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Weather in India

WINTER SEASON (January-February 2003)*

1. Introduction

Good rainfall activity, including snowfall, occurred in the northern parts of the country during the season. Many parts of North and Central India experienced *severe cold wave conditions*† on a number of days in the month of January. *Cold wave* and *cold day conditions* also prevailed over north, northwest and northeast India on many days during January. Incidences of *cold wave* conditions were rare in the month of February, which in turn received exceptionally good rainfall during the season. Fog prevailed in North India on most of the days in the month of January.

2. Seasonal rainfall (January-February)

Seasonal rainfall was *excess* in 16 meteorological sub-divisions, while it was *normal* in 6, *deficient* in 7 and *scanty* in 7.

Rainfall was *excess* in Sub-Himalayan West Bengal & Sikkim, Bihar, east Uttar Pradesh, west Uttar Pradesh, Uttaranchal, Haryana, Punjab, Jammu & Kashmir, west Rajasthan, east Rajasthan, west Madhya Pradesh, east Madhya Pradesh, Gujarat Region, Saurashtra & Kutch, Chattisgarh and Kerala; *normal* in Assam & Meghalaya, Jharkhand, Vidarbha, coastal Andhra Pradesh, south Interior Karnataka and Lakshadweep; *deficient* in Andaman & Nicobar Islands, Arunachal Pradesh, Nagaland-Manipur-Mizoram-Tripura, Gangetic West Bengal, Orissa, Himachal Pradesh and coastal Karnataka and was *scanty* in Konkan & Goa, Madhya Maharashtra, Marathwada, Telangana, Rayalaseema, Tamil Nadu and North Interior Karnataka.

Seasonal sub-divisionwise percentage rainfall departures are given in Fig. 1 and also in Table 1.

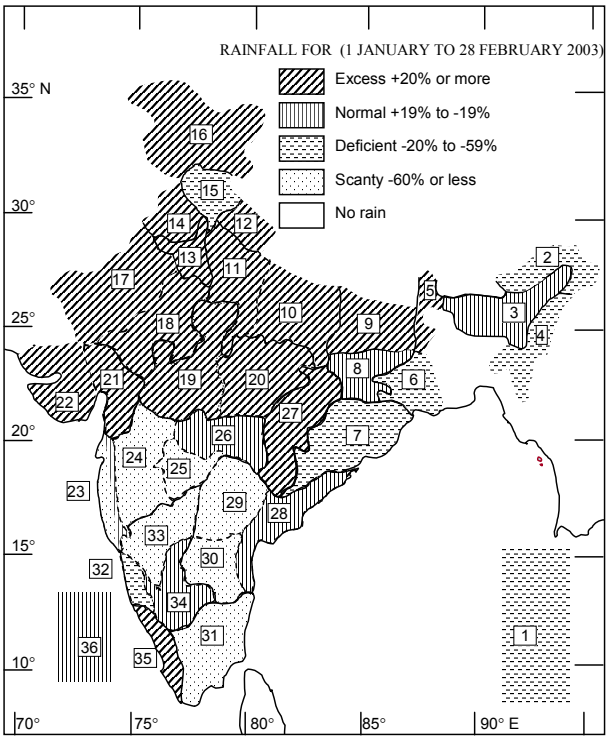

Fig. 1. Sub-divisionwise seasonal rainfall departure from normal (%) for winter season (January - February 2003). Sub-divisions are indicated by number on the map & bold letters in legend. The rainfall anomaly values for these 36 sub-divisions are indicated below :

1	–44	**7**	–29	**13**	51	**19**	106	**25**	–72	**31**	–62
2	–34	**8**	–15	**14**	92	**20**	89	**26**	10	**32**	–52
3	–16	**9**	132	**15**	–23	**21**	516	**27**	130	**33**	–65
4	–44	**10**	80	**16**	49	**22**	45	**28**	–3	**34**	8
5	34	**11**	117	**17**	275	**23**	–61	**29**	–74	**35**	106
6	–35	**12**	162	**18**	181	**24**	–68	**30**	–94	**36**	–16

3. Monthly features

3.1. *January*

3.1.1. *Weather and associated synoptic features*

There were in all 13 western disturbances including 2 induced low pressure areas and 2 induced cyclonic circulations, 1 other cyclonic circulation, 7 troughs in easterlies and 1 trough in westerlies which affected the weather over the country during this month. Details of these systems are given in Table 2.

Rain/snow occurred *at most places* on 3 days in Uttaranchal, Himachal Pradesh and on 1 day in Jammu & Kashmir; *at many places* on 2 days in Jammu & Kashmir and on 1 day in Uttaranchal; *at a few places* on 1 day in Himachal Pradesh and *at isolated places* on 2 days in Jammu & Kashmir.

