Mausam, (1997), **48**, 1, 91-98

Weather in India

WINTER SEASON (JANUARY-FEBRUARY 1996)*

1. Introduction

Andaman and Nicobar Islands and hilly regions of northwest India, which are the main rainfall belts in winter, received normal to excess rainfall. In addition, Punjab, Haryana, plains of Uttar Pradesh, parts of central India and Lakshadweep also received good spells of rain. Sub-divisionwise seasonal rainfall distribution is given in Fig. 1.

Table 3 gives the monthly and seasonal rainfall distribution

2. Chief features

(i) In association with western disturbance, northwest India and adjoining north and central India received normal or excess rainfall.

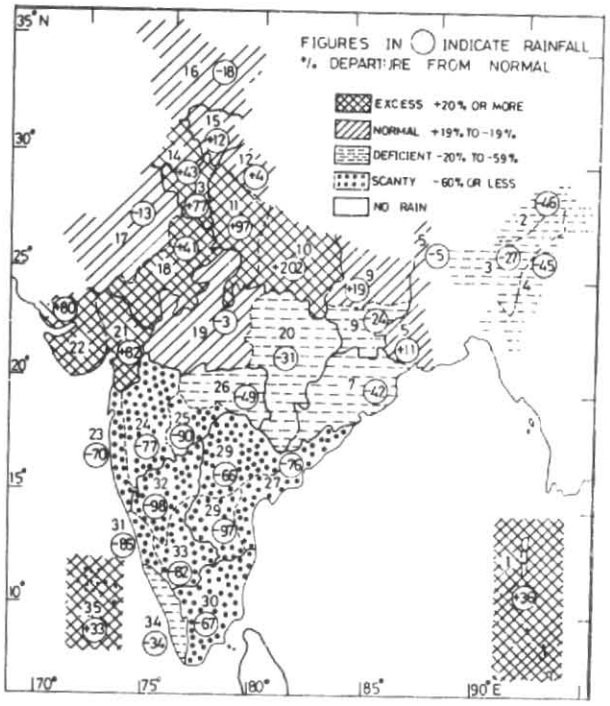

Fig. 1. Rainfall for the period 1 January to 28 February 1996

(ii) Rainfall activity was subdued in northeast India and in peninsular India.

(iii) Cold wave conditions prevailed over northwest and northern parts of India for some days in January.

3. Season's rainfall

The season's rainfall was excess in 9, normal in 8, deficient in 8 and scanty in the remaining 10 sub-divisions (Table 3).

Season's accumulated rainfall was excess in Andaman and Nicobar Islands, plains of Uttar Pradesh, Haryana, Punjab, east Rajasthan, Gujarat State and Lakshadweep and normal in West Bengal & Sikkim, Bihar Plains. Hills of west Uttar Pradesh, Himachal Pradesh, Jammu & Kashmir, west Rajasthan and west Madhya Pradesh. It was deficient in Arunachal Pradesh. Assam & Meghalaya, Nagaland, Manipur, Mizoram & Tripura, Orissa, Bihar Plateau, east Madhya Pradesh, Vidarbha and Kerala and scanty in Konkan & Goa, Madhya Maharashtra, Marathwada, Andhra Pradesh, Tamil Nadu and Karnataka.

4. January

4.1. *Weather and associated synoptic features*

Out of 6 western disturbances which moved across northwest India, only 3 western disturbances (formed during 8 to 17 January) were active. One induced low pressure area (15-16 January), one induced cyclonic circulation (12-15 January) and two mid and upper tropospheric westerly troughs also affected northwest India. Two cyclonic circulations during 1 to 4 January over west Rajasthan and Gujarat region and a trough in easterlies in lower levels from west Madhya Pradesh to north interior Karnataka between 6 and 14 also formed. These systems caused a good rainfall activity with excess to normal rainfall over most of the region

*Compiled by : U. S. De, D. S. Desai and S. G. Bhandari, Meteorological Office, Pune.

north of Lat. 20° N during 1 to 17 January. Details of these and other weather systems formed during the month are given in Table 1.

