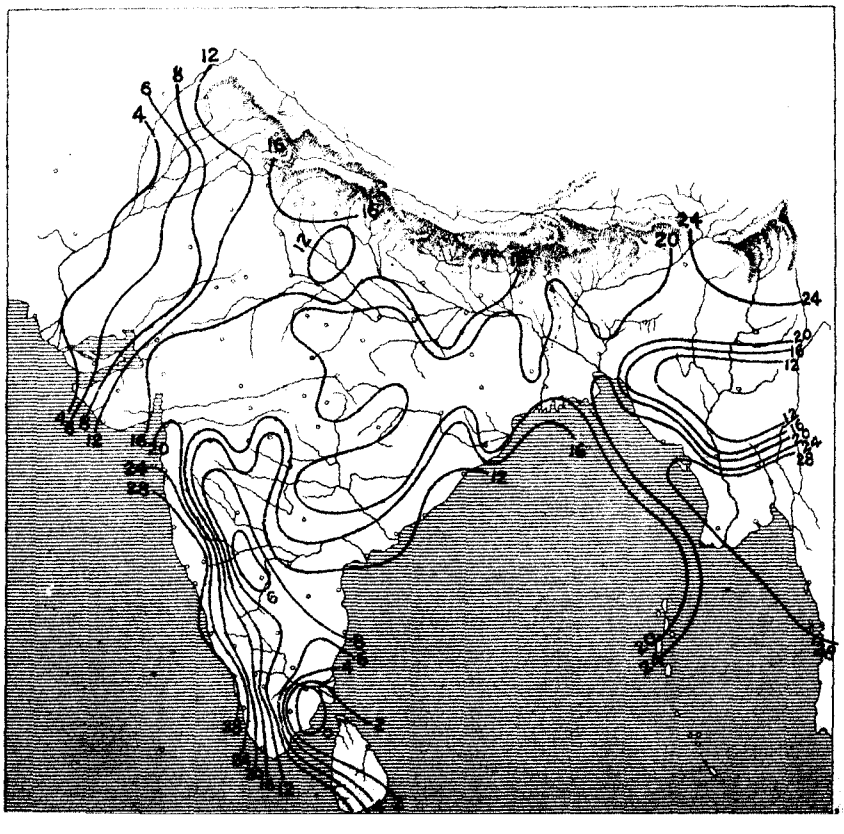
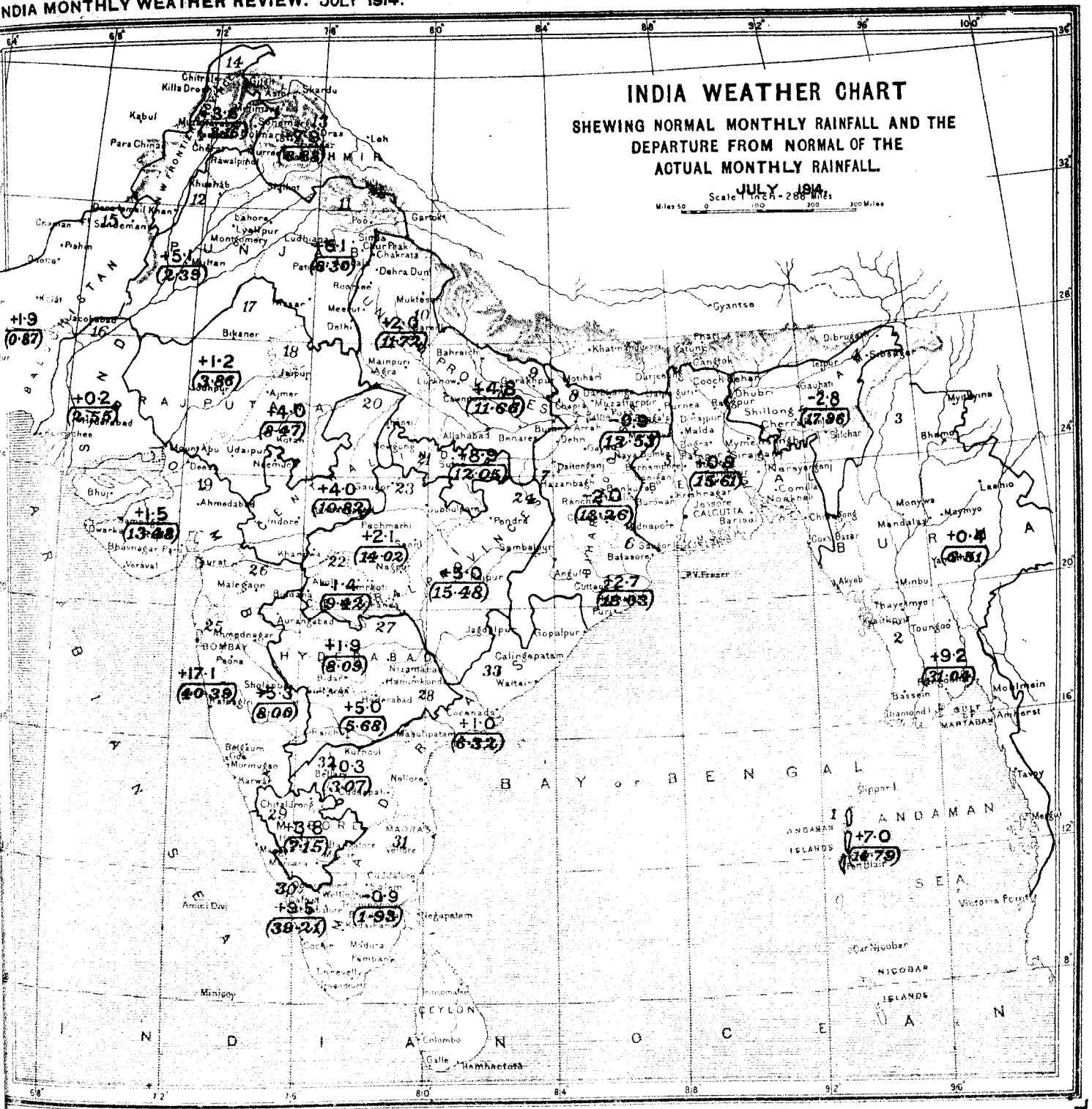


CHART SHEWING THE TOTAL NUMBER OF DAYS IN THE
MONTH ON WHICH RAINFALL EQUALLED OR
EXCEEDED 0·10 INCH.
(BASED ON THE RETURNS OF TABLE B.)





The country is divided into 33 areas as shewn in the list below. The numbers in that list correspond with the red numbers on the chart, and serve to identify the areas. The numbers in brackets on the chart give the average over the divisions of the normal monthly rainfall, the numbers above these give the departures from normal of the average actual rainfall over the divisions.

1. Bay Islands
2. Lower Burma
3. Upper Burma
4. Assam
5. Bengal
6. Orissa
7. Chota Nagpur
8. Bihar
9. United Provinces, East
10. United Provinces, West
11. Punjab, East and North
12. Do., Southwest
13. Kashmir
14. Northwest Frontier Province
15. Baluchistan
16. Sind
17. Rajputana, West
18. Rajputana, East
19. Gujarat
20. Central India, West
21. Do., East
22. Berar
23. Central Provinces, West
24. Do., East
25. Konkan
26. Bombay, Deccan
27. Hyderabad, North
28. Hyderabad, South
29. Mysore
30. Malabar
31. Madras, Southeast.
32. Madras, Deccan
33. Madras Coast, North

GOVERNMENT OF INDIA.

METEOROLOGICAL DEPARTMENT.

MONTHLY WEATHER REVIEW

PUBLISHED BY ORDER OF

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CALCUTTA, AUGUST, 1914.

INTRODUCTION.

THIS review of the weather in India during the month of August, 1914, is based on observations taken daily at 8 hrs. at 219 stations, and on additional observations taken at 10 hrs. and 16 hrs. at 13 stations. In the rainfall summary have been utilized the data furnished by the meteorological observatories, and such rainfall statements of the month as had been published by the Provincial Governments up to the date of the preparation of the review. The brief notes on solar, magnetic and seismic disturbances are supplied by the chief observatories in the Indian area.

For a statement of the methods adopted in recording and tabulating the data, for each of the elements of observation, reference should be made to the introductory portion of the review for January.

Summary of the chief features of the weather in India during the month.

2. Notwithstanding the prevalence during the last week of an almost complete break in the region usually served by the Arabian Sea current the total quantity of rainfall produced during the month by the monsoon was only 3 per cent. in defect of the normal. The local distribution of rainfall was however not quite satisfactory, for in the region comprising the Punjab East and North, Baluchistan, Sind, Rajputana West, Gujarat and Central India West the amounts received were over 40 per cent. in defect of the normal.

Of climatic elements other than rainfall temperature and humidity were very nearly normal throughout the Indian region, while the quantity of cloud was decidedly low in Assam, the Punjab, Sind, Rajputana, Kashmir and Hyderabad.

Barometric pressure averaged over the plains was ·011″ below the average.

Solar, magnetic and seismic disturbances.

KODAIKANAL OBSERVATORY.

3. *Solar Observations.*—No observation of the sun could be made on two days during the month and on four other days prominences could not be recorded.

Sunspots.—Five new groups of spots were observed during the month of which all except one were small. The daily average number was 0·6 and the average life of a spot was 3·6 days.

One large spot of symmetrical outline (No. 2079) came round the east limb on the 13th and was visible until the 26th when it passed to the other side of the sun. The C line was observed reversed close to the spot on several days and on the 19th was brilliantly reversed over the umbra.

The distribution in latitude of the spots was as follows :—

TABLE 1.

—	0—10	11—20	21—30	Mean latitude.	Extreme latitude.
North . . .	...	2	...	18·0°	17° & 19°
South . . .	1	1	1	16·3°	10° & 22°

Prominences.—Fifty-one large and three eruptive prominences were observed during the month. The greatest height attained was 125″ and was recorded on the 9th at Latitude — 47 E and on the 16th at Latitude + 18 E.

Magnetic Disturbances.—Moderate disturbances were recorded from the 1st to 4th, on the 23rd and from 28th to 29th. The disturbances at the beginning and near the end of the month appear to be " recurrences " of the " Great " disturbances of the 5th to 6th July separated by intervals of a synodic rotation of the sun.

J. EVERSHED,

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Kodaikanal and Madras Observatories.

Seismic records.

$\phi = 10° 13' 50''$; $\lambda = 77° 28' 00''$; $h = 2343$ m. *Subsoil* Rock.

Apparatus.—Milne's Horizontal Pendulum Seismograph.

TABLE 2.

	V	To	ϵ	$\frac{r}{To^2}$
AN:				
AE:	9·76	16·8	1	2·9
AZ:				

Date.	Phase.	Time G. M. T.	Period (Sec.)	Amplitude (u). AN.	AE.	AZ.	Distance △ (Km.)	Remarks.
1914.		h. m. s.						
August 4th	e P	4 28 18	...	...	...	...	...	
	e L	4 30 6	...	...	...	...	...	
	M	4 32 6	...	...	70	...	...	
	F	4 38 18	...	...	...	...	...	
„ 4th	e P	22 53 48	...	...	...	...	...	
	e L	22 54 36	...	...	...	...	...	
	M	23 01 18	...	...	1300	...	...	
	F	0 58 42	...	...	...	...	...	
„ 5th	e P	10 53 48	...	...	...	...	...	
	e L	10 54 36	...	...	...	...	...	
	M	10 56 6	...	...	70	...	...	
	F	11 14 36	...	...	...	...	...	
„ 6th	e P	4 14 54	...	...	...	...	...	
	L	?	...	...	...	...	...	
	M	?	...	...	?	...	...	Instrument examined at 4-16.

Date.	Phase.	Time G. M. T.	Period (Sec.)	Amplitude (u). AN.	AE.	AZ.	Distance △ (Km.)	Remarks.
1914.		h. m. s.						
August 6th	F	5 4 24	...	...	...	...	...	
„ 16th to 17th	e P	23 35 54	...	...	...	...	...	Widening of line.
	L	...	...	...	...	...	...	
	M	...	...	...	...	...	...	
	F	0 20 12	...	...	...	...	...	
„ 28th	e P	6 42 0	...	...	...	...	...	
	e L	6 44 42	...	...	...	...	...	
	M	6 53 24	...	...	40	...	...	
	F	7 18 36	...	...	...	...	...	

T. ROYDS,

Assistant Director,

Kodaikanal and Madras Observatories.

BOMBAY OBSERVATORY.

Alibag magnetic record.

4. During the month of August 1914 the traces showed 8 calm days and 23 days of small disturbance.

The days of the month selected as quiet for the purposes of the Magnetic Survey of India are the 5th, 10th, 14th, 22nd and 27th.

The following table represents the magnetic character of each day during the month.

TABLE 3.

Day.	Character.	Day.	Character.	Day.	Character.	Day.	Character
1	S	9	C	17	C	25	S
2	S	10	C	18	S	26	S
3	S	11	S	19	S	27	C
4	S	12	S	20	S	28	S
5	C	13	S	21	S	29	S
6	S	14	C	22	C	30	S
7	S	15	S	23	S	31	S
8	S	16	C	24	S	...	...

C = calm; S = small; M = moderate; G = great; V. G. = very great.

The mean observed absolute values of the several magnet elements reduced to the mean monthly tabulations of th magnetograms, as also the ranges and the summed ranges (the horizontal force and declination for the month, are s follow :—

Easterly declination	0° 43′ 51″
Horizontal force	0·36878 C.G.S. unit.
Vertical force	0·16588 „ „
Inclination	24° 13′·1
Horizontal force range	0·00037 C.G.S. unit.
Horizontal force summed range	0·00247 „ „
Declination range	5′·2
Declination summed range	21′·6

(NOTE.—Summed range means sum without regard to sign of the 24 ordinates diurnal inequality.)

Seismic records.

$\phi = 18° 53' 36''$; $\lambda = 72° 48' 56''$; $h = 11$ m. *Subsoil* Trap.

Apparatus.—Milne's Horizontal Pendulum Seismograph.

TABLE 4.

	V	To	ϵ	$\frac{r}{To^2}$
AN:				
AE:	9	21	1	
AZ:				

Date.	Phase.	Time, G. M. T.	Period (Sec.)	Amplitude (u) An.	Ae.	Az.	Distance △ (Km.)	Remarks.
		h. m. s.						
1914 Aug. 4-5th	P	22 48 0	...	...	...	...	...	
	M	22 58 11	...	...	722	...	...	
	F	0 54 56	...	...	...	...	...	
„ 5th	P	10 52 31	...	...	...	...	...	
	M	10 52 49	...	...	56	...	...	
	F	11 6 56	...	...	...	...	...	
„ 6th	P	...	...	...	...	...	...	Beginning mixed in tremors.
	M	4 35 52	...	...	56	...	...	
	F	5 3 5	...	...	...	...	...	
„ 28th	P	9 39 7	...	...	...	...	...	
	M	9 48 29	...	...	67	...	...	
	F	10 9 9	...	...	...	...	...	

Thickening of line was noted on the following occasions:—

D. H. M. D. H. M. D. H. M. D. H. M. D. H. M.
1 7 0; 1 22 18; 2 23 39; 9 19 34; 12 2 29;
24 3 54 to 57; 26 6 33; 27 13 34; 27 19 13; 31 11 52.

Sensibility to tilt 1·0 mm. of amplitude on the trace = 0·29″.

N. A. F. MOOS,
Director,
Bombay and Alibag Observatories.

5. CALCUTTA (ALIPORE) OBSERVATORY.

Seismic records.

$\phi = 22° 32'$; $\lambda = 88° 21'$ E; $h = 6·4$ m. *Subsoil* Alluvial.

Apparatus.—Milne's Horizontal Pendulum Seismograph.

TABLE 5.

	V	To	ϵ	$\frac{r}{To^2}$
AN:				
AE:	8·688	18	1	
AZ:				

Date.	Phase.	Time, G. M. T.	Period (Sec.)	Amplitude (u). An.	Ae.	Az.	Distance △ (Km.)	Remarks.
		h. m. s.						
1914. August 4th	i	20 46 26	...	...	...	...	...	
	L	22 48 54	...	...	...	...	...	
	M	22 52 28	...	...	?†	...	...	† As the boom moved throughout the trace max: amplitude cannot be measured.
	C	22 57 2	...	...	...	...	...	
	F*	—	...	...	...	...	...	* Ends in morning air tremor.
„ 5th	P	10 44 25	...	...	...	...	...	
	L	10 47 28	...	...	...	...	...	
	M	10 47 59	...	...	288	...	...	
	F	11 27 7	...	...	...	...	...	
„ 6th	P	4 21 30	...	...	...	...	...	
	L	4 22 31	...	...	...	...	...	
	M	4 30 9	...	...	115	...	...	
	F	5 5 42	...	...	...	...	...	
„ 28th	P	9 47 47	...	...	...	...	...	
	M	10 0 29	...	...	57	...	...	
	F	10 59 58	...	...	...	...	...	

E. P. HARRISON,
Offg. Meteorologist, Calcutta.

6. SIMLA OBSERVATORY.

The Simla seismograph notes will appear in a future number of the Monthly Weather Review.

The following table contains a list of earthquakes that were reported :—

TABLE 6.

Place at which felt.	Date.	G. M. T. of earthquake.	Duration.	Intensity Rossi-Forel scale.	No. of shocks.
	August.	h. m.	Sec.		
Drosh ...	2nd	11 25	15	6	1
Diamond Island	5th	0 58	3	4	2
Drosh	15th	8 55	10	6	1

Solar radiation.—No observations with the Angstrom's pyrheliometer were possible during the month owing to overcast skies.

C. W. NORMAND,
Imperial Meteorologist, Simla.

ROYAL ALFRED OBSERVATORY, MAURITIUS.

7. No information has been received.

Weather in the Indian Ocean.

8. In the equatorial belt, as represented by Zanzibar and Seychelles, conditions were on the whole normal.

TABLE 7.

—	Mauritius.	Zanzibar.	Seychelles.
Departure from normal of mean pressure		+·002	+·007
Actual mean wind direction		S 5°W	S 41° E
Normal mean wind direction		S 1° W	S 35° E
Actual mean wind velocity (miles per diem.)		108	250
Normal mean wind velocity (miles per diem.)		120	231
Rainfall departure from normal		+1·93	—1·83

Depressions and cyclonic storms.

9. Two depressions affected the weather during the month, one of which was formed in north-east India and the other in the Bay of Bengal. The former appeared over Chota Nagpur on the 4th and after remaining stationary for 24 hours developed a westerly movement. It practically disappeared in the east of Central India on the 8th. Throughout its existence it was feebly marked and exercised no great influence on the weather. The depression in the Bay of Bengal was generated off the Sandheads on the 22nd, it crossed inland near Balasore on the 24th, and then drifted northwards and disappeared over Bihar on the 28th. It was a mere wave of low pressure, but was noteworthy for the heavy downpours of rain which it gave to Bihar.

TABLE 8.

District.	Station.	Rainfall in 24 hrs. preceding 8 A.M. of date. 27th.	28th.	29th.	Total of period.
		"	"	"	"
Darbhanga	Roserha	6·01	7·06	9·55	22·62
Monghyr	Begusarai	9·20	8·50	7·20	24·90
	Monghyr	8·24	8·15	8·35	24·74
	Jamalpur	5·24	0·91	14·59	20·74
	Kharagpur	5·74	11·92	5·50	23·16

Pressure.

10. Barometric pressure was on the mean of the month slightly above the normal in the Bay Islands, the eastern half of Burma and the greater part of the Peninsula, and was in defect in the rest of the country. The deficiency was greatest in amount in the North-West Frontier Province and along the foot of the Himalayas, and as a result of this the trough of low pressure over northern India lay considerably further north than usual.

TABLE 9.

DIVISION.	Departure from normal of mean 8 hrs. pressure.
	"
Burma	−·005
Assam	−·027
Bengal	−·023
Bihar and Orissa	−·021
United Provinces	−·020
Punjab	−·022
North-West Frontier Province	−·039
Sind	−·011
Rajputana	−·001
Bombay	0
Central India	−·007
Central Provinces	+·001
Hyderabad	+·003
Mysore	+·009
Madras	+·006

The vertical gradient was weaker than usual in north-west India, and was above its normal value in the Peninsula.

TABLE 10.

HILL STATION.	Departure from normal pressure. A	PLAIN STATION.	Departure from normal pressure. B	Departure of pressure difference. B—A
	"		"	"
Quetta	0	Jacobabad	−·028	−·028
Leh	−·002	Lahore	−·026	−·024
Murree	−·016	Peshawar	−·036	−·020
Simla	−·006	Ludhiana	−·019	−·013
Chakrata	−·003	Roorkee	−·023	−·020
Mount Abu	+·001	Deesa	+·009	+·008
Pachmarhi	−·003	Khandwa	+·013	+·016
Kodaikanal	+·007	Madura	+·025	+·018

Temperature.

11. There was a defect of about 3° in the day temperature in Upper Burma and the Punjab South-west, and of 2° in the night temperature in Kashmir, but in all other sub-divisions the monthly values of both day and night temperature lay within 1½° of the normal.

TABLE 11.

SUB-DIVISION.	ACTUAL TEMPERATURE.					DEPARTURE FROM NORMAL OF		
	Mean maximum.	Mean minimum.	Monthly mean of mean between maximum and minimum.	Mean daily range of temperature.	Absolute range during month.	Maximum.	Minimum.	Daily range.
	°	°	°	°	°	°	°	°
1. Bay Islands	83·3	75·9	79·6	7·5	14·7	—1·2	—1·3	+0·1
2. Lower Burma	83·8	75·0	79·4	8·9	16·8	—0·6	0	—0·6
3. Upper Burma	87·0	75·4	81·2	11·6	21·0	—2·5	—0·1	—2·4
4. Assam	87·6	77·0	82·3	10·6	18·8	—1·2	+0·1	—1·3
5. Bengal	87·6	78·7	83·1	8·9	16·6	+0·3	+0·3	0
6. Orissa	87·8	78·0	82·9	9·8	19·9	—0·3	0	—0·3
7. Chota Nagpur	88·9	76·3	82·7	12·6	23·2	+0·9	+0·6	+0·3
8. Bihar	88·5	78·2	83·3	10·3	18·9	—0·6	—0·4	—0·2
9. United Provinces, East	89·5	78·5	84·0	11·0	20·4	—0·4	0	—0·4
10. Do., West	90·8	77·8	84·3	13·0	22·3	+0·5	0	+0·5
11. Punjab, East and North	94·7	77·6	86·1	17·1	30·1	+0·3	—0·7	+1·0
12. Do., South-west	97·9	79·7	88·8	18·2	32·9	—2·9	—0·8	—2·1
13. Kashmir	81·4	57·9	69·6	23·6	39·6	—1·3	—2·2	+0·9
14. North-West Frontier Province	98·8	79·1	88·9	19·7	34·2	—1·3	—0·3	—1·0
15. Baluchistan	97·3	69·3	83·3	28·0	38·3	+1·1	—1·2	+2·3
16. Sind	96·2	80·7	88·4	15·5	23·8	+1·6	+1·6	0
17. Rajputana, West	95·7	78·0	86·8	17·7	31·8	+2·2	—1·2	+3·4
18. Do., East	89·4	76·3	82·8	13·1	26·0	—1·1	—0·7	—0·4
19. Gujarat	88·7	76·7	82·7	12·0	18·8	+0·5	0	+0·5
20. Central India, West	84·6	72·5	78·5	12·1	22·8	+0·7	+0·5	+0·2
21. Do., East	86·8	77·0	81·9	9·8	18·7	—0·1	+0·7	—0·8
22. Berar	84·9	72·3	78·6	12·6	21·9	—0·3	+0·4	—0·7
23. Central Provinces, West	85·0	73·6	79·3	11·3	21·8	+0·1	+0·1	0
24. Do., East	85·0	74·0	79·5	11·0	20·5	+0·1	+0·2	—0·1
25. Konkan	82·5	75·4	78·9	7·1	12·5	—0·9	—0·3	—0·6
26. Bombay Deccan	83·4	69·5	76·5	13·9	21·9	—0·7	+0·1	—0·8
27. Hyderabad, North	84·9	70·7	77·9	14·2	21·6	+0·1	+0·3	—0·2
28. Do., South	86·4	72·4	79·4	14·0	22·4	—1·3	—0·1	—1·2
29. Mysore	80·2	66·5	73·4	13·7	21·0	—1·3	+0·4	—1·7
30. Malabar	82·3	74·3	78·2	8·0	14·1	—0·8	+0·7	—1·5
31. Madras, South-east	93·0	76·2	84·6	16·7	25·1	—0·5	+0·5	—1·0
32. Do., Deccan	90·1	74·4	82·3	15·7	24·9	—1·4	—0·3	—1·1
33. Do. Coast, North	89·9	77·9	83·9	12·0	23·1	—0·7	—0·8	+0·1

TABLE 12.

Division.	Departure from normal of		
	Mean maximum temperature.	Mean minimum temperature.	Mean temperature.
	°	°	°
Burma	−1·4	0	−0·7
Assam	−1·2	+0·1	−0·5
Bengal	+0·3	+0·3	+0·3
Bihar and Orissa	−0·2	−0·1	−0·1
United Provinces	0	0	0
Punjab	−1·1	−0·7	−0·9
North-West Frontier Province	−1·3	−0·3	−0·8
Sind	+1·6	+1·6	+1·6
Rajputana	−0·3	−0·8	−0·6
Bombay	−0·2	0	−0·1
Central India	+0·3	+0·6	+0·5
Central Provinces	+0·1	+0·2	+0·1
Hyderabad	−0·9	0	−0·5
Mysore	−1·3	+0·4	−0·5
Madras	−0·7	+0·1	−0·3

Winds.

12 (*a*). The rate of air movement was appreciably higher than usual in Rajputana and Mysore, and was below the average in Bengal, the United Provinces, the North-West Frontier Province, Bombay, Central India and Hyderabad.

(*b*) The steadiness was low in Bengal, and high in Assam, Bihar and Orissa, Sind and Mysore.

(*c*) The mean direction of wind was somewhat more southerly or less easterly than usual over Bengal, and contained an undue westerly component at Benares, Cawnpore, Mainpuri, Roorkee, Ludhiana and Lahore; these deflections were apparently related to the abnormal position of the monsoon trough of low pressure referred to in the section on "Pressure."

TABLE 13.

Division.	Departure from normal of	
	Hourly wind velocity.	Wind steadiness.
Burma	+0·4	+2
Assam	−0·3	+7
Bengal	−0·9	−7
Bihar and Orissa	0	+8
United Provinces	−0·4	+2
Punjab	−0·1	−3
North-West Frontier Province	−0·7	−3
Sind	−0·6	+8
Rajputana	+1·1	+1
Bombay	−1·3	0
Central India	−1·2	+4
Central Provinces	−0·2	+3
Hyderabad	−1·0	+1
Mysore	+0·9	+8
Madras	+0·4	−4

Humidity and cloud.

13. In general the hygrometric conditions of the month did not depart to any great extent from the normal.

There was considerably less cloud than usual in North-west India (excluding the North-West Frontier Province), but elsewhere the departures from the average were feebly marked.

TABLE 14.

DIVISION.	HYGROMETRY; 8 HRS.				CLOUD.	
	Mean humidity.	Departure from normal.	Mean vapour tension in inches of mercury.	Departure from normal in inches of mercury.	Mean cloud amount at 8 hrs.	Departure from normal.
	%					
Burma . .	90	+1	·867	—·007	8·2	+0·1
Assam . .	92	0	·930	0	7·2	—2·1
Bengal . .	89	—1	·961	+·003	7·8	—0·2
Bihar and Orissa .	88	+1	·931	+·003	7·2	—0·2
United Provinces .	85	—1	·929	—·003	6·6	—0·5
Punjab . .	74	—2	·860	—·014	3·1	—(
North-West Frontier Province.	73	+1	·869	—·012	2·6	—0
Sind . . .	74	—2	·876	+·031	3·2	—1
Rajputana . .	73	—2	·770	—·055	5·2	—1
Bombay . .	84	0	·813	+·006	7·7	(
Central India .	87	0	·820	—·004	7·9	+(
Central Provinces	86	—1	·788	—·004	7·2	—(
Hyderabad . .	82	+2	·722	0	7·3	—(
Mysore . .	85	+3	·635	+·005	8·1	—(
Madras . .	79	+1	·808	—·009	6·9	+(

Rainfall.

14. The monsoon, as measured by the total quantity of rainfall in the plains of India, was up to its average strength, but its activity was displayed largely in Lower Burma, Bihar and the Peninsula to the detriment of the greater part of Northern and Central India. One of the most noteworthy features of the meteorology of the month was a large decrease in the activity of the Arabian Sea current and the consequent prevalence of an almost complete break over its field during the last eight days.

No cyclonic storms were recorded during the month, but the excessive rainfall in Bihar, which occurred chiefly from the 26th to the 28th, was produced by a shallow low pressure area from the Bay.

The aggregate rainfall of the month was within 20 cent. of the normal in the Bay Islands, Burma, Assa Bengal, Orissa, Chota Nagpur, United Provinces E Punjab South-west, North-West Frontier Province, Cen India East, Central Provinces, Hyderabad North, Mys Madras South-east and Madras Coast North; was in excess 31 per cent. in Hyderabad South, 28 per cent. in the Kon and Madras Deccan, 52 per cent. in the Bombay Dec and 48 per cent. in Bihar; and was in defect by 20 per c or over in the rest of the country. The deficiency was la *i.e.*, upwards of 50 per cent., in Baluchistan, Sind Gujarat.

TABLE 1

SUB-DIVISION.	NUMBER OF RAINY DAYS.		RAINFALL.			
	Actual.	Normal.	Actual.	Normal.	Departure from normal.	Percenta departu from nor
			"	"	"	
1. Bay Islands	24·0	18·1	16·19	13·83	+2·36	+17
2. Lower Burma	25·2	24·0	31·86	27·94	+3·92	+14
3. Upper Burma	10·3	10·9	6·98	7·38	—0·40	— 5
4. Assam	19·6	17·9	18·26	16·84	+1·42	+ 8
5. Bengal	15·9	16·6	13·88	14·39	—0·51	— 4
6. Orissa	14·4	15·6	10·72	12·72	—2·00	—16
7. Chota Nagpur	14·5	17·1	12·58	13·65	—1·07	— 8
8. Bihar	14·3	13·9	18·12	12·28	+5·84	+48

Sub-division.	Number of rainy days.		Rainfall.			
	Actual.	Normal.	Actual.	Normal.	Departure from normal.	Percentage departure from normal.
			"	"	"	
9. United Provinces, East	12·8	12·6	12·62	11·36	+1·26	+ 11
10. Do., West	10·0	11·7	8·60	11·68	—3·08	— 26
11. Punjab, East and North	4·5	6·8	3·68	6·56	—2·88	— 44
12. Punjab, South-West	2·9	2·8	2·36	2·32	+0·04	+ 2
13. Kashmir	5·9	8·5	6·15	8·60	—2·45	— 28
14. North-West Frontier Province	3·5	4·2	3·58	3·28	+0·30	+ 9
15. Baluchistan	0·5	1·1	0·29	0·66	—0·37	— 56
16. Sind	0·1	2·1	0·03	1·77	—1·74	— 98
17. Rajputana, West	3·4	5·7	2·38	4·51	—2·13	— 47
18. Do., East	6·5	9·5	4·78	7·88	—3·10	— 39
19. Gujarat	7·6	11·0	4·14	8·48	—4·34	— 51
20. Central India, West	9·0	12·4	5·57	10·07	—4·50	— 45
21. Do., East	11·5	12·8	9·72	12·00	—2·28	— 19
22. Berar	9·8	10·6	7·00	7·27	—0·27	— 4
23. Central Provinces, West	13·8	14·1	10·47	12·25	—1·78	— 15
24. Do., East	14·7	15·5	13·60	14·45	—0·85	— 6
25. Konkan	27·1	24·3	30·64	23·99	+6·65	+ 28
26. Bombay Deccan	10·6	9·7	8·53	5·61	+2·92	+ 52
27. Hyderabad, North	10·7	11·1	7·71	7·64	+0·07	+ 1
28. Do., South	13·0	10·3	8·50	6·50	+2·00	+ 31
29. Mysore	10·4	8·9	5·39	5·40	—0·01	0
30. Malabar	24·6	21·2	24·76	20·64	+4·12	+ 20
31. Madras, South-East	6·5	5·6	3·95	3·78	+0·17	+ 4
32. Do., Deccan	9·7	6·8	5·17	4·04	+1·13	+ 28
33. Do., Coast, North	11·4	10·2	7·78	6·97	+0·81	+ 12

TABLE 16.

Division.	Rainfall.			
	Actual.	Normal.	Departure from normal.	Percentage departure from normal.
	"	"	"	
Burma	16·73	15·43	+1·30	+ 8
Assam	18·26	16·84	+1·42	+ 8
Bengal	13·88	14·39	—0·51	— 4
Bihar and Orissa	14·86	12·73	+2·13	+17
United Provinces	10·70	11·51	—0·81	— 7
Punjab	3·35	5·52	—2·17	—39
North-West Frontier Province	3·58	3·28	+0·30	+ 9

Division.	Rainfall.			
	Actual.	Normal.	Departure from normal.	Percentage departure from normal.
	"	"	"	
Sind	0·03	1·77	—1·74	—98
Rajputana	4·05	6·86	—2·81	—41
Bombay	11·08	9·83	+1·25	+13
Central India	7·41	11·04	—3·63	—33
Central Provinces	10·71	11·71	—1·00	— 9
Hyderabad	8·11	7·02	+1·09	+16
Mysore	5·39	5·40	—0·01	0
Madras	7·11	6·28	+0·83	+13
Mean of India	9·68	9·93	—0·25	— 3

Snowfall.

I.—AFGHANISTAN.

15. No information has arrived.

II.—NORTH-WEST FRONTIER PROVINCE.

No information and probably no snow fell.

III.—KASHMIR.

Light snow fell on the 2nd, 3rd and 10th on the higher peaks of the Afferwata mountains, on the 4th on the higher elevations near Skardu, and on the 5th on the mountains around Kargil. By the end of the month all the hills around Kargil had become bare of snow.

IV.—PUNJAB.

Light snowfall occurred on the 4th and 5th on the ranges near Kilba; the fall on the 4th descended to 10,000 feet, while that of the 5th did not extend below 17,500 feet.

V.—UNITED PROVINCES.

In Almora the aggregate fall of the month was estimated at 7 feet in Malla Johar, about 6 feet in Byans, 4 feet in Malla Darma, 3 feet in Chaudas and 4 inches in Malla Danpur.

TABLE 17.

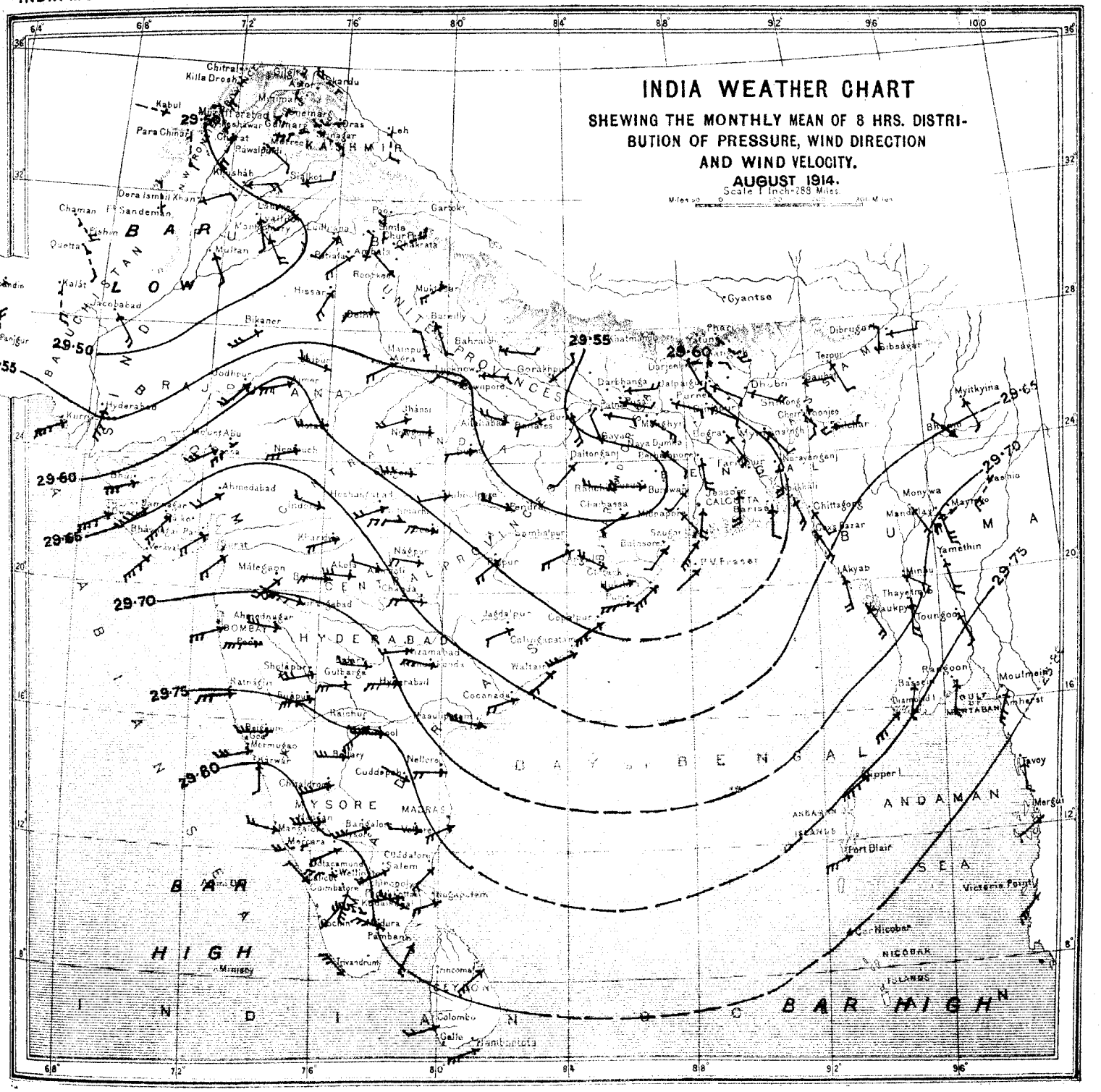
Name of pass or peak.		DEPTH OF ACCUMULATION AT THE END OF THE MONTH.	
		Reported.	Normal.
		Feet.	Feet.
Nuwe	Pass	11	17
Pindari	Peak	½	½
Kaphini	„	½	½
Kuntela	„	½	½
Untadhura		7	6
Balamdhura		1	4
Lipulekh	Pass	4½	3½
Lampia	„	7½	7½
Binkaru	„	6	12

The snowline descended to a distance of about 2½ mil below the perpetual snows in Malla Darma and ¾ mile bel in Chaudas.