† Definitions of the terms in *Italics* are given in Appendix.

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TABLE 1

Sub-divisionwise rainfall (mm) for each month and season as a whole (January-February 2003)

S. No.	Meteorological Sub-divisions	January			February			Season		
		Actual (mm)	Normal (mm)	Dep. (%)	Actual (mm)	Normal (mm)	Dep. (%)	Actual (mm)	Normal (mm)	Dep. (%)
1.	A & N Islands	41	77	-47	25	41	-39	65	117	-44
2.	Arunachal Pradesh	15	39	-61	66	84	-21	81	123	-34
3.	Assam & Meghalaya	6	18	-69	34	29	18	39	47	-16
4.	Naga., Mani., Mizo. and Tri.	5	14	-62	17	26	-35	22	40	-44
5.	S. H. W. B. & Sikkim	16	33	-52	83	41	104	99	74	34
6.	Gangetic West Bengal	1	12	-96	19	18	5	19	30	-35
7.	Orissa	0	11	-99	22	20	9	22	32	-29
8.	Jharkhand	3	17	-85	29	20	46	31	37	-15
9.	Bihar	12	18	-34	57	12	377	68	29	132
10.	East Uttar Pradesh	20	19	0	40	13	196	59	33	80
11.	West Uttar Pradesh	24	20	20	54	16	240	78	36	117
12.	Uttaranchal	66	51	31	185	45	309	251	96	162
13.	Haryana, Chandigarh & Delhi	22	21	4	35	17	109	57	38	51
14.	Punjab	16	26	-40	80	24	236	96	50	92
15.	Himachal Pradesh	35	96	-64	104	84	25	139	180	-23
16.	Jammu & Kashmir	25	76	-67	221	89	149	246	165	49
17.	West Rajasthan	3	4	-28	29	4	570	33	9	275
18.	East Rajasthan	6	7	-17	29	5	449	35	13	181
19.	West Madhya Pradesh	2	11	-80	33	6	466	36	17	106
20.	East Madhya Pradesh	2	25	-93	82	19	332	84	44	89
21.	Gujarat Region	0	1	-95	9	1	1433	9	1	516
22.	Saurashtra & Kutch	0	1	-100	2	1	167	2	1	45
23.	Konkan & Goa	0	1	-98	**	**	50	**	1	-61
24.	Madhya Maharashtra	**	2	-87	1	1	-33	1	3	-68
25.	Marathwada	0	3	-99	2	3	-45	2	6	-72
26.	Vidarbha	0	12	-100	25	11	128	25	23	10
27.	Chattisgarh	1	11	-93	56	13	323	57	25	130
28.	Coastal Andhra Pradesh	3	7	-60	11	8	45	14	14	-3
29.	Telangana	0	5	-100	3	6	-55	3	11	-74
30.	Rayalaseema	0	3	-100	**	4	-89	**	7	-94
31.	Tamil Nadu	1	19	-95	12	14	-16	13	33	-62
32.	Coastal Karnataka	**	2	-90	1	1	30	1	3	-52
33.	North Interior Karnataka	**	2	-97	1	2	-37	1	3	-65
34.	South interior Karnataka	1	2	-63	5	3	48	5	5	8
35.	Kerala	1	11	-89	53	15	248	54	26	106
36.	Lakshadweep	12	20	-40	18	16	13	30	36	-16