Rain or thundershowers occurred either almost at all places or at many places on 3 days in Himachal Pradesh and on 1 or 2 days in west Bengal and Sikkim, Bihar Plains, Uttar Pradesh, Haryana, Punjab, Jammu & Kashmir, east Madhya Pradesh, Kerala and Lakshadweep. Rain or thundershowers occurred either at a few places or at one or two places on 14 days in Orissa and Madhya Pradesh, on 10 to 13 days in the Andaman & Nicobar Islands and Jammu & Kashmir, on 5 to 9 days in Arunachal Pradesh, Assam & Meghalaya, Sub-Himalayan West Bengal & Sikkim, Bihar Plateau, hills of west Uttar Pradesh, Haryana, Punjab, Himachal Pradesh and Tamil Nadu and on 1 to 4 days in Gangetic West Bengal, Bihar Plains, plains of Uttar Pradesh, Rajasthan, Gujarat State, Maharashtra, coastal Andhra Pradesh, south interior Karnataka, Kerala and Lakshadweep.

4.2. *Month's rainfall*

The month's rainfall was excess in 8, normal in 11, deficient in 5 and scanty in 7 sub-divisions. There was no rain in the remaining 4 sub-divisions (Table 3). Month's accumulated rainfall was excess in Sub-Himalayan West Bangal & Sikkim, Bihar Plains, east Uttar Pradesh, Madhya Pradesh, Gujarat state and Lakshadweep and normal in Andaman & Nicobar Islands. Arunachal Pradesh, Gangetic West Bengal. Orissa, plains of west Uttar Pradesh, Haryana, Punjab, Himachal Pradesh, Rajasthan and Kerala. It was deficient in Assam & Meghalaya, Bihar Plateau, hills of west Uttar Pradesh, Jammu & Kashmir and Konkan & Goa and scanty in Nagaland, Manipur, Mizoram & Tripura, Madhya Maharashtra, Marathwada, Vidarbha, coastal Andhra Pradesh, Tamil Nadu and south interior Karnataka. There was no rain in Telangana, Rayalaseema, coastal Karnataka and north interior Karnataka. Principal amounts of rainfall are given in Table 4.

4.3. *Temperature*

Severe cold wave conditions prevailed in parts of Jammu & Kashmir, Punjab, Haryana, Rajasthan, Uttar Pradesh, north Madhya Pradesh and Bihar Plains for 2 to 3 days in the last week of January. Cold wave conditions also prevailed in parts of north-west India for 6 to 10 days during 1st, 3rd and 4th week of January. Lowest temperature of –1°C was recorded in plains, at Amritsar in Punjab on 30 January. In the hills, lowest temperature of – 11°C was recorded at Quazigund on 29 and 30 January.

4.4. *Disastrous weather events and damages*

Cold wave claimed two lives in Darjeeling district on 16 January and 12 lives in Raxaul area in Bihar on 27 January. In Begusarai area of Bihar 5 lakh acres area of crops damaged due to heavy rain. In Punjab a few people were reported dead due to severe cold wave.

5. February

5.1. *Weather and associated synoptic features*

During the month, 4 western disturbances, 2 induced cyclonic circulations, 2 cyclonic circulations and 3 mid and upper tropospheric westerly troughs affected northwest India. One cyclonic circulation over Bihar Plains and neighbourhood and one trough at mid tropospheric levels extending from east Uttar Pradesh to Gujarat Region also affected northern and central parts of India. Under the influence of these systems rainfall activity was mainly restricted to northwest, central and parts of north India during 2nd and 4th week of the month. Rainfall activity over peninsular India was subdued. Details of these and other weather systems that formed during the month are given in Table 2.

Rain or thundershowers occurred either almost at all the places or at many places on 5 or 6 days in Himachal Pradesh and hills of west Uttar Pradesh, on 3 or 4 days in Punjab and Jammu & Kashmir and on one or two days in Gangetic West Bengal. Bihar, Plains of Uttar Pradesh and Haryana. Rain or thundershowers occurred either at a few places or at one or two places on 10 to 12 days in Andaman & Nicobar Islands, Assam & Meghalaya, Sub-Himalayan West Bengal & Sikkim, Orissa, Tamil Nadu and Kerala, on 6 to 9 days in Nagaland, Manipur, Mizoram & Tripura, Gangetic West Bengal, west Uttar Pradesh, Haryana, Jammu & Kashmir, east Madhya Pradesh, Vidarbha and coastal Andhra Pradesh, on 3 to 5 days in Bihar, east Uttar Pradesh, Punjab, Himachal Pradesh, Rajasthan, west Madhya Pradesh, Telangana and south interior Karnataka, on one or two days in Konkan & Goa, Madhya Maharashtra, Marathwada, Rayalaseema, coastal Karnataka and north interior Karnataka.