SUMMARY.

16. There was no heavy or general snowfall, and t snowfall conditions of the month were therefore by no mea abnormal in character.

HEM RAJ.



The lines of the above chart represent isobars or lines of equal barometric pressure, the numbers attached indicating the barometric pressure in inches and being drawn for differences of pressure of ·05 inch. The isobars in the Bay of Bengal are filled in by means of the shore observations, and by comparison with the normal distribution of pressure.

The mean 8 hrs. wind directions of the month are shewn by means of arrows flying with the wind, and are calculated by means of Lambert's formula applied to the winds as given in Table B of the 8 hrs. observations. The mean wind directions for the hill stations are indicated by broken arrows to distinguish them from the wind arrows for the plain stations. The mean velocity of the winds during the month is shewn by the following notation:—

Velocity of	0 to 2	miles	per	hour	...	one	feather	added	to	the	wind	arrow.
,, ,,	2 to 5	,,	,,	,,	...	two	feathers	,,	,,	,,	,,	
,, ,,	5 to 10	,,	,,	,,	...	three	,,	,,	,,	,,	,,	
,, ,,	10 to 20	,,	,,	,,	...	four	,,	,,	,,	,,	,,	
	over 20	,,	,,	,,	...	five	,,	,,	,,	,,	,,	

Wind strengths are based on factor 2·2 for the standard type of Beckley Robinson anemograph, instead of 3·0 as used for this plate

The chart shows the departure from normal of the mean during the month of 8 hrs. pressure by means of lines drawn for equal amounts of departure. The numbers are given in thousandths of an inch, 20 representing ·020″ or two hundredths of an inch, &c. Continuous lines indicate that the pressure was in excess by amounts indicated by the numbers attached to the lines, and broken or dotted lines that it was in defect by amounts indicated by the numbers attached to the lines. Two parallel lines near to each other, one continuous and the other broken or dotted, represent the line of no departure, the dotted line facing the area of deficient pressure or negative departures.

CHART SHEWING THE DEPARTURE FROM NORMAL
OF THE MONTHLY MEAN OF DAILY
MAXIMUM TEMPERATURE.

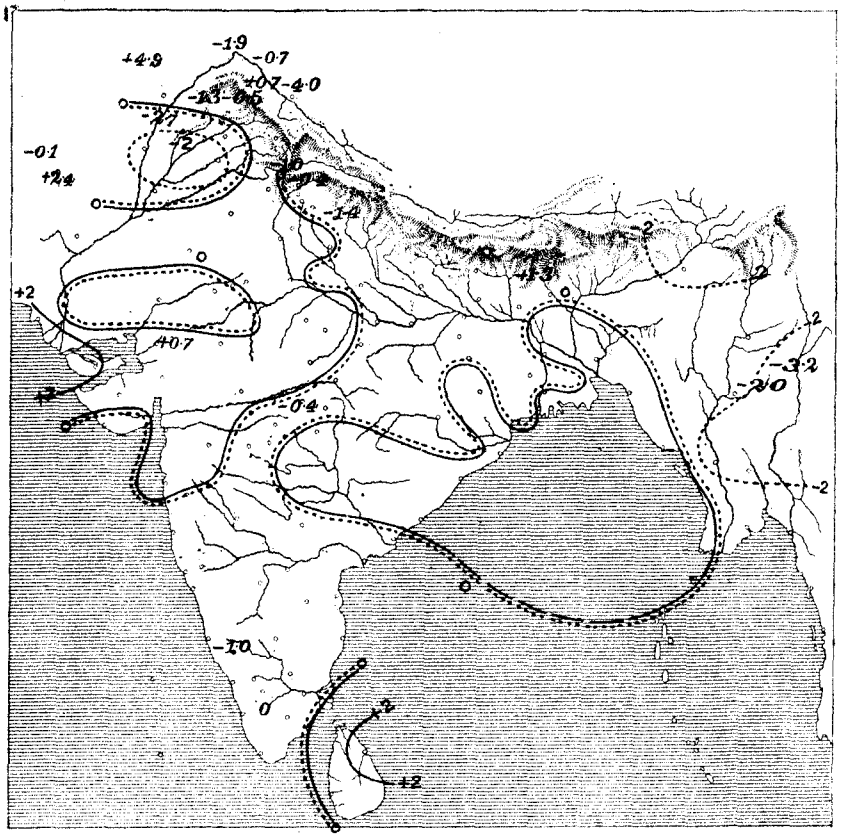


CHART SHEWING THE DEPARTURE FROM NORMAL
OF THE MONTHLY MEAN OF DAILY
MINIMUM TEMPERATURE.

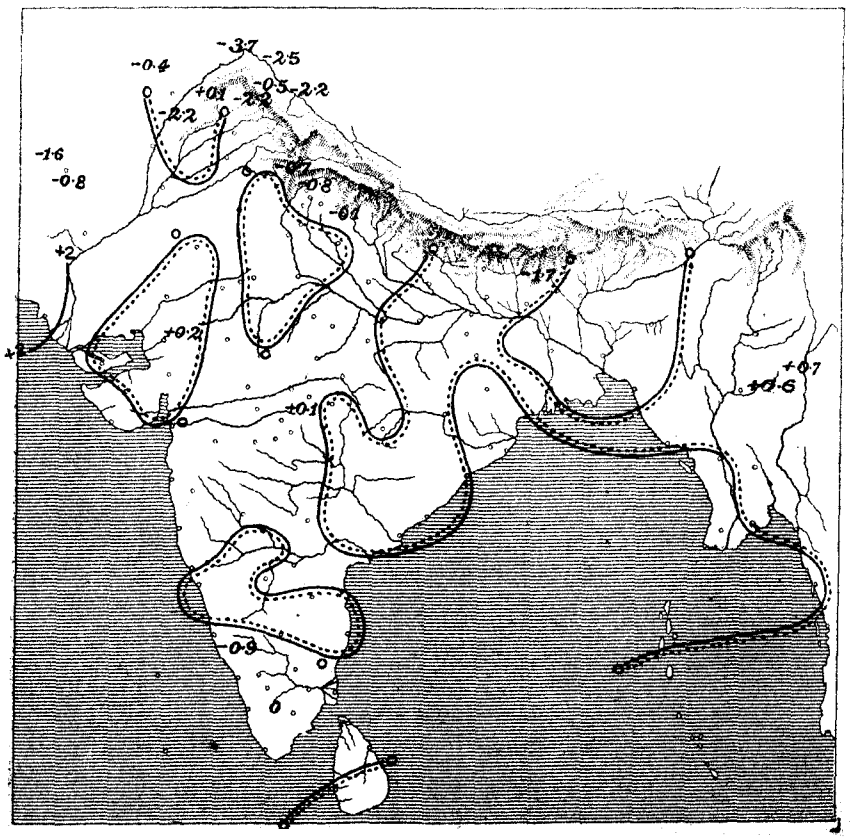


CHART SHEWING THE DEPARTURE FROM NORMAL
OF THE MONTHLY MEAN OF DAILY
MEAN TEMPERATURE.

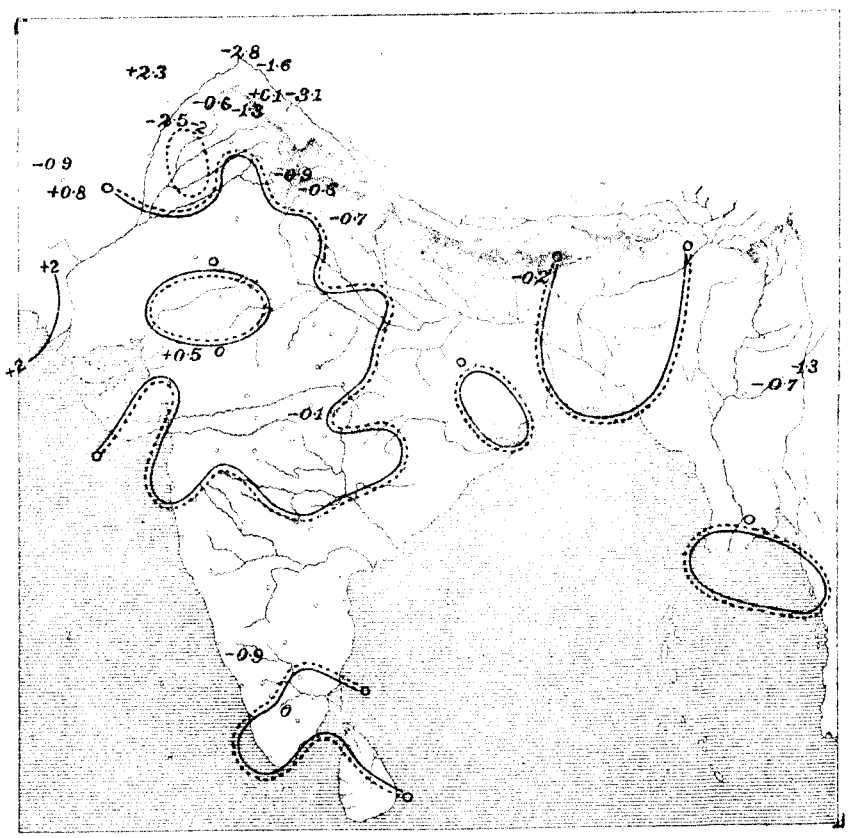


CHART SHEWING THE DEPARTURE FROM NORMAL
OF THE MONTHLY MEAN OF ABSOLUTE
HUMIDITY AT 8 HRS.

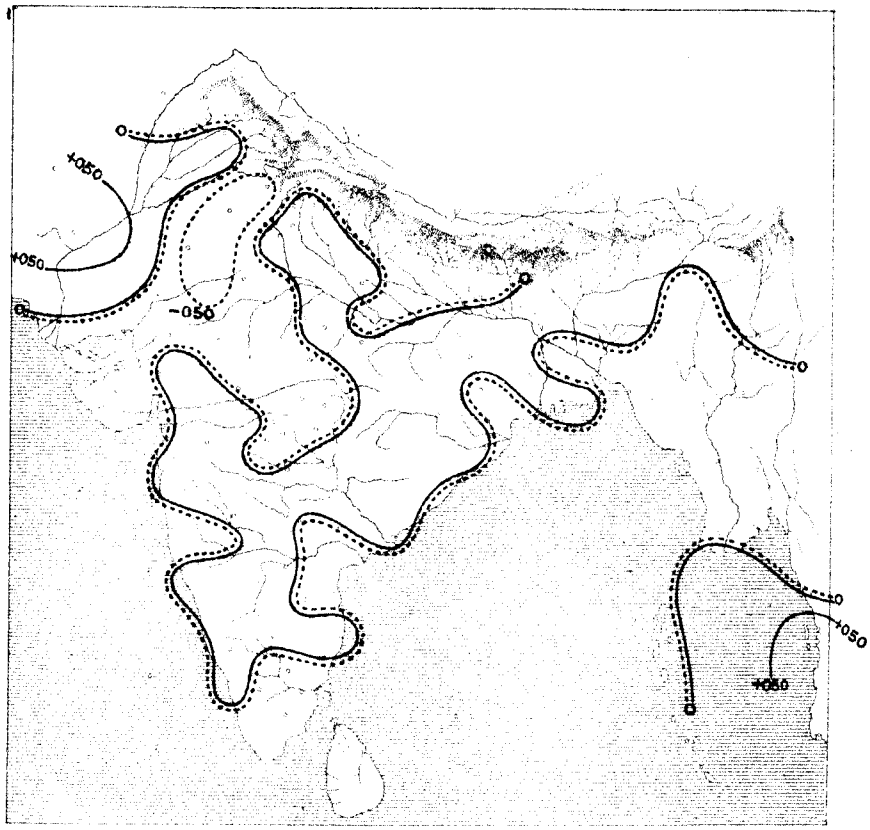


CHART SHEWING THE DEPARTURE FROM NORMAL
OF THE MONTHLY MEAN OF RELATIVE
HUMIDITY AT 8 HRS.

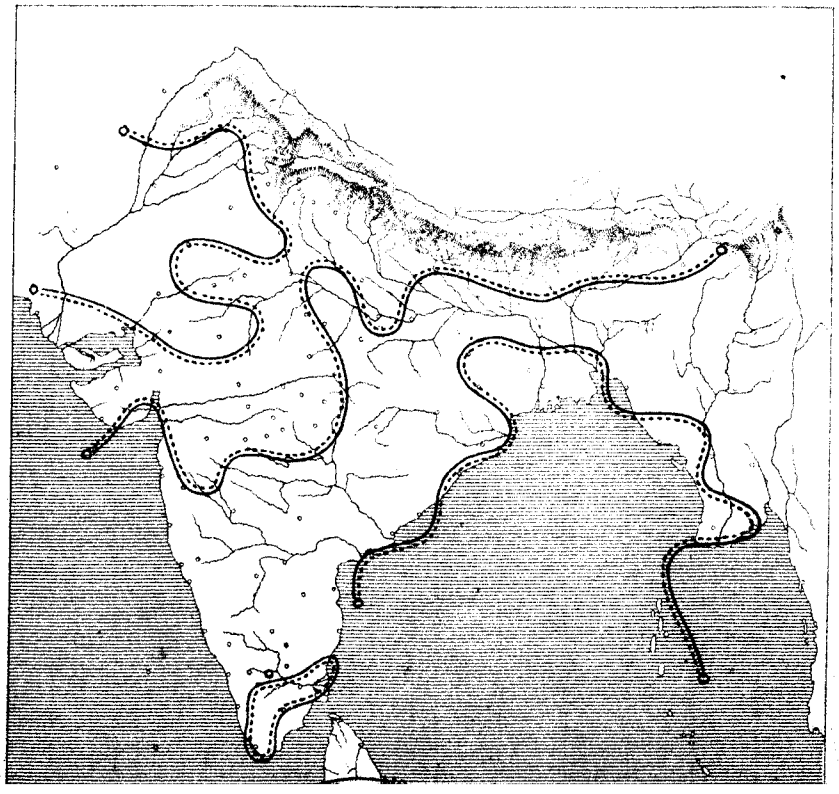


CHART SHEWING THE DEPARTURE FROM NORMAL OF THE MONTHLY MEAN OF CLOUD AMOUNT AT 8 HRS.

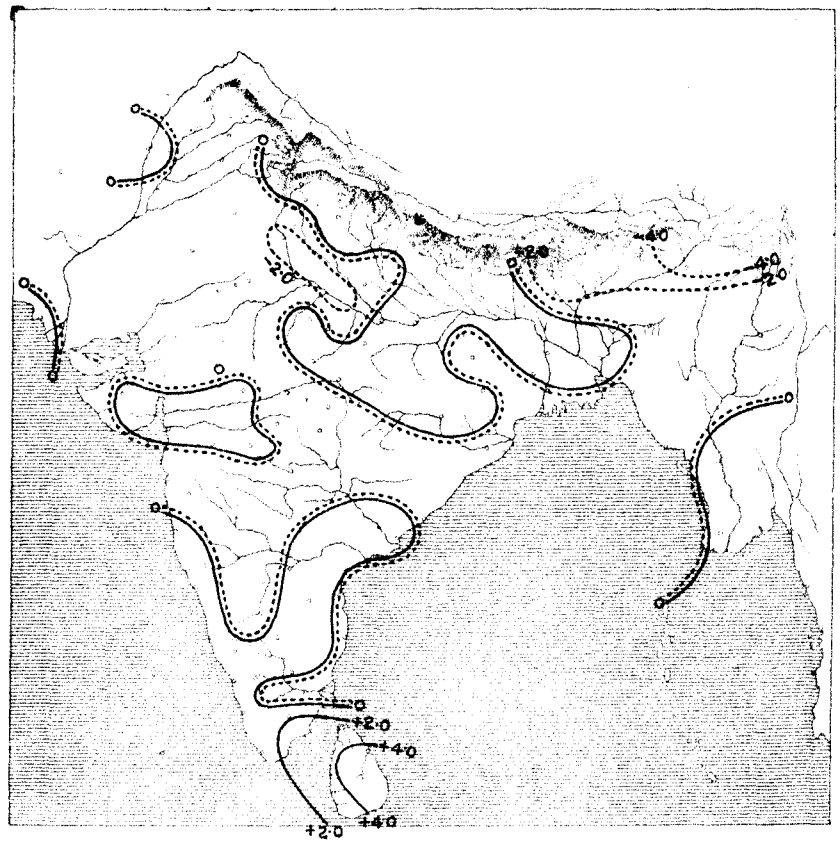
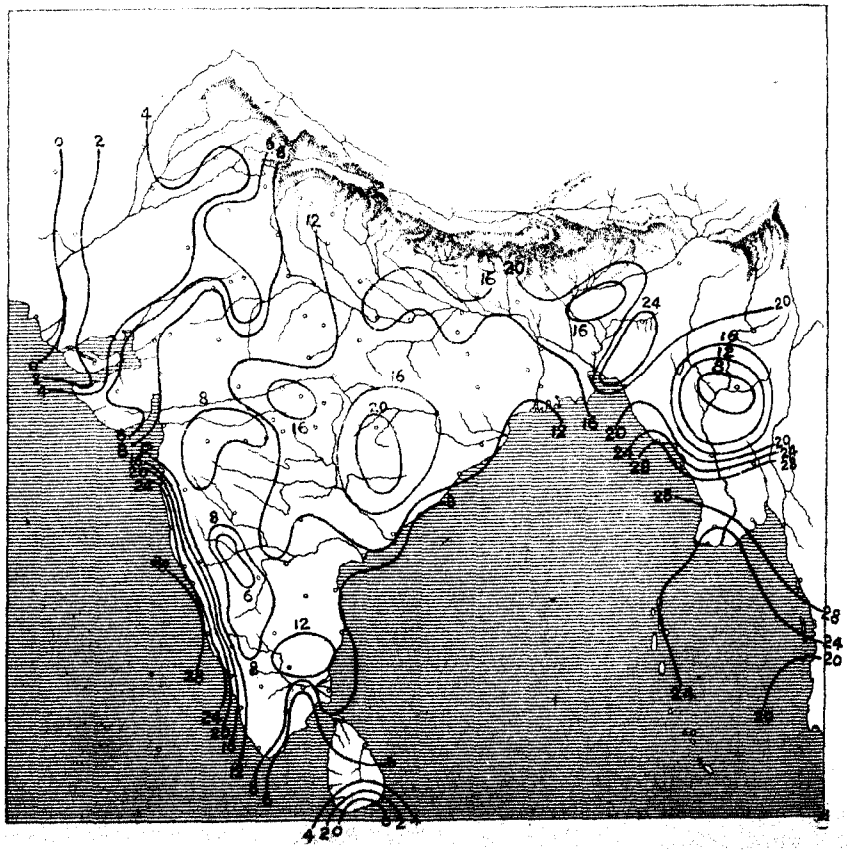
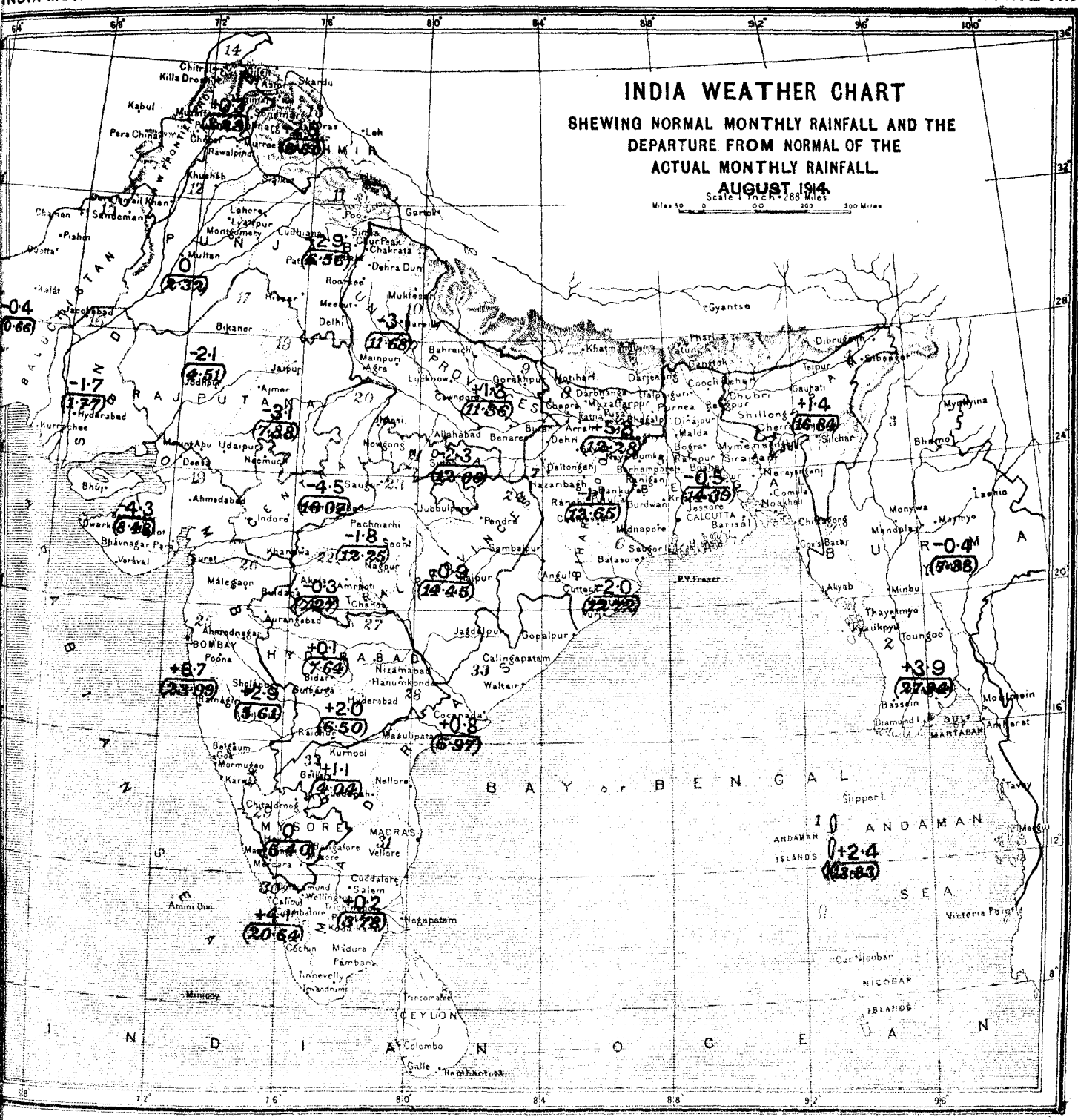


CHART SHEWING THE TOTAL NUMBER OF DAYS IN THE MONTH ON WHICH RAINFALL EQUALLED OR EXCEEDED 0·10 INCH.

(BASED ON THE RETURNS OF TABLE B.)





The country is divided into 33 areas as shewn in the list below. The numbers in that list correspond with the red numbers on the chart, and serve to identify the areas. The numbers in brackets on the chart give the average over the divisions of the normal monthly rainfall, the numbers above these give the departures from normal of the average actual rainfall over the divisions.

1. Bay Islands
2. Lower Burma
3. Upper Burma
4. Assam
5. Bengal
6. Orissa
7. Chota Nagpur
8. Bihar
9. United Provinces, East
10. United Provinces, West
11. Punjab, East and North
12. Do., Southwest
13. Kashmir
14. Northwest Frontier Province
15. Baluchistan
16. Sind
17. Rajputana, West
18. Rajputana, East
19. Gujarat
20. Central India, West
21. Do., East
22. Berar
23. Central Provinces, West
24. Do., East
25. Konkan
26. Bombay, Deccan
27. Hyderabad, North
28. Hyderabad, South
29. Mysore
30. Malabar
31. Madras, Southeast
32. Madras, Deccan
33. Madras Coast, North

GOVERNMENT OF INDIA.

METEOROLOGICAL DEPARTMENT.

MONTHLY WEATHER REVIEW.

PUBLISHED BY ORDER OF

THE GOVERNMENT OF INDIA.

CALCUTTA, SEPTEMBER, 1914.

INTRODUCTION.

THIS review of the weather in India during the month of September, 1914, is based on observations taken daily at 8 hrs. at 221 stations, and on additional observations taken at 10 hrs. and 16 hrs. at 15 stations. In the rainfall summary have been utilized the data furnished by the meteorological observatories, and such rainfall statements of the month as had been published by the Provincial Governments up to the date of the preparation of the review.

The brief notes on solar, seismic and magnetic disturbances are supplied by the chief observatories in the Indian area.

For a statement of the methods adopted in recording and tabulating the data, for each of the elements of observation, reference should be made to the introductory portion of the review for January.

Summary of the chief features of the weather in India during the month.

2. Rainfall of the month was heavy in Orissa, the United Provinces West, the Punjab, the North-West Frontier Province, Baluchistan, Gujarat, Rajputana East, Berar, the Central Provinces East, Bombay, Hyderabad and Madras excepting Malabar; it was normal in Assam, Sind, Rajputana West, Central India West, the Central Provinces West and Malabar, and light elsewhere. In the region comprising Bihar and Central India East the month's actual fall was barely 50 per cent. of the normal.

The final retreat of the monsoon from the north-west occurred on the 20th; ordinarily this event takes place about the 15th.

On the average of the month the weather was slightly warmer by night and the air damper than is usual in September in the North-West Frontier Province, Baluchistan and Sind; cloud was in excess in the Punjab, the North-West Frontier Province, Baluchistan, Kashmir, Central India West, Gujarat and Chota Nagpur, and markedly in defect in Upper Burma, Assam, Bengal and the United Provinces.

The mean monthly barometric pressure over the plains was ·026″ above the average.

Solar, magnetic and seismic disturbances.

KODAIKANAL OBSERVATORY.

3. *Solar observations.*—The sun was examined for spots and faculæ on all the days during the month, but the weather was not good enough to secure prominence photographs on 8 days.

Sunspots.—Four groups of spots were observed of which one was a "return" of the large spot observed in August. The daily average number was 1·3 as against 0·6 in August and the average life of a spot also rose to 10·5 days. The distribution of the spots in latitude was as follows:—

TABLE 1.

...	0°–10°	11°–20°	21°–30°	Mean latitudes.	Extreme latitude.
North	...	1	1	20°	18° & 22°
South	...	1	1	24°	24° & 29°

Prominences.—Fifty-five large prominences were observed during the month. The highest was only 120″ and was observed on the 1st at latitude +15° east.

Magnetic disturbances.—"Moderate" disturbances were recorded on the 18th, 23rd and 27th of the month.

J. EVERSHED,
Director,
Kodaikanal and Madras Observatories.

Seismic records.

$\phi = 10° 13' 50''$; $\lambda = 77° 28' 00''$; $h = 2343$ m. Subsoil Rock.

Apparatus.—Milne's Horizontal Pendulum Seismograph.

TABLE 2.

	V	To	€	$\frac{r}{To^2}$
AN:				
AE:	...	16·4	1	3·2
AZ:				

Date.	Phase.	Time G. M. T.	Period (Sec.)	Amplitude (u). An.	Ae.	Az.	Distance Δ (Km.)	Remarks.
1914.		h. m. s.						
Sept. 23rd	e P	2 17 42	...	...	...	...	...	Widening of line.
	F	2 29 00	...	...	...	...	...	
,, 26th	e P	5 17 42	...	...	...	...	...	
	i L	5 18 30	...	...	...	...	...	
	M	5 20 30	...	...	40	...	...	
	F	P	...	...	...	...	...	Instrument examined at 5h. 34m.

T. ROYDS,
Assistant Director,
Kodaikanal and Madras Observatories.

BOMBAY OBSERVATORY.

Alibag magnetic record.

4. During the month of September 1914 the traces showed 7 calm days, 22 days of small, and 1 day of moderate disturbance.

The days of the month selected as quiet for the purposes of the Magnetic Survey of India are the 2nd, 8th, 17th, 22nd and 26th.

The following table represents the magnetic character of each day during the month:—

TABLE 3.

Day.	Character.	Day.	Character.	Day.	Character.	Day.	Character.
1	S	9	S	17	C	25	S
2	C	10	S	18	S	26	C
3	S	11	S	19	S	27	M
4	S	12	S	20	S	28	S
5	S	13	S	21	C	29	S
6	S	14	S	22	C	30	S
7	C	15	S	23	S	...	...
8	C	16	S	24	S	...	...

C. = calm; S. = small; M. = moderate; G. = great; V. G. = very great.

The mean observed absolute values of the several magnetic elements reduced to the mean monthly tabulations of the magnetograms as also the ranges and the summed ranges of the horizontal force and declination for the month are as follow:—

Easterly declination	0° 43′ 28″.
Horizontal force	0·36872 C.G.S. unit.
Vertical force	0·16604 C.G.S. „
Inclination	24° 14′6.
Horizontal force range	0·00031 C.G.S. unit.
Horizontal force summed range	0·00186 C.G.S. „
Declination range	5′·8.
Declination summed range	19′·7.

(NOTE.—Summed range means sum without regard to sign of the 24 ordinates of the diurnal inequality.)

Seismic records.

$\phi = 18° 53' 36''$; $\lambda = 72° 48' 56''$; $h = 11$ m. Subsoil Trap.

Apparatus.—Milne's Horizontal Pendulum Seismograph.

TABLE 4.

	V	To	ϵ	$\frac{r}{To^2}$
AN:				
AE:	9	21	1	...
AZ:				

Date.	Phase.	Time G. M. T.	Period (Sec.)	Amplitude (u). An.	Ae.	Az.	Distance Δ (Km.)	Remarks.
1914.		h. m. s.						
Sept. 26th	P	5 14 43	...	...	...	...	...	
	L	5 17 32	...	...	...	...	...	
	M	5 18 45	...	...	89	...	...	
	F	5 25 48	...	...	...	...	...	

Thickening of line was noted on the following occasions:—

D. H. M. D. H. M. D. H. M. M. D. H. M. M. D. H. M.
3 7 57; 10 10 55; 10 17 40 to 45; 15 0 34 to 36; 22 4 25;
D. H. M. D. H. M. M. D. H. M.
23 2 23; 25 12 2 to 6; 29 12 15.

Sensibility to tilt 1·0 mm. of amplitude on the trace = 0·29".

N. A. F. MOOS,
Director,
Bombay and Alibag Observatories.

5.—CALCUTTA (ALIPORE) OBSERVATORY.

Seismic records.

$= 22° 32' N$; $\lambda = 88° 21' E$; $h = 6·4$ m. Subsoil Alluvial.

Apparatus.—Milne's Horizontal Pendulum Seismograph.

TABLE 5.

	V	To	ϵ	$\frac{r}{To^2}$
AN:				
AE:	8·688	18	1	
AZ:				

Date.	Phase.	Time G. M. T.	Period (Sec.)	Amplitude (u). An.	Ae.	Az.	Distance Δ (Km.)	Remarks.
1914.		h. m. s.						
Sept. 2nd	P	20 37 43	...	...	...	...	...	Thickening of line.
	F	21 2 35	...	...	...	...	...	

E. P. HARRISON,
Offg. Meteorologist, Calcutta.

6.—SIMLA OBSERVATORY.

The Simla seismograph notes will appear in a future number of the Monthly Weather Review.

The following table contains a list of earthquakes that were reported:—

TABLE 6.

Place at which felt.	Date.	G. M. T. of earthquake.	Duration.	Intensity Rossi-Forel scale.	No. of shocks.
		h. m.	Sec.		
Angul	Sept. 6th	9 30	...	...	...
Salem	„ 7th	9 15	80	4	1
Drosh	„ 16th	13 25	20	4	1
„	„ 21st	6 40	15	4	1
Narayanganj	„ 27th	8 30	5	4	2

Solar radiation.—The following figures give the intensity of solar radiation, as measured at Simla by Angstrom's pyrheliometer. The values are corrected to local noon, and expressed in grammecalories per square centimetre per minute:—

Maximum	1·43
Minimum	1·38
Mean	1·41
Number of days of observation	2

C. W. NORMAND,
Imperial Meteorologist, Simla.

ROYAL ALFRED OBSERVATORY, MAURITIUS.

7. No information has been received.

Weather in the Indian Ocean.

8. In the equatorial region pressure was normal at Zanzibar and in defect at Seychelles ; the air motion was of the ordinary character and rainfall was irregularly distributed. At Mauritius conditions were fairly normal.

TABLE 7.

	Mauritius.	Zanzibar.	Seychelles.
Departure from normal of mean pressure.	+·008	+·002	−·016
Actual mean wind direction . .	S 73° E	S 5° W	S 31° E
Normal mean wind direction . .	S 71° E	S 5° E	S 40° E
Actual mean wind velocity (miles per diem).	204	96	195
Normal mean wind velocity (miles per diem).	186	98	210
Rainfall departure from normal . .	−0·32	−1·06	+6·11

Depressions and cyclonic storms.

9. Three disturbances in all were recorded during the month. The first appeared over the north of the Bay on the 3rd, crossed the north Madras coast on the 6th and disappeared over the Central Provinces on the 8th. Although feeble it marked the termination of the break in the rains which had prevailed since the last week in August over the region dominated by the Arabian Sea current. The dissipation of this depression synchronized with the appearance of the second disturbance over the north of the Bay. The latter developed slowly from the 10th to the 12th, passed inland to the north of Vizagapatam on the early morning of the 13th and then moved into the Central Provinces, the centre lying near Chanda on the morning of the 14th. During the next 24 hours there was only a slight change in its position, but thereafter its rate of motion increased considerably, so that by the morning of the 16th it had reached the neighbourhood of Indore. At 8 hours of the 17th the centre was apparently between Deesa and Ahmedabad; the storm then recurved and travelling in a north-easterly course past Ajmer and Delhi broke up in the Simla-Mussooree hills some time on the 19th. Its depth was slight, only about a seventh of an inch, at the time of its entry into north Madras, but increased as it progressed inland to a third of an inch on the 16th and 17th. The depth then diminished, and was only a tenth of an inch on the last day of the storm's existence. Heavy rainfall occurred practically along the whole of its track, but the storm was specially remarkable for the excessive downpours it gave locally in Gujarat, the east Punjab and the west of the United Provinces.

TABLE 8.