Note : ** indicates rainfall amounts 0.1 to 0.4 mm

TABLE 2

Details of the weather systems during January 2003

S. No.	System	Duration	Place of first location	Direction of movement	Place of final location	Remarks
(1)	(2)	(3)	(4)	(5)	(6)	(7)
(**A**)	*Western disturbances / eastward moving systems*					
(*i*)	*Upper air systems*					
1.	Mid tropospheric levels	5 – 7	North Pakistan and adjoining areas of Jammu & Kashmir	Eastnorth-eastwards	Eastern parts of Jammu & Kashmir	Moved away on 8
2.	Do	7 – 9	Do	Do	Do	Moved away on 10
3.	Do	9 – 12	Do	Do	Uttaranchal and neighbourhood	Moved away on 13
4.	Do	11 – 13	Do	Do	Eastern parts of Jammu & Kashmir	Moved away on 14
5.	Do	14 – 21	Do	Do	Himachal Pradesh, Uttaranchal and neighbourhood	Moved away on 22
6.	Do	18 – 23	Do	Do	Eastern parts of Jammu & Kashmir and adjoining Himachal Pradesh and Uttaranchal	Moved away on 24
7.	Do	23 – 27	North Pakistan and neighbourhood	Do	Himachal Pradesh and neighbourhood	Moved away on 28
8.	Do	25 – 30	Do	Do	Extreme eastern parts of Himachal Pradesh and neighbourhood	Moved away on 31
9.	Do	31 Jan – 4 Feb	North Pakistan and adjoining Jammu & Kashmir	Do	Uttaranchal and neighbourhood	Moved away on 5 February
(*ii*)	*Induced lows*					
1.	Induced low pressure area	27 – 29	Saurashtra & Kutch and neighbourhood	Do	East Madhya Pradesh and neighbourhood	Less marked on 30. However, the associated cyclonic circulation extended upto lower tropospheric levels over Jharkhand and neighbourhood which became less marked on 1 February
2.	Induced low pressure area	30 – 31	Central Pakistan and adjoining west Rajasthan	Do	East Rajasthan and adjoining Haryana	Less marked on 1 February. Associated cyclonic circulation in the lower tropospheric levels further moved eastwards upto Bihar and neighbourhood and became less marked on 3 February
(*iii*)	*Induced cyclonic circulations*					
1.	Mid tropospheric levels	2 – 3	South Pakistan and adjoining west Rajasthan	Northeasterly	Haryana and neighbourhood	Less marked on 4
2.	Do	20	Northern parts of Rajasthan, Haryana and adjoining west Uttar Pradesh	Stationary	*In-situ*	Less marked on 21

TABLE 2 (*Contd.*)

(1)	(2)	(3)	(4)	(5)	(6)	(7)
(**B**)	*Other cyclonic circulations*					
1.	Mid tropospheric levels	11 – 14	South Gujarat coast and neighbourhood	Quasi-stationary	Gujarat and neighbourhood	Less marked on 15
(**C**)	*Trough in easterlies*					
1.	Lower levels	6 – 17	Central parts of south Bay	Westerly	Southwest Arabian Sea	Less marked on 18
2.	Do	29 Dec-15 Jan	Andaman Sea	Do	Do	Less marked on 16
3.	Do	12 – 20	Do	Do	Comorin area and neighbourhood	Less marked on 21
4.	Do	15 – 16	Do	Do	Southeast Bay and adjoining Andaman Sea	Merged with trough in the lower levels over southeast Bay on 17
5.	Do	22 Jan – 4 Feb	South Andaman Sea and adjoining southeast Bay	Do	Lakshadweep area	Less marked on 5
6.	Do	28 Jan – 7 Feb	Andaman Sea	Do	Maldives-Commorin area	Less marked on 8
7.	Do	24 – 28	Southern parts of southwest Bay	Do	Southeast Arabian Sea	Less marked on 29
(**D**)	*Trough in westerly*					
1.	Mid tropospheric levels	24 – 25	Sub-Himalayan West Bengal & Sikkim to Gangetic West Bengal along 88° E	Stationary	*In-situ*	Less marked on 26

Rain/thundershowers also occurred *at most places* on 1 to 3 days in Sub-Himalayan West Bengal & Sikkim, Bihar, east Uttar Pradesh, west Uttar Pradesh and Haryana, Punjab and Lakshadweep; *at a few places* on 6 days in Andaman & Nicobar Islands and on 1 to 2 days in Arunachal Pradesh, Sub-Himalayan West Bengal & Sikkim, Gangetic West Bengal, Jharkhand, west Uttar Pradesh, Haryana, Punjab, west Rajasthan, east Rajasthan and Lakshadweep and *at isolated places* on 8 to 11 days in Andaman & Nicobar Islands and Assam & Meghalaya; on 3 to 4 days in Arunachal Pradesh, Nagaland-Manipur-Mizoram-Tripura, east Uttar Pradesh, Madhya Maharashtra, coastal Andhra Pradesh, Tamil Nadu and Kerala and on 1 to 2 days in Sub-Himalayan West Bengal & Sikkim, Orissa, Jharkhand, Bihar, west Uttar Pradesh, Punjab, west Rajasthan, east Rajasthan, west Madhya Pradesh, east Madhya Pradesh, Gujarat Region, Konkan & Goa, coastal Karnataka, north interior Karnataka and south interior Karnataka.

