

# Maximum Dew-Point Temperatures in India

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The fundamental assumption\* on which computation of the maximum possible rainfall is based is that the maximum possible precipitation can be calculated from an optimum combination of moisture content of the air mass and convergence of the wind. In this note we will consider the moisture content only. The maximum effective moisture content may be taken to be equal to that of a saturated air mass with pseudo-adiabatic lapse rate; for, a lesser lapse rate indicating higher moisture content would be stable, and a higher lapse rate would indicate a lower moisture content though unstable. Moreover, convective equilibrium conditions are closely approached, if not equalled, in centres of convergent activity associated with heavy rains. The moisture content of such an air mass over a station depends upon the dew-point at the station; and the higher the dew-point, the higher is the moisture content of the air mass. A knowledge of the maximum possible dew-point at a place is thus necessary for estimating the maximum possible precipitation.

2. It was, therefore, considered that an examination of the maximum dew-point temperatures at representative stations in the country will provide valuable data for the calculation of maximum possible precipitation. The following stations were selected for this purpose—

- |                |                    |
|----------------|--------------------|
| (1) Calcutta   | (13) Nagpur        |
| (2) Jalpaiguri | (14) Bombay        |
| (3) Sambalpur  | (15) Belgaum       |
| (4) Jamshedpur | (16) Hyderabad     |
| (5) Daltonganj | (17) Bangalore     |
| (6) Motihari   | (18) Cochin        |
| (7) Lucknow    | (19) Madras        |
| (8) New Delhi  | (20) Vizagapatam   |
| (9) Kotah      | (21) Darjeeling    |
| (10) Ahmedabad | (22) Mukteswar     |
| (11) Neemuch   | (23) Mt. Abu       |
| (12) Khandwa   | (24) Mahabaleshwar |

Dew-point temperatures are recorded in the Monthly Meteorological Registers of observatories in India from July 1944. In this note, five years' data (July 1944 to June 1949) have been considered. The highest dew-points recorded at 0800 IST and 1700 IST in each month, at each station were picked out for each year, and from these the highest dew-points recorded during the five-year period in each month at a station were obtained. The data are given in Table 1. In addition, the data of heaviest rainfall recorded in a day in the forty-year period 1901-1940 were examined, and five of the rainiest days picked out for each station. Dew-points at 0800 IST and 1700 IST (1700 IST observations are available only from about 1930) were computed for each station for these days. The highest dew-points during the five rainiest days thus obtained for the stations are given in Table 2.

3. The observations were taken at most of the stations only at 0800 IST and 1700 IST and these have been considered in this note. It is possible that higher dew-point temperatures might have occurred at some other hour, but they are unlikely to be appreciably higher than those at both the 0800 IST and 1700 IST on a day of high dew-point temperatures. Besides, only five years' data have been considered, but a comparison of Table 1 and Table 2 shows that the maximum dew-points given in Table 1 are higher than those in Table 2, *i.e.* higher than those on the five rainiest days during forty years. The figures in Table 1 may, therefore, be taken to represent approximately the highest dew-point temperatures likely to be recorded at the stations mentioned. It would appear that for estimating the maximum possible precipitation, the maximum dew-point temperature that need be taken into account in India for practical purposes is 90° F.

4. For estimating the amount of precipitation, the Hydro-meteorological Section\*,

\* Hydrometeorological Reports—U.S. Weather Bureau

U.S. Weather Bureau, has prepared a diagram showing the depths of precipitable water in a column of air of given height above 1000 mb, assuming saturation with a pseudo-adiabatic lapse rate for surface dew-point temperatures varying from  $-10^{\circ}\text{C}$  to  $28^{\circ}\text{C}$ . In India, higher dew-point temperatures are recorded. The depths of precipi-

table water have, therefore, been calculated for dew-point temperatures of  $30^{\circ}\text{C}$ ,  $32^{\circ}\text{C}$  and  $34^{\circ}\text{C}$  and the accompanying figure covers the range  $-10^{\circ}\text{C}$  to  $+34^{\circ}\text{C}$ . The extended diagram provides for the maximum dew-point temperatures likely to be met with in India.

