Mausam, (1996), **47**, 1, 107-114

Weather in India

WINTER SEASON (JANUARY-FEBRUARY 1995)*

1. Introduction

The winter season of 1995 was characterised by a good spell of rain in most parts of the plains of northwest and central India in addition to hilly regions of north India which is the main rainfall belt in winter. In Andaman & Nicobar Islands, however, as in last year, this year also rainfall was deficient. Lakshadweep Islands received good spells of rain. Monthwise synoptic features for the season are given in Tables 1 & 2. Table 3 contains the monthly and seasonal rainfall figures.

2. Chief features

(*i*) Fairly widespread rainfall in most parts of the country, outside northeast India during the first half of January.

(*ii*) Cold wave conditions over most parts of northwest India on many days and on some days in central parts of the country.

(*iii*) Avalanches and landslides and heavy snowfall in Kashmir.

3. Season's rainfall

The season's rainfall was excess in 19, normal in 7 and deficient in the remaining 9 sub-divisions. Seasonal rainfall departures are given in Table 3 and Fig. 1.

The seasonal accumulated rainfall was excess in Gangetic West Bengal, Orissa, east Uttar Pradesh, Haryana, Punjab, Jammu & Kashmir, Rajasthan, west Madhya Pradesh, Gujarat region, Maharashtra, coastal Andhra Pradesh, Telangana, coastal and north interior Karnataka and Lakshadweep. It was normal in Assam & Meghalaya, Nagaland, Manipur, Mizoram & Tripura, Plains of west Uttar Pradesh, Himachal Pradesh, east Madhya Pradesh, Rayalaseema and south interior Karnataka and deficient in Andaman & Nicobar Islands, Arunachal Pradesh, Sub-Himalayan West Bengal & Sikkim, Bihar, hills of west Uttar Pradesh, Saurashtra & Kutch, Tamil Nadu and Kerala.

4. January

4.1. *Weather and associated synoptic features*

Two western disturbances, a low pressure area with associated cyclonic circulation upto 3.1 km asl, one induced and one other cyclonic circulation were quite active and produced fairly widespread to scattered rainfall mainly over northwest India during 1-18 January 1995. In addition to these systems a well marked low pressure area, an induced low pressure area with associated cyclonic circulation in the lower levels, 3 cyclonic circulations, and a deep mid and upper tropospheric westerly trough which moved across north India in the 1st half of January, gave a well distributed rainfall over many parts of north, central and Peninsular India. Details of these and other weather systems which formed during the month are given in Table 1.

Rain or thundershowers occurred either almost at all the places or many places on 3 to 6 days in Bihar Plateau, Punjab, Himachal Pradesh, Jammu & Kashmir, east Madhya Pradesh, Marathwada and Telangana and on 1 or 2 days in Assam & Meghalaya, Sub-Himalayan West Bengal & Sikkim, Gangetic West Bengal, Orissa, Bihar plains, east Uttar Pradesh, hills of west Uttar Pradesh, Haryana, west Madhya Pradesh, Gujarat region, Konkan & Goa, Madhya Maharashtra, Vidarbha, coastal Andhara Pradesh, north interior Karnataka and Lakshadweep. Rain or thundershowers occurred either at a few places or at one or two places on 20 days in Tamil Nadu, 10 to 14 days in Andaman & Nicobar Islands, plains of west Uttar Pradesh, Himachal Pradesh, coastal Andhra Pradesh, Rayalaseema, south interior Karnataka and Kerala, on 5 to 9 days in Arunachal Pradesh, Assam & Meghalaya, Nagaland, Manipur, Mizoram & Tripua, Orissa, hills of west Uttar Pradesh, Haryana, Jammu & Kashmir, Rajasthan, Madhya Pradesh,