3.1.2. *Monthly rainfall*

Monthly rainfall was *excess* in 2, *normal* in 3, *deficient* in 6 and *scanty* in 21 meteorological sub-divisions. There was no rain in the remaining 4 meteorological sub-divisions. Monthly rainfall was *excess* in west Uttar Pradesh and Uttaranchal; *normal* in east Uttar Pradesh, Haryana and east Rajasthan and *deficient* in Andaman & Nicobar Islands, Sub-Himalayan West Bengal & Sikkim, Bihar, Punjab, west Rajasthan and Lakshadweep; *scanty* in Arunachal Pradesh, Assam & Meghalaya, Nagaland-Manipur-Mizoram-Tripura, Gangetic West Bengal, Orissa, Jharkhand, Himachal

Pradesh, Jammu & Kashmir, west Madhya Pradesh, east Madhya Pradesh, Gujarat Region, Konkan & Goa, Madhya Maharashtra, Marathwada, Chattisgarh, coastal Andhra Pradesh, Tamil Nadu, coastal Karnataka, north interior Karnataka, south interior Karnataka and Kerala. There was no rain in Saurashtra & Kutch, Vidarbha, Telangana and Rayalaseema.

Principal amounts of rainfall for the month of January are given in Table 4.

3.1.3. *Temperature*

Severe cold wave conditions prevailed on 10 days in Bihar, 5 days each in some parts of Jharkhand and of east Uttar Pradesh and on 1 to 2 days in some parts of Orissa, west Uttar Pradesh, Uttaranchal, Jammu & Kashmir, west Rajasthan and of east Rajasthan. *Cold wave conditions* also prevailed on 8 to 12 days in some parts of Jharkhand, Bihar, east Uttar Pradesh, west Uttar Pradesh, Haryana, Punjab, Jammu & Kashmir and of east Madhya Pradesh; on 4 to 7 days in some parts of Orissa, west Rajasthan, east Rajasthan, west Madhya Pradesh and of Vidarbha and on 1 to 3 days in some parts of Nagaland-Manipur-Mizoram-Tripura, Sub-Himalayan West Bengal & Sikkim, Gangetic West Bengal, Uttaranchal and of Chattisgarh. *Cold day conditions* prevailed on 8 to 12 days in some parts of west Uttar Pradesh, Haryana and Punjab; on 4 to 6 days in east Uttar Pradesh, Himachal Pradesh and of Jammu & Kashmir and on 1 to 3 days in some parts of Assam & Meghalaya, Nagaland-Manipur-Mizoram-Tripura, Sub-Himalayan West Bengal & Sikkim, Bihar, Uttaranchal, west Rajasthan, east Rajasthan and of Konkan & Goa. Night temperatures were *appreciably* to *markedly below normal* on 8 to 13 days in some parts of Orissa, Jammu & Kashmir, east Rajasthan, west Madhya Pradesh, east Madhya Pradesh and of coastal Andhra Pradesh; on 4 to 7 days in some parts of Nagaland-Manipur-Mizoram-Tripura, Sub-Himalayan West Bengal & Sikkim, Gangetic West Bengal, Jharkhand, Uttaranchal, west Rajasthan, Madhya Maharashtra, Marathwada, Chattisgarh and of Telangana and on 1 to 3 days in some parts of Bihar, east Uttar Pradesh, west Uttar Pradesh, Haryana, Punjab, Himachal Pradesh, Gujarat Region, Saurashtra & Kutch, Konkan & Goa, Vidarbha, Rayalaseema, Tamil Nadu and of coastal Karnataka. Night temperatures were generally *appreciably* to *markedly above normal* on many days in peninsular India on the first fortnight and over North, West and Central India in the last week of the month.

During the month, the lowest minimum temperature recorded over the plains was –1.1° C at Churu (Rajasthan) on 11 January 2003.

3.1.4. *Disastrous natural events and damage*

During the month, deaths due to cold wave exceeded 600 in Bihar. It also took a toll of 201 persons in Uttar Pradesh, 100 in Rajasthan, 17 in Punjab & Haryana, 7 in Madhya Pradesh, 5 in West Bengal and 1 in Vidarbha (Maharashtra).

3.2. *February*

3.2.1. *Weather and associated synoptic features*

There were 8 western disturbances (including a depression and an induced cyclonic circulation), 2 other cyclonic circulations, 1 embedded cyclonic circulation, 2 east-west troughs, 3 troughs in westerlies, 5 troughs in easterlies and 3 other troughs which affected weather in India during the month of February. Details of these systems are given in Table 3.

It is for the first time after a span of 22 years that a system in westerlies intensified into a depression. It gave rise to widespread rainfall/ snowfall over the hilly regions for two consecutive days.