Province or division.	District.	Station.	Rainfall in 24 hours preceding 8 A.M. of date.				
			16th.	17th.	18th.	19th.	20th.
			"	"	"	"	"
Gujarat	Kathiawar	Rajkot	0·14	1·03	5·34	...	...
		Dhoraji	1·38	2·37	15·93	1·15	...
		Manikvada (Jatalsar)	2·78	1·92	15·15	0·56	...
		Junagad	2·22	1·86	14·50	1·91	...
		Veraval	0·60	2·30	6·01	5·16	...
		Jafrabad	0·64	4·17	8·57	1·00	...
United Provinces	Meerut	Meerut	...	0·70	5·55	2·77	0·80
	Roorkee	Roorkee	...	0·12	7·82	5·84	0·74
	Delhi	Delhi	...	0·58	5·83	3·12	3·81
Punjab	Rohtak	Gohana	...	0·31	6·79	2·62	...
	Ditto	Sampla	...	0·38	2·89	4·58	2·50
	Ditto	Sonepat	...	0·44	5·80	2·05	1·00
	Gurgaon	Palwal	...	1·45	4·36	3·82	2·90
	Karnal	Thanesar	...	...	6·25	3·81	0·90

Province or division.	District.	Station.	Rainfall in 24 hours preceding 8 A.M. of date.				
			16th.	17th.	18th.	19th.	20th.
			"	"	"	"	"
UNJAB	Ambala	Ambala	...	...	3·50	6·52	1·98
	Ditto	Kasauli	...	0·30	3·75	5·10	2·14
	Ditto	Dadupur	...	...	5·10	5·05	0·70
	Jhind State	Safidan	...	...	...	6·35	4·50
	Jullundur	Nawashahr	...	...	2·82	5·91	3·62
	Ludhiana	Ludhiana	...	...	3·44	4·26	2·57

According to newspaper reports breaches occurred in the ast coast section of the Bengal-Nagpur Railway line, on the udh-Rohilkhand Railway and on the Junagad line in Kathiawar.

The third disturbance of the month first became visible as a shallow depression over Sind on the 22nd, and during the next three days caused some precipitation in the Punjab and the North-West Frontier Province, without changing however appreciably in position.

Pressure.

10. Barometric pressure was in excess of the normal over he whole of the Indian plains with the exception of west Rajputana, Gujarat and the west coast of the Peninsula here it was in defect. The excess was large in amount between ·035″ and ·063″) over Upper Burma, Assam, Bengal, Bihar and Orissa, the greater part of the United Provinces and the Punjab, and averaged ·026″ for the country as a whole. As temperature was very nearly normal n almost all places, it is evident that the high density of the tmosphere was not due to this circumstance.

Further the data of the observing hill stations show that n the whole the excess was somewhat less marked there han at the adjacent plains.

TABLE 9.

Division.	Departure from normal of mean 8 hrs. pressure.
	"
urma	+·032
eam	+·050
engal	+·049
ihar and Orissa	+·052
nited Provinces	+·043
unjab	+·043
orth-West Frontier Province	+·021
ind	+·013
Rajputana	+·008
Bombay	−·007
Central India	+·021
Central Provinces	+·025
Hyderabad	+·011
Mysore	+·013
Madras	+·019

TABLE 10.

Hill station.	Departure from normal pressure. A	Plain station.	Departure from normal pressure. B	Departure of pressure difference. B—A.
	"		"	"
Quetta	+·003	Jacobabad	+·023	+·020
Leh	+·037	Lahore	+·048	+·011
Murree	+·040	Peshawar	+·018	−·022
Simla	+·042	Ludhiana	+·054	+·012
Mount Abu	−·008	Deesa	−·003	+·005
Pachmarhi	+·021	Khandwa	+·017	−·004
Kodaikanal	+·007	Madura	+·036	+·029

Temperature.

11. Day temperature was 2½° below the average in the unjab, and in excess by a similar amount in Kashmir and aluchistan, while night temperature was higher than usual by 4° in Sind and Baluchistan and by 2½° in the North-West Frontier Province.

TABLE 11.

SUB-DIVISION.	ACTUAL TEMPERATURE.					DEPARTURE FROM NORMAL OF		
	Mean maximum.	Mean minimum.	Monthly mean of mean between maximum and minimum.	Mean daily range of temperature.	Absolute range during month.	Maximum.	Minimum.	Daily range.
	°	°	°	°	°	°	°	°
1. Bay Islands	85·1	76·7	80·9	8·5	14·5	+1·1	—0·1	+1·2
2. Lower Burma	86·3	75·8	80·9	11·0	17·4	+1·1	+0·3	+0·8
3. Upper Burma	89·9	74·2	82·1	15·8	24·1	—0·3	—0·7	+0·4
4. Assam	88·1	75·5	81·8	12·6	21·6	+0·1	—0·5	+0·6
5. Bengal	88·6	77·3	83·0	11·2	18·2	+0·6	—0·5	+1·1
6. Orissa	87·8	76·7	82·3	11·2	18·8	—1·7	—1·2	—0·5
7. Chota Nagpur	88·5	74·0	81·3	14·5	24·2	—1·3	—0·4	—0·9
8. Bihar	90·8	77·5	84·1	13·3	20·9	+1·5	—0·3	+1·8
9. United Provinces, East	91·6	77·5	84·5	14·1	22·6	+0·2	+0·6	—0·4
10. Do. do., West	92·2	76·4	84·3	15·8	27·4	+0·2	+0·9	—0·7
11. Punjab, East and North	93·1	73·8	83·8	19·2	35·2	—2·2	+0·7	—2·9
12. Do., South-west	97·1	76·0	86·5	21·0	38·5	—3·0	+0·9	—3·9
13. Kashmir	78·4	54·0	66·2	24·4	47·4	+2·4	+2·0	+0·4
14. North-West Frontier Province	96·5	75·1	85·8	21·4	38·7	—1·7	+2·6	—4·3
15. Baluchistan	94·3	65·7	80·0	28·5	49·6	+2·7	+3·9	—1·2
16. Sind	96·8	79·6	88·2	17·2	33·1	+1·3	+3·7	—2·4
17. Rajputana, West	97·0	77·7	87·3	19·3	33·3	—0·1	0	—0·1
18. Do., East	91·9	76·1	84·0	15·8	26·8	—0·7	+1·2	—1·9
19. Gujarat	89·1	75·8	82·5	13·3	22·1	—0·6	+0·7	—1·3
20. Central India, West	87·1	71·5	79·3	15·5	24·3	+0·4	+1·1	—0·7
21. Do., East	88·9	75·9	82·3	13·0	19·4	—0·3	+1·1	—1·4
22. Berar	86·3	72·2	79·2	14·1	21·7	—0·6	+0·9	—1·5
23. Central Provinces, West	87·2	72·9	80·1	14·3	22·1	—0·3	+0·4	—0·7
24. Do., East	86·3	72·9	79·6	13·3	20·7	—0·8	0	—0·8
25. Konkan	84·0	75·7	79·9	8·3	13·5	+0·3	+0·7	—0·4
26. Bombay Deccan	85·2	69·3	77·2	15·9	25·1	+0·1	+0·6	—0·5
27. Hyderabad, North	84·9	70·8	77·8	14·1	22·2	—0·8	+0·6	—1·4
28. Do., South	86·7	72·9	79·8	13·8	21·9	—0·9	+0·8	—1·7
29. Mysore	88·8	67·1	75·4	16·7	25·2	+1·3	+1·2	+0·1
30. Malabar	85·2	75·4	80·3	9·8	15·7	+1·2	+1·5	—0·3
31. Madras, South-east	92·4	76·1	84·2	16·3	23·9	—0·1	+1·2	—1·3
32. Do. Deccan	90·9	74·2	82·6	16·7	26·2	+0·1	+0·3	—0·2
33. Do. Coast, North	89·2	77·2	83·2	12·0	22·6	—0·8	—0·7	—0·1

TABLE 12.

DIVISION.	DEPARTURE FROM NORMAL OF		
	Mean maximum temperature.	Mean minimum temperature.	Mean temperature.
	°	°	°
irma	+0·5	−0·1	+0·2
sam	+0·1	−0·5	−0·2
ngal	+0·6	−0·5	+0·1
ihar and Orissa	0	−0·6	−0·3
nited Provinces	+0·2	+0·7	+0·5
unjab	−2·5	+0·8	−0·9
orth-West Frontier Province	−1·7	+2·6	+0·5
Sind	+1·3	+3·7	+2·5
Rajputana	−0·4	+0·7	+0·1
Bombay	−0·1	+0·7	+0·3
Central India	0	+1·1	+0·5
Central Provinces	−0·5	+0·4	0
Hyderabad	−0·8	+0·7	−0·1
Mysore	+1·3	+1·2	+1·3
Madras	+0·1	+0·7	+0·4

Winds.

12. (*a*) Winds were unduly easterly over the head of the Bay and at stations from Gaya to Agra, and thus shewed that the area under the influence of the Bay current was more extensive than usual.

(*b*) Except in a few places, both branches of the monsoon current were weaker and less steady than is usually the case in September.

TABLE 13.

DIVISION.	DEPARTURE FROM NORMAL OF	
	Hourly wind velocity.	Wind steadiness.
Burma	−0·5	−16
Assam	−0·7	+11
Bengal	−1·1	−13
Bihar and Orissa	−0·8	−11
United Provinces	0	−2
Punjab	+0·4	−5
North-West Frontier Province	−0·5	−2
Sind	−1·2	−10
Rajputana	+0·6	−25
Bombay	−0·9	−17
Central India	−0·1	−25
Central Provinces	−0·4	−14
Hyderabad	−0·5	0
Mysore	−0·2	−9
Madras	+0·3	−5

Humidity and cloud.

13. The air was more humid than usual in north-west India, but elsewhere the hygrometric conditions of the month departed but little from the normal.

The sky was unusually clear except in Chota Nagpur, Central India West, Gujarat, the Punjab and its surrounding hills, the greatest defect in the cloud amount being recorded in Upper Burma, Assam, Bengal and the United Provinces.

TABLE 14.

DIVISION.	HYGROMETRY; 8 HRS.				CLOUD.	
	Mean humidity.	Departure from normal.	Mean vapour tension in inches of mercury.	Departure from normal in inches of mercury.	Mean cloud amount at 8 hrs.	Departure from normal.
	%					
Burma . . .	89	— 1	·868	—·010	6·2	—0·7
Assam . . .	90	— 2	·893	—·019	5·1	—3·4
Bengal . .	87	— 2	·937	—·018	5·7	—1·5
Bihar and Orissa .	84	— 1	·893	—·007	5·3	—0·1
United Provinces .	78	— 2	·869	+·011	3·3	—0·9
Punjab . .	73	+ 4	·779	+·045	2·9	+0
North-West Frontier Province.	71	+ 5	·767	+·085	2·3	+1
Sind . . .	75	+ 2	·876	+·093	2·2	—0
Rajputana . .	67	— 2	·783	—·007	2·8	—0
Bombay . .	86	+ 3	·830	+·087	6·1	+0
Central India .	83	+ 2	·802	+·021	5·5	+0
Central Provinces .	84	+ 1	·779	+·002	5·4	—0
Hyderabad . .	82	+ 2	·743	+·012	6·4	—1
Mysore . .	83	— 1	·642	+·013	7·7	—0
Madras . .	81	+ 1	·837	+·015	6·0	—0

Rainfall.

14. The almost complete break in the rains which had set in over the field of the Arabian Sea current during the last week of August persisted through the first three days of September. On the 4th a depression appeared off the north Madras coast and during the next few days re-introduced monsoon conditions into the Peninsula; in the north-west the break lasted until the 9th. The Bay depression dispersed on the 8th over the Central Provinces; and on the same day there formed over the Bay a cyclonic storm which crossed inland to the north of Vizagapatam on the 13th and thence travelling by a curved path through the Central Provinces, the west of Central India, east Gujarat and Rajputana broke up in the hills of the east Punjab on the 19th. It was well-defined throughout and caused remarkably heavy rainfall in eastern half of the Punjab and the western parts of the United Provinces. With its disappearance dry weather set in over the Punjab and adjacent districts, and except for a few light local showers held uninterruptedly during the rest of the month. The monsoon rains of 1914 in the north-west may therefore be regarded as having ended on the 20 about five days after the customary date.

After retreating from the north-west the monsoon g rain chiefly in north-east India, Burma and the Peninsula.

Averaged over the whole country the month's rainfall 7 per cent. above normal. Its local distribution was howe characterized by much irregularity. Thus the aggregate more or less in excess of the normal in Orissa, the Un Provinces West, the Punjab, the North-West Fron Province, Baluchistan, Rajputana East, Gujarat, Berar, Central Provinces East, the Konkan, the Bombay Dec Hyderabad and Madras, and normal or in defect over rest of the country. The greatest excess occurred in Madras Coast North (4½″ or 65 per cent.), Kon (7½″ or 61 per cent.), Gujarat (5½″ or 118 per ce Berar (5″ or 89 per cent.), the United Provinces West (5 89 per cent.) and Orissa (4¾″ or 50 per cent.); while defect was most pronounced in the area comprising Bihar Central India East which barely received 50 per cent. of t normal fall.

TABLE 15.

SUB-DIVISION.	NUMBER OF RAINY DAYS.		RAINFALL.			
	Actual.	Normal.	Actual.	Normal.	Departure from normal.	Percentage departure from normal.
			"	"	"	
1. Bay Islands	16·0	18·4	11·19	15·19	—4·00	— 26
2. Lower Burma	14·5	19·4	12·78	18·72	—5·94	— 32
3. Upper Burma	9·4	11·0	6·56	8·14	—1·58	— 19
4. Assam	13·1	13·6	12·15	12·14	+0·01	0
5. Bengal	11·2	12·4	8·85	11·46	−2·61	— 23
6. Orissa	16·5	12·0	14·18	9·43	+4·75	+ 50
7. Chota Nagpur	10·3	10·6	6·31	8·67	−2·36	— 27
8. Bihar	5·9	9·2	3·98	8·64	−4·66	— 54
9. United Provinces, East	5·1	7·2	3·89	6·60	—2·71	— 41
10. Do., West	6·5	5·8	10·51	5·57	+4·94	+ 89
11. Punjab, East and North	4·7	3·2	6·08	3·23	+2·85	+ 88
12. Do., South-west	1·9	1·3	1·41	1·02	+0·39	+ 38
13. Kashmir	3·9	4·2	3·47	4·57	—1·10	— 24
14. North-West Frontier Province	2·9	1·9	1·70	1·27	+0·43	+ 34
15. Baluchistan	1·1	0·3	0·50	0·13	+0·37	+285
16. Sind	0·9	0·6	0·45	0·45	0	0
17. Rajputana, West	2·6	2·3	2·10	2·11	—0·01	0
18. Do., East	5·3	4·8	4·54	4·08	+0·46	+ 11
19. Gujarat	9·9	5·6	10·35	4·74	+5·61	+118
20. Central India, West	8·4	7·2	5·78	5·89	—0·11	— 2
21. Do., East	6·1	6·9	3·10	6·69	—3·59	— 54
22. Berar	12·7	7·9	11·00	5·81	+5·19	+ 89
23. Central Provinces, West	11·5	9·5	7·83	7·80	+0·03	0
24. Do., East	12·9	9·6	9·28	8·00	+1·28	+ 16
25. Konkan	17·6	15·5	20·24	12·60	+7·64	+ 61
26. Bombay Deccan	10·3	8·2	7·33	5·63	+1·70	+ 30
27. Hyderabad, North	14·7	10·0	11·32	8·31	+3·01	+ 36
28. Do., South	14·9	9·8	9·45	6·96	+2·49	+ 36
29. Mysore	7·1	7·9	3·91	4·95	—1·04	— 21
30. Malabar	14·1	13·7	9·79	9·49	+0·30	+ 3
31. Madras, South-east	6·3	6·1	4·92	4·44	+0·48	+ 11
32. Do. Deccan	9·3	7·6	6·21	5·40	+0·81	+ 15
33. Do. Coast, North	12·5	9·1	11·29	6·85	+4·44	+ 65

TABLE 16.

DIVISION.	RAINFALL.			
	Actual.	Normal.	Departure from normal.	Percentage departure from normal.
	"	"	"	
Burma	9·00	12·29	−3·29	−27
Assam	12·15	12·14	+0·01	0
Bengal	8·85	11·46	−2·61	−23
Bihar and Orissa	7·17	8·85	−1·68	−19
United Provinces	7·07	6·11	+0·96	+16
Punjab	4·93	2·69	+2·24	+83
North-West Frontier Province	1·70	1·27	+0·43	+34
Sind	0·45	0·45	0	0
Rajputana	3·77	3·48	+0·29	+8
Bombay	10·62	6·59	+4·03	+61
Central India	4·44	6·29	−1·85	−29
Central Provinces	9·28	7·32	+1·96	+27
Hyderabad	10·44	7·57	+2·87	+38
Mysore	3·91	4·95	−1·04	−21
Madras	7·39	5·72	+1·67	+29
Mean of India	7 35	6·89	+0·46	+7

Snowfall.

I.—AFGHANISTAN.

15. No information has arrived.

II.—NORTH-WEST FRONTIER PROVINCE.

No information has been received.

III.—KASHMIR.

(*a*) *Gulmarg.*—On the mountains to the south-west snowfall was observed on the 20th, 21st and 24th to 27th. The snow line came down to the foot of the Khallanmerg on the 26th.

No snow fell during the month on the mountains around Srinagar, Dras and Kargil.

(*b*) *Skardu.*—Snowstorms occurred on the higher passes on the 3rd, 11th and 16th giving altogether about 2 feet of snow.

IV.—PUNJAB.

Simla Hills.—On the ranges around Kilba there were daily falls between the 16th and the 20th. The lowest level reached was about 10,000 feet, and here the total quantity received was about 4″.

V.—UNITED PROVINCES.

(*a*) *Garhwal.*—No information.

(*b*) *Almora.*—The total snowfall was reported to measure 8¾ feet in Byans, 7 feet in Mallas Johar and Darma, 4 feet in Chaudas and 2 feet in Malla Danpur.

The snow line descended from the perpetual snows to a distance of 6 miles in Malla Darma and 4½ miles in Byans.

TABLE 17.

Name of pass or peak.	DEPTH OF ACCUMULATION AT THE END OF THE MONTH.	
	Reported.	Normal.
	Feet.	Feet.
Nuwe Pass	15	19½
Binkaru "	10	12½
Lipulekh "	10	4½
Lampia "	14	5
Untadhura	7	9
Ralamdhura	5	6

SUMMARY.

16. According to the limited information available there were a few falls in Kashmir and the Punjab Himalayas but they were light and local. There was apparently moderately heavy fall in the Almora hills.

HEM RAJ.

The lines of the above chart represent isobars or lines of equal barometric pressure, the numbers attached indicating the barometric pressure in inches and being drawn for differences of pressure of ·05 inch. The isobars in the Bay of Bengal are filled in by means of the shore observations, and by comparison with the normal distribution of pressure.

The mean 8 hrs. wind directions of the month are shewn by means of arrows flying with the wind, and are calculated by means of Lambert's formula applied to the winds as given in Table B of the 8 hrs. observations. The mean wind directions for the hill stations are indicated by broken arrows to distinguish them from the wind arrows for the plain stations. The mean velocity of the winds during the month is shewn by the following notation:—

Velocity of	0 to 2	miles per hour	...	one	feather	added to the	wind	arrow.				
,,	,, 2 to 5	,,	,,	,,	...	two	feathers	,,	,,	,,	,,	
,,	,, 5 to 10	,,	,,	,,	...	three	,,	,,	,,	,,	,,	
,,	,, 10 to 20	,,	,,	,,	...	four	,,	,,	,,	,,	,,	
	over 20	,,	,,	,,	...	five	,,	,,	,,	,,	,,	

Wind strengths are based on factor 2·2 for the standard type of Beckley Robinson anemograph, instead of 3·0 as used for this plate up to December 1911 inclusive.

The chart shows the departure from normal of the mean during the month of 8 hrs. pressure by means of lines drawn for equal amounts of departure. The numbers are given in thousandths of an inch, 20 representing ·020′ or two hundredths of an inch, &c. Continuous lines indicate that the pressure was in excess by amounts indicated by the numbers attached to the lines, and broken or dotted lines that it was in defect by amounts indicated by the numbers attached to the lines. Two parallel lines near to each other, one continuous and the other broken or dotted, represent the line of no departure, the dotted line facing the area of deficient pressure or negative departures.

CHART SHEWING THE DEPARTURE FROM NORMAL
OF THE MONTHLY MEAN OF DAILY
MAXIMUM TEMPERATURE.

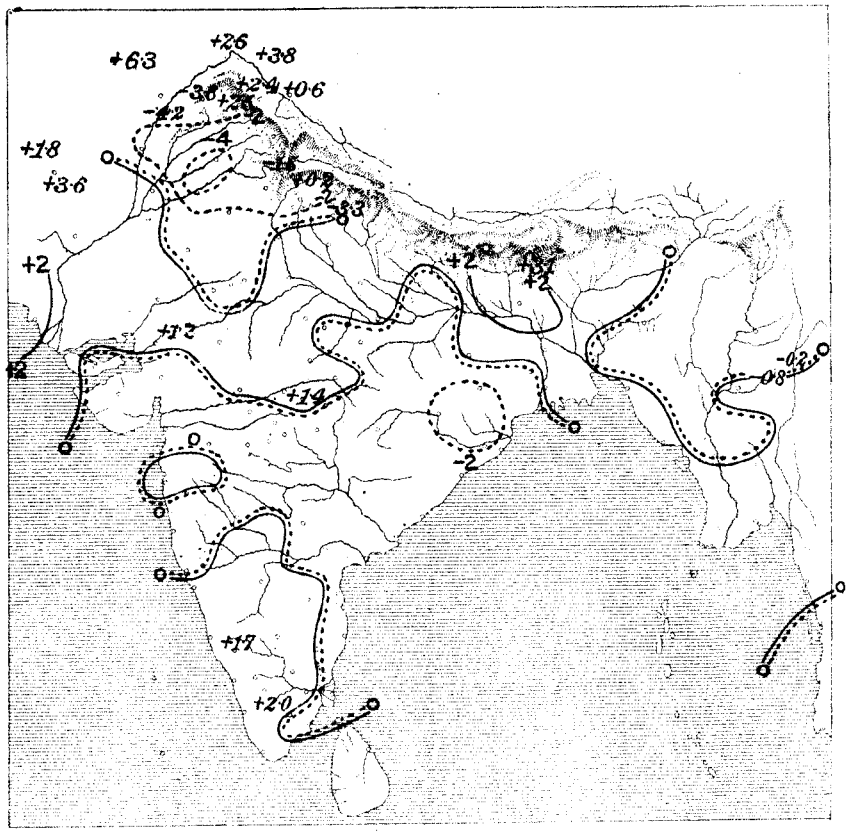


CHART SHEWING THE DEPARTURE FROM NORMAL
OF THE MONTHLY MEAN OF DAILY
MINIMUM TEMPERATURE.

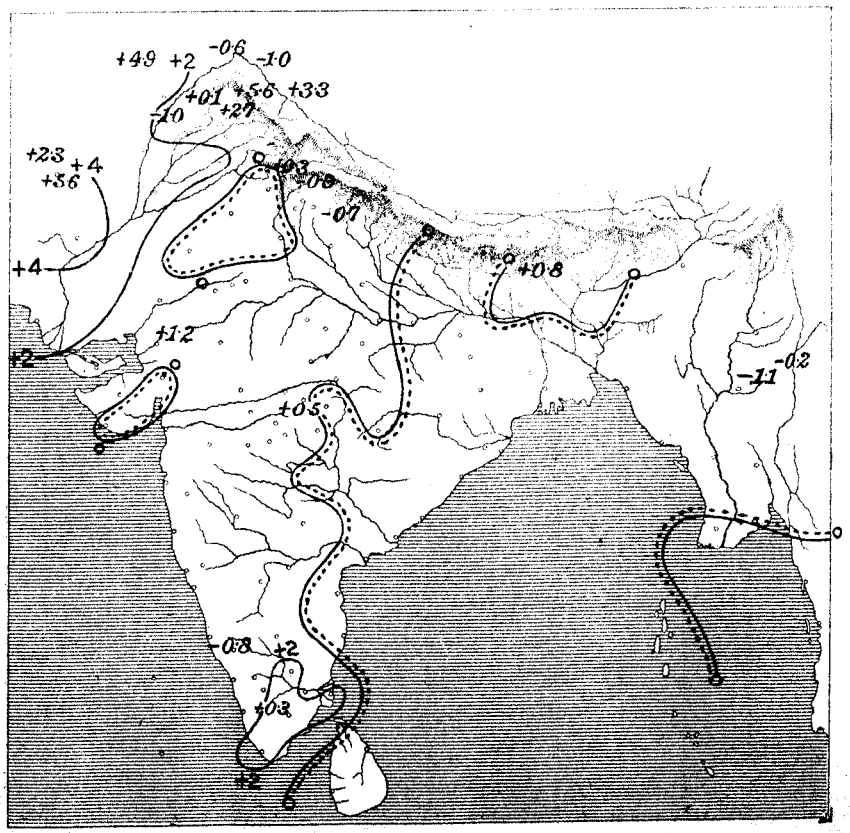


CHART SHEWING THE DEPARTURE FROM NORMAL
OF THE MONTHLY MEAN OF DAILY
MEAN TEMPERATURE.

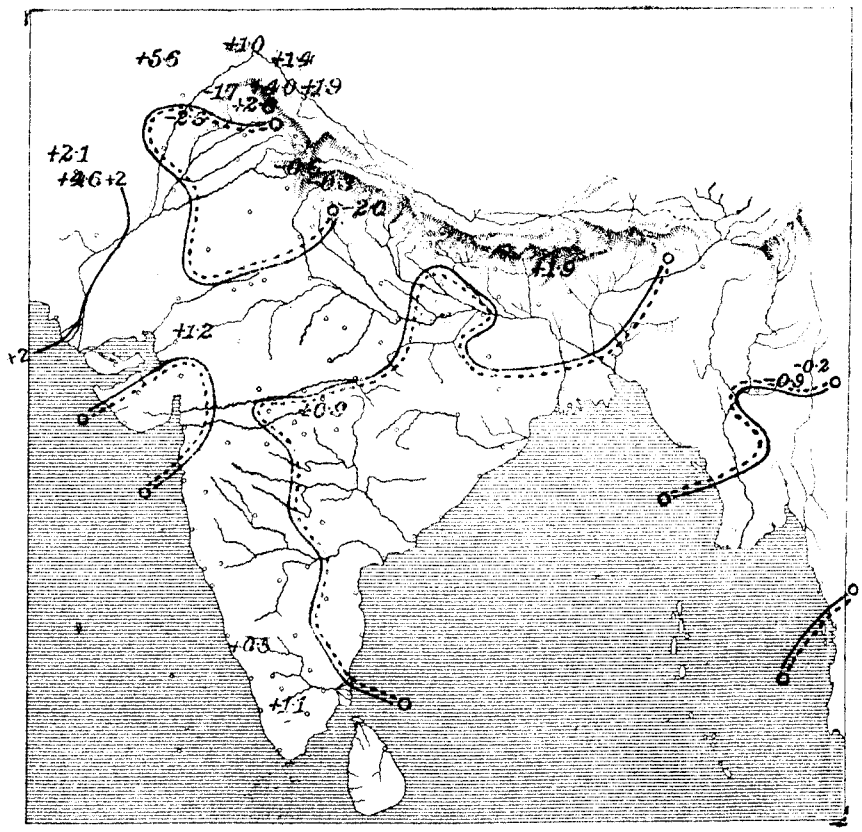


CHART SHEWING THE DEPARTURE FROM NORMAL
OF THE MONTHLY MEAN OF ABSOLUTE
HUMIDITY AT 8 HRS.

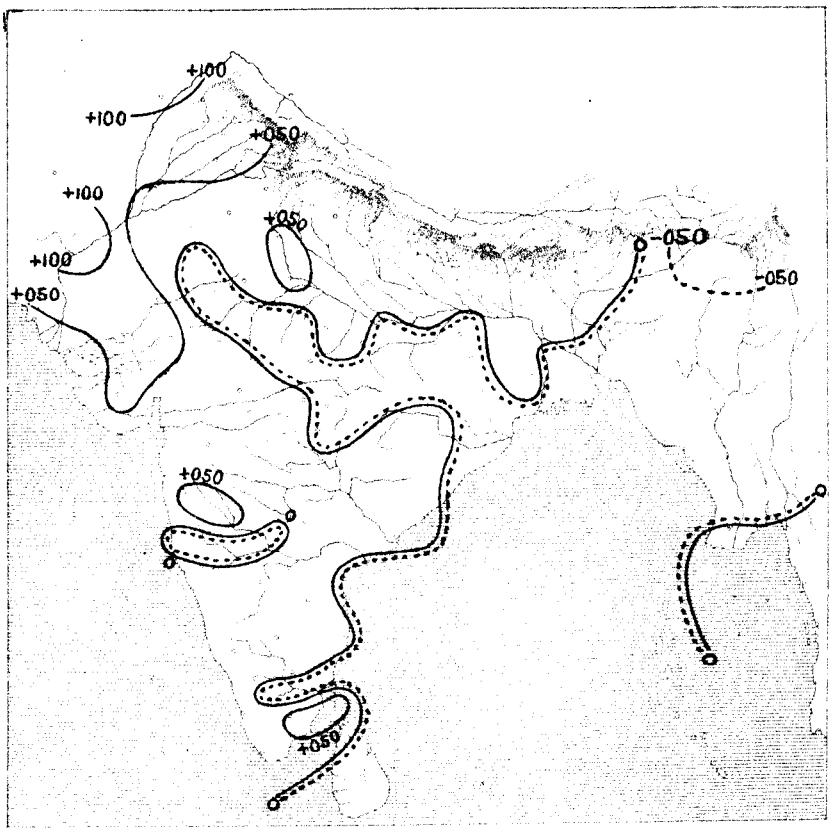


CHART SHEWING THE DEPARTURE FROM NORMAL
OF THE MONTHLY MEAN OF RELATIVE
HUMIDITY AT 8 HRS.

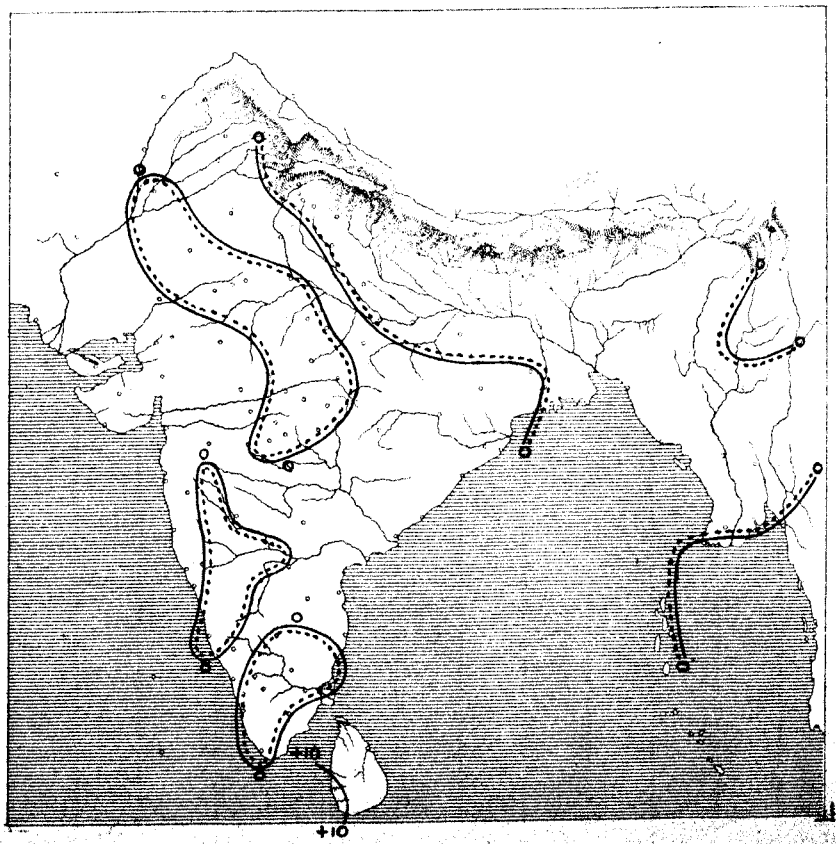


CHART SHEWING THE DEPARTURE FROM NORMAL
OF THE MONTHLY MEAN OF CLOUD
AMOUNT AT 8 HRS.

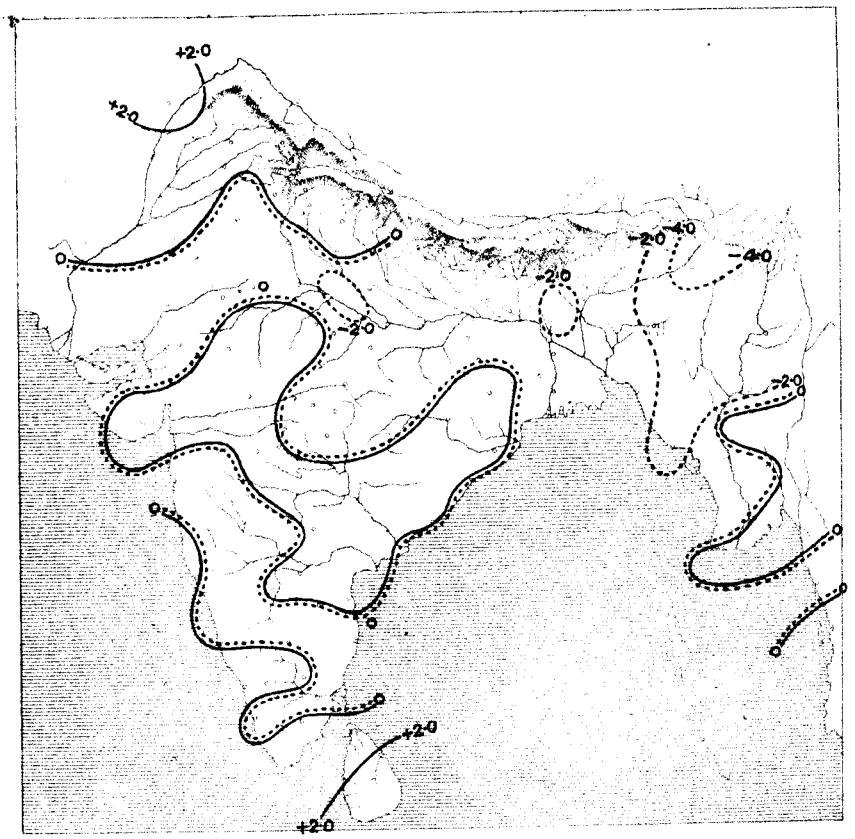
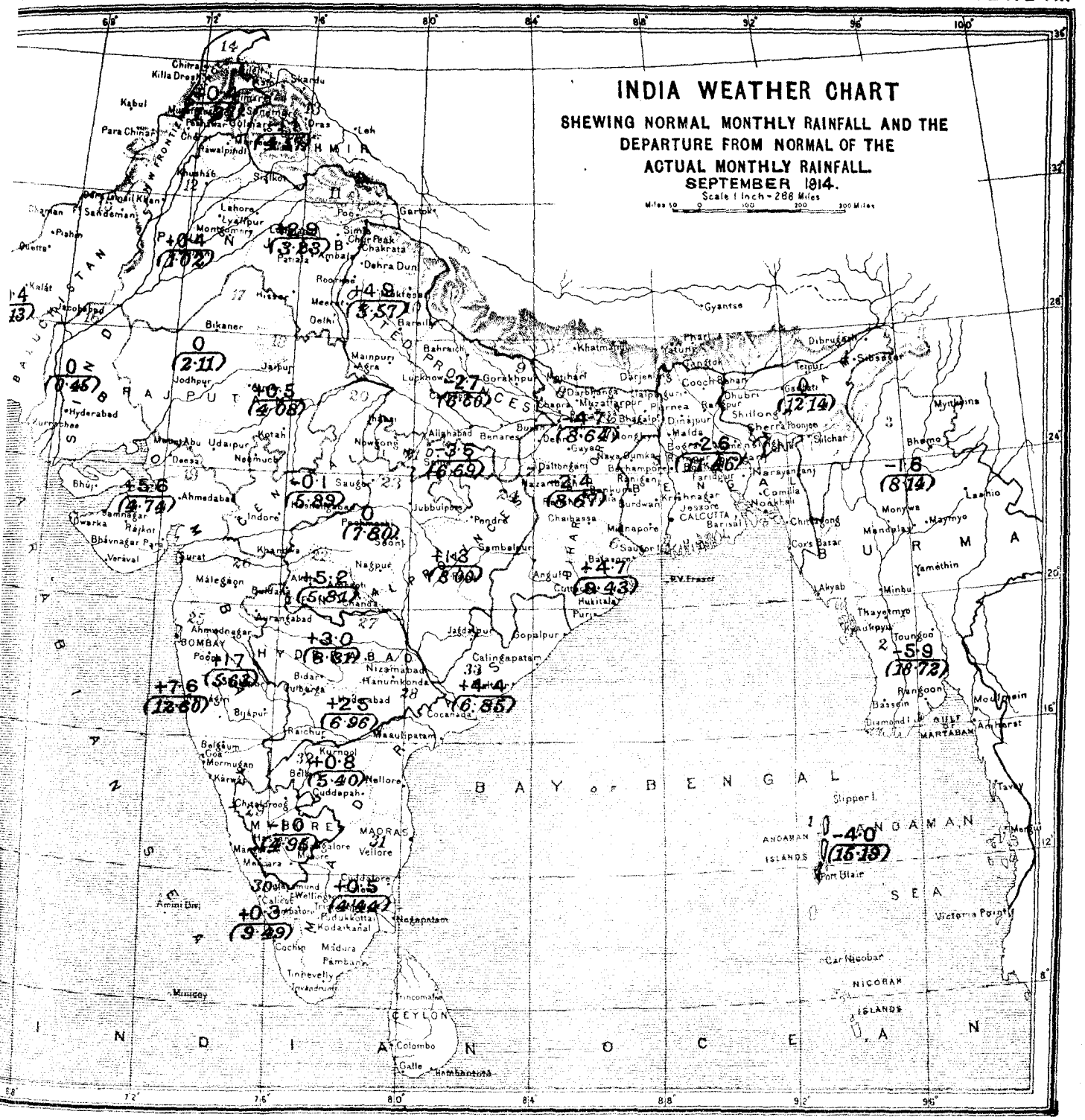


CHART SHEWING THE TOTAL NUMBER OF DAYS IN THE
MONTH ON WHICH RAINFALL EQUALLED OR
EXCEEDED 0·10 INCH.
(BASED ON THE RETURNS OF TABLE B.)