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

TABLE 1

Details of the weather systems during January 1995

S. No. (1)	System (2)	Period (3)	Place of first location (4)	Direction of movement (5)	Place of dissipation (6)	Remarks (7)
(A)	*Western Disturbances*					
1.	Upper air system	31 Dec-6 Jan	North Pakistan and adjoining Rajasthan	Northeasterly	Moved away across Jammu & Kashmir	
2.	Do.	13-16	North Afghanistan and neighbourhood	Do.	Do.	
3.	Do.	18-20	North Pakistan and neighbourhood	Do.	Do.	
4.	Do.	19-23	Afghanistan and neighbourhood	Do.	Do	
5.	Do.	23-27	North Pakistan and neighbourhood	Do.	Do.	
6.	Do.	27-30	Afghanistan and adjoining Pakistan	Do.	Do.	
(B)	*Low pressure areas*					
1.	Well-marked low pressure area	8-9	Southeast Rajasthan and adjoining Gujarat region	Northeasterly	Plains of west Uttar Padesh and neighbourhood	It was first observed as an induced cyclonic circulation in mid-tropospheric levels over northeast Arabian Sea and adjoining south Gujarat and north Maharashtra
2.	Low pressure area	9-11	East Pakistan and neighbourhood	Do.	Jammu & Kashmir	Associated cyclonic circulation extended upto 3.1 km asl. On 10 it was seen as an upper air cyclonic circulation and extended upto 3.1 km asl over northeast Pakistan and neighbourhood
(C)	*Induced low pressure area*					
1.	Induced low pressure area	13-16	South Pakistan and neighbourhood	Easterly	Southeast Rajasthan and adjoining Madhya Pradesh	Associated cyclonic circulation extended upto 1.5 km asl upto 16th and less marked over east Madhya Pradesh
(D)	*Troughs in the westerlies*					
1.	Mid and upper tropospheric westerlies	6-14	70°E. north of 10°N.	Northeasterly	79°E. north of 10°N	
2.	Do.	16-21	73°E. north of 20°N	Easterly	87°E. north of 15°N	

TABLE 1 (*Contd.*)

(1)	(2)	(3)	(4)	(5)	(6)	(7)
(E)	*Trough in the easterly*					
1.	Lower level	17-21	Karnataka; south Tamil Nadu to north interior Konkan	Westerly	Karnataka coast; south Kerala coast to Karnataka coast	
(F)	*Other troughs*					
1.	Lower levels	30 Dec 8-Jan	Andaman Sea and neighbourhood	Westerly	Off Tamil Nadu coast	
2.	Do.	5-13	North Maharashtra coast to Lakshadweep area	Quasi-stationary	Comorin to Telangana	
3.	Do.	14-24	Andaman Sea	Westerly	Southwest Bay off Tamil Nadu coast	
4.	Do.	22-27	Andaman Sea	Stationary	*In situ*	
5.	Do.	27 Jan-1 Feb	Southwest Bay off Tamil Nadu coast	Do.	Do.	
(G)	*Induced cyclonic circulations*					
1.	Lower levels	2-5	West Rajasthan and adjoining Pakistan	Easterly	West Uttar Pradesh and neighbourhood	With a trough extending upto north Gujarat region
2.	Do.	24-27	Southwest Rajasthan and adjoining Pakistan	Do.	Northwest Madhya Pradesh and neighbourhood	
(H)	*Other cyclonic circulations*					
1.	Lower levels	2-4	Assam and Meghalaya and neighbourhood	Stationary	*In situ*	
2.	Do.	3-9	Lakshadweep and Maldives	Do.	Do.	
3.	Lower tropospheric levels	6-7	Punjab and neighbourhood	Northeasterly	Punjab and adjoining Haryana	
4.	Do.	11-12	North Madhya Maharashtra and neighbourhood	Easterly	Vidarbha and adjoining east Madhya Pradesh	
5.	Do.	15-17	Coastal Karnataka and neighbourhood	Stationary	*In situ*	

Madhya Maharashtra, Vidarbha and coastal and north interior Karnataka and on 1 to 3 days in West Bengal & Sikkim, Bihar plains, east Uttar Pradesh, Punjab, Gujarat state, Konkan & Goa, Marathwada, Telangana and Lakshadweep.

4.2. *Month's rainfall*

Month's accumulated rainfall was excess in 22, normal in 4, deficient in 7 and scanty in the remaining 2 sub-divisions (Table 3).

TABLE 2

Details of the weather systems during February 1995

S. No. (1)	System (2)	Period (3)	Place of first location (4)	Direction of movement (5)	Place of dissipation (6)	Remarks (7)
(A)	*Western Disturbances*					
1.	Upper air system	2-6	North Pakistan and neighbourhood	Eastnorth-easterly	Moved away across Punjab and adjoining Jammu & Kashmir	
2.	Do.	7-9	Do.	Northeasterly	Moved away across Jammu & Kashmir	
3.	Do.	9-13	Afghanistan and adjoining Pakistan	Eastnorth-easterly	North Pakistan and adjoining Jammu & Kashmir	
4.	Do.	13-16	North Pakistan and neighbourhood	Northeasterly	Moved away across Jammu & Kashmir	
5.	Do.	16-19	Do.	Do.	Do.	
6.	Do.	21-25	North Pakistan and adjoining Jammu & Kashmir	Do.	Do.	
(B)	*Induced low pressure area*					
1.	Lower Levels	10-13	Northeast Pakistan and neighbourhood	Easterly	Merged with the fresh induced low pressure area over Rajasthan and neighbourhood which became less marked on 13	**Associated cyclonic circulation extended upto 1.5 km asl**
(C)	*Troughs in the westerlies*					
1.	Mid and Upper tropospheric westerlies	14-17	62°E, north of 20°N	Easterly	80°E, north of 15°N	
2.	Do.	27-28	68°E, north of 25°N	Stationary	*In situ*	
(D)	*Trough in the easterlies*					
1.	Lower levels	12-23	South Kerala coast to south Maharashtra coast	Quasi-stationary	South Tamil Nadu coast to south Madhya Maharashtra	
(E)	*Other troughs*					
1.	Lower tropospheric levels	30 Jan-3 Feb	Kerala coast to Maharashtra coast	Quasi-stationary	Lakshadweep to Maharashtra coast	
2.	Lower levels	5-9	Off Tamil Nadu coast	Stationary	*In situ*	