Rain/snow occurred *at most places* on 5 days in Jammu & Kashmir; on 3 days in Himachal Pradesh and 2 days in Jammu & Kashmir; *at many places* on 1 day each in Himachal Pradesh and Jammu & Kashmir; *at a few places* on 1 to 3 days in Uttaranchal, Himachal Pradesh and Jammu & Kashmir and *at isolated places* on 6 days each in Himachal Pradesh and Jammu & Kashmir and on 1 day in Uttaranchal. Rain or thundershowers occurred *at most places* on 5 days in Sub-Himalayan West Bengal & Sikkim, and on 1 to 3 days in Arunachal Pradesh, Orissa, Bihar, east Uttar Pradesh, west Uttar Pradesh, Haryana, Punjab, east Rajasthan and east Madhya Pradesh; *at many places* on 1 to 3 days in Arunachal Pradesh, Assam & Meghalaya, Gangetic West Bengal, Orissa, Jharkhand, Bihar, Punjab, east Rajasthan, west Madhya Pradesh, east Madhya Pradesh, Konkan & Goa, Chattisgarh and Kerala; *at a few places* on 4 to 6 days in Andaman & Nicobar Islands, Arunachal Pradesh, Sub-Himalayan West Bengal & Sikkim, Orissa, east Madhya Pradesh, Vidarbha and Kerala and on 1 to 3 days in Assam & Meghalaya, Nagaland-Manipur-Mizoram-Tripura, Gangetic West Bengal, Jharkhand, Bihar, east Uttar Pradesh, west Uttar Pradesh, Haryana, west Rajasthan, west Madhya Pradesh, Gujarat Region, Madhya Maharashtra, Marathwada, Chattisgarh and Lakshadweep and *at isolated* places on 11 to 15 days in Assam & Meghalaya, Orissa, coastal Andhra Pradesh, Tamil Nadu and Kerala; on 8 to 10 days in Sub-Himalayan West Bengal & Sikkim, Gangetic West Bengal and south interior Karnataka; on 4 to 7 days in Andaman & Nicobar Islands, Arunachal Pradesh, Nagaland-

TABLE 3

Details of the weather systems during February 2003

S. No. (1)	System (2)	Duration (3)	Place of first location (4)	Direction of movement (5)	Place of final location (6)	Remarks (7)
(**A**)	*Western disturbances / eastward moving systems*					
(*i*)	*Western depression*					
1.	Depression	18	Close to Ganganagar	Eastnorth-easterly	Northwest Rajasthan and neighbourhood	It was seen as an induced cyclonic circulation over central Pakistan and adjoining west Rajasthan on 15 and 16 which became a low pressure area on 17. The depression weakened into a well marked low pressure area over northwest Rajasthan and neighbourhood on 19 and became less marked on 20. A trough from this system extended to Bihar along Lat. 25° N on 18 and upto north Bay through Haryana, Uttar Pradesh, Jharkhand and Gangetic West Bengal on 19
(*ii*)	*Upper air systems*					
1.	Mid tropospheric levels	3 – 4	North Pakistan and adjoining Jammu & Kashmir	Eastnorth-easterly	Jammu & Kashmir and neighbourhood	Moved away on 5
2.	Do	5 – 11	Do	Do	Do	Moved away on 12
3.	Do	9 – 12	North Pakistan and adjoining areas of Punjab	Do	West Uttar Pradesh and neighbourhood	Moved away on 13
4.	Do	12 – 19	North Pakistan and adjoining Jammu & Kashmir	Do	Eastern parts of Jammu & Kashmir	Moved away on 20
5.	Do	20 – 23	North Pakistan and adjoining Punjab and Jammu & Kashmir	Northeasterly	Eastern parts of Jammu & Kashmir	Moved away on 24
6.	Do	24 Feb - 2 Mar	North Pakistan and adjoining Jammu & Kashmir	Do	Jammu & Kashmir and neighbourhood	Moved away on 3 March
(*iii*)	*Induced cyclonic circulations*					
1.	Mid tropospheric levels	23 – 26	Central Pakistan and adjoining west Rajasthan	Northeasterly	Uttaranchal and neighbourhood	Moved away on 27
(**B**)	*Other cyclonic circulation*					
1.	Lower tropospheric levels	2	West Madhya Pradesh and neighbourhood	Stationary	*In-situ*	Less marked on 3
2.	Mid tropospheric levels	8 – 9	West Madhya Pradesh and neighbourhood	Do	Do	Less marked on 10
(**C**)	*Embedded cyclonic circulation*					
1.		24 – 25	Coastal Karnataka and neighbourhood	Quasi-stationary	Southern parts of Karnataka	Less marked on 26. It lay embedded in the trough from Kerala to Orissa through interior Karnataka, Rayalaseema, Telangana and Chattisgarh
(**D**)	*Troughs in easterlies*					
1.	Lower levels	3 – 13	Andaman Sea and adjoining southeast Bay	Westerly	Maldives-Comorin area	Less marked on 14

TABLE 3 (*Contd.*)