The country is divided into 33 areas as shewn in the list below. The numbers in that list correspond with the red numbers on the chart, d serve to identify the areas. The numbers in brackets on the chart give the average over the divisions of the normal monthly rainfall, e numbers above these give the departures from normal of the average actual rainfall over the divisions.

1. Bay Islands
2. Lower Burma
3. Upper Burma
4. Assam
5. Bengal
6. Orissa
7. Chota Nagpur
8. Bihar
9. United Provinces, East
10. United Provinces, West
11. Punjab, East and North
12. Do., Southwest
13. Kashmir
14. Northwest Frontier Province
15. Baluchistan
16. Sind
17. Rajputana, West
18. Rajputana, East
19. Gujarat
20. Central India, West
21. Do., East
22. Berar
23. Central Provinces, West
24. Do., East
25. Konkan
26. Bombay, Deccan
27. Hyderabad, North
28. Hyderabad, South
29. Mysore
30. Malabar
31. Madras, Southeast
32. Madras, Deccan
33. Madras Coast, North

GOVERNMENT OF INDIA.

METEOROLOGICAL DEPARTMENT.

MONTHLY WEATHER REVIEW

PUBLISHED BY ORDER OF

THE GOVERNMENT OF INDIA.

CALCUTTA, OCTOBER, 1914.

INTRODUCTION.

THIS review of the weather in India during the month of October, 1914, is based on observations taken daily at 8 hrs. at 217 stations, and on additional observations taken at 10 hrs. and 16 hrs. at 13 stations. In the rainfall summary have been utilized the data furnished by the meteorological observatories, and such rainfall statements of the month as had been published by the Provincial Governments up to the date of the preparation of the review. The brief notes on solar, seismic and magnetic disturbances are supplied by the chief observatories in the Indian area.

For a statement of the methods adopted in recording and tabulating the data, for each of the elements of observation, reference should be made to the introductory portion of the review for January.

Summary of the chief features of the weather in India during the month.

2. The monsoon was very weak and its activity was shown mainly in Burma and the south of the Peninsula. In the central parts of the country, the north of the Peninsula and the greater part of north-east India, where moderate to heavy rainfall occurs under ordinary conditions, weather was practically dry. In north-west India on the other hand the weather was disturbed during the greater part of the month owing to an early setting in of winter actions. The first well-formed winter storm of the season affected the north-west frontier as early as the 27th of October, and was the cause of widespread and locally heavy precipitation.

The total rainfall of the month was distinctly above the average in Malabar, Madras South-east and the greater part of north-west India, was normal in Burma, and was lighter than usual over the rest of the country. In Assam, Bengal, Orissa, the Konkan, the Bombay Deccan, Hyderabad South, the Madras Deccan and the Madras Coast North the deficiency was large, ranging between 2″ and 5″. Rainfall was on the other hand unusually heavy for the time of year in the Punjab, Kashmir, the North-West Frontier Province, Baluchistan, Sind and Rajputana West.

Of climatic features other than rainfall humidity was markedly high in Baluchistan, the Punjab, the North-West Frontier Province and Sind, while the cloud amount was in excess generally in north-west India, Malabar and on the south Coromandel coast, and decidedly below the average in north-east India and Hyderabad. Temperature agreed closely with the normal except in Assam, Kashmir and the Punjab, where it was 3° lower than usual.

Solar, magnetic and seismic disturbances.

KODAIKANAL OBSERVATORY.

3. *Solar observations.*—No observations of the sun were made on 4 days during the month and on 9 other days prominences could not be photographed.

Sunspots.—Five groups of spots were observed as against 4 in September; all of them were small. The daily average number fell from 1·3 in September to 0·6 in October. The average life of a spot was 3·6 days. The distribution of the spots in latitude was as follows:—

TABLE 1.

—	0°—11°	11°—20°	21°—30°	Mean latitude.	Extreme latitudes.
North . . .	...	2	1	20°	19° & 21°
South . . .	...	1	1	20·°5	13° & 28°

Prominences.—Thirty-five large prominences were recorded during the month. One eruptive and metallic prominence was observed on the 11th at latitude —50° east. The highest prominence did not reach more than 120″ and two prominences of this height were observed on the 4th and 5th at latitudes +35° east and +33° east.

Magnetic disturbances.—"Moderate" disturbances were recorded from the 26th to 29th.

J. EVERSHED,
Director,
Kodaikanal and Madras Observatories.

Seismic records.

TABLE 2.

$\phi = 10° 13' 50''$; $\lambda = 77° 28' 00''$; $h = 2343$m—Subsoil Rock.

Apparatus.—Milne's Horizontal Pendulum Seismograph.

	V	To	ϵ	$\frac{r}{To^2}$
AN:				
AE:	9·76	16·1	1	3·2
AZ:				

Date.	Phase.	Time, G. M. T.	Period (Sec.)	Amplitude (u). An.	Ae.	Az.	Distance △ (Km.)	Remarks.
1914.		h. m. s.						
October 3rd	e P	17 44 6	...	...	...	...	...	
	i L	18 30 0	...	...	...	...	...	
	M 1	18 40 48	...	...	70	...	...	
	M 2	0 43 48	...	...	70	...	...	
	F	19 34 48	...	...	...	...	...	
„ 3rd	e P	22 18 42	...	...	...	...	...	
	i L	22 27 18	...	...	...	...	...	
	M	22 40 48	...	...	500	...	...	
	F	23 50 12	...	...	...	...	...	
„ 6th	e P	20 02 54	...	...	...	...	...	Widening of line.
	F	20 38 42	...	...	...	...	...	
„ 9th	P	...	...	...	...	...	...	No preliminary tremors.
	i L	2 48 36	...	...	...	...	...	
	M	2 51 42	...	...	1030	...	...	
	F	3 48 48	...	...	...	...	...	
1914.		h. m. s.						
Oct. 11th	e P	16 24 48	...	...	...	...	...	
	i L	16 31 12	...	...	...	...	...	
	M	16 27 54	...	...	50	...	...	
	F	16 35 48	...	...	...	...	...	
„ 23rd	e P	6 28 18	...	...	...	...	...	
	i L	6 34 42	...	...	...	...	...	
	M	6 40 18	...	...	500	...	...	
	F	7 33 18	...	...	...	...	...	

T. ROYDS,
Assistant Director.

BOMBAY OBSERVATORY.

Alibag magnetic record.

4. During the month of October 1914, the traces showed 10 calm days, 20 days of small and one day of moderate disturbance.

The days of the month selected as quiet for the purposes of the Magnetic Survey of India are the 5th, 12th, 15th, 24th, and 25th.

The following table represents the magnetic character of each day during the month :—

TABLE 3.

Day.	Character.	Day.	Character.	Day.	Character.	Day.	Character.
1	S	9	S	17	S	25	C
2	S	10	S	18	S	26	C
3	S	11	S	19	S	27	S
4	S	12	C	20	S	28	S
5	C	13	S	21	S	29	M
6	S	14	C	22	S	30	S
7	S	15	C	23	C	31	C
8	S	16	C	24	C	...	...

C = calm; S = small; M = moderate; G = great; V. G. = very great.

The mean observed absolute values of the several magnetic elements reduced to the mean monthly tabulations of the magnetograms, as also the ranges and the summed ranges of the horizontal force and declination for the month are as follow :—

Easterly declination	0° 4′ 5″
Horizontal force	0·36875 C.G.S. unit.
Vertical force	0·16615 C.G.S. unit.
Inclination	24° 15′·3.
Horizontal force range	0·00038 C.G.S. unit.
Horizontal force summed range	0·00211 C.G.S. unit.
Declination range	2′·6.
Declination summed range	9′·3.

(NOTE :—Summed range means sum without regard to sign of the twenty-four ordinates of the diurnal inequality.)

Seismic records.

=18° 53′ 36″; λ = 72° 48′ 56″; h=11 m. *Subsoil* Trap.

Apparatus.—Milne's Horizontal Pendulum Seismograph.

TABLE 4.

	V	To	ϵ	$\frac{r}{To^2}$
AN:				
AE:	9	21	1	
AZ:				

Date.	Phase.	Time, G. M. T.	Period (Sec.)	Amplitude (u). An.	Ae.	Az.	Distance Δ (Km.)	Remarks.
1914.		h. m. s.						
t. 3rd	P	17 42 57	...	...	...	...	...	
	M	18 37 34	...	...	178	...	...	
	F	19 44 10	...	...	...	...	...	
„ 3rd	P	22 15 1	...	...	...	...	...	
	S	22 22 59	...	...	...	...	...	
	L	22 29 57	...	...	...	...	...	
	M	22 35 5	...	...	311	...	...	
	F	23 54 2	...	...	...	...	...	
„ 6th	P	20 4 8	...	...	...	...	...	
	M	20 21 17	...	...	44	...	...	
	F	20 41 57	...	...	...	...	...	
„ 9th	P	2 44 59	...	...	...	...	...	
	M	2 47 0	...	...	489	...	...	
	F	3 17 15	...	...	...	...	...	
„ 11th	P	16 21 15	...	...	...	...	...	
	M	16 28 10	...	...	33	...	...	
	F	16 41 59	...	...	...	...	...	
„ 23rd	P	6 28 40	...	...	...	...	...	
	S	6 36 20	...	...	...	...	...	
	M	6 55 41	...	...	344	...	...	
	F	8 29 22	...	...	...	...	...	

Thickening of line was noted on the following occasions:—

D. H. M. D. H. M. D. H. M. D. H. M. D. H. M. M.

1 13 30; 4 2 49; 4 13 14; 6 4 26 to 29; 8 13 13 to 17;
9 3 40; 17 6 52 to 59; 22 3 35; 27 5 10 to 15; 29 6 16.

Sensibility to tilt 1·0 mm. of amplitude on the trace = 0·29″.

N. A. F. MOOS,
Director,
Bombay and Alibag Observatories.

5. CALCUTTA (ALIPORE) OBSERVATORY.

Seismic records.

ϕ = 22° 32′ N; λ=88° 21′ E; h=6·4 m. *Subsoil* Alluvial.

Apparatus.—Milne's Horizontal Pendulum Seismograph.

TABLE 5.

	V	To	ϵ	$\frac{r}{To^2}$
AN:				
AE:	8·688	18	1	
AZ:				

Date.	Phase.	Time, G. M. T.	Period (Sec.)	Amplitude (u). An.	Ae.	Az.	Distance Δ (Km.)	Remarks.
1914.		h. m. s.						
Oct. 3rd	P	17 41 43	...	...	..	...	...	
	L	18 38 10	...	...	...	...	...	
	M	18 40 43	...	...	230	...	...	
	C	18 46 49	...	...	201	...	...	
	F	19 56 0	...	...	...	...	...	
„ 3rd	P	22 17 55	...	...	...	...	...	
	L	22 25 2	..	..	... *	...	...	* Measured from base line. ? Ends in morning air tremors.
	M	22 42 19	...	...	1151	...	...	
	F	?	...	...	...	...	...	
„ 9th	P	2 45 18	...	...	...	...	...	
	L	2 46 19	...	...	...	...	...	
	M	2 48 21	...	...	345	...	...	
	F	3 31 4	...	...	...	...	...	
„ 11th	P	16 20 1	...	...	...	...	...	
	L	16 25 37	...	...	...	...	...	
	M	16 30 12	...	...	144	...	...	
	F	17 23 37	...	...	...	...	...	
„ 23rd	P	6 26 15	...	...	...	...	...	
	L	6 31 20	...	...	...	...	...	
	M	6 44 33	...	...	1554 †	...	...	† Measured from base line.
	C	6 50 8	...	...	1209 †	...	...	
	F	7 58 47	...	...	...	...	...	

E. P. HARRISON,
Offg. Meteorologist, Calcutta.

6. SIMLA OBSERVATORY.

Following table contains a list of earthquakes that were reported :—

TABLE 6.

Place at which felt.	Date.	G. M. T. of earthquake.	Duration.	Intensity Rossi-Forel scale.	No. of shocks.	REMARKS.
		h. m.	sec.			
Mansehra (Hazara District).	Oct. 9th	2 35	30	5	1	
Dras . . .	„ 9th	2 37	120	7	3	
Sialkot . . .	„ 9th	2 38	25	6	3	
Dharmsala (Kangra District).	„ 9th	2 40	...	...	...	One death reported by the Deputy Commissioner.
Ghora Gali (Murree) .	„ 9th	2 40	6	6	2	
Lahore . . .	„ 9th	2 40	30	6	2	
Simla . . .	„ 9th	2 40	45	7	1	Slight incessant tremblings were felt before and after the shock.
Srinagar . . .	„ 9th	2 40	120	7	2	
Rawalpindi . .	„ 9th	2 41	20	5	2	
Skardu . . .	„ 9th	2 50	2	3	1	
Sarain (Jubbal State, Simla District).	„ 9th	2 55	5	3	1	
Sialkot . . .	Oct. 9th	3 27	3	4	2	
Simla . . .	„ 9th	3 33	3	5	1	
Srinagar . .	„ 9th	3 35	12	5	1	
Jalapahar (Darjiling).	„ 11th	1 50	15	4	1	
Ross Island (Port Blair).	„ 11th	16 55	30	6	1	
Salonah (Nowgong District, Assam).	„ 19th	14 52	7	5	2	
Ditto . .	„ 21st	19 59	15	5	5	
Meshed (Persia) .	„ 27th	22 0	30	5	1	

Solar radiation.—The following figures give the intensity of solar radiation, as measured at Simla by Angstrom's pyrheliometer. The values are corrected to local noon, and expressed in grammecalories per square centimetre per minute :—

Maximum	1·47
Minimum	1·25
Mean	1·38
Number of days of observation	10

C. W. NORMAND,
Imperial Meteorologist, Simla.

ROYAL ALFRED OBSERVATORY, MAURITIUS.

7. No information has been received.

Weather in the Indian Ocean.

8. In the equatorial belt, as represented by Zanzibar and Seychelles, pressure was somewhat above the normal; the air movement was lighter than usual and the rainfall was on the whole markedly in excess.

TABLE 7.

—	Mauritius.	Zanzibar.	Seychelles.
Departure from normal of mean pressure		+·015	+·005
Actual mean wind direction . .		S 5°E	S 43° E
Normal mean wind direction . .		S 20° E	S 39° E
Actual mean wind velocity (miles per diem).		75	119
Normal mean wind velocity (miles per diem).		89	139
Rainfall departure from normal . .		—2·78	+6·08

Depressions and cyclonic storms.

9. Only one disturbance occurred over the Bay during the course of the month. This, according to the available marine information, formed over the Andaman Sea on the 1st, travelled north-westwards on the 2nd and 3rd and then, recurving to north and north-east crossed the coast nearly midway between Chittagong and Akyab on the morning of the 6th. Its barometric depth apparently was not large not more than three tenths of an inch and the strongest winds actually recorded on board vessels involved in it were only of force 7. It however occasioned heavy rain over Burma, particularly along the Arakan coast.

The statement below gives approximately the position of the centre on each day of its existence :—

TABLE 8.

DATE.	APPROXIMATE POSITION OF THE CENTRE AT 8 HRS.	
	Lat. N.	Long. E.
	° ′	° ′
2nd	11 45	94 35
3rd	13 35	92 10
4th	16 10	90 30
5th	17 50	89 50
6th	21 55	93 20

Over the Arabian Sea conditions were unsettled from the 12th to the 18th, but as far as can be ascertained from the limited information available at the present time they did not concentrate into a storm.

In northwest India the weather was controlled by five depressions; four of these were apparently formed locally over Sind and the adjoining districts, and the fifth over the Persian region. The first influenced the weather from the 6th to the 8th, the second on the 10th and 11th, the third between the 13th and the 17th, the fourth on the 22nd and 23rd and the fifth from the 27th to the 1st November. The precipitation accompanying the first four was confined mainly to the Punjab, the North-West Frontier Province and Kashmir, but that associated with the fifth occurred also in Baluchistan and was in places very heavy.

Pressure.

10. Barometric pressure was above the normal throughout the plains by amounts ranging from about ·02″ on the Malabar coast to a tenth of an inch in the region defined by Waltair, Cocanada and Masulipatam. On the mean of all the plains observatories there was an excess of ·071″ which has been surpassed only on three occasions during the past forty years. The temperature conditions as recorded in the lowest stratum of the atmosphere over India were by no means abnormal.

The statement below giving the most noteworthy excesses recorded in previous years shows the extraordinary character of the pressure conditions prevailing in October 1914.

TABLE 9.

MONTH.	Departure from normal of mean pressure over the Indian plains.
	″
January 1877	+·073
February 1902	+·088
October „	+·077

The high pressure conditions were not peculiar to India but extended, although in a modified degree, southwards to Seychelles and Zanzibar and westwards into Persia.

TABLE 10.

STATION.	Departure from normal of monthly pressure.
	″
Jask	+·014
Muscat	+·020
Bushire	+·010
Aden	+·012
Zanzibar	+·015
Seychelles	+·005

Over the greater part of the country, but particularly in northern India, the excess was chiefly a feature of the lower atmosphere for at the level of the observing hill stations there was either a defect or the excess was comparatively small.

TABLE 11.

DIVISION.	Departure from normal of mean pressure.
	″
Burma	+·065
Assam	+·086
Bengal	+·077
Bihar and Orissa	+·086
United Provinces	+·084
Punjab	+·079
North-West Frontier Province	+·057
Sind	+·046
Rajputana	+·059
Bombay	+·062
Central India	+·071
Central Provinces	+·084
Hyderabad	+·075
Mysore	+·052
Madras	+·063

TABLE 12.

HILL STATION.	Departure from normal pressure. A	PLAIN STATION.	Departure from normal pressure. B	Departure of pressure difference. B—A
	″		″	″
Quetta	—·007	Jacobabad	+·021	+·028
Leh	—·007	Lahore	+·080	+·087
Murree	+·020	Peshawar	+·054	+·034
Simla	+·042	Ludhiana	+·090	+·048
Chakrata	+·030	Roorkee	+·095	+·065
Mount Abu	+·050	Deesa	+·077	+·022
Pachmarhi	+·083	Khandwa	+·085	+·002
Kodaikanal	+·034	Madura	+·073	+·039

Temperature.

11. There were only two areas in which temperature conditions of the month departed to a marked extent from the normal. One comprised Kashmir, the North-West Frontier Province, the Punjab and the adjoining districts of the United Provinces and was characterized by a considerable defect of day temperature, and the other embraced north Burma and upper Assam and was distinguished by an appreciable lowness of both the maximum and the minimum temperatures.

TABLE 18.

Sub-division.	Actual temperature.					Departure from normal of		
	Mean maximum.	Mean minimum.	Monthly mean of mean between maximum and minimum.	Mean daily range of temperature.	Absolute range during month.	Maximum.	Minimum.	Daily range.
	°	°	°	°	°	°	°	°
1. Bay Islands	87·2	78·5	82·9	8·7	15·5	+1·2	+0·8	+0·4
2. Lower Burma	87·6	74·4	81·0	13·2	19·9	+0·3	—0·5	+0·7
3. Upper Burma	86·7	68·2	77·4	18·5	30·0	—2·8	—3·7	+0·9
4. Assam	84·6	67·5	76·1	17·2	30·5	—2·1	—3·4	+1·3
5. Bengal	87·8	71·6	79·7	16·3	26·8	+0·4	—2·6	+3·0
6. Orissa	90·3	71·6	81·0	18·7	29·4	+1·3	—2·2	+3·5
7. Chota Nagpur	88·7	65·4	77·1	23·3	35·0	+1·0	—1·9	+2·9
8. Bihar	89·1	67·9	78·5	21·1	33·3	+1·0	—4·1	+5·1
9. United Provinces, East	90·2	65·9	78·1	24·3	36·9	—0·1	—1·5	+1·4
10. Do., West	89·2	65·0	77·1	24·1	37·8	—2·4	—0·5	—1·9
11. Punjab, East and North	86·6	62·6	74·6	24·0	40·8	—6·9	0	—6·9
12. Do., South-west	89·4	64·6	77·0	24·8	43·8	—5·9	+1·8	—7·7
13. Kashmir	62·5	40·0	51·2	22·5	47·0	—4·5	—1·5	—3·0
14. North-West Frontier Province	84·9	60·8	72·9	24·1	45·3	—6·3	+1·9	—8·2
15. Baluchistan	84·3	54·5	69·4	29·8	49·0	+1·7	+3·1	—1·4
16. Sind	98·5	72·4	83·0	21·1	35·9	—1·0	+4·5	—5·5
17. Rajputana, West	95·6	68·9	82·3	26·7	40·7	—1·1	+1·4	—2·5
18. Do., East	91·3	65·7	78·5	25·5	37·9	—1·9	+2·1	—4·0
19. Gujarat	98·8	70·7	82·3	23·1	32·9	+0·3	—0·1	+0·4
20. Central India, West	90·5	63·9	77·3	26·5	34·3	+1·3	—0·1	+1·4
21. Do., East	89·8	65·3	77·5	24·5	36·1	+0·7	—0·1	+0·8
22. Berar	91·8	67·7	79·8	24·1	34·3	+2·7	+0·5	+2·2
23. Central Provinces, West	90·8	65·8	78·3	25·0	33·9	+2·0	—0·1	+2·1
24. Do., East	88·2	65·9	77·1	22·3	33·2	+1·8	—0·6	+2·4
25. Konkan	89·5	76·1	82·8	13·5	21·1	+3·5	+1·6	+1·9
26. Bombay Deccan	89·9	66·3	78·1	23·7	34·4	+1·9	0	+1·9
27. Hyderabad, North	90·0	67·4	78·7	22·6	31·9	+1·1	—0·7	+1·8
28. Do., South	90·3	70·1	80·2	20·2	29·3	+1·1	0	+1·1
29. Mysore	83·9	66·3	75·1	17·7	25·2	+1·1	+0·2	+0·9
30. Malabar	86·9	75·5	81·1	11·4	17·5	+1·4	+1·5	—0·1
31. Madras, South-east	87·8	74·0	80·7	13·8	23·9	—1·7	+0·2	—1·9
32. Do., Deccan	91·7	71·2	81·5	20·6	29·2	+0·9	—0·9	+1·8
33. Do. Coast, North	89·8	74·7	82·2	15·1	24·7	+0·8	—0·9	+1·7

TABLE 14.

DIVISION.	DEPARTURE FROM NORMAL OF		
	Mean maximum temperature.	Mean minimum temperature.	Mean temperature.
	°	°	°
Burma	−1·1	−1·8	−1·5
Assam	−2·1	−3·4	−2·7
Bengal	+0·4	−2·6	−1·0
Bihar and Orissa	+1·1	−3·0	−0·9
United Provinces	−1·2	−1·1	−1·1
Punjab	−6·5	+0·7	−2·9
North-West Frontier Province	−6·3	+1·9	−2·2
Sind	−1·0	+4·5	+1·8
Rajputana	−1·6	+1·9	+0·1
Bombay	+1·5	+0·3	+0·9
Central India	+1·0	−0·1	+0·4
Central Provinces	+2·1	0	+1·0
Hyderabad	+1·1	−0·2	+0·5
Mysore	+1·1	+0·2	+0·7
Madras	−0·1	0	0

Winds.

12. (*a*) The rate of air motion was less than usual in October in the North-West Frontier Province, the United Provinces, north-east India, the Central Provinces and the north and west of the Peninsula and was above the normal in the Punjab, Madras and Mysore. On the other hand the degree of steadiness was distinctly high in all the provinces with the exception of Bengal, the United Provinces, Rajputana and Central India.

(*b*) The direction of air movement in Lower Burma, the Andamans, along the Coromandel coast and at Colombo was such as is characteristic of the middle of November rather than of October.

TABLE 15.

DIVISION.	DEPARTURE FROM NORMAL OF	
	Hourly wind velocity.	Wind steadiness.
Burma	+0·3	+ 7
Assam	−0·3	+21
Bengal	−0·9	+ 1
Bihar and Orissa	−0·3	+ 9
United Provinces	−0·4	− 6
Punjab	+0·8	+ 9
North-West Frontier Province	−0·4	+ 2
Sind	0	+31
Rajputana	+0·3	− 7
Bombay	−0·9	+ 9
Central India	+0·3	−18
Central Provinces	−0·5	+ 7
Hyderabad	−1·1	+26
Mysore	+0·9	+42
Madras	+0·4	+ 9

Humidity and cloud.

13. The air was much damper than usual, both absolutely and relatively, in Baluchistan, Sind, the North-West Frontier Province and the Punjab, and was very dry in the east of the Bombay Deccan and the greater part of the Central Provinces.

In north-east India and Upper Burma the absolute humidity was markedly in defect, but the percentage of saturation was nearly normal owing to the lowness of temperature. Elsewhere the hygrometric conditions were nearly normal.

The sky was unusually cloudy over the greater part of north-west India and in the coast districts of the south of the Peninsula, and was clearer than usual in almost all other parts of the country. In north-east India the recorded proportion was only half of the normal.

TABLE 16.

DIVISION.	HYGROMETRY; 8 HRS.				CLOUD.	
	Mean humidity.	Departure from normal.	Mean vapour tension in inches of mercury.	Departure from normal in inches of mercury.	Mean cloud amount at 8 hrs.	Departure from normal.
	%					
Burma . .	87	0	·797	—·051	4·7	—0·5
Assam . .	89	— 2	·707	—·086	3·4	—2·3
Bengal . .	82	— 3	·778	—·066	2·1	—2·0
Bihar and Orissa .	75	— 4	·683	—·060	1·3	—1·6
United Provinces .	67	— 2	·577	—·023	1·0	—0·3
Punjab . .	70	+14	·501	+·070	2·3	+1·6
North-West Frontier Province.	73	+15	·481	+·087	2·9	+2·1
Sind . . .	73	+16	·718	+·187	1·7	+1·0
Rajputana . .	49	0	·449	+·023	1·2	+0·2
Bombay . .	68	— 3	·668	—·012	2·8	+0·1
Central India .	60	— 1	·524	—·009	1·3	—0·2
Central Provinces	61	— 5	·551	—·033	1·4	—1·1
Hyderabad . .	62	— 7	·602	—·044	2·6	—1·7
Mysore . .	80	— 1	·634	—·005	6·4	—0·1
Madras . .	81	0	·808	—·011	5·3	—0·1

Rainfall.

14. There was a defect of rainfall during the month over the United Provinces, north-east India, Lower Burma, Central India, the Central Provinces and the greater part of the Peninsula, the two subdivisions of Madras South-east and Malabar alone being exceptions to this condition. The deficiency was greatest in absolute amount in the Bay Islands and the Madras Coast North (5″), and by percentage comparison with the normal in the United Provinces East, Central India East, Berar and the Central Provinces East, which obtained less than 12 per cent. of their proper share. In north-west India excluding Gujarat the weather was unusually disturbed, and the rainfall was in many places in excess of the normal by considerable amounts.

TABLE 17.

SUB-DIVISION.	NUMBER OF RAINY DAYS.		RAINFALL.			
	Actual.	Normal.	Actual.	Normal.	Departure from normal.	Percentage departure from normal.
			"	"	"	
1. Bay Islands	8·0	12·9	3·53	8·71	—5·18	— 59
2. Lower Burma	7·6	10·4	7·24	7·69	—0·45	— 6
3. Upper Burma	5·9	7·3	5·93	5·42	+0·51	+ 9
4. Assam	4·6	6·4	2·79	5·11	—2·32	— 45
5. Bengal	2·0	5·0	1·47	4·51	—3·04	— 67
6. Orissa	1·3	5·1	0·66	4·23	—3·57	— 84
7. Chota Nagpur	1·4	3·0	0·80	2·09	—1·29	— 62
8. Bihar	0·7	2·6	0·38	2·36	—1·98	— 84

Sub-division.	Number of rainy days.		Rainfall.			
	Actual.	Normal.	Actual.	Normal.	Departure from normal.	Percentage departure from normal.
			"	"	"	
9. United Provinces, East	0·4	1·6	0·13	1·90	−1·77	− 93
10. Do., West	1·9	0·8	0·56	0·86	−0·30	− 35
11. Punjab, East and North	3·3	0·4	1·46	0·26	+1·20	+462
12. Punjab, South-west	2·0	0·1	0·93	0·04	+0·89	+2225
13. Kashmir	7·9	1·2	5·12	0·64	+4·48	+700
14. North-West Frontier Province	4·9	0·6	3·68	0·27	+3·41	+1263
15. Baluchistan	2·7	0·1	1·53	0·03	+1·50	+5000
16. Sind	0·5	0	0·16	0·01	+0·15	+1500
17. Rajputana, West	0·6	0·1	0·24	0·05	+0·19	+380
18. Do., East	1·3	0·4	0·59	0·44	+0·15	+ 34
19. Gujarat	0·7	0·8	0·38	0·59	−0·21	− 36
20. Central India, West	0·6	0·8	0·26	0·56	−0·30	− 54
21. Do., East	0·2	1·1	0·09	1·02	−0·93	− 91
22. Berar	0·4	2·1	0·19	1·55	−1·36	− 88
23. Central Provinces, West	0·7	1·8	0·37	1·33	−0·96	− 72
24. Do., East	0·5	2·2	0·17	1·55	−1·38	− 89
25. Konkan	1·9	5·4	1·07	3·97	−2·90	− 73
26. Bombay Deccan	1·6	4·5	0·96	3·08	−2·12	− 69
27. Hyderabad, North	0·7	3·3	0·54	2·43	−1·89	− 78
28. Do., South	1·2	4·3	0·54	2·91	−2·37	− 81
29. Mysore	7·3	7·9	4·56	5·42	−0·86	− 16
30. Malabar	14·8	11·4	12·96	9·05	+3·91	+ 43
31. Madras, South-east	15·2	9·0	12·00	7·33	+4·67	+ 64
32. Do., Deccan	2·9	5·8	1·32	4·20	−2·88	− 69
33. Do. Coast, North	2·4	6·6	1·43	6·33	−4·90	− 77

TABLE 18.

Division.	Rainfall.			
	Actual.	Normal.	Departure from normal.	Percentage departure from normal.
	"	"	"	
Burma	6·45	631	+0·14	+ 2
Assam	2·79	5·11	−2·32	−45
Bengal	1·47	4·51	−3·04	−67
Bihar and Orissa	0·56	2.77	−2·21	−80
United Provinces	0·34	1·40	−1·06	−76
Punjab	1·33	0·21	+1·12	+533
North-West Frontier Province	3·68	0·27	+3·41	+1263

Division.	Rainfall.			
	Actual.	Normal.	Departure from normal.	Percentage departure from normal.
	"	"	"	
Sind	0·16	0·01	+0·15	+1500
Rajputana	0·45	0·32	+0·13	+41
Bombay	0·79	2·44	−1·65	−68
Central India	0·18	0·79	−0·61	−77
Central Provinces	0·24	1·48	−1·24	−84
Hyderabad	0·54	2·69	−2·15	−80
Mysore	4·56	5·42	−0·86	−16
Madras	7·68	6·81	+0·87	+13
Mean of India	2·16	2·84	−0·68	−24

Snowfall.

I.—AFGHANISTAN.

15. There was apparently heavy snowfall, between 3 and 5 feet, on the peaks of the hills around Kabul.

II.—NORTH-WEST FRONTIER PROVINCE.

Kurram.—Snowstorms occurred on the higher parts of the Sufed Koh on the 14th, 16th, 23rd, 24th, 28th, 29th and 31st. At the end of the month the accumulations on the Paiwar Kotal measured about 7 inches in depth.

Malakand.—The first fall of the winter season of 1914-15 occurred on the Laram hills (elevation 6,800 feet), 24 miles north of Malakand, as early as the 15th.

III.—KASHMIR.

The statement below shows the character of snowfall in this area :—

TABLE 19.

Locality.	Date of occurrence.	Aggregate fall.	REMARKS.
Mountains around Srinagar.	14th to 17th	Not known	The snowline descended to 6,500 feet.
Dras	14th to 18th, 23rd, 24th and 29th to 31st.	1¾ feet	The Zojila pass was closed to ponies owing to heavy snowfall.
Kargil	17th, 18th and 23rd.	About 2 inches.	
Ranges near Kargil.	15th to 18th, 23rd, 24th and 30th.	Not reported	At the end of the month the unmelted residue measured 3 feet in depth.
Hills around Skardu.	15th, 18th, 29th and 30th.	2½ feet	

IV.—PUNJAB.

Kilba (Simla Hills)—On the ranges near Kilba snowstorms were observed on the 5th, 16th, 24th, 29th and 31st. The snowline descended to 8,000 feet on the last occasion. The total fall amounted to about 11 feet on the Brua pass, 8 feet on the Rupin and 3 feet on the Harang. About 6 inches of snow was lying near Narkanda on the 16th. At the close of the month the unmelted residue measured about 5 feet in depth on the Brua and 3 feet on the Rupin.

V.—UNITED PROVINCES.

(*a*) *Garhwal.*—Snow fell on the 9th, 16th, 23rd and 29th on the higher peaks in the north of the district. The lowest level reached was 8,600 feet.

(*b*) *Almora.*—The aggregate fall of the month was estimated at 14 feet in Byans, 6½ feet in Malla Darma, 4½ feet in Chaudas, 4 feet in Malla Danpur and 3 feet in Malla Johar. The snowline came down to a distance of 3 to 6 miles from the perpetual snow.

TABLE 20.

Name of pass or peak.	DEPTH OF ACCUMULATION AT THE END OF THE MONTH.	
	Reported.	Normal.
	Feet.	Feet.
Nuwe Pass	15	23
Binkaru „	11	12½
Lipulekh „	13	2½
Lampia „	18	4½
Untadhura	9	9½
Ralamdhura	6	6½

VI.—SIKKIM.

There was a light fall at Yatung on the 13th.

SUMMARY.

16. In the hill districts bordering upper India, according to the available information, snowfall began earlier than usual, and was on the whole above the average.

HEM RAJ.

The lines of the above chart represent isobars or lines of equal barometric pressure, the numbers attached indicating the barometric pressure in inches and being drawn for differences of pressure of ·05 inch. The isobars in the Bay of Bengal are filled in by means of the shore observations, and by comparison with the normal distribution of pressure.

The mean 8 hrs. wind directions of the month are shewn by means of arrows flying with the wind, and are calculated by means of Lambert's formula applied to the winds as given in Table B of the 8 hrs. observations. The mean wind directions for the hill stations are indicated by broken arrows to distinguish them from the wind arrows for the plain stations. The mean velocity of the winds during the month is shewn by the following notation:—

Velocity of	0 to 2	miles per hour	...	one	feather added to the wind arrow.
,, ,,	2 to 5	,, ,, ,,	...	two	feathers ,, ,, ,, ,,
,, ,,	5 to 10	,, ,, ,,	...	three	,, ,, ,, ,, ,,
,, ,,	10 to 20	,, ,, ,,	...	four	,, ,, ,, ,, ,,
	over 20	,, ,, ,,	...	five	,, ,, ,, ,, ,,

Wind strengths are based on factor 2·2 for the standard type of Beckley Robinson anemograph, instead of 3·0 as used for this plate

The chart shows the departure from normal of the mean during the month of 8 hrs. pressure by means of lines drawn for equal amounts of departure. The numbers are given in thousandths of an inch, 20 representing ·020″ or two hundredths of an inch, &c. Continuous lines indicate that the pressure was in excess by amounts indicated by the numbers attached to the lines, and broken or dotted lines that it was in defect by amounts indicated by the numbers attached to the lines. Two parallel lines near to each other, one continuous and the other broken or dotted, represent the line of no departure, the dotted line facing the area of deficient pressure or negative departures.

CHART SHEWING THE DEPARTURE FROM NORMAL
OF THE MONTHLY MEAN OF DAILY
MAXIMUM TEMPERATURE.