TABLE 2 (*Contd.*)

(1)	(2)	(3)	(4)	(5)	(6)	(7)
(F)	*Induced cyclonic circulations*					
1.	Lower levels	2-6	South Pakistan and adjoining west Rajasthan	Easterly	Southeast Madhya Pradesh and neighbourhood	
2.	Lower tropospheric levels	13-17	West Rajasthan and neighbourhood	Eastnorth-easterly	Central parts of Uttar Pradesh	
3.	Do.	18-20	Punjab and neighbourhood	Do.	Moved away across Himachal Pradesh	
4.	Lower Levels	19-21	Southwest Rajasthan and neighbourhood	Easterly	East Madhya Pradesh and neighbourhood	
5.	Lower tropospheric levels	21-24	Do.	Do.	Bihar	
6.	Do.	24 Feb-1 Mar	South Pakistan	Northeasterly	Southeast Uttar Pradesh and neighbourhood	A trough from this system in the lower levels to Telangana was located on 27 & 28 and again over Bihar Plains to Vidarbha on 1 March and became less marked on 2 March
7.	Do.	26-27	Southwest Rajasthan and neighbourhood	Quasi-stationary		Merged with the above induced cyclonic circulation over southeast Uttar Pradesh and neighbourhood on 27
(G)	*Cyclonic circulation*					
1.	Lower tropospheric levels	20-22	Meghalaya and neighbourhood	Stationary	*In situ*	

During the month, rainfall was excess in Gangetic West Bengal, Orissa, plains of Uttar Pradesh, Haryana, Punjab, Rajasthan, Madhya Pradesh, Gujarat region, Maharashtra, Andhra Pradesh, Karnataka and Lakshadweep and normal in Himachal Pradesh, Jammu & Kashmir, Saurashtra & Kutch and Tamil Nadu. Rainfall was deficient in Andaman & Nicobar Islands, Arunachal Pradesh, Nagaland, Manipur, Mizoram & Tripura, Sub-Himalayan West Bengal & Sikkim, Bihar Plateau, hills of west Uttar Pradesh and Kerala and was scanty in Assam & Meghalaya and Bihar Plains. Principal amounts of rainfall are given in Table. 4.

4.3. *Temperature*

Moderate to severe cold wave conditions prevailed in Jammu & Kashmir for many days in the month and for 5 to 8 days in Bihar Plains and Nagaland, Manipur, Mizorm & Tripura. Cold wave conditions also prevailed for 5 to 8 days in most parts of northwest India, Uttar Pradesh, Bihar Plateau and Marathwada. In the plains, lowest temperature of −2°C was recorded at Adampur on 23 January. In the hills lowest temperature of −8°C was recorded at Srinagar on 2, 6 and 25 January.

4.4. *Disastrous weather events and damages*

Cold wave claimed 5 lives in Jammu & Kashmir in the 1st week of January. Parts of Dal lake were frozen due to cold wave and snowfall. More than 150 people were killed in avalanches and landslides on Srinagar — Jammu national highway, in the wake of unprecedented snowfall during 1 to 18 January. Jammu & Kashmir and Ladakh tribal belt recorded heaviest snowfall in the last 15 years. Hailstorm and cold wave caused death of 8 persons in Rajasthan, 27 in Bihar and 10 in Darjeeling district during mid-January.