(1)	(2)	(3)	(4)	(5)	(6)	(7)
2.	Lower levels	8 – 10	South Andaman Sea and adjoining southeast Bay	Stationary	*In-situ*	Merged with trough in the lower levels over southwest Bay and adjoining Sri Lanka off Tamil Nadu coast on 11
3.	Do	12 – 19	South Andaman Sea	Westerly	Southern parts of southwest Bay	Less marked on 20
4.	Do	16 Feb - 5 Mar	South Andaman Sea	Do	Southwest Bay and adjoining Sri Lanka-Comorin area	Less marked on 6 March
5.	Do	22 – 26	South Andaman Sea and adjoining southeast Bay	Quasi-stationary	Southeast Bay	Merged with the trough in the lower levels over south Andaman Sea on 26
(**E**)	*Troughs in westerlies*					
1.	Mid tropospheric levels	5 – 6	Bihar to Orissa	Quasi-stationary	Bihar to north Orissa through Jharkhand along Long. 92° E, north of Lat. 23° N	Less marked on 7
2.	Lower tropospheric levels	13 – 14	Sub-Himalayan West Bengal & Sikkim to north Orissa	Stationary	*In-situ*	Less marked on 15
3.	Lower tropospheric levels	20 Feb-2 Mar	Sub-Himalayan West Bengal & Sikkim to Chattisgarh	Quasi-stationary	Nagaland to Jharkhand	It was seen as a cyclonic circulation in lower tropospheric levels over Assam and neighbourhood on 3 & 4 and became less marked on 5 March
(**F**)	*East-west troughs*					
1.	Lower levels	10 – 12	Jharkhand to Mizoram	Eastnorth-easterly	Assam & Meghalaya and neighbourhood	It lay as a westerly trough and extended upto 2.1 kms a.s.l. over Assam & Meghalaya and adjoining Manipur and Nagaland
2.	Do	15	Lat. 26° N, east of Long. 88° E	Stationary	*In-situ*	Less marked on 16
(**G**)	*Other troughs*					
1.	Sea level chart	3 – 5	South Maharashtra coast to northeast Madhya Pradesh	Quasi-stationary	Coastal Karnataka to northeast Madhya Pradesh through north interior Karnataka, Marathwada and Vidarbha	Less marked on 6
2.	Do	11 – 16	Kerala to Bihar through interior Karnataka, Marathwada, Vidarbha, east Madhya Pradesh and Chattisgarh	Quasi-stationary	Kerala to Orissa through interior Karnataka, Telangana and Chattisgarh	Less marked on 17
3.	Do	23 – 27	Kerala to Orissa through interior Karnataka, Rayalaseema, Telangana and Chattisgarh	Quasi-stationary	Kerala to Chattisgarh	Less marked on 28

TABLE 4

Principal amounts of rainfall in cm over different stations for the month of January and February 2003