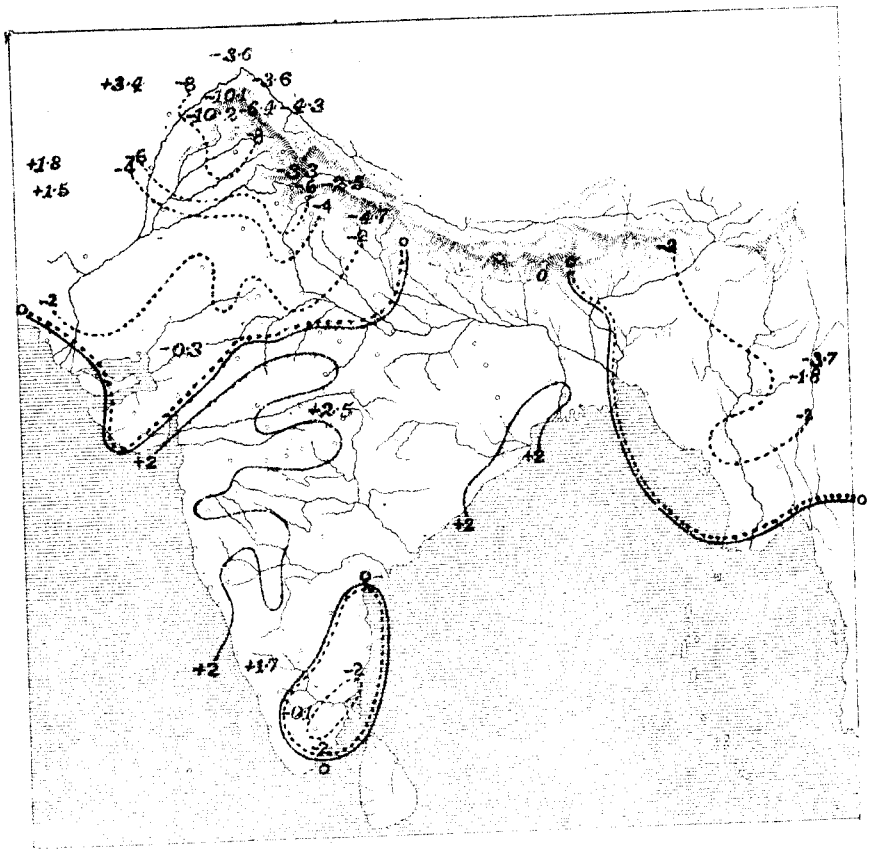


CHART SHEWING THE DEPARTURE FROM NORMAL
OF THE MONTHLY MEAN OF DAILY
MINIMUM TEMPERATURE.

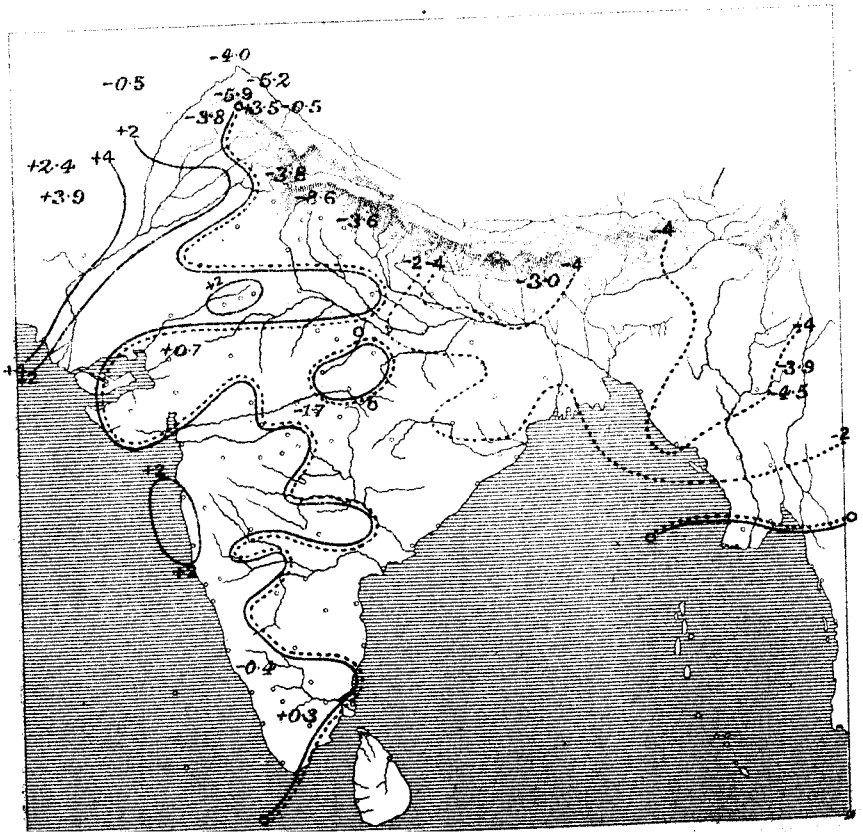


CHART SHEWING THE DEPARTURE FROM NORMAL
OF THE MONTHLY MEAN OF DAILY
MEAN TEMPERATURE.

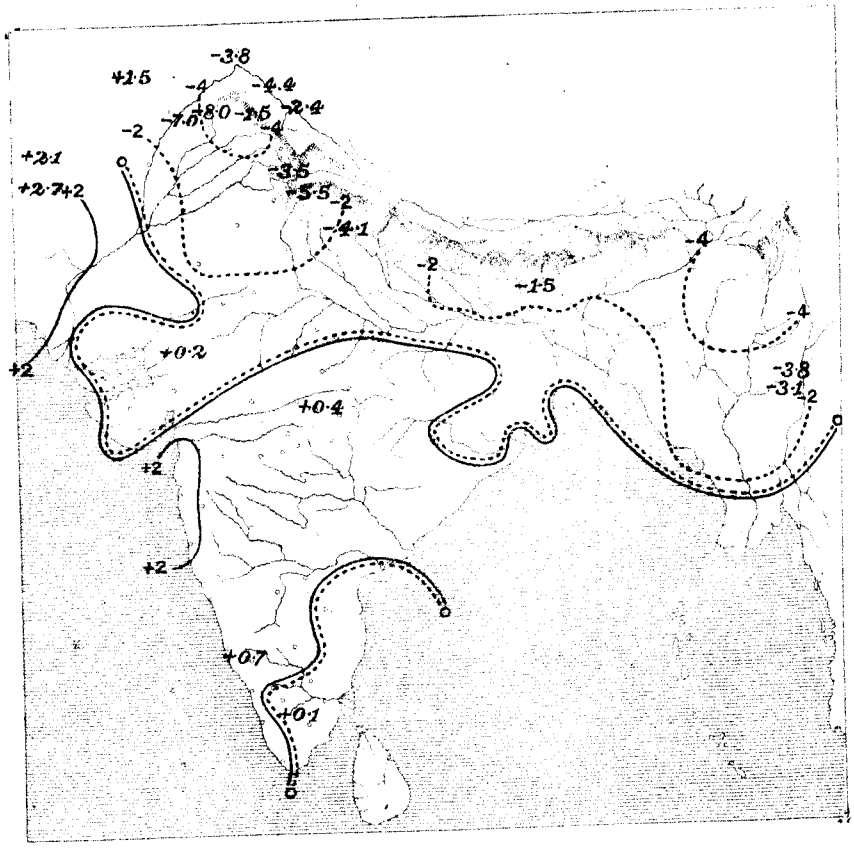


CHART SHEWING THE DEPARTURE FROM NORMAL
OF THE MONTHLY MEAN OF ABSOLUTE
HUMIDITY AT 8 HRS.

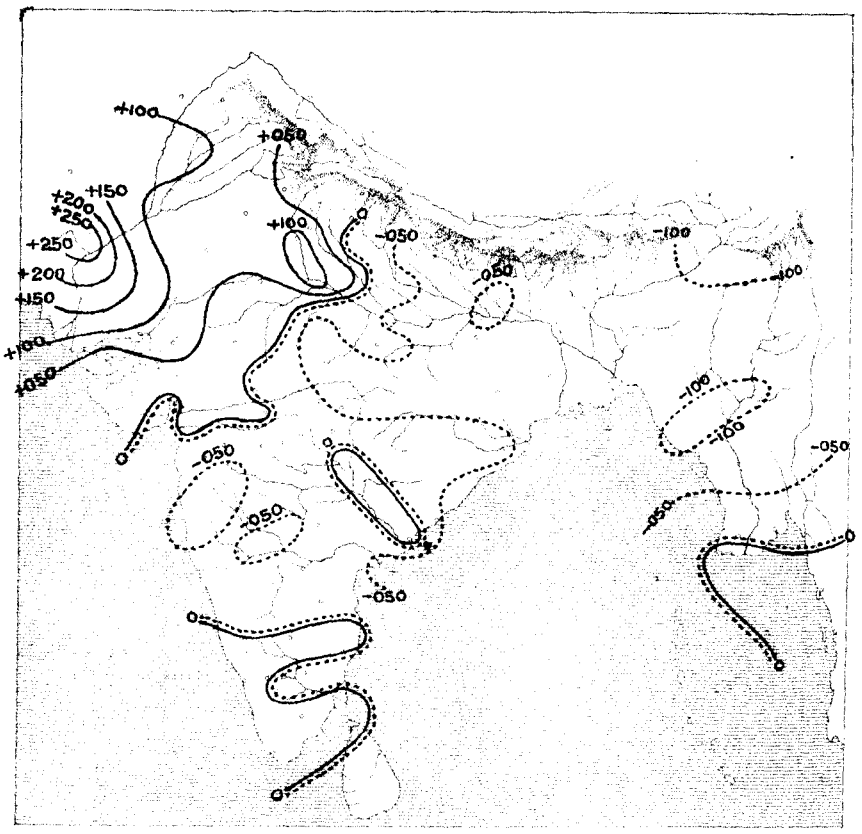


CHART SHEWING THE DEPARTURE FROM NORMAL
OF THE MONTHLY MEAN OF RELATIVE
HUMIDITY AT 8 HRS.

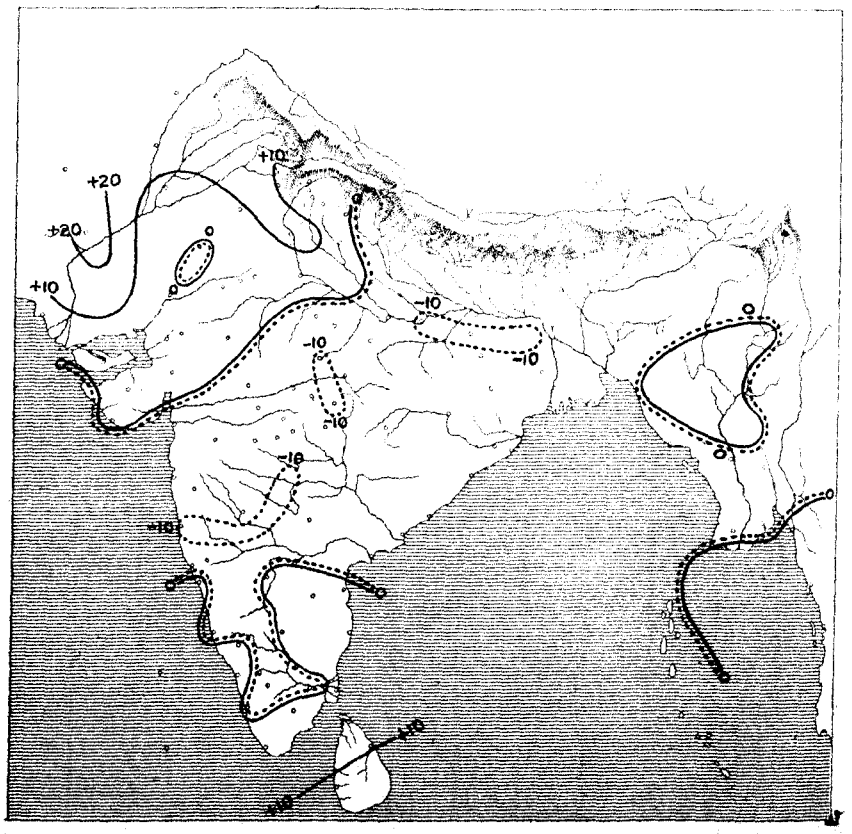


CHART SHEWING THE DEPARTURE FROM NORMAL OF THE MONTHLY MEAN OF CLOUD AMOUNT AT 8 HRS.

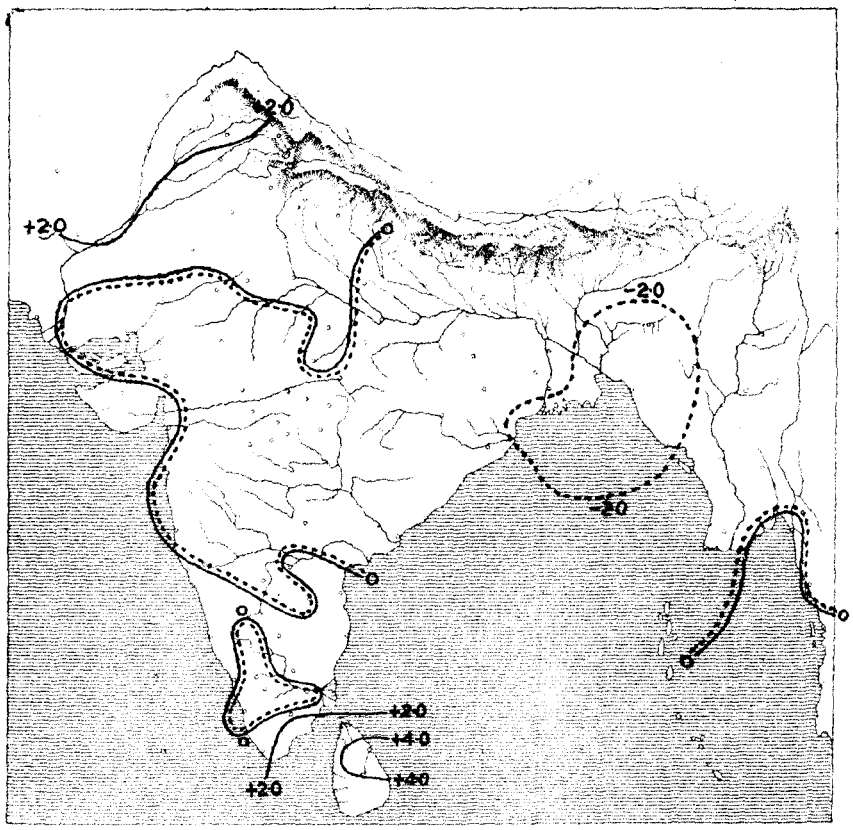
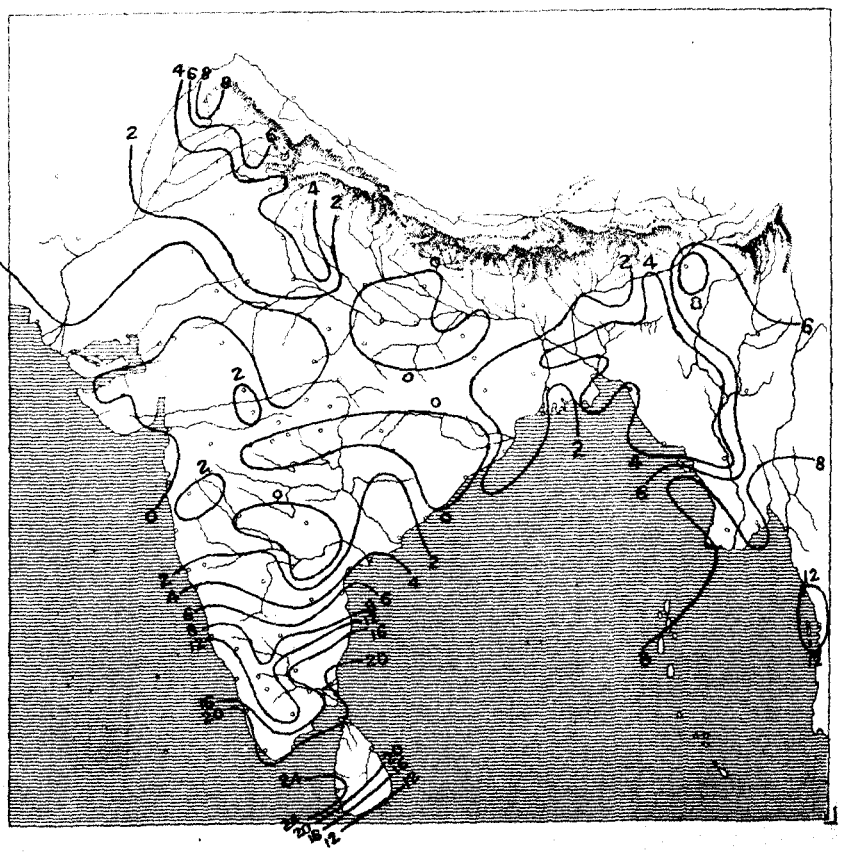
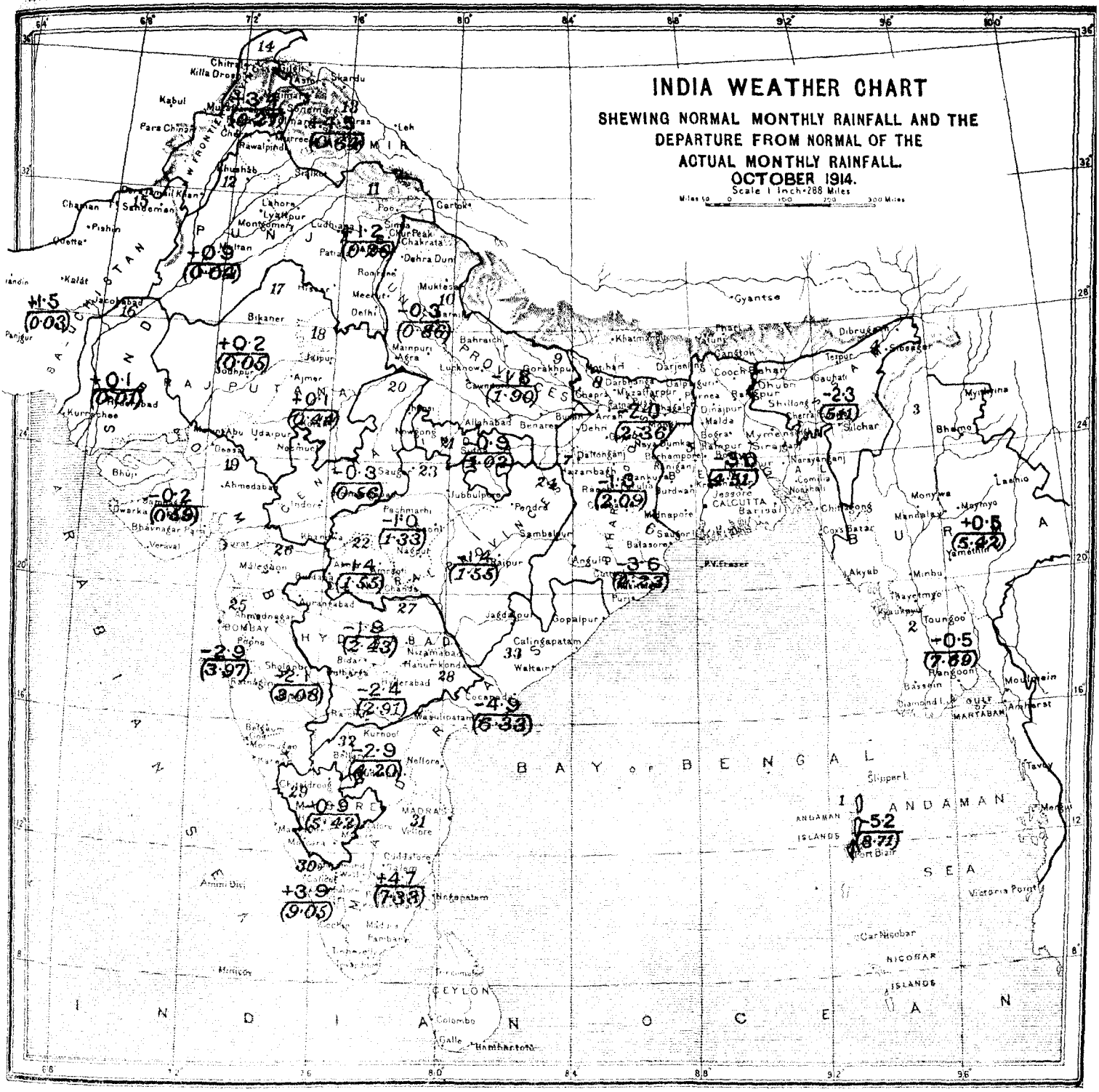


CHART SHEWING THE TOTAL NUMBER OF DAYS IN THE MONTH ON WHICH RAINFALL EQUALLED OR EXCEEDED 0·10 INCH.

(BASED ON THE RETURNS OF TABLE B.)





The country is divided into 33 areas as shewn in the list below. The numbers in that list correspond with the red numbers on the chart, and serve to identify the areas. The numbers in brackets on the chart give the average over the divisions of the normal monthly rainfall, the numbers above these give the departures from normal of the average actual rainfall over the divisions.

1. Bay Islands
2. Lower Burma
3. Upper Burma
4. Assam
5. Bengal
6. Orissa
7. Chota Nagpur
8. Bihar
9. United Provinces, East
10. United Provinces, West
11. Punjab, East and North
12. Do., Southwest
13. Kashmir
14. Northwest Frontier Province
15. Baluchistan
16. Sind
17. Rajputana, West
18. Rajputana, East
19. Gujarat
20. Central India, West
21. Do., East
22. Berar
23. Central Provinces, West
24. Do., East
25. Konkan
26. Bombay, Deccan
27. Hyderabad, North
28. Hyderabad, South
29. Mysore
30. Malabar
31. Madras, Southeast
32. Madras, Deccan
33. Madras Coast, North

GOVERNMENT OF INDIA.

METEOROLOGICAL DEPARTMENT.

MONTHLY WEATHER REVIEW.

PUBLISHED BY ORDER OF

THE GOVERNMENT OF INDIA.

CALCUTTA, NOVEMBER, 1914.

INTRODUCTION.

THIS review of the weather in India during the month of November, 1914, is based on observations taken daily at 8 hrs. at 214 stations, and on additional observations taken at 10 hrs. and 16 hrs. at 13 stations. In the rainfall summary the data furnished by the meteorological observatories, and such rainfall statements of the month as had been published by the Provincial Governments up to the date of the preparation of the review, have been utilized.

The brief notes on solar, seismic and magnetic disturbances have been supplied by the chief observatories.

For a statement of the methods adopted in recording and tabulating the data, for each of the elements of observation, reference should be made to the introductory portion of the review for January.

Summary of the chief features of the weather in India during the month.

2. The noteworthy features of the meteorology of the month were (*a*) the extreme weakness of the monsoon in Madras, and (*b*) the frequent occurrence of disturbed weather in north-west India due to an abnormally early commencement of winter actions.

Two disturbances formed in the Bay but neither developed into a storm of any severity.

The total precipitation of the month was in marked excess in north-west India excluding Sind, in the Bombay Deccan and in the west of the United Provinces and of Central India, and in appreciable defect in Upper Burma, north-east India, the Central Provinces, Hyderabad, Madras, and the east of the United Provinces and of Central India. The largest departures were an excess of 1·37″ or 489 per cent. in Kashmir, of 1·66″ or 722 per cent. in Baluchistan and a defect of 1·91″ or 59 per cent. in the Madras Coast North.

Cloud was appreciably in defect in north-east India and Mysore, and above the average in the Punjab, Kashmir, Baluchistan, Bombay excluding Gujarat, the Central Provinces, Malabar, and over the greater part of Burma, while humidity was markedly in excess in the Punjab, the North-West Frontier Province, Sind and Baluchistan. Temperature was in excess by 4° in Sind, and by 3° in Gujarat, Central India and the Central Provinces. In the last three areas the high temperature occurred chiefly during the period 3rd to 11th.

Solar, magnetic and seismic disturbances.

KODAIKANAL OBSERVATORY.

3. *Solar observations.*—Sunspot observations were possible on 27 days, but on one of those days the telescope could not be used, the object glass being removed for cleaning. Spots were recorded on 26 days. Prominence records were obtained on 27 days. From October 1, 1914, prominence drawings and estimates of their areas, heights, and bases are obtained entirely from the photographs, visual observations being confined to the study of displacements of the lines and to metallic reversals of lines.

Sunspots.—Eleven new groups were recorded—the largest number since the last maximum. The daily average number was 1·7 and the average life of a spot was 3·8 days. The spots were in rather high latitudes, as shown in the table below :—

TABLE 1.

—	0°—10°	11°—20°	21°—30°	Extreme latitudes.
North	...	3	1	18° , 24°
South	...	4	3	16° , 27°

The two groups 2093 (a double spot group) and 2097 reached a fairly large size, but the umbræ were very small. No. 2093 was by far the most disturbed group of the month. On the 10th when it was about half a day's march west of the central meridian a reversal of the C line was found, when observed with a wide slit, to be of a clearly prominence-like form about 15″ in width. On the next day, the 11th, bright reversals of C were observed in several places and also large displacements of the dark C line which for some time changed violently in direction and amount, the greatest amount corresponding to a velocity of about 140 miles per second away from the observer. Disturbances in C were frequent in the month.

Prominences.—Sixty "large" prominences and one metallic prominence were recorded during the month. The highest prominence was at + 35° west on the 9th and was 220″ high.

Magnetic disturbances.—There was a "moderate" magnetic disturbance on the 26th and 27th. There were two spot groups on those 2 days, one in the eastern hemisphere and the other in the western.

J. EVERSHED,
Director,
Kodaikanal and Madras Observatories.

Seismic records.

$\phi = 10°\ 13'\ 50''$; $\lambda = 77°\ 28'\ 00''$; $h = 2343$ m. Subsoil Rock.

Apparatus.—Milne's Horizontal Pendulum Seismograph.

TABLE 2.

	V	To	ϵ	$\frac{r}{To^2}$
AN:				
AE:	9·76	15·3	1	3·6
AZ:				

Date.	Phase.	Time G. M. T.	Period (Sec.)	Amplitude (u). An.	Ae.	Az.	Distance Δ (Km.)	Remarks.
1914. Novr. 4th	e P	h. m. s. 8 30 00	...	..	...	...	...	Widening of line. Lasted about 2 minutes. Was merged in the hour mark.
„ 4th	e P	9 01 30	...	...	...	...	...	Widening of line.
	F	9 18 06	...	...	...	...	...	
„ 4th	e P	11 01 00	...	...	...	...	...	
	e L	11 16 54	...	...	...	...	...	
	M	11 22 48	...	...	50	..	...	
	F	11 46 24	...	...	...	...	...	
„ 10th	e P	6 54 30	...	...	...	...	...	
	e L	7 27 54	...	...	...	...	...	
	M	7 45 00	...	...	30	...	...	
	F	8 01 00	...	...	...	...	...	
„ 18th	e P	10 41 48	...	...	...	...	...	
	e L	11 08 30	...	...	...	...	...	
	M	11 30 30	...	...	50	...	...	
	F	11 44 54	...	...	...	...	...	
„ 24th	i E	12 04 12	...	...	...	..	...	No preliminary tremors.
	M	12 32 18	...	...	80	...	...	
	F	13 44 54	...	...	...	...	...	
„ 27th	e P	15 14 30	...	...	...	...	...	Widening of line.
	F	15 21 12	...	...	...	...	...	
„ 28th	e P	10 58 12	...	...	...		...	
	i L	11 19 48	...	...	...	...	...	
	M	11 28 12	...	...	70	...	...	
	F	11 52 54	...	...	...	...	...	
„ 29th	e P	5 12 24	...	...	...	...	...	Widening of line. End lost in hour mark.
	F	5 30 00?	...	...	...	...	...	

S. SITARAMA AIYAR,
Offg. Assistant Director,
Kodaikanal and Madras Observatories.

BOMBAY OBSERVATORY.

Alibag magnetic record.

4. During the month of November, 1914, the traces showed 12 calm days, 17 days of small, and 1 day of moderate disturbance.

The days of the month selected as quiet for the purposes of the Magnetic Survey of India are the 6th, 9th, 13th, 22nd and 25th.

The following table represents the magnetic character of each day during the month :—

TABLE 3.

Day.	Character.	Day.	Character.	Day.	Character.	Day.	Character.
1	S	9	C	17	S	25	C
2	S	10	S	18	S	26	S
3	S	11	M	19	C	27	S
4	S	12	S	20	C	28	S
5	S	13	C	21	C	29	S
6	C	14	S	22	C	30	S
7	C	15	S	23	C	...	...
8	C	16	S	24	C	...	...

C.=calm; S.=small; M.=moderate; G.=great; V. G.=very great.

The mean observed absolute values of the several magnetic elements reduced to the mean monthly tabulations of the magnetograms as also the ranges and the summed ranges of the horizontal force and declination for the month are as follow :—

Easterly declination	0° 42′ 47″.
Horizontal force	0·36881 C.G.S. unit.
Vertical force	0·16627 C.G.S. „
Inclination	24° 16′·1.
Horizontal force range	0·00038 C.G.S. unit.
Horizontal force summed range	0·00235 C.G.S. „
Declination range	1′·0.
Declination summed range	6′·2.

(NOTE.—Summed range means sum without regard to sign of the 24 ordinates of the diurnal inequality.)

Seismic records.

$\phi = 18° 53′ 36″$; $\lambda = 72° 48′ 56″$; $h = 11$ m. Subsoil Trap.

Apparatus.—Milne's Horizontal Pendulum Seismograph.

TABLE 4.

	V	To	ϵ	$\frac{r}{To^2}$
AN:				
AE:	9	21	...	...
AZ:				

Date.	Phase.	Time G. M. T. h. m. s.	Period (Sec.)	Amplitude (a). An.	Ae.	Az.	Distance Δ (Km.)	Remarks.
1914. Novr. 4th	P	11 14 15	...	...	...	...	...	
	M	11 16 10	...	...	56	...	...	
	F	11 32 18	...	...	...	...	...	
„ 4th	P	16 38 45	...	...	...	...	...	
	M	16 56 54	...	...	100	...	...	
	F	17 4 9	...	...	...	...	...	
„ 10th	P	7 34 48	...	...	...	...	...	
	M	7 41 3	...	...	44	...	...	
	F	7 55 10	...	...	...	...	...	
„ 18th	P	10 57 4	...	...	...	...	...	
	M	11 12 40	...	...	56	...	...	
	F	11 44 10	...	...	...	...	...	
„ 22nd	P	8 35 17	...	...	...	...	...	
	M	9 18 45	...	...	33	...	...	
	F	9 27 25	...	...	...	...	...	
„ 24th	P	12 3 43	...	...	...	...	...	
	M	12 27 13	...	...	178	...	...	
	F	18 4 44	...	...	...	...	...	
„ 28th	P	10 55 23	...	...	...	...	...	
	M	11 23 29	...	...	156	...	...	
	F	11 58 25	...	...	...	...	...	

Thickening of line was noted on the following occasions :—

D. H. M. D. H. M. D. H. M. D. H. M. H. M.
8 13 13; 13 4 28; 23 19 38; 28 13 55 to 14 0;

Sensibility to tilt 1·0 mm. of amplitude on the trace = 0·29″.

N. A. F. MOOS,
Director,
Bombay and Alibag Observatories.

5.—CALCUTTA (ALIPORE) OBSERVATORY.

Seismic records.

$\phi = 22° 32' N$; $\lambda = 88° 21' E$; $h = 6{\cdot}4$ m. Subsoil Alluvial.

Apparatus.—Milne's Horizontal Pendulum Seismograph.

TABLE 5.

	V	To	ϵ	$\frac{r}{To^2}$
AN :				
AE :	8·688	18	1	
AZ :				

Date.	Phase.	Time G. M. T.	Period (Sec.)	Amplitude (a). An.	Ae.	Az.	Distance Δ (Km.)	Remarks.
1914.		h. m. s.						
Novr. 4th	P	11 13 32	...	...	...	...	...	
	L	11 16 5	...	...	...	...	...	
	M	11 17 36	...	...	173	...	...	
	F	11 37 26	...	...	...	...	...	
„ 10th	P	7 33 52	...	...	...	...	...	
	L	7 39 27	...	...	...	...	...	
	M	7 44 2	...	...	86	...	...	
	F	8 9 28	...	...	...	...	...	
„ 24th	P	11 58 5	...	...	...	...	...	
	L	12 9 17	...	...	...	...	...	
	M	12 41 49	...	...	115	...	...	
	F	14 4 14	...	...	...	...	...	
„ 28th	P	10 53 8	...	...	...	...	...	
	S	11 2 17	...	...	...	...	...	
	L	11 7 52	...	...	...	...	...	
	M	11 15 31	...	...	403	...	...	
	F	12 2 17	...	...	...	...	...	
	P	13 33 48	...	...	...	...	...	
	L	13 44 59	...	...	...	...	...	
	M	13 49 3	...	...	86	...	...	
	F	14 8 22	...	...	...	...	...	
„ 29th	P	5 11 46	...	...	...	...	...	
	M	5 15 50	...	...	57	...	...	
	F	5 40 45	...	...	...	...	...	

6.—SIMLA OBSERVATORY.

The Simla seismograph notes will appear in the next number of the Monthly Weather Review.

The following table contains a list of earthquakes that were reported :—

TABLE 6.

Place at which felt.	Date.	G. M. T. of earthquake.	Duration.	Intensity Rossi-Forel scale.	No. of shocks.
		h. m.	Sec.		
Borjuli (Darrang District, Assam.)	Nov. 3rd	9 14	3	6	1
Dera Ismail Khan . .	„ 4th	11 7	51	7	Severe
Shillong	„ 5th	0 49	1	2	1
„	„ 5th	6 39	1	2	1
Borjuli (Darrang District, Assam.)	„ 7th	13 41	2	6	1
Kila Drosh	„ 15th	17 15	30	5	1
„ „	„ 25th	9 35	10	6	1
„ „	„ 25th	20 0	25	5	1
„ „	„ 30th	14 50	35	5	1

Solar radiation.—The following figures give the intensity of solar radiation, as measured at Simla by Angstrom's pyrheliometer. The values are corrected to local noon, and expressed in grammecalories per square centimetre per minute :—

Maximum	1·49
Minimum	1·43
Mean	1·46
Number of days of observation .	8

C. W. NORMAND,

Imperial Meteorologist, Simla.

ROYAL ALFRED OBSERVATORY, MAURITIUS.

7. No information has been received.

Weather in the Indian Ocean.

8. In the equatorial belt barometric pressure was low, the direction of air movement unusual and rainfall in defect.

TABLE 7.

	Mauritius.	Zanzibar.	Seychelles.
Departure from normal of mean pressure		″ −·004	″ −·022
Actual mean wind direction . .		S 31° W	N 86° W
Normal mean wind direction . .		S 45° E	S 56° E
Actual mean wind velocity (miles per diem).		60	92
Normal mean wind velocity (miles per diem).		82	93
Rainfall departure from normal . .		−4·32	−2·33

Depressions and cyclonic storms.

9. During the month two depressions developed in the Bay of Bengal. The first had been forming in the last few days of the previous month and on the morning of the first its centre was roughly 200 miles to the east of Cuddalore. The depression was a shallow one barometrically and the winds were light, though forming part of a well marked circulation. It advanced in a west north-westerly direction across the Peninsula, crossing the east coast on the night of the first and appearing on the morning of the 3rd as a low pressure area over the east Arabian Sea. The low pressure persisted off the west coast for the next few days and gave rise to local rain squalls over the sea. There was widespread rainfall in the south of the Peninsula during the passage of the depression. The heaviest falls occurred over a strip of country lying to the south of a line joining Madras and Karwar and a large number of rain gauge stations in that area recorded falls of 5″ to 7″ on the 2nd or 3rd.

In the third week of the month the area of relatively low pressure began to extend slowly northwards from the south of the Bay. From the land observations it appeared that a storm existed to the west of the Andamans on the 20th and that it moved slowly towards the Arakan coast disappearing off that coast on the 23rd. The observations from a few ships are however now available and these indicate that the depression developed very little beyond the V shaped stage and that the area of lowest pressure had the form of a large elongated oval pointing N N E towards the Arakan coast. Some of the ships report rain squalls and moderate seas from the 19th to the 23rd, when the isobars favoured southerly winds. Burma experienced widespread and in places heavy rainfall.