TABLE 3

Rainfall figures (mm) for each month and season as a whole
(January - February 1995)

Sl. No.	Meteorological Sub-division	January			February			Season		
		Actual (mm)	Normal (mm)	Dep. (%)	Actual (mm)	Normal (mm)	Dep. (%)	Actual (mm)	Normal (mm)	Dep. (%)
1.	A and N Islands	50	73	—32	23	47	—51	73	120	—39
2.	Arunachal Pradesh	23	44	—48	29	66	—56	52	110	—53
3.	Assam and Meghalaya	5	18	—72	43	27	59	48	45	7
4.	Nag., Mani., Miz. & Tri.	7	15	—53	28	28	0	35	43	—19
5.	SHWB & Sikkim	8	17	—53	22	22	0	30	39	—23
6.	Gangetic West Bengal	21	13	62	31	20	55	52	33	58
7.	Orissa	48	13	269	14	25	—44	62	38	63
8.	Bihar Plateau	11	20	—45	12	25	—52	23	45	—49
9.	Bihar Plains	6	15	—60	10	16	—38	16	31	—48
10.	East U.P.	29	18	61	19	16	19	48	34	41
11.	Plains of West U. P.	31	22	41	15	18	—17	46	40	15
12.	Hills of West U. P.	47	66	—29	43	63	— 32	90	129	—30
13.	Haryana, CHD. & DLH.	62	22	182	34	19	79	96	41	134
14.	Punjab	47	29	62	68	26	162	115	55	109
15.	Himachal Pradesh	68	79	—14	109	74	47	177	153	16
16.	Jammu & Kashmir	73	78	—6	132	92	43	205	170	21
17.	West Rajasthan	14	4	250	6	9	—33	20	13	54
18.	East Rajasthan	35	7	400	3	11	—73	38	18	111
19.	West Madhya Pradesh	24	13	85	3	8	—63	27	21	29
20.	East Madhya Pradesh	35	20	75	13	22	—41	48	42	14
21.	Gujarat Region	9	2	350	0	0	—100	9	2	350
22.	Sau. & Kutch	1	1	0	0	1	—100	1	2	—50
23.	Konkan & Goa	5	1	400	0	1	—52	5	2	150
24.	Madhya Maharashtra	35	4	775	0	1	—98	35	5	600
25.	Marathwada	61	3	1933	0	3	—88	61	6	917
26.	Vidarbha	59	12	392	7	10	—30	66	22	200
27.	Coastal A. P.	39	10	290	3	11	—73	42	21	100
28.	Telangana	68	4	1600	0	6	—95	68	10	580
29.	Rayalaseema	9	7	29	1	5	—80	10	12	—17
30.	Tamil Nadu	35	34	3	4	15	—73	39	49	—20
31.	Coastal Karnataka	7	2	250	0	1	—100	7	3	133
32.	N. I. Karnataka	38	2	1800	0	3	—100	38	5	660
33.	S. I. Karnataka	6	3	100	0	4	—91	6	7	—14
34.	Kerala	11	15	—27	7	17	—59	18	32	—44
35.	Lakshadweep	131	25	424	19	9	111	150	34	341

TABLE 4

Principal amounts of rainfall (cm)
(January and February 1995)

Date	January	February
1	Nil	Nil
2	Nil	Nil
3	Nil	Nil
4	Nil	Nil
5	Nil	Nil
6	Khajuraho 3	Nil
7	Nil	Nil
8	Betul, Chittorgarh and Nellore 5 each, Adirampattinam, Nagpur and Parbhani 3 each	Nil
9	Ambala 12, Hindon 9, Chandigarh 8, Dhuri 7, New Delhi 6, Jagdalpur 5	Nil
10	Bapatla 7, Jammu 3	Nil
11	Thenmala 6	Nil
12	Waltair 6, Kalingapatnam 5, Kondul 3	Dharamshala 6, Kondul, Narwana, Pathankot and Srinagar 3 each
13	Madras 4, Kakinada 3	Guhla 5, Amritsar 4
14	Kondul 9, Hut Bay 5	Nurpur 7, Adampur 6, Sonipat 5, Manali and Udhampur 3 each
15	Bapatla 4	Udhampur 6, Dharmshala and Ludhiana 5 each, Chandigarh and Dehra Dun 3 each
16	Kolhapur and Madras 6 each, Bangana, Pathankot and Udhampur 4, Parbhani 3	Nil
17	Nizamabad 7, Mandi 4, Raichur 3	Nil.
18	Adirampattinam 3	Nil
19	Nil	Sandheads 3
20	Karaikal and Nagapattinam 4 each	Punalur 3
21	Nil	Nil
22	Nil	Nil
23	Nil	Nil
24	Nil	Bhubaneswar 8, Sandheads 7, Agartala 3
25	Nil	Dibrugarh 3
26	Nil	Kondul 7, Parur 4, north Lakhimpur 3
27	Kondul 6	Alapuzha 3
28	Nil	Nakodar 5, Kondul and Shimla 4 each, Calcutta and Jammu 3 each
29	Nil	
30	Nil	
31	Nil	