TABLE 1

Details of the weather systems during January 1996

S.No.	System	Period	Place of first location	Direction of movement	Place of dissipation	Remarks
(1)	(2)	(3)	(4)	(5)	(6)	(7)
(A)	*Western disturbances*					
1.	Upper air system	6-7	North Pakistan and neighbourhood	Northeasterly	Moved away across Jammu & Kashmir	
2.	Do	8-11	Do	Do	Do	
3.	Do	12-14	Do	Do	Do	
4.	Do	14-17	Pakistan and adjoining Afghanistan	Easterly	Haryana and neighbourhood	It was seen as a well marked low pressure area over Pakistan and neighbourhood on 15. Associated cyclonic circulation extended upto mid-tropospheric levels. It became low pressure area over northwest Rajasthan and neighbourhood on 16 and was seen as a cyclonic circulation in lower levels on 18 over Haryana and neighbourhood and became less marked thereafter.
5.	Do	20-24	North Pakistan and neighbourhood	Northeasterly	Moved away across Jammu & Kashmir	
6.	Do	25-27	Pakistan and neighbourhood	Do	Do	
(B)	*Induced cyclonic circulation*					
1.	Lower levels	12-15	West Rajasthan and neighbourhood	Stationary	*In situ*	Merged with the well marked low pressure area
(C)	*Other cyclonic circulations*					
1.	Lower tropospheric levels	1-3	Gujarat Region and neighbourhood	Stationary	*In situ*	
2.	Mid-tropospheric levels	1-4	Northwest Rajasthan and neighbourhood	Easterly	Northwest Madhya Pradesh and neighbourhood	
3.	Lower levels	5-8	Saurashtra and neighbourhood	Do	West Madhya Pradesh and neighbourhood	
4.	Mid-tropospheric levels	10-11	Punjab and neighbourhood	Northeasterly	Moved away across Haryana	
5.	Lower levels	18-19	Gulf of Cambay and neighbourhood	Stationary	*In situ*	

Contd.

TABLE 1 — Contd.

Details of the weather systems during January

S.No.	System	Period	Place of first location	Direction of movement	Place of dissipation	Remarks
(1)	(2)	(3)	(4)	(5)	(6)	(7)
6.	Do	20-29	North Assam and neighbourhood	Easterly	Moved away across Himachal Pradesh	
(D)	*Troughs in the easterlies*					
1.	Lower levels	6-14	West Madhya Pradesh to north interior Karnataka	Quasi-stationary	South Kerala to southwest Madhya Pradesh	
2.	Do	19-22	South Tamil Nadu to north interior Karnataka	Westerly	Do	
(E)	*Troughs in westerlies*					
1.	Mid- and upper-tropospheric westerlies	15-17	69°E, north of 25°N	Northeasterly	76°E, north 35° N	
2.	Upper tropospheric levels	28-29	65°E,north of 20°N	Do.	Moved away across northwest India	
(F)	*Other troughs*					
1.	Lower levels	27 Dec-6 Jan	Southwest Bay off north Tamil Nadu-Sri Lanka coasts	Stationary	*In situ*	
2.	Lower tropospheric levels	6-10	West Uttar Pradesh to north Konkan	Quasi-stationary	Haryana to Kutch	
3.	Lower levels	26 Jan-2 Feb	Andaman Sea	Westerly	Comorin area and neighbourhood	

5.2. *Month's rainfall*

Accumulated rainfall during the month was excess in 8, normal in 6, deficient in 6 and scanty in 10 met. sub-divisions. There was no rain in the remaining 5 sub-divisions. Sub-divisionwise rainfall departures are given in Table 3.

Rainfall was excess in Andaman & Nicobar Islands, Uttar Pradesh, Haryana, Punjab, Himachal Pradesh, and east Rajasthan and normal in Assam & Meghalaya, Nagaland, Manipur, Mizoram & Tripura, Gangetic West Bengal, Bihar and Jammu & Kashmir. Rainfall was deficient in Sub-Himalayan West Bengal and Sikkim, west Rajasthan, Vidarbha, Telangana, Tamil Nadu and Kerala and scanty in Arunachal Pradesh, Orissa, east Madhya Pradesh, Marathwada, coastal Andhra Pradesh, Rayalaseema, Karnataka and Lakshadweep. There was no rain in west Madhya Pradesh, Gujarat State, Konkan & Goa and Madhya Maharashtra. Principal amounts of rainfall are given in Table 4.