Of the disturbances of the cold weather type, which affected the weather of northern India, the most important was that which had crossed the north-west frontier at the end of the previous month. It caused some moderately heavy falls in the plains of the Punjab on the 1st, and in the surrounding hills the precipitation continued for another two days. In addition five other disturbances could be traced as having been transmitted from Persia. They were generally ill-defined and their influence on the weather, if measured by the precipitation they produced, was mainly confined to the hills of north-west India. The dates on which they caused rain or snowfall were as follows:—the first disturbance on the 6th and 7th, the second on the 14th, 15th and 16th, the third on the 18th and 19th, the fourth on the 23rd and 24th and the fifth on the 27th. Only the first and second of these disturbances produced rainfall on the plains, the former in the north Punjab and the latter in the west of the United Provinces, and the amounts were nowhere large.

Pressure.

10. On the mean of the month the atmospheric pressure was below the normal at practically every station. In the plains, however, the deficiencies were nowhere large, and only in a few small isolated areas were they greater than 02″.

Pressure at the hill stations in north-east Baluchistan was about ·05″ in defect, which indicates an unusual steepness in the vertical gradient in that region. A similar steepness is noticeable in the south of the Peninsula, but elsewhere the vertical gradients seem to have been nearly normal.

TABLE 8.

DIVISION.	Departure from normal of mean 8 hrs. pressure.
	"
Burma	—·012
Assam	—·007
Bengal	—·008
Bihar and Orissa	—·006
United Provinces	—·009
Punjab	—·010
North-West Frontier Province	—·026
Sind	—·015
Rajputana	—·013
Bombay	—·015
Central India	—·007
Central Provinces	—·004
Hyderabad	—·007
Mysore	—·011
Madras	—·006

TABLE 9.

HILL STATION.	Departure from normal pressure. A	PLAIN STATION.	Departure from normal pressure. B	Departure of pressure difference. B—A.
	"		"	"
Quetta	—·053	Jacobabad	—·016	+·036
Leh	+·002	Lahore	—·006	—·008
Murree	—·016	Peshawar	—·024	—·008
Simla	—·001	Ludhiana	+·004	+·005
Mount Abu	—·002	Deesa	—·011	—·009
Pachmarhi	+·015	Khandwa	+·003	—·012
Kodaikanal	—·015	Madura	+·007	+·022

Temperature.

11. The greatest departures in the day temperature occurred in the North-West Frontier Province and the north of the Punjab, where on the mean of the month the defect was more than 4°. The defect was between 2° and 4° in central Burma, in the south Punjab, and the adjoining districts of Sind and of the United Provinces. On the other hand there was an excess of 2° to 4° at many stations in the Central provinces, Central India, Bihar and Orissa, and the east of the United Provinces.

The mean minimum temperature of the month was more than two degrees above the normal in the area to the north-west of a line through Bahraich, Allahabad, Nagpur and Ratnagiri. This excess increased towards the west, and at Jacobabad was as much as 11°.

The mean of the maximum and minimum temperatures lay within 2° of the average in all the divisions except the Central Provinces, Central India and the Bombay Presidency.

TABLE 10.

SUB-DIVISION.	ACTUAL TEMPERATURE.					DEPARTURE FROM NORMAL OF		
	Mean maximum.	Mean minimum.	Monthly mean of mean between maximum and minimum.	Mean daily range of temperature.	Absolute range during month.	Maximum.	Minimum.	Daily range.
	°	°	°	°	°	°	°	°
1. Bay Islands	87·1	78·5	82·9	8·5	15·4	+1·7	+1·5	+0·2
2 Lower Burma	86·7	72·6	79·7	14·1	23·7	0	+0·8	—0·8
3 Upper Burma	83·3	63·4	73·4	19·9	32·5	—1·8	0	—1·8
4 Assam	81·8	59·9	70·9	21·9	30·8	+0·2	—0·8	+1·0
5. Bengal	84·4	63·1	73·8	21·2	30·8	+1·7	—1·2	+2·9
6 Orissa	86·7	63·2	75·0	23·4	35·7	+2·1	—1·0	+3·1
7 Chota Nagpur	84·6	58·0	71·3	26·6	38·1	+1·9	—0·5	+2·4
8. Bihar	84·3	58·6	71·3	25·6	36·9	+2·1	—2·0	+4·1
9. United Provinces, East	84·3	57·4	70·9	26·9	39·8	+1·6	+0·7	+0·9

Sub-division.	Actual temperature.					Departure from normal of		
	Mean maximum.	Mean minimum.	Monthly mean of mean between maximum and minimum.	Mean daily range of temperature.	Absolute range during month.	Maximum.	Minimum.	Daily range.
	°	°	°	°	°	°	°	°
10. United Provinces West	83·2	57·2	70·2	25·9	40·1	+0·1	+3·0	−2·9
11. Punjab, East and North	78·7	54·1	66·4	24·5	38·3	−3·4	+4·1	−7·5
12. Do., South-west	80·1	54·5	67·3	25·7	39·9	−3·2	+5·1	−8·3
13. Kashmir	52·1	31·0	41·5	21·1	36·7	−3·4	+1·5	−4·9
14. North-West Frontier Province	74·9	52·5	63·7	22·4	35·5	−4·7	+6·5	−11·2
15. Baluchistan	72·0	49·3	60·7	22·7	34·7	−2·4	+4·5	−6·9
16. Sind	86·5	66·5	76·5	19·9	34·2	+0·3	+7·7	−7·4
17. Rajputana, West	87·1	61·7	74·5	25·4	40·9	−1·3	+4·5	−5·8
18. Do., East	85·0	60·2	72·5	24·8	40·7	0	+3·5	−3·5
19. Gujarat	91·4	67·1	79·3	24·3	37·3	+1·6	+3·8	−2·2
20. Central India, West	85·7	59·7	72·7	26·0	41·3	+1·9	+5·3	−3·4
21. Do., East	83·9	57·1	70·5	26·9	42·9	+2·3	+3·5	−1·2
22. Berar	87·4	63·6	75·5	23·9	37·1	+2·6	+4·1	−1·5
23. Central Provinces, West	85·9	60·5	73·2	25·4	40·0	+2·4	+3·9	−1·5
24. Do., East	84·2	59·4	71·8	24·8	38·9	+2·0	+1·1	+0·9
25. Konkan	89·3	73·7	81·5	15·5	24·3	+1·3	+2·3	−1·0
26. Bombay Deccan	85·6	62·0	73·8	23·6	37·2	0	+2·5	−2·5
27. Hyderabad, North	86·0	62·7	74·4	23·2	36·7	+0·6	+2·3	−1·7
28. Do., South	86·7	65·7	76·2	21·0	34·3	+1·0	+1·6	−0·6
29. Mysore	82·1	63·1	72·6	18·9	28·7	+1·1	+0·7	+0·4
30. Malabar	87·6	74·7	81·1	12·9	19·9	+0·8	+1·2	−0·4
31. Madras, South-east	86·4	71·8	79·1	14·6	23·5	+0·5	+0·4	+0·1
32. Do. Deccan	89·1	67·1	78·1	21·9	33·8	+1·3	+0·8	+0·5
33. Do. Coast, North	86·1	69·8	77·9	16·3	27·2	+1·3	−0·4	+1·7

TABLE 11.

Division.	Departure from normal of		
	Mean maximum temperature.	Mean minimum temperature.	Mean temperature.
	°	°	°
Burma	−0·8	+0·4	−0·2
Assam	+0·2	−0·8	−0·3
Bengal	+1·7	−1·2	+0·3
Bihar and Orissa	+2·1	−1·4	+0·3
United Provinces	+0·8	+1·8	+1·3
Punjab	−3·4	+4·5	+0·6
North-West Frontier Province	−4·7	+6·5	+0·9

Division.	Departure from normal of		
	Mean maximum temperature	Mean minimum temperature.	Mean temperature.
	°	°	°
Sind	+0·3	+7·7	+4·0
Rajputana	−0·6	+3·9	+1·7
Bombay	+1·0	+3·0	+2·0
Central India	+2·1	+4·4	+3·3
Central Provinces	+2·3	+3·4	+2·9
Hyderabad	+0·9	+1·9	+1·3
Mysore	+1·1	+0·7	+0·9
Madras	+0·9	+0·5	+0·7

Winds.

12. (*a*) The air movement was above its usual strength in the Punjab, Central India and Madras, but was lighter even than usual in Bengal, the North-West Frontier Province, Sind, Bombay and Hyderabad.

(*b*) A relatively high degree of steadiness characterised the wind direction over the Punjab, the North-West Frontier Province, Hyderabad, Mysore and Madras, but in Bengal and Central India the directions were more variable than usual.

(*c*) The mean wind direction was more easterly than usual in Rajputana and more northerly than usual along the coast of the Bombay Presidency.

TABLE 12.

DIVISION.	DEPARTURE FROM NORMAL OF	
	Hourly wind velocity.	Wind steadiness.
Burma	—0·2	0
Assam	0	+ 3
Bengal	—0·5	— 9
Bihar and Orissa	—0·1	+ 1
United Provinces	—0·1	+ 3
Punjab	+0·4	+ 7
North-West Frontier Province	—0·5	+ 7
Sind	—0·3	+ 4
Rajputana	0	— 2
Bombay	—0·7	— 4
Central India	+0·9	— 5
Central Provinces	—0·2	- 2
Hyderabad	—0·9	+ 9
Mysore	—0·2	+ 8
Madras	+0·9	+ 6

Humidity and cloud.

13. On account of the unusually large number of winter disturbances the air over north-west India was very damp; and this excessive humidity was noticeable even in Sind in spite of the fact that the rainfall there was just as scanty as usual. Over the rest of the country the humidity was approximately normal.

The cloud amount was less than usual in Assam, Bengal, Bihar, Mysore and the north of Burma but was above the normal on the Tenasserim coast, in the Punjab, Kashmir, Malabar, the west of the Central Provinces, and in Bombay excluding Gujarat.

TABLE 13.

DIVISION.	HYGROMETRY; 8 HRS.				CLOUD.	
	Mean humidity.	Departure from normal.	Mean vapour tension in inches of mercury.	Departure from normal in inches of mercury.	Mean cloud amount at 8 hrs.	Departure from normal.
	%					
Burma	86	+ 3	·716	+ ·025	4·4	+0·8
Assam	89	— 4	·563	—·024	2·6	—1·2
Bengal	81	— 3	·593	—·033	1·3	—0·9
Bihar and Orissa	71	— 6	·491	—·039	1·1	—0·4
United Provinces	69	— 3	·445	+ ·026	0·8	—0·3
Punjab	79	+ 18	·414	+ ·117	2·3	+0·6
North-West Frontier Province.	86	+ 21	·407	+ ·137	2·4	+0·3
Sind	69	+ 16	·539	+ ·178	1·8	+0·2
Rajputana	55	+ 5	·377	+ ·058	1·7	+0·1
Bombay	64	0	·560	+ ·061	2·2	+0·7
Central India	60	+ 1	·414	+ ·045	1·4	+0·3
Central Provinces	59	— 4	·431	+ ·006	1·8	+0·5
Hyderabad	61	— 3	·512	—·008	3·4	—0·3
Mysore	74	— 1	·553	—·004	4·3	—0·5
Madras	77	— 2	·717	—·012	4·5	+0·4

Rainfall.

14. The monsoon was exceptionally weak in the Madras Coast North where the defect in the rainfall amount averaged about 2″. Baluchistan and Kashmir had average excesses of 1·7″ and 1·4″, respectively, although the normal amounts are only 0·2″ and 0·3″. Generally the rainfall of the month may be described as excessive in north-west India, the west of the United Provinces and of Central India and in the Bombay Deccan, and as defective in most other parts.

TABLE 14.

SUB-DIVISION.	NUMBER OF RAINY DAYS.		RAINFALL.			
	Actual.	Normal.	Actual.	Normal.	Departure from normal.	Percentage departure from normal.
			″	″	″	
1. Bay Islands	9·5	9·3	6·67	7·75	—1·08	— 14
2. Lower Burma	4·5	3·4	2·82	2·53	+0·29	+ 11
3. Upper Burma	3·0	3·1	1·35	1·98	—0·63	— 32
4. Assam	1·1	1·5	0·39	0·92	—0·53	— 58
5. Bengal	0·2	0·8	0·12	0·67	—0·55	— 82
6. Orissa	0	1·0	0	0·81	—0·81	—100
7. Chota Nagpur	0	0·4	0	0·20	—0·20	—100
8. Bihar	0	0·3	0	0·18	—0·18	—100
9. United Provinces, East	0	0·3	0·03	0·15	—0·12	— 80
10. Do., West	0·7	2·4	0·25	0·11	+0·14	+127
11. Punjab, East and North	1·0	0·2	0·36	0·10	+0·26	+260
12. Do., South-west	1·2	0·2	0·45	0·09	+0·36	+400
13. Kashmir	2·9	0·6	1·65	0·28	+1·37	+489
14. North-West Frontier Province	2·0	0·5	0·69	0·34	+0·35	+103
15. Baluchistan	4·2	0·6	1·89	0·23	+1·66	+722
16. Sind	0·1	0·1	0·06	0·07	—0·01	— 14
17. Rajputana, West	0·4	0·1	0·14	0·07	+0·07	+100
18. Do., East	0·5	0·2	0·17	0·11	+0·06	+ 55
19. Gujarat	0·5	0·3	0·23	0·18	+0·05	+ 28
20. Central India, West	0·8	0·3	0·45	0·18	+0·27	+150
21. Do., East	0	0·4	0·01	0·28	—0·27	— 96
22. Berar	0·9	0·8	0·37	0·52	—0·15	— 29
23. Central Provinces, West	0·5	0·7	0·17	0·41	—0·24	— 59
24. Do., East	0·1	0·6	0·02	0·44	—0·42	— 95
25. Konkan	1·6	1·3	0·94	0·78	+0·16	+ 21
26. Bombay Deccan	2·3	1·3	1·56	0·76	+0·80	+105
27. Hyderabad, North	0·9	1·2	0·43	0·77	—0·34	— 44
28. Do., South	0·7	1·8	0·35	0·97	—0·62	— 64

Sub-Division.	Number of rainy days.		Rainfall.			
	Actual.	Normal.	Actual.	Normal.	Departure from normal.	Percentage departure from normal.
			"	"	"	
29. Mysore	3·4	3·3	2·61	2·14	+0·47	+ 22
30. Malabar	4·2	5·2	3·64	3·87	—0·23	— 6
31. Madras, South-east	6·5	7·6	5·29	6·42	—1·13	— 18
32. Do., Deccan	2·5	2·9	1·33	1·88	—0·55	— 29
33. Do., Coast, North	1·6	3·2	1·31	3·22	—1·91	— 59

TABLE 15.

Division.	Rainfall.			
	Actual.	Normal.	Departure from normal.	Percentage departure from normal.
	"	"	"	
Burma	1·93	2·19	−0·26	− 12
Assam	0·39	0·92	—0·53	— 58
Bengal	0·12	0·67	−0·55	− 82
Bihar and Orissa	0	0·34	−0·34	−100
United Provinces	0·13	0·13	0	0
Punjab	0·38	0·10	+0·28	+280
North-West Frontier Province	0·69	0·34	+0·35	+103

Division.	Rainfall.			
	Actual.	Normal.	Departure from normal.	Percentage departure from normal.
	"	"	"	
Sind	0·06	0·07	—0·01	— 14
Rajputana	0·16	0·10	+0·06	+ 60
Bombay	1·02	0·58	+0·44	+ 76
Central India	0·23	0·23	0	0
Central Provinces	0·17	0·45	—0·28	− 62
Hyderabad	0·38	0·88	—0·50	— 57
Mysore	2·61	2·14	+0·47	+ 22
Madras	3·49	4·70	—1·21	— 26
Mean of India	0·85	0·99	—0·14	— 14

Snowfall.

I.—PERSIA.

15. Snow to a depth of six inches is reported to have fallen at Meshed on the 4th. Weather was on the whole mild.

II.—AFGHANISTAN.

Snow fell on hills around Kabul on the 15th, 16th, 18th and 20th. The aggregate fall of the month was estimated at 3 feet on the Paghman and Shakardara ranges, 2 feet on the Koh Korugh, 1 foot on the Koh Chinari and 6 inches on the Shakhi Barantai and the Koh Dahsabz. At the end of the month the unmelted residue of accumulations on different peaks was between 2 and 3 feet in depth.

III.—BALUCHISTAN.

Light falls of snow occurred on the 24th and 25th on the hills around Quetta.

IV.—NORTH-WEST FRONTIER PROVINCE.

(*a*) *Wano.*—Three inches of snow fell on the 16th on the Marwatti and Pirghal ranges (elevation 11,000 feet). At the end of the month the ranges were bare of snow.

(*b*) *Kurram.*—Snow fell on the peaks of the Sufed Koh altogether on nine days during the month. The unmelted residue on the Paiwar Kotal and the Agam pass was estimated at about 1½ and 5 feet, respectively.

(*c*) *Drosh.*—Snow fell in all on nine days on the surrounding hills.

V.—KASHMIR.

(*a*) *Srinagar.*—There was no snowfall in the main valley but snowstorms were observed on the surrounding hills.

(*b*) *Dras.*—Snow fell on four days to a total depth of 2½ feet. Owing to the heavy fall of snow in the beginning of the month the Zojila became quite impassable for horses and men.

(*c*) *Kargil.*—Snow fell on the 3rd to a depth of about half a foot. The estimated accumulation on the higher peaks at the end of the month was over 5 feet in depth.

(*d*) *Skardu.*—Light falls of snow occurred on the 1st and 3rd on the surrounding hills.

VI.—PUNJAB.

Simla (*Kilba Hills*).—There were altogether 3 falls on the surrounding hills, *viz.*, on the 17th, 18th and 30th. The lowest level reached was 9,000 feet. On the last day of the month snow lay about 5 feet deep on the Rupin pass and 6 feet on the Brua pass.

VII.—UNITED PROVINCES.

(*a*) *Garhwal.*—Snow fell on the 1st and 18th in the north of the district down to a level of 7,000 feet.

(*b*) *Almora.*—The total fall during the month was estimated at 11 feet in Byans, 6 feet in Malla Darma, 5½ feet in Malla Danpur, 5 feet in Chaudas and 1 foot in Malla Johar. The snow line came down from the perpetual snow

to a distance of 6 or 7 miles in Byans, 10 miles in Malla Darma, 14 miles in Chaudas, 4 miles in Malla Danpur and 12 miles in Malla Johar.

TABLE 16.

Name of pass or peak.	Depth of accumulation at the end of the month.	
	Reported.	Normal.
	Feet.	Feet.
Nuwe Pass	13	19½
Binkaru „	12	16
Lipulekh „	16	4
Lampia „	21	7
Untadhura	10	8
Ralamdhura	7	6½

VIII.—SIKKIM.

At Yatung about six inches of snow fell on the 19th.

SUMMARY.

16. According to the available information the snowfall of the month in the mountain zone bordering upper India was on the whole heavier than usual, particularly in Afghanistan.

C. W. NORMAND.

The lines of the above chart represent isobars or lines of equal barometric pressure, the numbers attached indicating the barometric pressure in inches and being drawn for differences of pressure of ·05 inch. The isobars in the Bay of Bengal are filled in by means of the shore observations, and by comparison with the normal distribution of pressure.

The mean 8 hrs. wind directions of the month are shewn by means of arrows flying with the wind, and are calculated by means of Lambert's formula applied to the winds as given in Table B of the 8 hrs. observations. The mean wind directions for the hill stations are indicated by broken arrows to distinguish them from the wind arrows for the plain stations. The mean velocity of the winds during the month is shewn by the following notation:—

Velocity of	0 to 2	miles	per	hour	...	one	feather	added	to	the	wind	arrow.
,, ,,	2 to 5	,,	,,	,,	...	two	feathers	,,	,,	,,	,,	
,, ,,	5 to 10	,,	,,	,,	...	three	,,	,,	,,	,,	,,	
,, ,,	10 to 20	,,	,,	,,	...	four	,,	,,	,,	,,	,,	
	over 20	,,	,,	,,	...	five	,,	,,	,,	,,	,,	

Wind strengths are based on factor 2·2 for the standard type of Beckley Robinson anemograph, instead of 3·0 as used for this plate up to December 1911 inclusive.

The chart shows the departure from normal of the mean during the month of 8 hrs. pressure by means of lines drawn for equal amounts of departure. The numbers are given in thousandths of an inch, 20 representing '020" or two hundredths of an inch, &c. Continuous lines indicate that the pressure was in excess by amounts indicated by the numbers attached to the lines, and broken or dotted lines that it was in defect by amounts indicated by the numbers attached to the lines. Two parallel lines near to each other, one continuous and the other broken or dotted, represent the line of no departure, the dotted line facing the area of deficient pressure or negative departures.

CHART SHEWING THE DEPARTURE FROM NORMAL
OF THE MONTHLY MEAN OF DAILY
MAXIMUM TEMPERATURE.

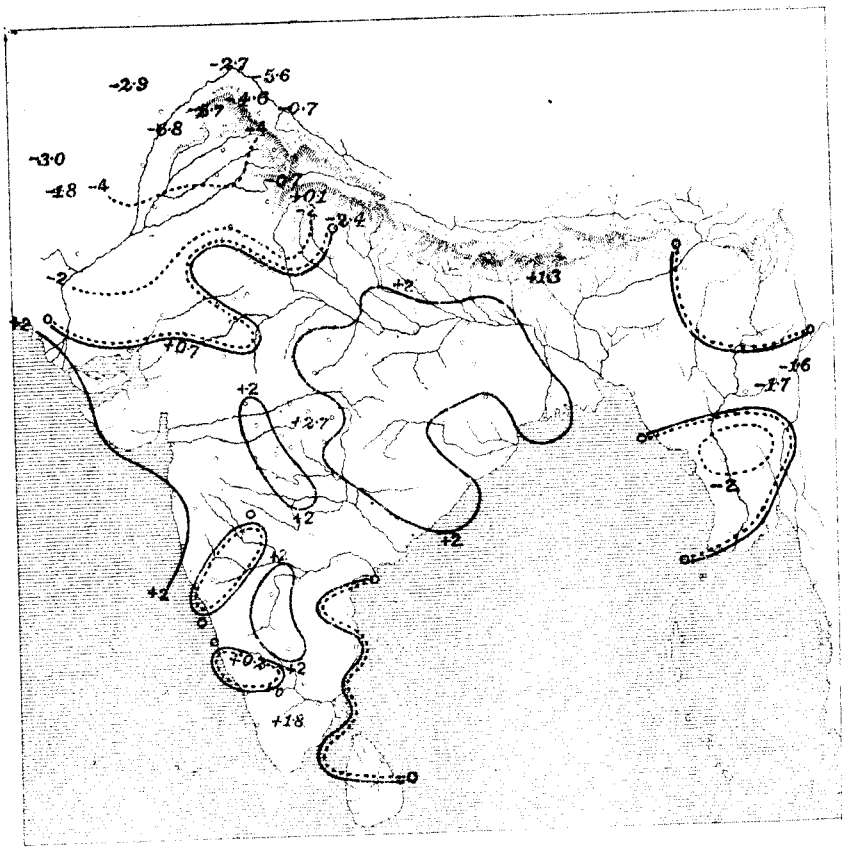


CHART SHEWING THE DEPARTURE FROM NORMAL
OF THE MONTHLY MEAN OF DAILY
MINIMUM TEMPERATURE.

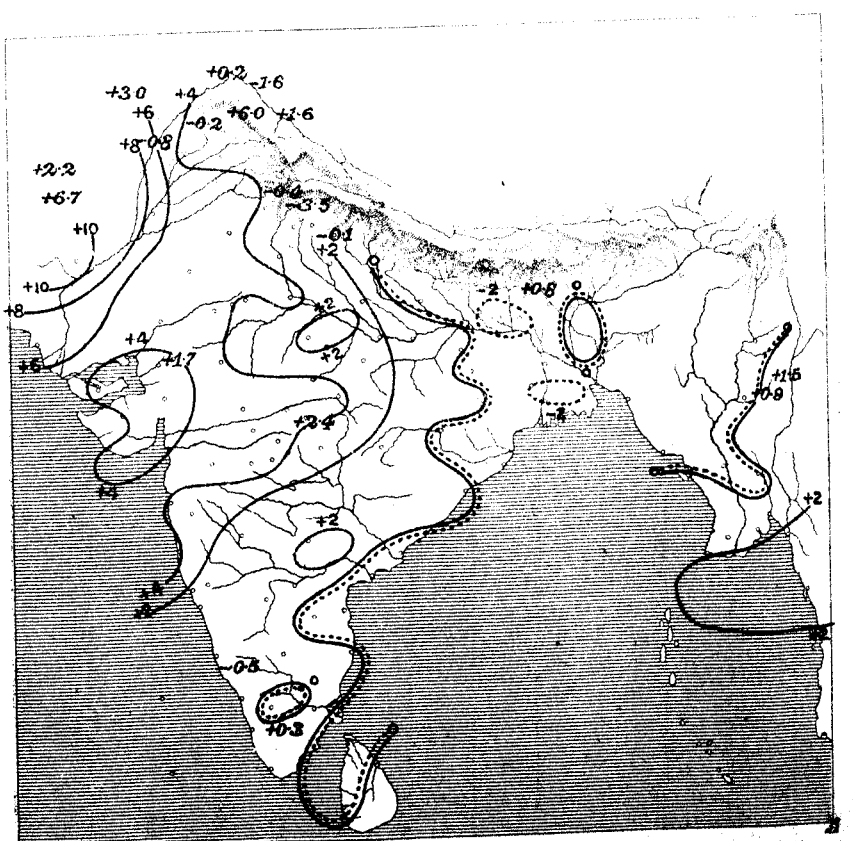


CHART SHEWING THE DEPARTURE FROM NORMAL
OF THE MONTHLY MEAN OF DAILY
MEAN TEMPERATURE.

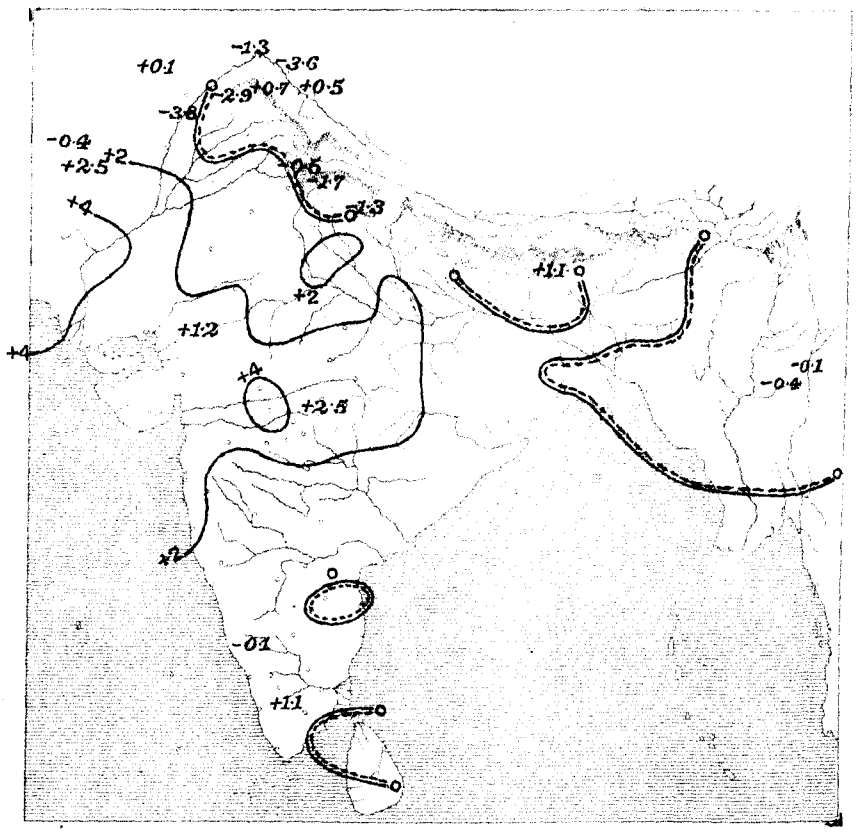


CHART SHEWING THE DEPARTURE FROM NORMAL OF THE MONTHLY MEAN OF ABSOLUTE HUMIDITY AT 8 HRS.

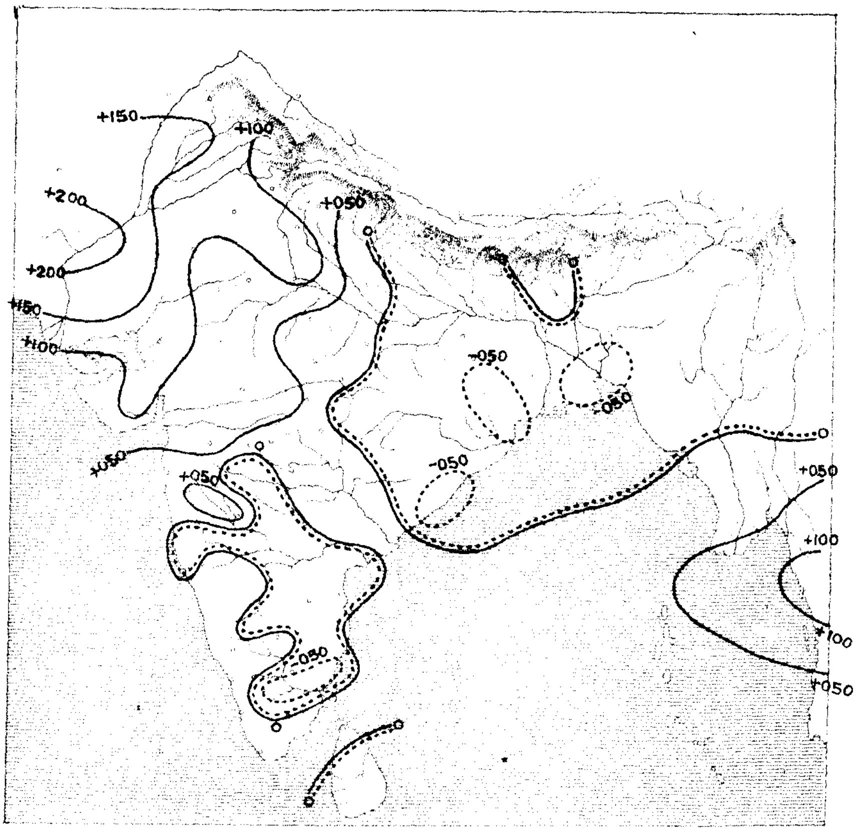


CHART SHEWING THE DEPARTURE FROM NORMAL OF THE MONTHLY MEAN OF RELATIVE HUMIDITY AT 8 HRS.

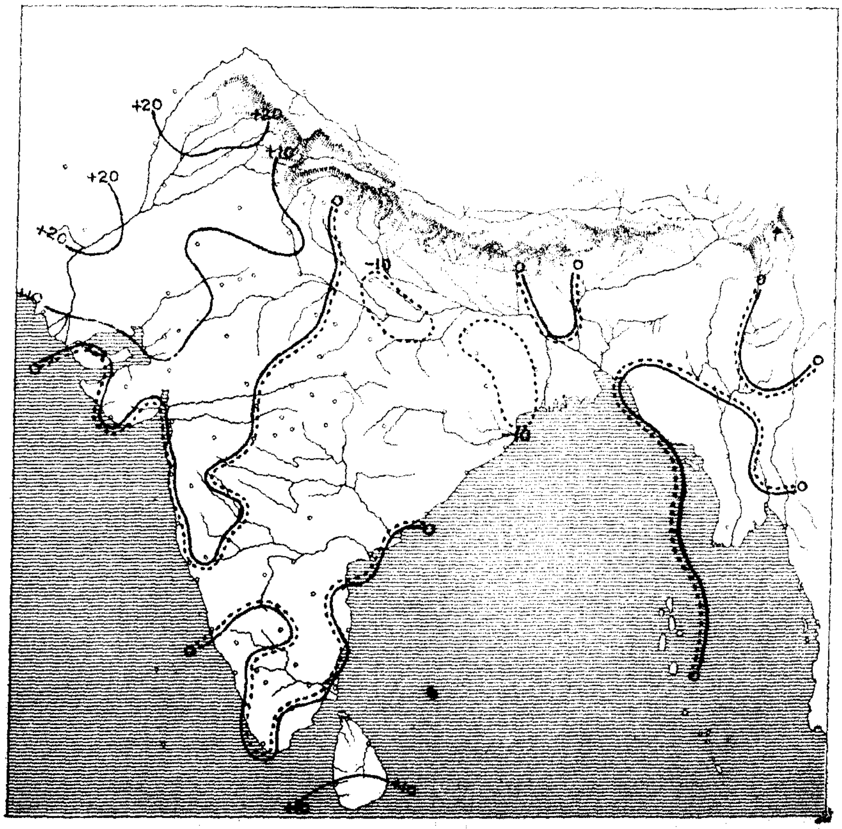


CHART SHEWING THE DEPARTURE FROM NORMAL
OF THE MONTHLY MEAN OF CLOUD
AMOUNT AT 8 HRS.