Date	January	February
1	Pantnagar & Phoolbagh 6 each, Sankalan & Ranikhet 4 each, Hapur 3, Lucknow, Gangtok, Tadong, Darjeeling & New Delhi 2 each	Kotdwar 10, Dasband 9, Patiala 5, Chandigarh, Mukteshwar & Dehra Dun 4 each, Ambala 3, Sankalan, Sitapur, Kathua, Bareilly, Bhagalpur & Lucknow 2 each, New Delhi, Ludhiana & Shimla 1 each
2	Tuni & Thiruvananthapuram 3 each	Senkottah 18, Chalakudy 10, Cochi 6, Sagar 4, Satna & Kodaikanal 3 each, Baghdogra, Allahabad & Tondi 2 each, Patna, Car Nicobar, Varanasi, Bhagalpur, Jabalpur & Alapuzha 1 each
3	Kondul 3, Nancowry 2	Srivaikuntam 8, Kondul 3, Nancowry & Satna 2 each, Haripad, Jabalpur &, Ranchi 1 each
4	Nancowry 5, Kondul 2	Sagar 5, Kanjirapally, Ajjampura & Bhopal 3 each, Gadag & Aurangabad 2 each, Jabalpur & Satna 1 each
5	Kohima 2, Nancowry 1	Murnbad & Panposh 2 each, Raipur, Mana, Satna, Keonjhargarh & Raipur 1 each
6	Port Blair 2	Mellabazar 4, AIE NH XING 3, Daporijo 2, Khonsa & Kalimpong 1 each
7	Nil	Subramanya, Gondia & Shillong 1 each
8	Nil	Tirunelveli 11, Thiruvanathapuram 5, Dibrugarh 2, Passighat, Chadrapur & Car Nicobar 1 each
9	Nil	Daporijo, Chhindwara, Keonjhargarh & Bhagalpur 1 each
10	Thiruvananthapuram 1	Pendra & Durgapur 3 each, Gheropara & Passighat 2 each, Jaipur & Jamshedpur 1 each
11	Humchadakatle 4, Agumbe 3, Quilandy 1	Champasarai 4, Mandala 3, Gangtok & Jalpaiguri 2 each, Pendra & Swamipatna 1 each
12	Minicoy 1	Berhampore 4, Sriniketan, Jharsuguda & Allahabad 1 each
13	Nasik 2, Car Nicobar 1	Nancowry 4, Aryankavu, Khonsa & Tuticorin 3 each, Guwahati, Chengannur, Palayamkottai & Guwahati 2 each, Thiruvanathapuram, Kondul, Kanyakumari, Dibrugarh & Raigarh 1 each
14	Nil	Varanasi 6, Jamsolaghat 2, Kolkata, Roing, Kuppady, Canning Town, Digha & Kolkata 1 each
15	Nancowry 6	Gunupur 2, Vythiri & Kozhikode 1 each
16	Kondul 2	Seoni 6, Alapuzha 5, Konni 4, Ballupet 3, Kochi & Thodupuzha 2 each, Banihal, Srinagar, Bhubaneswar, Cuttack, Quazigund & Minicoy 1 each
17	Kondul 2	Banihal 8, Quazigund 5, Manali 4, Bhuntar, Mohanal & Nagpur 3 each, Srinagar 1
18	Car Nicobar 3	Quazigund 13, Pahalgaum 11, Batote 9, Tissa 8, Deesa 7, Kondaghat & Jalore 5 each, Bhuntar 4, Srinagar, Tehri & Ajmer 3 each, Piravom, Amritsar, Jodhpur & Jaisalmer 2 each, Ganganagar, Mukteshwar, Udaipur, Khajuraho & Chandrapur 1 each
19	Nil	Awantipur & Malkapur 14 each, Mukerian 13, Quazigund 12, Kangra, Bharwain & Mukteshwar 11 each, Joshimath & Batinda 10 each, Srinagar 9, Bangana, Vyava, Ludhiana & Dharmsala 8 each, Surat 7, Faridabad 6, Shimla & Baroda 5 each, Varanasi, Phoolbagh, Mana, Satna & Khajuraho 4 each
20	Nagapattinam & Karaikal 1 each	Tharali 13, Katra 6, Bhagalpur & Batote 5 each, Banihal 4, Sankalan, Gheropara, Purnea & Malda 3 each, Jammu 2, Gangtok, Varanasi, Tehri, Quazigund, Jalpaiguri, Phoolbagh, Berhampore, Gaya & Una 1 each
21	Nancowry 1	Roing, Naraj & Konni 3 each, Passighat & Nakur 2 each, Gunupur & Cuttack 1 each
22	Nancowry & Minicoy 1 each	Cannur 3, Haripad 2, Punalur 1
23	Dholla Bazar 1	Cannur 3, Haripad 2, Gangtok, Bhuntar & Batote 1 each
24	Dibrugarh 3, Chouldhowaghat & Lakhimpur 2 each	Bhang 3, Shimla & Bhuntar 2 each, Manali, Batote, Dehra Dun, Tehri, Cannur & Cochi 1 each
25	Nil	Gangtok 4, Tadong 3, Pandoh, Kozhikode & Hyderabad 1 each
26	Nil	Jalpaiguri &, Baghdogra 7 each, Mysore 5, Mandya & Minicoy 4 each, Kanpur & Kozhikode 3 each, Sevoke 2, Uthagamandalam & Guwahati 1 each
27	Pahalgam, Quazigund & Banihal 2 each, Gulmarg & Ganj Baroda 1 each	Gangtok 5, Tadong, Nalbari, Valparai & Thiruvananthapuram 4 each, Cial Cochi & Jalpaiguri 2 each, Banihal 1
28	Ludhiana, Quazigund, Shimla & Banihal 2 each, Gangtok, Darjeeling, Gulmarg, Srinagar, Ambala, Bhuntar, New Delhi & Guna 1 each	Mahedragarh & Pahalgam 5 each, Batote, Banihal & Srinagar 3 each, Bhubaneswar & Hissar 2 each, Basirahat, Rohtak & Churu 1 each
29	Chandigarh 8, Lucknow 2, Dehra Dun, Shimla, Srinagar, Gangtok & Ambala 1 each	–
30	Sankalan, Khonsa & Dholai 2 each, Gangtok & Jalpaiguri 1 each	–
31	Alwar, Ranikhet, Kangra & Etawah 3 each, Sankalan & Pilani 2 each, Mukteshwar, Dehra Dun, Ambala, New Delhi, Patiala, Shimla, Srinagar, Bharatpur, Nahan & Churu 1 each	–