TABLE 2

Details of the weather systems during February 1996

S. No.	System	Period	Place of first location	Direction of movement	Place of dissipation	Remarks
(1)	(2)	(3)	(4)	(5)	(6)	(7)
(A) *Western disturbance*						
1.	Upper air systems	4-6	North Pakistan and adjoining Jammu & Kashmir	Northeasterly	Moved away across Jammu & Kashmir	
2.	Do	7-11	Do	Do	Do	
3.	Do	12-16	North Pakistan and neighbourhood	Do	Moved away across northern parts of Jammu & Kashmir	
4.	Do	18-20	Do	Do	Do	
(B) *Induced cyclonic circulations*						
1.	Lower levels	8-12	South Pakistan and adjoining Rajasthan	Eastnorth-easterly	Madhya Pradesh,Uttar Pradesh and Bihar	
2.	Do	14-16	West Rajasthan and adjoining parts of Pakistan	Do	Moved away across Haryana and Hills of West Uttar Pradesh	
(C) *Other cyclonic circulations*						
1.	Lower levels	5-10	Bihar Plains and neighbourhood	Easterly	Bangladesh and neighbourhood	
2.	Lower tropospheric levels	21-22	Northwest Rajasthan and neighbourhood	Stationary	*In situ*	
3.	Lower levels	21-26	North Assam and neighbourhood	Do	Do	
4.	Lower tropospheric levels	23-26	West Rajasthan and adjoining parts of Pakistan	Easterly	Punjab and adjoining parts of Haryana	
(D) *Troughs in the easterlies*						
1.	Lower tropospheric levels	15-21	South Tamil Nadu to north interior Karnataka	Westerly	Lakshadweep to south Maharashtra coast	
2.	Do	27 Feb-1 Mar	Do	Do	Do	
(E) *Troughs in the westerlies*						
1.	Mid and upper troposphere	10-11	74°E, north of 15°N	Easterly	Moved away eastwards.	
2.	Do.	14-16	65°E, north of 20°N	Do	70°E, north of 20°N	
3.	Lower tropospheric levels	21-27	West Madhya Pradesh to north interior Karnataka	Quasi-stationary	Punjab to north Madhya Maharashtra	
4.	Mid and upper troposphere	25-27	63°E, north of 20°N	Easterly	76°E,north of 20°N	
(F) *Other troughs*						
1.	Lower levels	2-9	Andaman Sea	Westerly	Southwest Bay and neighbourhood	
2.	Mid tropospheric levels	12-13	East Uttar Pradesh to Gujarat Region	Stationary	*In situ*	
3.	Lower levels	8-17	Kerala coast to south Maharashtra coast	Quasi-stationary	Kerala to north Madhya Maharashtra	
4.	Do	13-15	Andaman Sea	Stationary	*In situ*	
5.	Do	16-19	Southwest Bay and neighbourhood	Do	Do	

TABLE 3

Rainfall figures for each month and season as a whole (January - February 1996)