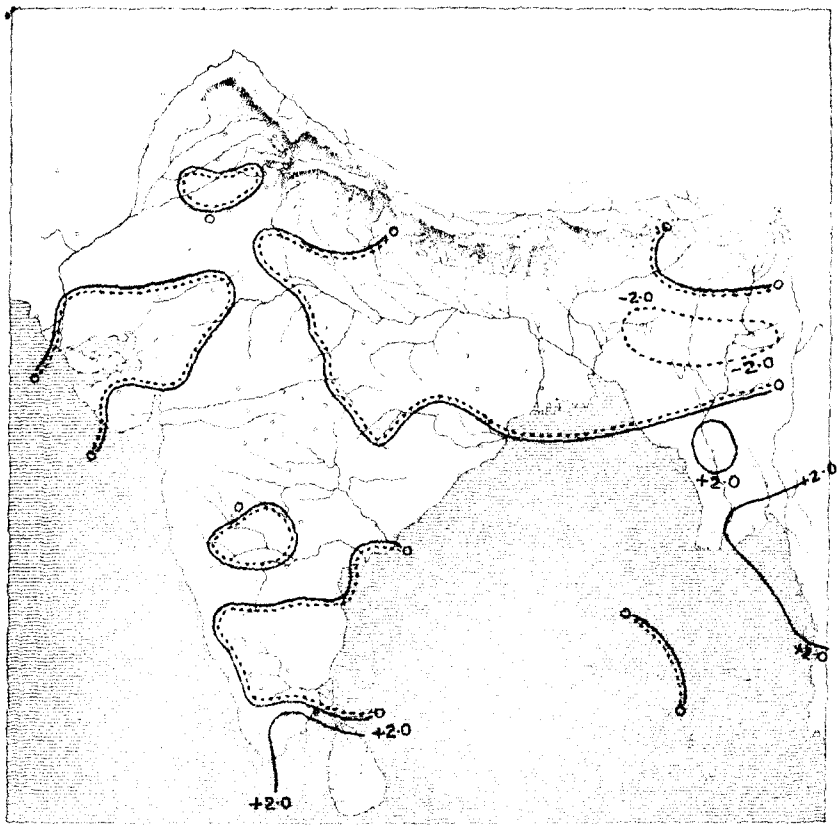
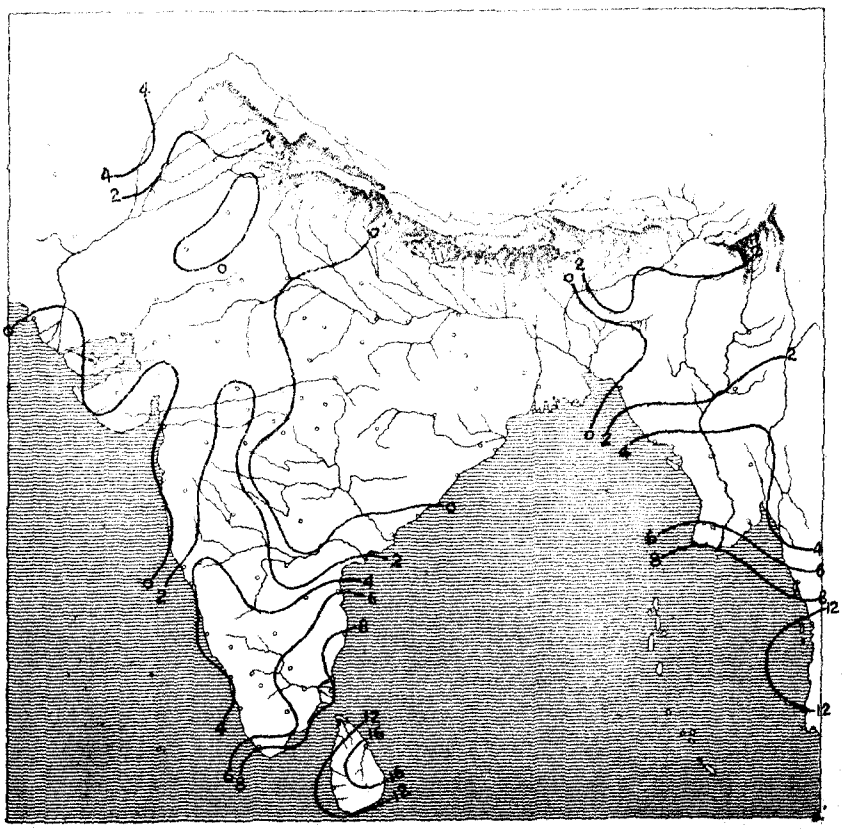
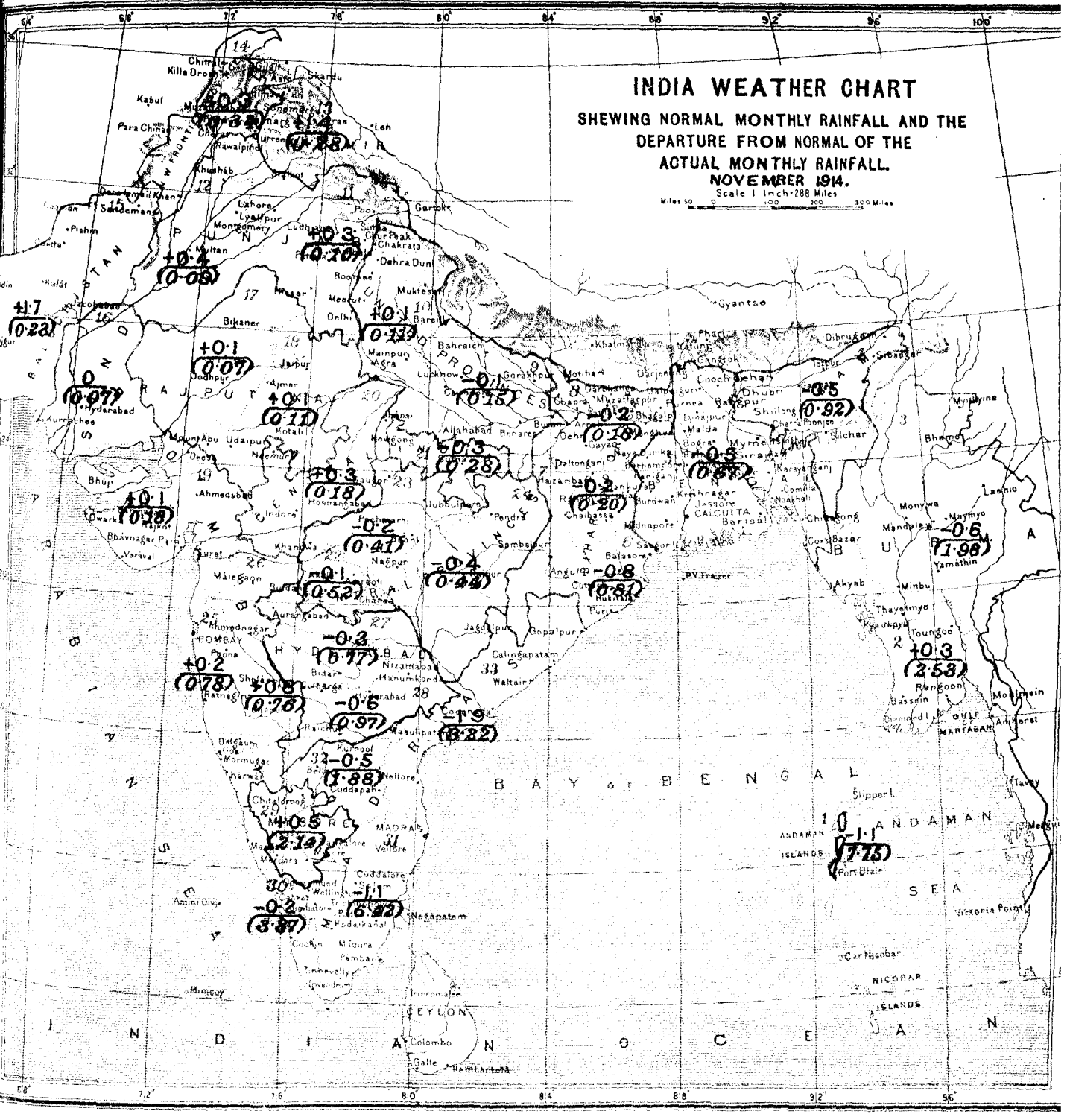


CHART SHEWING THE TOTAL NUMBER OF DAYS IN THE
MONTH ON WHICH RAINFALL EQUALLED OR
EXCEEDED 0·10 INCH.
(BASED ON THE RETURNS OF TABLE B.)





The country is divided into 33 areas as shewn in the list below. The numbers in that list correspond with the red numbers on the chart, and serve to identify the areas. The numbers in brackets on the chart give the average over the divisions of the normal monthly rainfall, the numbers above these give the departures from normal of the average actual rainfall over the divisions.

1. Bay Islands
2. Lower Burma
3. Upper Burma
4. Assam
5. Bengal
6. Orissa
7. Chota Nagpur
8. Bihar
9. United Provinces, East
10. United Provinces, West
11. Punjab, East and North
12. Do., Southwest
13. Kashmir
14. Northwest Frontier Province
15. Baluchistan
16. Sind
17. Rajputana, West
18. Rajputana, East
19. Gujarat
20. Central India, West
21. Do., East
22. Berar
23. Central Provinces, West
24. Do., East
25. Konkan
26. Bombay, Deccan
27. Hyderabad, North
28. Hyderabad, South
29. Mysore
30. Malabar
31. Madras, Southeast
32. Madras, Deccan
33. Madras Coast, North

GOVERNMENT OF INDIA.

METEOROLOGICAL DEPARTMENT.

MONTHLY WEATHER REVIEW

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INTRODUCTION.

THIS review of the weather in India during the month of December, 1914, is based on observations taken daily at 8 hrs. at 216 stations, and on additional observations taken at 10 hrs. and 16 hrs. at 14 stations. In the rainfall summary have been utilized the data furnished by the meteorological observatories, and such rainfall statements of the month as had been published by the Provincial Governments up to the date of the preparation of the review. The brief notes on solar, magnetic and seismic disturbances are supplied by the chief observatories in the Indian area.

For a statement of the methods adopted in recording and tabulating the data, for each of the elements of observation, reference should be made to the introductory portion of the review for January.

Summary of the chief features of the weather in India during the month.

2. Several disturbances affected north-west India in the course of the month, but only two of these were productive of important rain. The first lasted from the 1st to the 4th and was the cause of widespread rain over the region consisting of Baluchistan, the North-West Frontier Province, Kashmir and the Punjab; and the second occurred towards the end of the month occasioning fairly heavy snowfall in Kashmir.

In the Peninsula abundant rain fell in the south throughout the first week, and there were scattered falls during the next ten days.

In Burma and lower Bengal there was a remarkable burst of rain at the end of the third week in connection with a storm from the Bay; but in the region embracing Bihar, the United Provinces, Rajputana, Central India and Gujarat the weather was drier even than usual.

The aggregate precipitation of the month was distinctly above the normal in the Bay Islands, Burma, Bengal, Kashmir, the North-West Frontier Province, Berar, Hyderabad North, Mysore, Malabar and Madras South-east, and was appreciably in defect in the United Provinces, Rajputana East, Central India, the Central Provinces East, the Madras Deccan and the Madras Coast North. Of the climatic elements other than rainfall, cloud proportion was decidedly low generally in the United Provinces and north-west India, and very high in central Burma, Berar, Bombay and Hyderabad; and humidity was in excess in Baluchistan, the Punjab, the North-West Frontier Province, and the Bombay Deccan, and was in defect in Rajputana, Bundelkhand and the adjoining districts. Temperature was distinctly low in Kashmir and Baluchistan, and was 3° in excess in Mysore.

Barometric pressure in the plains was on the mean of the whole month ·011″ in defect.

Solar, magnetic and seismic disturbances.

KODAIKANAL OBSERVATORY.

3. *Solar Observations.*—No observations of the sun could be made on 6 days during the month and on 4 other days prominences could not be observed.

Sunspots.—The increased spot activity noticed in November continued during December also. Spots were recorded on all the days the sun was examined and there were from the 10th to 12th as many as five spots on the visible disc at the same time. Fourteen new groups of spots were recorded as

against 11 in November. The daily average number rose to 2·5 and the average life of a spot was 4·4 days. The spots still favour high latitudes and their distribution is as follows:—

TABLE 1.

—	0°–10°	11°–20°	21°–30°	31°–40°	Mean latitude.	Extreme latitudes.
North .	...	2	3	1	23°·5	16° & 35°
South .	...	3	5	...	21°·2	15° & 24°

The increased solar activity was also indicated by the frequent reversal and displacement of the C line in the neighbourhood of spots.

Prominences.—Fifty-six large, two eruptive and seven metallic prominences were recorded during the month. The highest was photographed on the 11th at latitude +7° west and reached to 250″ above the chromosphere.

Magnetic disturbances.—Only "small" disturbances were recorded during the month.

J. EVERSHED, *Director*,
Kodaikanal and Madras Observatories.

Seismic records.

$\phi = 10° 13' 50''$; $\lambda = 77° 28' 00''$; $h = 2343$m. Subsoil Rock.

Apparatus.—Milne's Horizontal Pendulum Seismograph.

TABLE 2.

	V	To	ϵ	r/To²
AN:				
AE:	9·76	15·7	1	3·8
AZ:				

Date.	Phase.	Time, G. M. T.	Period (Sec.)	Amplitude (s). An.	Ae.	Az.	Distance Δ (Km.)	Remarks.
1914.		h. m. s.						
Decr. 9th	e P	6 05 36	...	...	...	...	...	Widening of line.
	F	6 09 42	...	...	...	...	...	
„ 20th	e P	14 34 24	...	...	...	...	...	
	i L	14 38 00	...	...	...	...	...	
	M	14 38 54	...	...	50	...	...	
	F	14 34 36	...	...	...	...	...	

S. SITARAMA AIYAR,
Acting Assistant Director.

BOMBAY OBSERVATORY.

Alibag magnetic record.

4. During the month of December 1914, the traces showed 12 calm days and 19 days of small disturbance.

The days of the month selected as "quiet" for the purposes of the Magnetic Survey of India are the 3rd, 13th, 15th, 21st and 26th.

The following table represents the magnetic character of each day during the month:—

TABLE 3.

Day.	Character.	Day.	Character.	Day.	Character.	Day.	Character.
1	C	9	S	17	S	25	S
2	C	10	S	18	C	26	C
3	C	11	S	19	S	27	S
4	S	12	S	20	C	28	S
5	S	13	C	21	C	29	S
6	C	14	C	22	S	30	S
7	S	15	C	23	C	31	S
8	S	16	S	24	S	...	...

C = calm; S = small; M = moderate; G = great; V. G. = very great.

The mean observed absolute values of the several magnetic elements reduced to the mean monthly tabulations of the magnetograms, as also the ranges and the summed ranges of the horizontal force and declination for the month are as follow:—

Easterly declination . . .	0° 42′ 46″
Horizontal force . . .	0·36884 C.G.S. unit.
Vertical force . . .	0·16634 C.G.S. unit.
Inclination . . .	24° 16′·5
Horizontal force range . .	0·00030 C.G.S unit.
Horizontal force summed range .	0·00194 C.G.S. unit.
Declination range . . .	1′·4.
Declination summed range . .	6′·1.

(NOTE:—Summed range means sum without regard to sign of the twenty-four ordinates of the diurnal inequality.)

Seismic records.

$\phi = 18° 53' 36''$; $\lambda = 72° 48' 56''$; $h = 11$ m. Subsoil Trap.

Apparatus.—Milne's Horizontal Pendulum Seismograph.

TABLE 4.

	V	To	ϵ	r/To²
AN:				
AE:	9	21	1	
AZ:				

Date.	Phase.	Time, G. M. T.	Period (Sec.)	Amplitude (u). An.	Ae.	Az.	Distance Δ (Km.)	Remarks.
1914.		h. m. s.						
Dec. 3rd	...	12 0 0	...	...	...	...	...	Thickening of line.
,, 12th	...	6 12 0	...	...	...	...	...	,,
,, 30th	...	6 42 0	...	...	...	...	...	,,

Sensibility to tilt 1 mm. of ampli ude on the trace = 0·29″.

N. A. F. Moos,
Director,
Bombay and Alibag Observatories.

5. Calcutta (Alipore) Observatory.

Seismic records.

$\phi = 22° 32' N$; $\lambda = 88° 21' E$; $h = 6{\cdot}4$ m. Subsoil Alluvial.

Apparatus.—Milne's Horizontal Pendulum Seismograph.

Table 5.

	V	To	ϵ	$\frac{r}{To^2}$
An :				
Ae :	8·688	18	1	
Az :				

Date.	Phase.	Time, G. M. T.	Period (Sec.)	Amplitude (u). An.	Ae.	Az.	Distance Δ (Km.)	Remarks.
1914.		h. m. s.						
Decr.	...	.....	...	...	..	...	...	There was no displacement up to 20th December 1914, after this the instrument was dismantled.

C. W. Peake,
Meteorologist, Calcutta.

6. Simla Observatory.

Seismic records.

(March to December.)

$\phi = 31° 6' 0''$; $\lambda = 77° 11' 0''$; $h = 2433{\cdot}5$ Subsoil Rock.

Apparatus.—Two Omori-Ewing Horizontal Pendulum Seismographs (*Masses 50 Kg.*)

Table 6.

	V	To	ϵ	$\frac{r}{To^2}$
An :	14	45	1	
Ae :	14	45	1	
Az :				

Date.	Phase.	Time, G. M. T.	Period (Sec.)	Amplitude (u). An.	Ae.	Az.	Distance Δ (Km.)	Remar
1914.		h. m. s.						
Mar. 6th	e P	19 24 18	...	...	...	...	...	
	e L	19 40 6	..	...	...	..	...	
	M	19 46 0	18	21	18	...	...	
	e F	20 22 36	...	...	...	...	...	
,, 6th	e P	21 1 0	...	...	...	...	...	
	F	21 20 0	..	...	...	...	...	Slight more
,, 9th	e P	5 4 0	...	...	...	...	...	
	F	5 19 0	...	...	...	...	...	Slight more
,, 12th	P	9 59 12	...	...	...	...	...	
	S	10 0 12	2	11	11	...	...	
	L	10 1 12	10	18	14	...	...	
	M	10 1 24	...	...	...	...	...	
	F	10 8 36	...	...	...	...	...	
,, 14th	P	20 9 18	...	...	...	...	...	
	S	20 16 48	...	...	...	...	...	
	L	20 20 30	...	...	...	...	...	
	M	20 33 54	20	32	...	...	...	
	F	21 10 48	...	...	...	...	...	
,, 16th	e P	22 58 0	...	...	...	...	...	
	e F	23 17 0	...	...	...	...	...	

Date.	Phase.	Time, G. M. T.	Period (Sec.)	Amplitude (u). An.	Ae.	Az.	Distance △ (Km.)	Remarks.
1914.		h. m. s.						
Mar. 18th	P	6 36 36	...	...	...	...	...	
	L	6 53 0	...	...	...	...	...	
	M	6 57 30	17	25	11	...	...	
	F	7 30 30	...	...	...	...	...	
„ 22nd	P	1 29 0	...	...	...	...	...	
	S	1 30 24	...	...	...	...	...	
	L	1 31 30	...	...	...	...	...	
	M	1 32 30	12	7	4	...	...	
	F	1 41 0	...	...	...	...	...	
„ 28th	P	10 49 0	...	...	...	...	...	
	S	10 52 18	...	...	...	...	...	
	L	10 54 48	...	...	...	...	...	
	M	10 55 6	10	71	39	1	...	
	F	11 36 36	...	...	...	...	...	
„ 28th	e P	13 23 0	...	...	...	...	...	
	e F	13 41 0	...	...	...	...	...	Slight tremors.
„ 29th	P	19 49 42	...	...	...	...	...	
	F	19 52 6	Very rapid.	...	...	...	...	Very slight local shock.
„ 30th	P	1 2 54	...	...	...	...	...	
	M	1 54 6	33	164	78	...	...	
	F	3 20 36	...	...	...	...	...	
„ 30th	P	12 7 6	...	...	...	...	...	
	S	12 7 36	...	...	...	...	...	
	L & M	12 7 54	...	...	...	...	...	
	F	12 15 36	...	...	...	...	...	
April 8th	P	0 42 0	...	...	...	...	...	
	L & M	0 43 18	Very rapid.	25	14	...	...	
	F	0 52 48	...	...	...	...	...	
„ 11th	P	16 47 36	...	...	...	...	...	
	M	17 23 36	...	50	25	...	...	
	F	19 6 0	...	...	...	...	...	
„ 18th	P	23 38 30	...	...	...	...	...	
	M	23 38 36	Very rapid.	54	46	...	...	
	F	23 39 24	...	...	...	...	...	Slight local shock.
„ 20th	P	0 51 30	...	...	...	...	...	
	M	0 51 30	Rapid	36	25	...	...	
	F	0 52 6	...	...	...	...	...	

Date.	Phase.	Time, G. M. T.	Period (Sec.)	Amplitude (u) An.	Ae.	Az.	Distance △ (Km.)	Remarks.
1914.		h. m. s.						
April 25th	P	20 37 18	...	...	...	...	...	
	S	20 38 12	...	...	...	...	...	
	L	20 39 12	8	7	7	...		
	F	20 47 30	...	...	...	...	...	
„ 27th	P	2 5 0	...	...	...	...	...	
	S	2 5 54	...	...	...	...	...	
	L	2 6 48	...	...	...	...	...	
	F	2 16 30	...	...	...	...	...	
„ 28th	P	5 58 24	...	...	...	...	...	
	S	6 0 0	...	...	...	...	...	
	L	6 2 30	7	...	...	...	...	
	F	6 23 36	...	...	...	...		
„ 30th	P	22 18 6	...	...	...	...	...	
	S	22 18 36	...	...	...	...	...	
	L	22 18 48	...	...	...	...	...	
	F	22 34 42	...	...	...	...	...	
May 20th	P	8 27 54	...	...	...	...	...	
	S	8 29 24	...	...	...	...	...	
	L	8 31 12	...	...	...	...	...	
	M	8 31 54	7	71	53	...	...	
	F	9 7 30	...	...	...	...	...	
„ 26th	P	14 33 6	...	...	...	...	...	The swing was cut short by stops on several occasions between 14 hrs. 16 mins. so that the maximum amplitude is 40 mm. Period was 22 secs. at 15 hrs. 11 mins.
	S	14 41 48	...	...	...	...	...	
	e L	14 50 42	...	1429	1429	...	...	
	F	17 16 42	...	...	...	...	...	
„ 29th	e P	2 30 12	...	...	...	...	...	
	e F	2 48 0	8	7	...	...	...	Very slight tremors.
„ 29th	P	4 54 0	...	...	...	...	...	
	S	4 59 36	...	...	...	...	...	
	e L	5 4 18	...	...	...	...	...	
	M	5 14 48	9	104	93	...	...	
	F	7 6 48	...	...	...	...	...	

Date.	Phase.	Time, G. M. T.	Period (Sec.)	Amplitude (μ). An.	Ae.	Az.	Distance Δ (Km.)	Remarks.
1914. June 12th	P	h. m. s. 1 14 36	...	...	...	...	...	
	L	1 15 6	Very rapid.	17	21	...	...	
	F	1 16 24	..	...	...	...	...	
„ 20th	P	7 33 18	...	...	...	...	...	
	e L	8 0 42	23	17	11	...	...	
	F	9 6 42	...	...	...	...	...	
„ 25th	P	19 14 54	...	...	...	...	...	The swing was cut short by stops on several occasions so that the maximum amplitude is 40 mm.
	S	19 21 12	...	...	...	...	...	
	e L	19 28 42	..	...	...	...	...	
	F	22 7 42	...	...	...	...	...	
„ 26th	e F	5 5 12	...	...	...	...	...	
	e F	6 50 0	...	...	...	...	...	
„ 29th	e P	3 18 36	...	...	...	...	...	
	e L	3 20 0	...	...	...	...	...	
	F	3 34 0	...	...	...	...	...	
July 4th	e P	17 56 0	...	...	...	..	...	
	e F	18 48 0	...	...	...	...	...	Very slight tremors.
„ 4th	e P	23 46 0	...	...	...	...	...	
„ 5th	e F	0 48 0	...	...	...	...	...	
„ 14th	P	3 18 18	...	...	...	...	...	
	e L	3 35 18	...	...	...	...	...	
	M	3 40 18	20	17	...	...	...	
	F	?	...	...	...	...	...	End after 4 hrs. 34 mins. mixed up.
„ 17th	P	7 27 54	...	...	...	...	...	
	M	7 51 36	25	29	21	...	...	
	F	8 14 24	...	...	...	...	...	Tremors.
„ 25th	e P	21 53 24	...	...	...	...	...	
	M	22 4 54	17	14	14	...	...	
	F	22 24 54	...	...	...	...	...	Tremors.
„ 27th	P	4 21 12	...	...	...	...	...	
	L	4 21 18	Very rapid.	11	7	...	...	
	F	4 21 42	...	...	...	...	...	Very slight local shock.
„ 30th	P	3 58 24	...	...	...	...	...	
	S	3 59 12	...	...	...	...	...	

Date.	Phase.	Time, G. M. T.	Period (Sec.)	Amplitude (μ) An.	Ae.	Az.	Distance Δ (Km.)	Remarks.
1914. July 30th	L	h. m. s. 4 0 24	8	Very slight.		...	...	
	e F	4 11 0	...	...	...	...	...	
Aug. 4th	P	22 45 12	...	...	...	...	...	
	S	22 48 36	...	...	..	...	...	
	L	22 48 36	...	...	...	...	...	
	M	22 52 30	20	139	96	...	...	
„ 5th	F	0 31 18	...	...	...	...	...	
„ 5th	P	10 38 36	...	...	...	...	...	
	e S	10 43 0	...	...	...	...	...	
	e L	10 45 18	...	...	...	...	...	
	M	10 46 36	7	25	7	...	...	
	F	11 7 18	...	...	...	...	...	
„ 6th	P	4 26 24	...	...	...	...	...	
	L & M	4 26 36	Rapid	...	...	...	...	
	F	5 0 18	...	...	...	...	...	Slight local shock.
„ 10th	P	23 18 12	...	...	...	...	...	
	F	23 34 24	9	...	...	...	...	
„ 26th	P	7 0 12	...	...	...	...	...	
	F	7 11 0	8	...	...	...	...	Slight tremors.
„ 27th	P	14 42 0	...	...	...	...	...	
	L	14 42 12	Rapid	...	...	...	...	
	F	14 48 12	...	...	...	...	...	Very slight local shock.
„ 28th	P	9 48 0	...	...	...	...	...	
	F	10 22 36	...	...	...	...	...	Very slight tremors.
Sept. 13th	P	8 10 24	...	...	...	...	...	
	L	8 10 30	Rapid	17	4	...	...	Very slight local shock
	F	8 11 6	...	...	...	...	...	
„ 25th	P & L	3 46 6	11	...	...	...	...	
	F	3 47 6	...	...	...	...	...	
Oct. 3rd	P	17 42 36	...	...	...	...	...	
	e L	18 19 0	...	...	...	...	...	
	M	19 0 6	20	68	43	...	...	
	F	19 35 36	...	...	...	...	...	
„ 3rd	P	22 14 54	...	...	...	...	...	
	S	22 21 0	...	...	...	...	...	
	L	22 27 6	...	...	...	...	...	
	M	22 28 42	42	768	579	...	...	
	F	23 33 24	...	...	...	...	...	

Date.	Phase.	Time, G. M. T.	Period (Sec.)	Amplitude (u). An.	Amplitude (u). Ae.	Amplitude (u). Az.	Distance △ (Km.)	Remarks.
1914.		h. m. s.						
Oct. 6th	P	20 50 0	...	...	..	...	...	
	F	20 54 0	...	...	...	...	...	Slight tremors.
„ 9th	P	2 50 18	...	...	...	...	...	Severe local shock. The weight continued to swing between the stops for 5 mins.
	L	2 50 42	Very rapid.	...	...	...	...	
„ 9th	P	3 35 0	...	...	...	...	...	
	P—L	0 0 30	...	...	...	...	...	Slight vibrations were still being recorded when the second shock occurred. As the time marking clock stopped at 2 hrs. 41 mins. it is impossible to give the times of the second shock accurately.
„ 9th	P	11 11 54	...	...	...	...	...	
	F	11 12 42	...	21	...	...	...	Slight local shock.
„ 11th	P	16 22 48	...	...	...	...	...	
	S	16 28 0	...	...	...	...	...	
	e L	16 30 48	...	...	...	...	...	
	M	15 31 18	18	17	...	...	...	
	F	16 59 48	...	..	...	...	...	
„ 21st	e	16 22 6	...	...	...	...	...	
	F	16 40 54	...	...	...	...	...	Very slight tremors.
„ 23rd	P	6 27 42	...	...	...	...	...	
	S	6 35 12	...	...	...	...	...	
	e L	6 41 18	...	...	..	...	...	
	M	6 42 48	40	514	118	...	...	
	F	6 50 30	...	...	...	...	...	
„ 27th	e	4 9 0	...	...	...	...	...	
	F	4 41 0	...	...	...	...	...	Very slight tremors.
„ 27th	e	16 31 0	...	...	...	...	...	
	F	16 57 0	..	...	...	...	...	Slight tremors.
„ 28th	e	0 57 0	...	...	...	...	...	
	F	1 50 0	...	...	...	...	...	Slight tremors.
„ 28th	e	9 27 36	...	...	...	...	...	
	F	9 43 30	...	...	...	...	...	
Nov. 4th	P	11 8 36	...	...	...	...	...	
	S	11 9 42	...	...	...	...	...	

Date.	Phase.	Time, G. M. T.	Period (sec.)	Amplitude (u). An.	Amplitude (u). Ae.	Amplitude (u). Az.	Distance △ (Km.)	Remarks.
1914.		h. m. s.						
Nov. 4th	M	11 11 42	7	50	32	...	...	
	F	11 41 42	...	...	...	...	...	
„ 8th	P	21 16 54	...	...	...	...	...	
	L & M	21 17 6	...	...	...	...	...	
	F	21 32 24	...	...	...	...	...	Slight local shock.
„ 11th	e	7 39 18	...	...	..	...	...	
	F	7 57 36	...	...	..	...	...	Slight tremors.
„ 18th	e	10 53 0	...	...	...	...	...	
	F	11 49 0	...	...	...	...	...	
„ 22nd	e	8 34 6	...	...	...	...	...	
	F	9 19 30	...	...	...	...	...	Very slight tremors.
„ 24th	P	12 30 0	...	...	...	...	...	
	S	12 10 48	...	...	...	...	...	
	e L	12 18 0	...	...	...	...	...	
	M	12 24 42	17	193	93	...	...	
	F	13 1 30	...	...	...	...	...	
„ 27th	e	14 57 48	...	...	...	...	...	
	F	15 22 0	...	...	...	...	...	Slight tremors.
„ 28th	e P	11 0 30	...	...	...	...	...	
	e L	11 9 48	...	...	...	...	...	
	M	11 11 6	28	161	32	...	...	
	F	11 41 18	...	...	...	...	...	
„ 28th	e	13 45 0	...	...	...	...	...	
	F	14 3 30	...	...	...	...	...	Very slight tremors.
„ 28th	e	5 12 30	...	...	...	...	...	
	F	5 44 30	...	...	...	...	...	Very slight tremors.
Dec., 14th	P	0 40 36	...	...	...	...	...	
	L & M	0 40 42	Very rapid.	82	39	...	...	
	F	0 42 6	...	...	...	...	...	
„ 15th	P	10 21 12	...	...	...	...	...	
	S	10 22 18	...	...	...	...	...	
	L	10 23 12	...	...	...	...	...	
	M	10 23 54	8	32	21	...	...	
	F	10 43 0	...	...	...	...	...	
„ 20th	e	14 33 48	...	...	...	...	...	
	M	15 28 0	20	11	...	...	...	
	F	15 44 30	...	...	...	...	...	

The following table contains a list of earthquakes that were reported :—

TABLE 7.

Place at which felt.	Date.	G. M. T. of earthquake.	Duration.	Intensity Rossi-Forel scale.	No. of shocks.	REMARKS.
		h. m.	sec.			
Mandalay . .	Dec. 11th	6 35	2	7	2	
Shillong . . .	„ 14th	5 13	1	3	1	
Kila Drosh . .	„ 18th	21 35	7	5	1	
Sirajganj . .	„ 19th	18 46	5	7	1	
Kila Drosh . .	„ 26th	6 36	5	6	1	
Ditto .	„ 31st	21 0	7	5	1	

Solar radiation.—The following figures give the intensity of solar radiation, as measured at Simla by Angstrom's pyrheliometer. The values are corrected to local noon, and expressed in grammecalories per square centimetre per minute :—

Maximum	1·50
Minimum	1·42
Mean	1·45
Number of days of observation	8

G. C. SIMPSON,
Imperial Meteorologist, Simla.

ROYAL ALFRED OBSERVATORY, MAURITIUS.

7. No information has been received.

Weather in the Indian Ocean.

8. At all the three stations barometric pressure exceeded the normal and rainfall was in defect.

TABLE 8.

	Mauritius.	Zanzibar.	Seychelles.
Departure from normal of mean pressure	+·054	+·031	+·023
Actual mean wind direction . .	S 81° E	N 45° E	N 56° W
Normal mean wind direction . .	S 88° E	N 85° E	N 44° W
Actual mean wind velocity (miles per diem).	215	60	109
Normal mean wind velocity (miles per diem).	166	110	109
Rainfall departure from normal . .	—2·99	—1·17	—6·46

Depressions and cyclonic storms.

9. The abnormal conditions presaging an early and severe winter, which had characterized October and November, did not persist through December. In the extreme north weather was disturbed during the first five days and again near the end of the month, but there is no evidence of any well formed cold weather disturbance having crossed into north-west India from the highlands to the west of the Indus. On the other hand conditions were much more disturbed than usual over the Bay of Bengal where a cyclonic storm of a somewhat peculiar character occurred during the third week of the month. The following is a brief history of this storm :—

Cyclonic storm of the 16th to the 22nd over the Bay of Bengal.—The storm was generated between Ceylon and the Nicobars on the 16th and 17th. By the 18th the winds over the Bay had come fully under its influence and circulated cyclonically around a centre in about Latitude 7½° N. and Longitude 88¾°. According to the few observations from ships the centre lay in about Lat. 9°N and Long. 86°E on the morning of the 19th and had thus travelled through a distance of nearly 220 miles in a north-westerly direction during the preceding 24 hours. No information is available for the eastern semicircle, but in the western semicircle winds of force 6 to 9 prevailed and weather was rainy and squally with rough seas. The storm recurved considerably during the day and from the morning of the 20th when it lay about 300 miles east by south of Madras to about 23 hours of the 21st when it struck the coast near Akyab its line of travel was north-east. As usually happens it diminished rapidly in intensity after its passage inland and on the morning of the 22nd was shown as a diffuse low pressure area on the pressure chart. The statement below gives from day to day the approximate position of the centre, and the distance travelled.

TABLE 9.

DATE.	POSITION AT 8 A. M.		Distance travelled during interval.
	Lat.	Long.	
	° ′	° ′	Miles.
18th	7 20	88 45	...
19th	8 55	86 5	220
20th	12 40	84 25	320
21st	16 50	88 0	390
21st (11 P.M.)	20 30*	92 35*	400

* Position at 11 P.M.

In the absence of information regarding the centre it is not possible to form a correct estimate of the intensity of the storm. The strongest winds actually recorded were of force 9, and the greatest observed barometric depression was a little over four-tenths of an inch. The storm was remarkable chiefly for its northerly path and the unseasonable rain which it gave to Burma.

Pressure.

10. Although atmospheric pressure was below normal at practically all the observatories, Hyderabad was the only division in which the defect averaged more than 0·02″.

TABLE 10.

DIVISION.	Departure from normal of mean 8 hrs. pressure.
	″
Burma	—·016
Assam	—·003
Bengal	—·015
Bihar and Orissa	—·013
United Provinces	—·002
Punjab	0
North-West Frontier Province	—·011
Sind	+·006
Rajputana	—·004
Bombay	—·016
Central India	—·013
Central Provinces	—·018
Hyderabad	—·021
Mysore	—·007
Madras	—·012

The vertical gradient was approximately normal throughout the country.

TABLE 11.

HILL STATION.	Departure from normal pressure. A	PLAIN STATION.	Departure from normal pressure. B	Departure of pressure difference. B—A
	″		″	″
Quetta	—·010	Jacobabad	—·001	+·009
Leh	—·011	Lahore	+·001	+·012
Murree	—·023	Peshawar	—·003	+·020
Simla	+·002	Ludhiana	+·016	+·014
Mount Abu	—·013	Deesa	—·003	+·010
Pachmarhi	—·001	Khandwa	—·010	—·009
Kodaikanal	+·006	Madura	+·003	—·003

Temperature.

11. The mean maximum temperature of the month was in defect by more than 3° in Baluchistan, the North-West Frontier Province, Kashmir, the north Punjab and central Burma, and in excess by more than 3° in a small area defined by Bellary, Chitaldrug and Mysore.

The mean minimum temperature was appreciably above the average in Tenasserim, the Deccan and the coast districts between Calicut and Ratnagiri, and below it in north-west India; the largest deficiencies occurred in the inland districts of Gujarat and at the hill stations in Kashmir and Baluchistan.

TABLE 12.

SUB-DIVISION.	ACTUAL TEMPERATURE.					DEPARTURE FROM NORMAL OF		
	Mean maximum.	Mean minimum.	Monthly mean of mean between maximum and minimum.	Mean daily range of temperature.	Absolute range during month.	Maximum.	Minimum.	Daily range.
	°	°	°	°	°	°	°	°
1. Bay Islands	84·9	77·5	81·2	7·5	14·3	+0·5	+0·7	—0·2
2. Lower Burma	85·2	69·0	77·1	16·1	25·1	+0·2	+2·5	—2·3
3. Upper Burma	78·9	56·4	67·6	22·4	32·0	−1·8	+1·0	—2·8
4. Assam	76·9	53·2	65·0	23·7	33·8	+1·1	+1·1	0
5. Bengal	78·8	56·2	67·5	22·6	32·8	+1·4	+0·4	+1·0
6. Orissa	81·3	57·6	69·4	23·7	35·8	+0·3	+0·5	—0·2
7. Chota Nagpur	77·9	51·7	64·8	26·2	39·9	+0·3	+1·5	—1·2
8. Bihar	77·7	51·7	64·7	26·0	36·4	+2·3	+0·2	+2·1
9. United Provinces, East	76·2	48·1	62·1	28·1	41·3	+1·1	—0·2	+1·3
10. Do., West	74·0	45·2	59·6	28·8	44·3	—1·0	—2·3	+1·3
11. Punjab, East and North	69·7	41·7	55·7	28·0	42·6	—2·4	−1·0	−1·4
12. Do., South-west	70·5	40·1	55·3	30·5	46·4	—1·9	—1·3	—0·6
13. Kashmir	38·0	17·3	27·6	20·7	42·9	—5·7	—5·3	—0·4
14. North-West Frontier Province	65·7	38·9	52·3	26·8	39·9	—4·3	—0·6	—3·7
15. Baluchistan	61·1	34·8	47·9	26·3	47·0	—4·3	—5·1	+0·8
16. Sind	76·6	51·2	63·9	25·4	42·6	—1·5	—0·9	—0·6
17. Rajputana, West	75·7	47·9	61·8	27·8	48·5	—2·1	−4·3	+2·2
18. Do., East	76·1	47·6	61·9	28·4	43·4	—1·8	—2·0	+0·2
19. Gujarat	82·8	54·4	68·6	28·3	44·1	—1·4	—3·0	+1·6
20. Central India, West	79·1	48·6	63·9	30·5	45·5	+0·3	—0·8	+1·1
21. Do., East	75·3	46·6	61·0	28·7	42·9	+0·2	—0·1	+0·3
22. Berar	83·6	57·5	70·5	26·1	40·6	+1·7	+2·8	—1·1
23. Central Provinces, West	79·9	52·0	65·9	27·9	43·0	+0·7	+1·3	—0·6
24. Do., East	80·5	53·3	66·9	27·1	40·4	+1·3	+1·7	—0·4
25. Konkan	86·2	70·9	78·5	15·3	27·3	—0·8	+2·5	—3·3
26. Bombay Deccan	84·4	57·6	71·0	26·8	42·9	+0·6	+2·9	—2·3
27. Hyderabad, North	83·8	58·3	71·0	25·5	40·4	+0·6	+2·3	−1·7
28. Do., South	85·1	62·4	73·7	22·7	38·7	+1·1	+2·5	−1·4
29. Mysore	82·7	61·9	72·3	20·8	33·4	+2·6	+3·1	—0·5
30. Malabar	86·8	73·5	80·1	13·3	24·4	−0·6	+2·5	—3·1
31. Madras, South-east	84·4	70·0	77·2	14·4	26·9	+0·5	+0·9	—0·4
32. Do. Deccan	88·1	64·4	76·3	23·7	42·0	+1·7	+2·7	—1·0
33. Do. Coast, North	82·7	66·1	74·4	16·5	28·4	+0·8	+0·8	0

TABLE 13.