Depths of precipitable water in a column of air of given height above 1000 millibars  
Assuming saturation with a Pseudo-Adiabatic Lapse Rate for the indicated Surface Temperatures

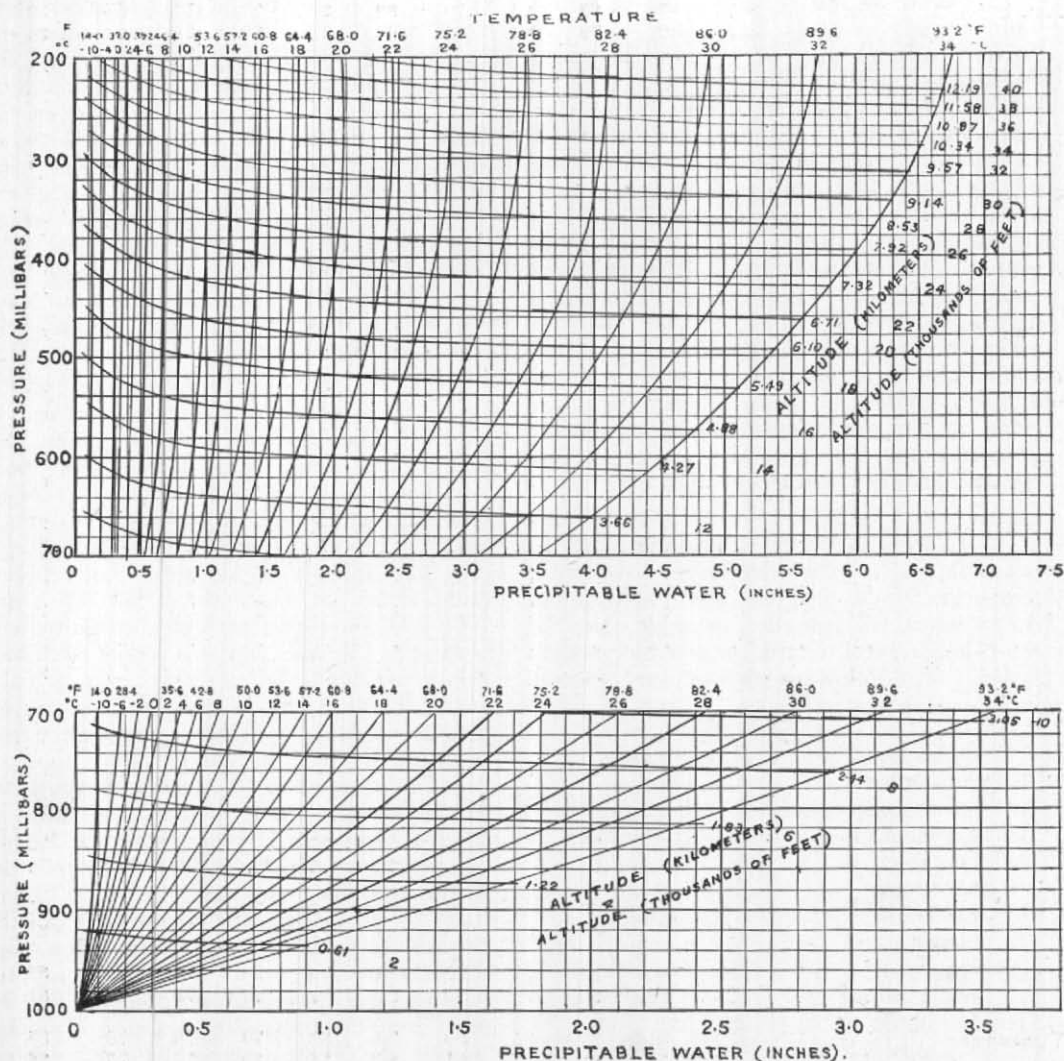


Fig. 1

TABLE 1

Highest dew-point temperatures ( $^{\circ}$ F) recorded during the five-year period  
July 1944—June 1949