S. No.	Meteorological Sub-division	January			February			Season		
		Actual (mm)	Normal (mm)	Dep. (%)	Actual (mm)	Normal (mm)	Dep. (%)	Actual (mm)	Normal (mm)	Dep. (%)
1.	A&N Islands	79	73	9	84	48	77	163	120	36
2.	Arunachal Pradesh	38	44	–14	23	70	–67	61	114	–46
3.	Assam & Meghalaya	9	18	–51	25	29	–13	34	47	–27
4.	Nag.Mani.Miz.&Tri.	0	14	–99	24	29	–18	24	43	–45
5.	SHWB & Sikkim	25	17	44	13	22	– 43	38	40	–5
6.	Gangetic West Bengal	15	13	8	23	20	13	38	34	11
7.	Orissa	15	13	19	7	25	–73	22	38	–42
8.	Bihar Plateau	11	20	–44	24	26	–8	35	46	–24
9.	Bihar Plains	19	16	22	19	17	16	38	32	19
10.	East U.P.	59	18	229	43	16	172	103	34	202
11.	Plains of West U.P.	23	22	7	56	18	205	79	40	97
12.	Hills of west U.P.	45	66	–31	89	63	41	134	129	4
13.	Haryana	25	22	16	48	19	146	73	41	77
14.	Punjab	27	29	–7	52	26	97	79	56	43
15.	Himachal Pradesh	72	80	–10	100	74	36	173	154	12
16.	Jammu & Kashmir	57	82	–30	81	86	–6	139	168	–18
17.	West Rajasthan	4	4	3	4	5	–27	8	9	–13
18.	East Rajasthan	6	7	–11	10	5	117	16	12	41
19.	West Madhya Pradesh	20	13	52	0	8	–100	20	21	–3
20.	East Madhya Pradesh	28	20	44	0	22	–99	29	41	–31
21.	Gujarat Region	5	2	196	0	1	–100	5	3	82
22.	Sau. & Kutch	4	1	220	0	1	–100	4	2	80
23.	Konkan & Goa	1	1	–54	0	1	–100	1	2	–70
24.	Madhya Maharashtra	1	4	–68	0	2	–100	1	6	–77
25.	Marathwada	0	3	–90	0	4	–90	1	7	–90
26.	Vidarbha	4	12	–69	7	10	–24	11	21	–49
27.	Coastal A.P.	1	10	–85	4	11	–68	5	21	–76
28.	Telangana	0	4	–100	4	7	–44	4	11	66
29.	Rayalaseema	0	8	–100	0	5	–93	0	12	–97
30.	Tamil Nadu	10	34	–72	7	15	–56	16	49	–67
31.	Coastal Karnataka	0	2	–100	1	1	–60	1	3	–85
32.	N.I. Karnataka	0	2	–100	0	3	–97	0	5	–98
33.	S.I. Karnataka	1	3	–80	1	4	–83	1	7	–82
34.	Kerala	13	15	–13	8	17	–51	21	32	–34
35.	Lakshadweep	45	25	77	1	9	–87	46	35	33

TABLE 4

Principal amounts of rainfall (cm) for the month of January and February 1996

Date	January	February
1.	Nil	Nil
2.	Nil	Hut Bay & Kondul 3 each
3.	Kanpur 5	Sakoli 4
4.	Nil	Kondul 3
5.	Nil	Kondul 5
6.	Nil	Kondul 7
7.	Nil	Nil
8.	Kondul 3	Nil
9.	Nil	Nil
10.	Nil	Jagadhari 7, Nahan 6, Gwalior & Jabalpur 5 each, Batote, Dehra Dun & Dholpur 4 each, Ludhiana & Varanasi 3 each
11.	Puri, Banihal, & North Lakhimpur 4 each	Ramagundam 3
12.	Port Blair 9	Mahabubnagar 4
13.	Nil	Kondul 9, Nancowry 5
14.	Nil	Nil
15.	Sujanpur Tira 6, Jammu 4	Banihal 5, Dharamsala & Shimoga 3 each
16.	Guler 8, Chengannur & Jagadhari 6 each, Lucknow & Nawashahar 5 each, Kodaikanal 4, Bareilly, Jabalpur, Minicoy & Patna 3 each	Nil
17.	Jagadhari & Nahan 4 each, Amini Divi 3	Nancowry 5
18.	Nil	Nil
19.	Bhubaneswar 6	Nil
20.	Puri 3	Kanitar 4
21.	Nil	Kannyakumari 4
22.	Nil	North Lakhimpur 3
23.	Bhuntar & Ghumarwin 3 each	Kodaikanal 3
24.	Nil	Manali 5
25.	Kondul 7	Kangra 4
26.	Nil	Berthin, Kalka & Ropar 6 each, Shahjahanpur 3
27.	Nil	Bahraich 3
28.	Nil	Nil
29.	Kondul 6 & Nancowry 3	
30.	Nancowry 9, Kondul 7	
31.	Nil	

5.3. *Temperature*

Severe cold wave conditions prevailed in Punjab for one day in 1st week of February. Cold wave conditions also prevailed in Haryana, Jammu & Kashmir and east Rajasthan for one or two days in the 1st week and in Punjab for 3 days in 3rd week and in Madhya Pradesh for 2 days in the last week of February. In the plains, lowest temperature of 1°C was recorded in Amritsar on 2 and 3 February. In the hills, lowest temperature of – 8°C was recorded at Quazigund on 1 and 2 February.

5.4. *Disastrous weather events and damages*

According to press report eleven persons and seven children were killed when lightening struck a school building in Kanyakumari district of Tamil Nadu on 27 February. The Kashmir valley was cut off from the rest of the country following the closure of 300 km long Srinagar - Jammu national highway due to landslides during the last week of February. Road traffic was also disrupted in Himachal Pradesh on 10 and 25 February due to snowfall.