DIVISION.	DEPARTURE FROM NORMAL OF		
	Mean maximum temperature.	Mean minimum temperature.	Mean temperature.
	°	°	°
Burma	−0·7	+1·9	+0·6
Assam	+1·1	+1·1	+1·1
Bengal	+1·4	+0·4	+0·9
Bihar and Orissa	+1·3	+0·6	+0·9
United Provinces	+0·2	−1·2	−0·5
Punjab	−2·2	−1·1	−1·7
North-West Frontier Province	−4·3	−0·6	−2·5
Sind	−1·5	−0·9	−1·2
Rajputana	−1·9	−2·9	−2·4
Bombay	−0·6	+0·2	−0·2
Central India	+0·3	−0·5	−0·1
Central Provinces	+1·0	+1·7	+1·3
Hyderabad	+0·9	+2·5	+1·7
Mysore	+2·6	+3·1	+2·9
Madras	+0·5	+1·5	+1·0

Winds.

12. The air movement was lighter than usual in Assam and Hyderabad; in the latter division and in the North-West Frontier Province the winds were more steady than usual but there was an abnormal unsteadiness in Bengal and Mysore. Many stations in north-west India showed large and irregular departures from normal of the wind direction, while along the Kathiawar and Konkan coasts the winds contained a more strongly marked northerly component than usual.

TABLE 14.

DIVISION.	DEPARTURE FROM NORMAL OF	
	Hourly wind velocity.	Wind steadiness.
Burma	−0·2	− 1
Assam	−1·3	− 6
Bengal	−0·3	−17
Bihar and Orissa	−0·1	− 7
United Provinces	−0·4	− 3
Punjab	+0·3	+ 5
North-West Frontier Province	−0·3	+12
Sind	−0·4	+ 3
Rajputana	+0·2	− 2
Bombay	−0·7	− 8
Central India	−0·1	− 5
Central Provinces	+0·1	− 2
Hyderabad	−0·9	+16
Mysore	+0·3	−16
Madras	+0·3	+ 4

Humidity and cloud.

13. The absolute humidity was markedly in excess in the south of Burma and the western half of the Peninsula, and in defect in Rajputana and round Saugor; while the relative humidity was very high in the Punjab, the North-West Frontier Province and parts of the Bombay Deccan, and unusually low in Rajputana and parts of the Central Provinces and of the United Provinces.

The cloud proportion was markedly above the normal in central Burma, the Deccan, the Konkan and Malabar.

TABLE 15.

DIVISION.	HYGROMETRY; 8 HRS.				CLOUD.	
	Mean humidity.	Departure from normal.	Mean vapour tension in inches of mercury.	Departure from normal in inches of mercury.	Mean cloud amount at 8 hrs.	Departure from normal.
	%					
Burma . .	86	+ 2	·602	+·044	3·8	+0·8
Assam . .	92	− 3	·451	+·019	3·3	+0·2
Bengal . .	82	− 3	·455	−·005	1·8	+0·2
Bihar and Orissa .	76	− 3	·395	+·005	1·7	+0·4
United Provinces .	73	− 5	·302	−·020	0·5	−0·9
Punjab . .	79	+ 9	·251	+·012	2·0	−0·8
North-West Frontier Province.	81	+11	·223	+·013	2·1	−1·1
Sind . . .	58	− 1	·267	−·011	1·1	−1·4
Rajputana . .	46	−12	·196	−·066	0·9	−1·4
Bombay . .	60	0	·404	+·001	2·3	+0·9
Central India .	57	− 6	·256	−·041	0·9	−0·3
Central Provinces	60	− 4	·328	−·015	2·3	+0·7
Hyderabad . .	63	0	·461	+·050	4·2	+1·1
Mysore . .	72	− 1	·507	+·027	3·7	+0·2
Madras . .	78	0	·660	+·021	4·1	+0·4

Rainfall.

14. The rainfall of the month was very heavy for the time of year in Burma, Bengal and Malabar, the amounts received being three to six times the normal; and it was 40 per cent. or more in excess also in the Bay Islands, Assam, the Punjab South-west, Kashmir, the North-West Frontier Province, Berar, Konkan, Hyderabad North, Mysore and Madras Southeast. Over the rest of the country rainfall was either normal or below it, the greatest actual deficiency occurring in the Madras Coast North.

In the United Provinces, Rajputana and Central India where under ordinary conditions nearly a third of an inch rain is recorded the month was absolutely rainless.

TABLE 16.

SUB-DIVISION.	NUMBER OF RAINY DAYS.		RAINFALL.			
	Actual.	Normal.	Actual.	Normal.	Departure from normal.	Percentage departure from normal.
			"	"	"	
1. Bay Islands	9·5	4·5	7·93	4·27	+3·66	+ 86
2. Lower Burma	1·6	0·5	1·87	0·29	+1·58	+545
3. Upper Burma	2·3	0·8	2·00	0·38	+1·62	+426
4. Assam	0·9	0·8	0·51	0·35	+0·16	+ 46
5. Bengal	1·1	0·3	0·88	0·16	+0·72	+450
6. Orissa	0·6	0·7	0·27	0·37	−0·10	− 27
7. Chota Nagpur	0·9	0·4	0·29	0·22	+0·07	+ 32
8. Bihar	0·1	0·2	0·04	0·09	−0·05	− 56

Sub-division.	Number of rainy days.		Rainfall.			
	Actual.	Normal.	Actual.	Normal.	Departure from normal.	Percentage departure from normal.
			"	"	"	
9. United Provinces, East	0	0·5	0·01	0·26	−0·25	− 96
10. Do., West	0	0·9	0	0·42	−0·42	−100
11. Punjab, East and North	1·0	0·9	0·50	0·49	+0·01	+ 2
12. Punjab, South-west	1·0	0·5	0·33	0·22	+0·11	+ 50
13. Kashmir	3·7	2·7	2·87	1·97	+0·90	+ 46
14. North-West Frontier Province	2·5	1·0	1·53	0·56	+0·97	+173
15. Baluchistan	1·5	1·9	0·60	0·78	−0·18	− 23
16. Sind	0·1	0·2	0·02	0·08	−0·06	− 75
17. Rajputana, West	0	0·3	0	0·14	−0·14	−100
18. Do., East	0	0·7	0	0·28	−0·28	−100
19. Gujarat	0	0·2	0	0·06	−0·06	−100
20. Central India, West	0	0·6	0	0·27	−0·27	−100
21. Do., East	0	0·6	0	0·28	−0·28	−100
22. Berar	1·5	0·7	0·63	0·39	+0·24	+ 62
23. Central Provinces, West	0·8	0·7	0·31	0·42	−0·11	− 26
24. Do., East	0·6	0·8	0·17	0·47	−0·30	− 64
25. Konkan	0·5	0·3	0·22	0·15	+0·07	+ 47
26. Bombay Deccan	0·8	0·5	0·43	0·31	+0·12	+ 39
27. Hyderabad, North	1·3	0·7	0·71	0·38	+0·33	+ 87
28. Do., South	0·6	0·4	0·24	0·21	+0·03	+ 14
29. Mysore	1·3	0·9	0·95	0·51	+0·44	+ 86
30. Malabar	4·1	1·4	3·44	1·04	+2·40	+231
31. Madras, South-east	6·0	4·2	5·57	3·53	+2·04	+ 58
32. Do. Deccan	0·6	0·8	0·25	0·51	−0·26	− 51
33. Do. Coast, North	0·4	1·1	0·18	1·06	−0·88	− 83

TABLE 17.

Division.	Rainfall.			
	Actual.	Normal.	Departure from normal.	Percentage departure from normal.
	"	"	"	
Burma	1·95	0·35	+1·60	*+457
Assam	0·51	0·35	+0·16	+ 46
Bengal	0·88	0·16	+0·72	+450
Bihar and Orissa	0·16	0·19	−0·03	− 16
United Provinces	0	0·35	−0·35	−100
Punjab	0·46	0·42	+0·04	+ 10
North-West Frontier Province	1·53	0·56	+0·97	+173

Division.	Rainfall.			
	Actual.	Normal.	Departure from normal.	Percentage departure from normal.
	"	"	"	
Sind	0·02	0·08	−0·06	− 75
Rajputana	0	0·24	−0·24	−100
Bombay	0·25	0·20	+0·05	+ 25
Central India	0	0·27	−0·27	−100
Central Provinces	0·35	0·43	−0·08	− 19
Hyderabad	0·47	0·29	+0·18	+ 62
Mysore	0·95	0·51	+0·44	+ 86
Madras	3·14	2·21	+0·93	+ 42
Mean of India	0·76	0·48	+0·28	+ 58

Snowfall.

I.—AFGHANISTAN.

15. In Kabul 2 inches of snow fell on the 3rd, 2 feet on the 4th and half an inch on the 28th. At the end of the month the unmelted residue of snow on the higher peaks was estimated at about 2 feet.

II.—BALUCHISTAN.

On the hills surrounding Quetta light snowfall occurred on the 3rd, 4th and 5th.

III.—NORTH-WEST FRONTIER PROVINCE.

(*a*) *Wano.*—The statement below shows the character of snowfall in this locality.

TABLE 18.

Locality.	Elevation.	Number of falls.	Total depth of snowfall.
	′		″
Marwatti and Pirghal . . .	11,000	2	9
Bosh and Drenashtar . . .	11,000	1	6
Jani Mela and Kundighar . . .	9,000	1	4
Kot Kun	7,900	1	3

The snow had almost entirely melted away by the end of the month.

(*b*) *Tochi* (*North Waziristan*).—On the nights of the 3rd and 4th a heavy fall of snow occurred on the hills; the snow line descended a little below the level of the Vezhda peak and the weather was intensely cold.

(*c*) *Kurram.*—Snow fell on all the peaks of the Sufed Koh on the 2nd, 3rd, 4th, 5th, 25th and 31st. The snow line descended to the level of the cantonment on the 3rd and 4th. At the close of the month snow to a depth of 2½ feet was said to be still lying on the Paiwar Kotal and 5½ feet on the Agam pass.

(*d*) *Kohat.*—On the Samana range snow fell to a total depth of 1½ feet.

(*e*) *Drosh.*—Some snow fell during the first week.

IV.—KASHMIR.

The statement below shows the character of snowfall in this area:—

TABLE 19.

Locality.	Number of days on which snow fell.	Aggregate amount of snowfall.	REMARKS.
Srinagar . .	3	About 2 feet .	
Dras . . .	9	„ 2½ „ .	The accumulations existing at the end of the month were 4½ feet in Dras itself and more than 7½ feet on the surrounding hills.
Skardu . . .	4	About ½ foot .	
Kargil . . .	5	Nearly 2 feet .	At the end of the month the unmelted residue on the surrounding hills was more than 8 feet deep.
Leh . . .	...	.....	Heavy snow fell on the hills to the north.

V.—PUNJAB.

(*a*) *Dalhousie.*—Snow fell on the 1st, 2nd, 29th and 30th down to a level of 6,000 feet. The accumulations at the close of the month measured 2 feet deep on the Kalatop and 8 inches on the Kainthli.

(*b*) *Chamba.*—Snow fell on the 2nd, 4th, 5th, 9th and 29th on the Khangu and Chatri ranges (elevation 6,500 feet) but melted away quickly.

(*c*) *Kilba* (*Simla Hills*).—Snowstorms occurred on 1st, 4th, 5th, 6th, 28th, 29th and 31st. The snow line descended to a level of 7,000 feet on the 5th. The total quantity measured at an elevation of about 8,000 feet amounted to about 4½ inches.

TABLE 20.

Name of pass.	Depth of accumulation at the end of the month.	
	Reported.	Normal.
	Feet.	Feet.
Rupin Pass	6	5½
Brua „	7	4½
Shatul „	7	5
Harang „	5	2

VI.—UNITED PROVINCES.

(*a*) *Garhwal.*—Snow fell on the 30th on the higher peaks. The weather was generally dry.

(*b*) *Almora.*—The aggregate snowfall of the month was estimated at 6 feet in Byans, 3 feet in Malla Darma and 2 feet in Chaudas, 1½ feet in Malla Danpur and ½ foot in Malla Johar. The snowline descended from the perpetual snows to a distance of 3 or 4 miles in Malla Danpur, 1½ miles in Chaudas, 5 miles in Malla Darma and 7¼ miles in Byans.

TABLE 21.

Name of pass or peak.		Depth of accumulation at the end of the month.	
		Reported.	Normal.
		Feet.	Feet.
Nuwe	Pass	11	33
Binkaru	"	8	26
Pindari	Peak	1½	3
Lipulekh	Pass	18	5
Lampia	"	24	3
		Foot.	
Ralamdhura		½	9
Untadhura		½	11½

SUMMARY.

16. So far as can be judged from the information ava able at the present time the snowfall of the month w either normal or in excess in the hills of the Punja Kashmir and the North-West Frontier Province as well in Afghanistan, and was less than usual in Baluchistan a the Kumaon Himalayas.

HEM RAJ

The lines of the above chart represent isobars or lines of equal barometric pressure, the numbers attached indicating the barometric pressure in inches and being drawn for differences of pressure of ·05 inch. The isobars in the Bay of Bengal are filled in by means of the shore observations, and by comparison with the normal distribution of pressure.

The mean 8 hrs. wind directions of the month are shewn by means of arrows flying with the wind, and are calculated by means of Lambert's formula applied to the winds as given in Table B of the 8 hrs. observations. The mean wind directions for the hill stations are indicated by broken arrows to distinguish them from the wind arrows for the plain stations. The mean velocity of the winds during the month is shewn by the following notation:—

Velocity of	0 to 2 miles per hour	...	one feather added to the wind arrow.
,, ,,	2 to 5 ,, ,, ,,	...	two feathers ,, ,, ,, ,,
,, ,,	5 to 10 ,, ,, ,,	...	three ,, ,, ,, ,, ,,
,, ,,	10 to 20 ,, ,, ,,	...	four ,, ,, ,, ,, ,,
	over 20 ,, ,, ,,	...	five ,, ,, ,, ,, ,,

Wind strengths are based on factor 2·2 for the standard type of Beckley Robinson anemograph, instead of 3·0 as used for this plat up to December 1911 inclusive.

The chart shows the departure from normal of the mean during the month of 8 hrs. pressure by means of lines drawn for equa amounts of departure. The numbers are given in thousandths of an inch, 20 representing ·020″ or two hundredths of an inch, &c Continuous lines indicate that the pressure was in excess by amounts indicated by the numbers attached to the lines, and broken or dotte lines that it was in defect by amounts indicated by the numbers attached to the lines. Two parallel lines near to each other, one continu ous and the other broken or dotted, represent the line of no departure, the dotted line facing the area of deficient pressure or negativ departures.

CHART SHEWING THE DEPARTURE FROM NORMAL
OF THE MONTHLY MEAN OF DAILY
MAXIMUM TEMPERATURE.

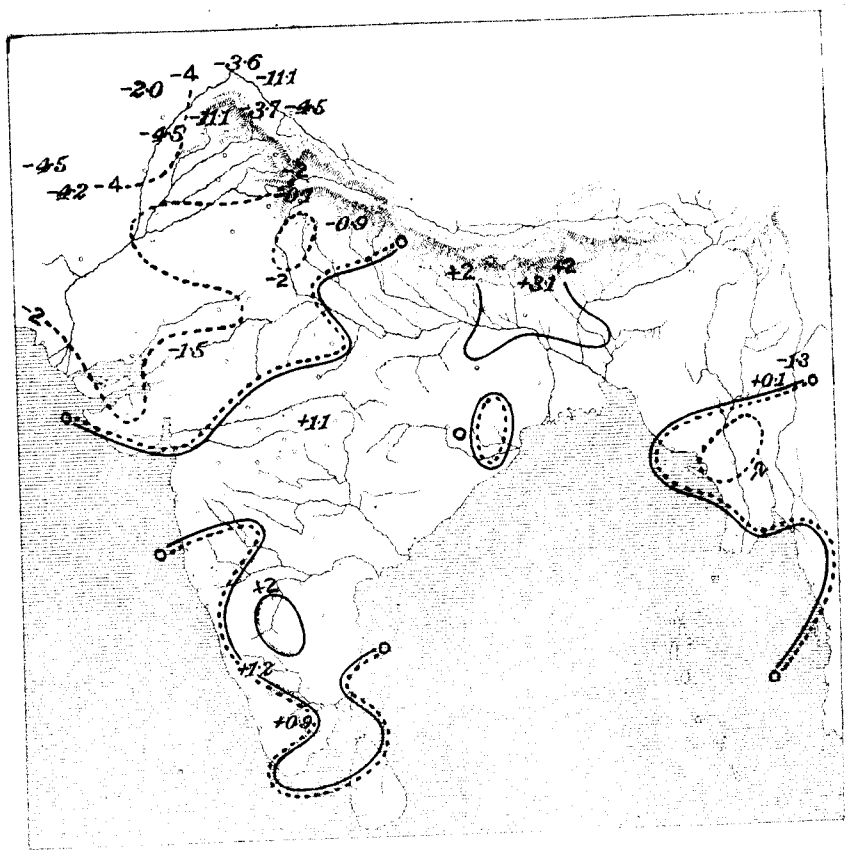


CHART SHEWING THE DEPARTURE FROM NORMAL
OF THE MONTHLY MEAN OF DAILY
MINIMUM TEMPERATURE.

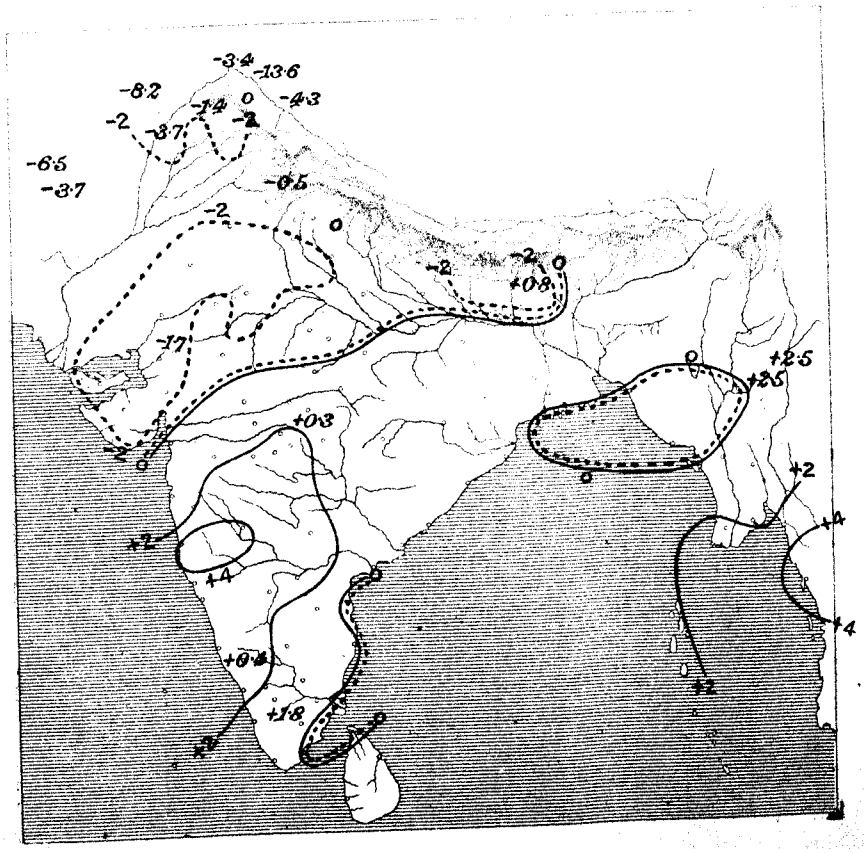


CHART SHEWING THE DEPARTURE FROM NORMAL
OF THE MONTHLY MEAN OF DAILY
MEAN TEMPERATURE.

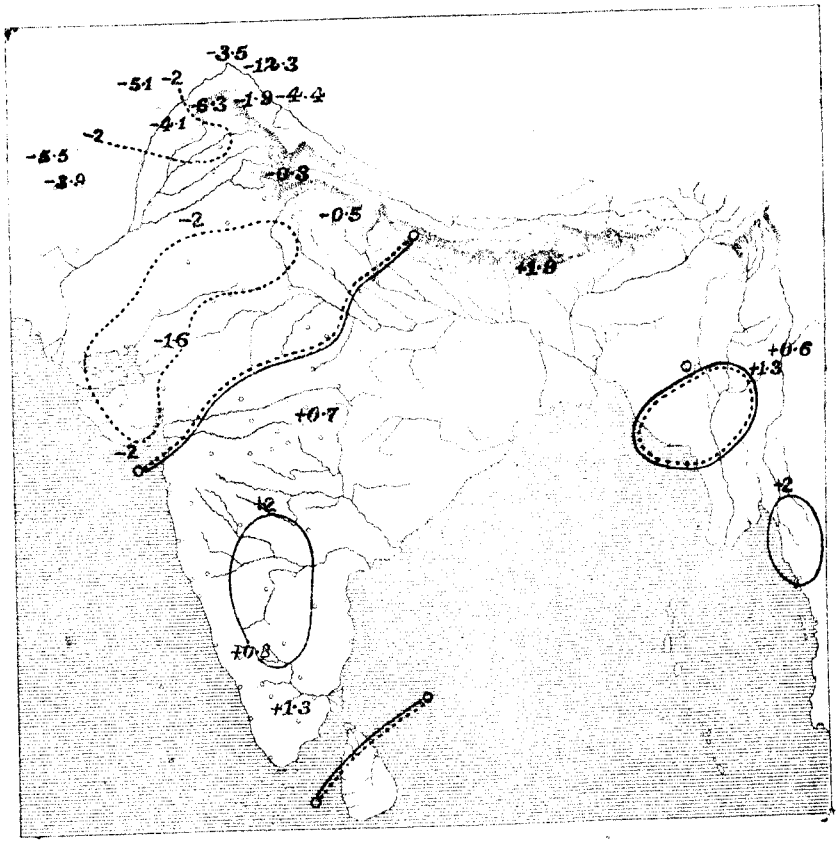


CHART SHEWING THE DEPARTURE FROM NORMAL OF THE MONTHLY MEAN OF ABSOLUTE HUMIDITY AT 8 HRS.

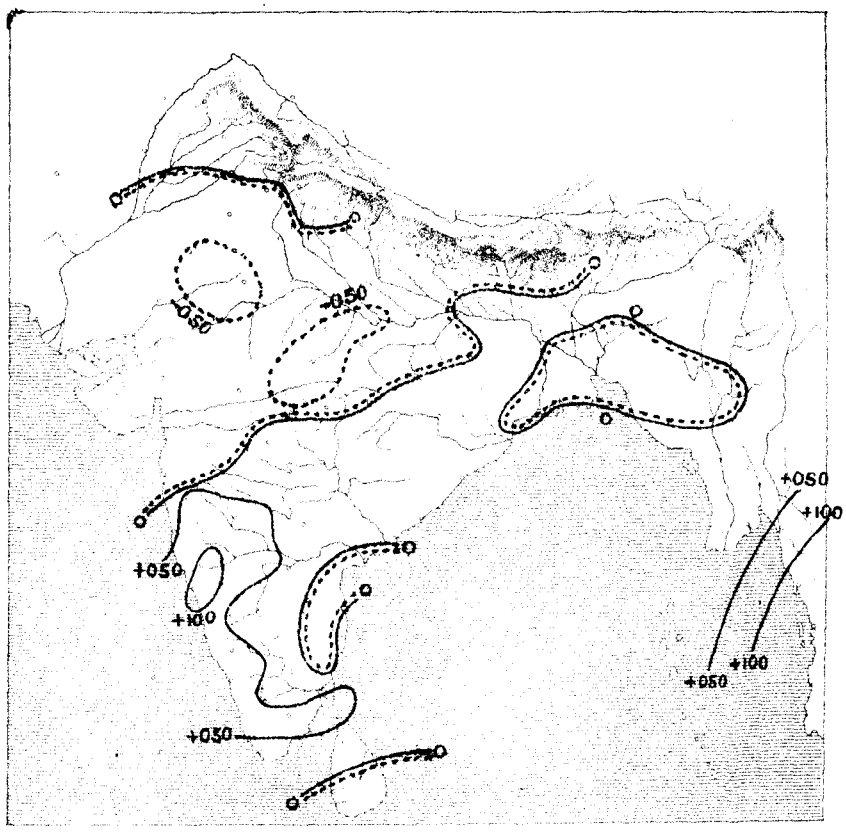


CHART SHEWING THE DEPARTURE FROM NORMAL OF THE MONTHLY MEAN OF RELATIVE HUMIDITY AT 8 HRS.

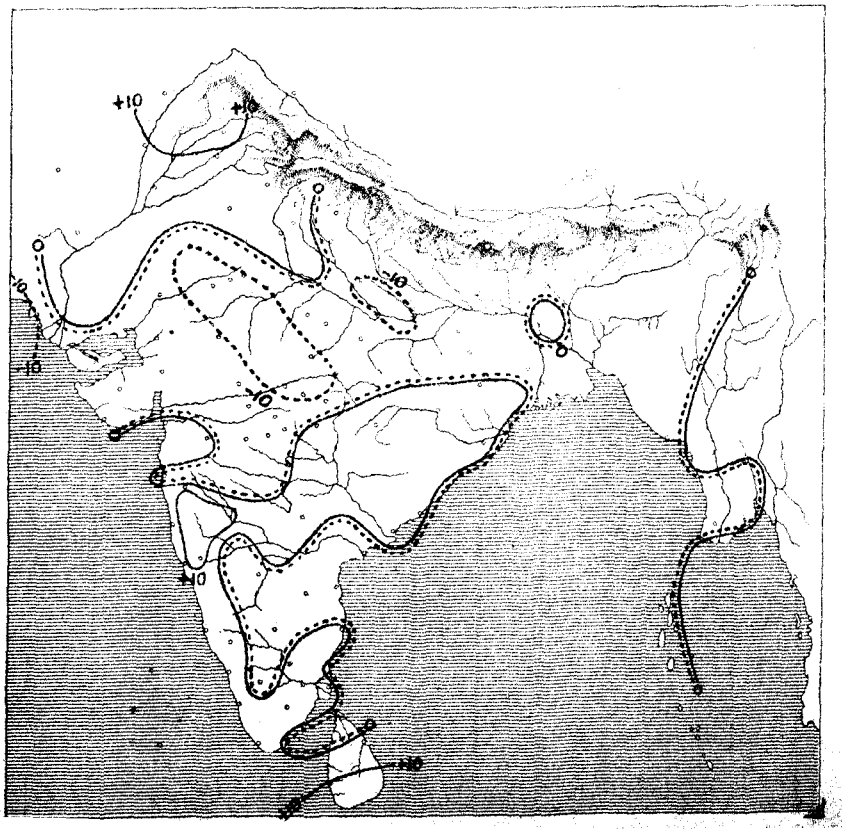


CHART SHEWING THE DEPARTURE FROM NORMAL OF THE MONTHLY MEAN OF CLOUD AMOUNT AT 8 HRS.

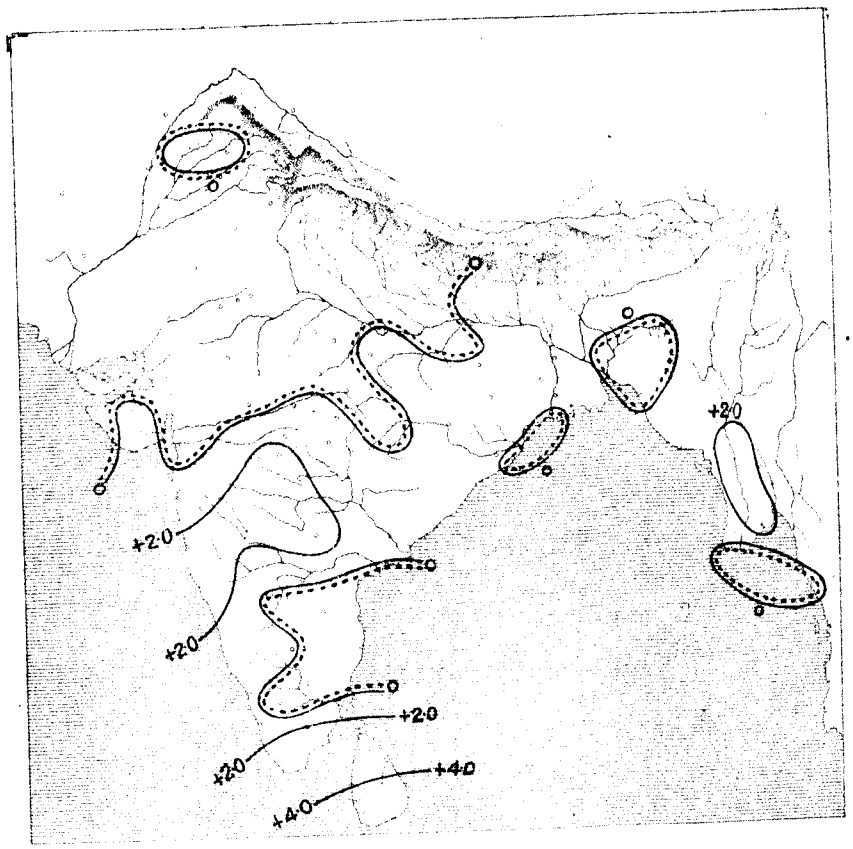
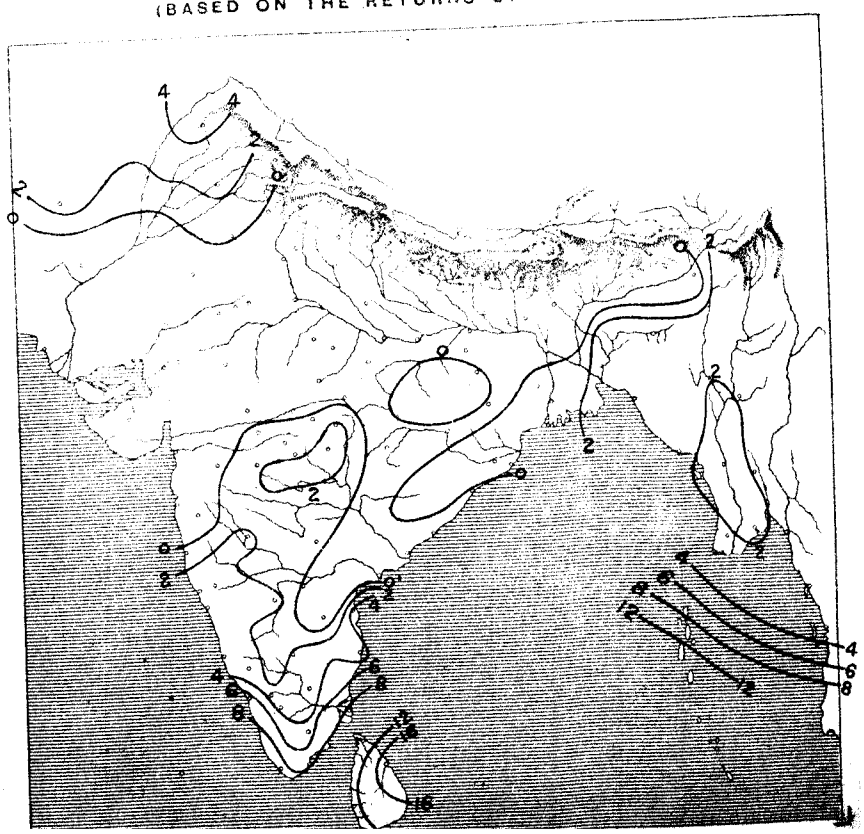
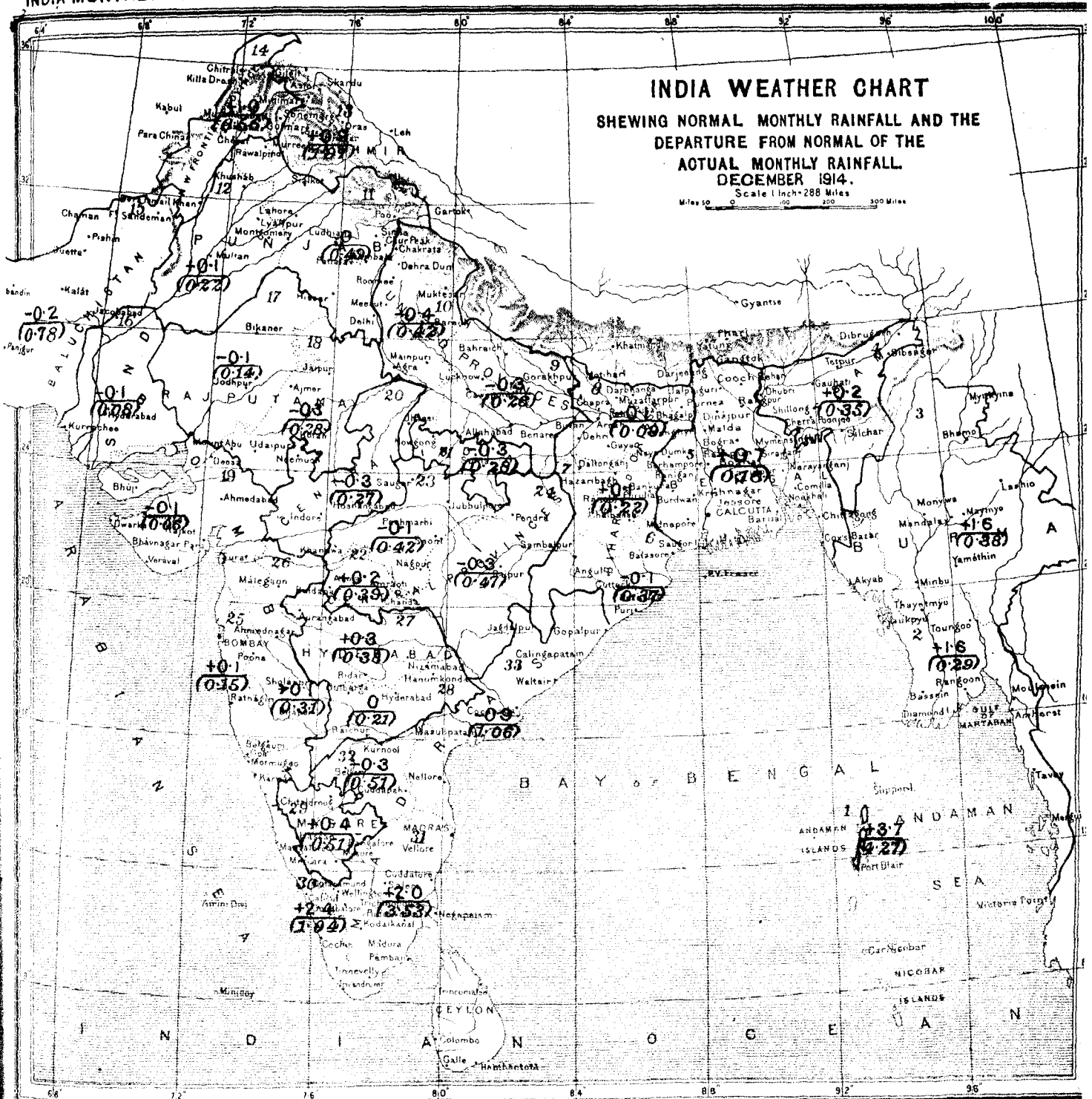


CHART SHEWING THE TOTAL NUMBER OF DAYS IN THE MONTH ON WHICH RAINFALL EQUALLED OR EXCEEDED 0·10 INCH.

(BASED ON THE RETURNS OF TABLE B.)





The country is divided into 33 areas as shewn in the list below. The numbers in that list correspond with the red numbers on the chart, and serve to identify the areas. The numbers in brackets on the chart give the average over the divisions of the normal monthly rainfall, the numbers above these give the departures from normal of the average actual rainfall over the divisions.

1. Bay Islands
2. Lower Burma
3. Upper Burma
4. Assam
5. Bengal
6. Orissa
7. Chota Nagpur
8. Bihar
9. United Provinces, East
10. United Provinces, West
11. Punjab, East and North
12. Do., Southwest
13. Kashmir
14. Northwest Frontier Province
15. Baluchistan
16. Sind
17. Rajputana, West
18. Rajputana, East
19. Gujarat
20. Central India, West
21. Do., East
22. Berar
23. Central Provinces, West
24. Do., East
25. Konkan
26. Bombay, Deccan
27. Hyderabad, North
28. Hyderabad, South
29. Mysore
30. Malabar
31. Madras, Southeast
32. Madras, Deccan
33. Madras Coast, North