Station	Hrs	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Annual
Calcutta	I	67	73	76	81	84	86	82	82	82	81	77	68	86
	II	67	72	76	81	85	86	83	84	83	81	76	70	86
Jalpaiguri	I	59	63	70	75	77	81	81	80	80	77	68	60	81
	II	61	64	73	79	82	81	83	81	81	79	70	64	83
Sambalpur	I	66	68	72	77	81	79	79	80	80	77	75	69	81
	II	68	73	78	80	78	81	81	81	80	79	75	71	81
Jamshedpur	I	63	65	72	79	83	83	79	80	81	77	74	67	83
	II	62	64	67	77	79	83	81	80	79	79	74	68	83
Daltonganj	I	62	64	68	73	77	83	83	80	79	76	72	65	83
	II	72	67	69	71	75	80	82	81	81	78	76	68	82
Motihari	I	61	67	73	80	81	83	83	83	84	80	78	61	84
	II	67	79	84	87	85	87	84	87	83	79	80	65	87
Lucknow	I	58	61	65	79	79	82	84	82	82	79	67	60	84
	II	66	66	62	78	80	83	84	85	86	83	79	64	86
New Delhi	I	57	60	61	70	73	80	81	84	79	76	61	56	84
	II	61	62	65	61	72	79	85	85	80	75	64	60	85
Kotah	I	60	62	59	63	71	78	79	80	78	78	67	63	80
	II	64	63	57	59	70	80	80	82	80	75	69	65	82
Ahmedabad	I	66	66	66	75	78	80	79	79	77	77	72	67	80
	II	66	63	63	77	75	81	80	87	80	77	69	72	87
Neemuch	I	62	60	63	76	76	84	77	77	76	75	68	67	84
	II	61	62	64	75	79	87	80	79	77	75	69	68	87
Khandwa	I	67	64	63	67	73	83	75	76	75	75	73	70	83
	II	64	70	57	61	73	83	78	77	78	75	75	67	83
Nagpur	I	64	65	69	73	76	76	78	77	78	77	75	63	78
	II	68	77	78	81	78	77	79	83	77	73	83	65	83
Bombay	I	71	72	79	78	81	80	79	79	79	79	77	78	81
	II	73	78	79	80	80	84	80	79	80	79	79	75	84
Belgaum	I	63	63	70	72	73	72	71	71	70	72	69	66	73
	II	62	61	69	74	75	74	74	72	72	71	71	69	75
Hyderabad	I	67	70	71	79	78	77	76	75	75	76	73	69	79
	II	67	78	79	79	77	82	77	76	76	79	76	70	82
Bangalore	I	65	66	69	71	72	69	70	69	71	71	69	67	72
	II	64	58	61	67	70	70	71	71	70	70	69	70	71
Cochin	I	77	76	79	79	80	81	79	78	78	77	77	78	81
	II	76	78	79	81	81	80	78	78	77	77	77	77	81
Madras	I	75	76	77	82	79	79	79	79	79	80	79	78	82
	II	75	77	78	81	80	79	80	81	79	79	79	77	81
Vizagapatam	I	75	72	79	81	83	85	80	79	80	79	78	73	85
	II	73	77	78	81	85	86	81	84	84	80	77	73	86

Hr I=0800 IST

Hr II=1700 IST

TABLE 1 (contd.)

Station	Hrs	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Annual
Darjeeling	I	43	46	56	59	61	68	65	64	62	61	50	46	68
	II	47	50	55	58	63	65	66	67	65	61	55	46	67
Mukteswar	I	38	39	44	56	59	63	64	68	66	56	44	39	68
	II	41	45	51	58	60	72	69	67	66	59	48	48	72
Mt. Abu	I	54	59	63	74	79	72	72	71	69	70	63	64	79
	II	59	63	68	75	78	76	82	76	72	71	60	68	82
Mahabaleshwar	I	61	55	68	68	68	68	66	65	65	66	64	59	68
	II	67	66	69	71	70	71	68	71	68	69	69	65	71

Hr I=0800 IST

Hr II=1700 IST

TABLE 2

**Highest dew-point temperatures (°F) among those during five of the rainiest days in the years 1901-1940**

Calcutta ..	..	..	79	Nagpur ..	..	..	73
Jalpaiguri ..	..	..	77	Bombay ..	..	..	77
Sambalpur ..	..	..	77	Belgaum ..	..	..	70
Jamshedpur	..	..	75	Hyderabad ..	..	..	72
Daltonganj ..	..	..	79	Bangalore ..	..	..	68
Motihari ..	..	..	77	Cochin ..	..	..	76
Lucknow ..	..	..	79	Madras ..	..	..	76
New Delhi ..	..	..	79	Vizagapatam	..	..	75
Kotah ..	..	..	78	Darjeeling ..	..	..	59
Ahmedabad ..	..	..	77	Mukteswar	..	..	59
Neemuch ..	..	..	72	Mt. Abu ..	..	..	70
Khandwa ..	..	..	73	Mahabaleshwar	..	..	64