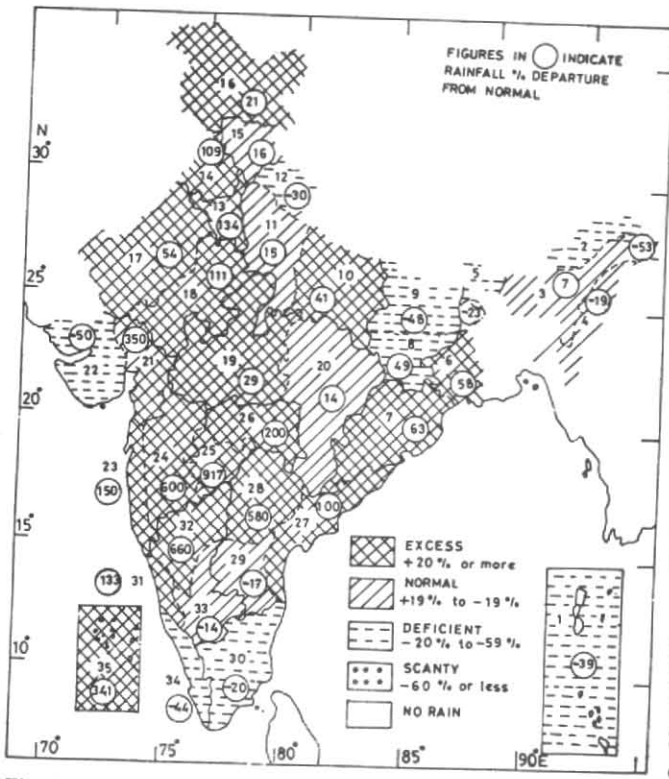

Fig. 1. Rainfall for the period 1 January to 28 February 1995

5. February

5.1. *Weather and associated synoptic features*

6 western disturbances, 1 induced low pressure area with associated cyclonic circulations in lower levels, 6 induced cyclonic circulations in lower tropospheric levels and two mid and upper tropospheric westerlies affected northwest India and parts of north India. Out of these systems, 3 western disturbances, 1 induced low pressure area, 1 mid and upper tropospheric westerly trough and 3 induced cyclonic circulations which formed during the period 8 to 15 February and 25 February to 1 March were active and gave good rainfall in northwest India and Uttar Pradesh. During the last week of February fairly wide-spread to scattered rains also occurred over coastal Andhra Pradesh, Orissa, Gangetic West Bengal, Bihar Plains and northeast region. Details of weather systems in the month are given in Table 2.

Rain or thundershowers occurred almost at all the places or at many places on 11 days in Jammu & Kashmir, on 3 to 5 days in Haryana, Punjab and Himachal Pradesh and on 1 or 2 days in Sub-Himalayan West Bengal & Sikkim, Orissa, Bihar and east Madhya Pradesh. Rain or thundershowers also occurred at a few places or at one or two places on 18 days in hills of west Uttar Pradesh, on 10 to 13 days in Assam & Meghalaya, Nagaland, Manipur, Mizoram & Tripura, Haryana, Himachal Pradesh, east Madhya Pradesh, Tamil Nadu and Kerala, on 5 to 9 days in Andaman & Nicobar Islands, Arunachal Pradesh, West Bengal, Orissa, plains of Uttar Pradesh, Punjab, Jammu & Kashmir, west Madhya Pradesh, Vidarbha and coastal Andhra Pradesh and on 1 to 4 days in Bihar, Rajasthan, Madhya Maharashtra, Marathwada, Rayalaseema, south interior Karnataka and Lakshadweep.

5.2. *Month's rainfall*

Accumulated monthly rainfall was excess in 7, normal in 4, deficient in 11 and scanty in 9 sub-divisions. There was no rain in remaining 4 sub-division. Sub-divisionwise rainfall departures are given in Table 3.

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

5.3. *Temperature*

Moderate to severe cold wave conditions prevailed in Himachal Pradesh during the last week of February. Cold wave conditions also prevailed in Kashmir and Punjab for 7 days during 1st and last week and in Haryana for 2 days during the last week. In the plains, lowest temperature of 0°C was recorded at Adampur on 1 February. In the hills, lowest temperature −6°C was recorded at Srinagar on 1 February.

5.4. *Disastrous weather events and damages*

An earthquake of moderate intensity measuring 5.8 on Richter scale was reported in Assam & Meghalaya and Arunachal Pradesh on 7 February 1995.

Snowfall over Jammu & Kashmir and Himachal Pradesh disrupted normal life and vehicular traffic during the last week of the month.