Manipur-Mizoram-Tripura, Punjab, west Rajasthan, west Madhya Pradesh, Vidarbha, Chattisgarh, Telangana and north interior Karnataka and on 1 to 3 days in Jharkhand, Bihar, east Uttar Pradesh, west Uttar Pradesh, Haryana, east Rajasthan, east Madhya Pradesh, Gujarat Region, Saurashtra & Kutch, Madhya Maharashtra, Marathwada, Rayalaseema and coastal Karnataka. *Very heavy rain* occurred on 1 to 2 days in Punjab, Jammu & Kashmir and Tamil Nadu. Also *heavy rain* occurred on 1 to 2 days in Sub-Himalayan West Bengal & Sikkim, west Uttar Pradesh, Uttaranchal, Punjab, Himachal Pradesh, Jammu & Kashmir, Gujarat Region, Tamil Nadu and Kerala.

3.2.2. *Monthly rainfall*

Monthly rainfall was *excess* in 23; *normal* in 5 and *deficient* in 7 meteorological sub-divisions and *scanty* in 1 meteorological sub-division. Monthly rainfall was *excess* in Sub-Himalayan West Bengal & Sikkim, Jharkhand, Bihar, east Uttar Pradesh, west Uttar Pradesh, Uttaranchal, Haryana, Punjab, Himachal Pradesh, Jammu & Kashmir, west Rajasthan, east Rajasthan, west Madhya Pradesh, east Madhya Pradesh, Gujarat Region, Saurashtra & Kutch, Konkan & Goa, Vidarbha, Chattisgarh, coastal Andhra Pradesh, coastal Karnataka, south interior Karnataka and Kerala; *normal* in Assam & Meghalaya, Gangetic West Bengal, Orissa, Tamil Nadu and Lakshadweep; *deficient* in Andaman & Nicobar Islands, Arunachal Pradesh, Nagaland-Manipur-Mizoram-Tripura, Madhya Maharashtra, Marathwada, Telangana and north interior Karnataka and *scanty* in Rayalaseema.

Principal amounts of rainfall for the month of February are given in Table 4.

3.2.3. *Temperature*

Cold wave conditions prevailed on 1 day each in Uttaranchal and Himachal Pradesh. Night temperatures were *appreciably* to *markedly below normal* on 1 to 2 days in some parts of Nagaland-Manipur-Mizoram-Tripura, Orissa, Bihar, east Uttar Pradesh, west Uttar Pradesh, Uttaranchal, Haryana, Punjab, Himachal Pradesh, west Rajasthan, east Madhya Pradesh, Madhya Maharashtra, Vidarbha and of Tamil Nadu. Otherwise, the night temperatures were generally *appreciably* to *markedly above normal* on many days over most parts of the country.

During the month, the lowest minimum temperature of 2.0^{o} C was recorded at Bhatinda (Punjab) on 2 February and at Adampur (Punjab) on 9 February 2003.

3.2.4. *Disastrous weather events and damage*

During the month, lightning, hailstorm, squall and unseasonal heavy rainfall took a toll of 20 people in Madhya Pradesh, 6 in Gujarat and 3 in Vidarbha (Maharashtra). It also caused damage to standing crops & houses, uprooted trees and disrupted telephone & power supply lines in Assam & Meghalaya. In the middle of the month, 30 persons lost their lives due to heavy rain/ snowfall in northwest India.

Appendix

Definitions of the terms given in '*Italics*'

Rainfall

Excess	- percentage departure from normal rainfall is + 20% or more.
Normal	- percentage departure from normal rainfall is from –19 % to + 19 %.
Deficient	- percentage departure from normal rainfall is from –20 % to –59 %.
Scanty	- percentage departure from normal rainfall is from –60 % to –99 %.
At most places	- 75 % or more stations of a meteorological sub-division reporting at least 2.5 mm rainfall.
At many places	- 51% to 74 % stations of a meteorological sub-division reporting at least 2.5 mm rainfall.
At a few places	- 26 % to 50% stations of a meteorological sub-division reporting at least 2.5 mm rainfall.
At isolated places	25% or less stations of a meteorological sub-division reporting at least 2.5 mm rainfall.
Heavy rain	rainfall amount from 6.5 cm to 12.4 cm.
Very heavy rain	rainfall amount 12.5 cm or more.

Temperature

As per the revised criteria for declaring heat/ cold wave, the actual minimum temperature of a station should be reduced to 'Wind Chill Effective minimum temperature' (WCTn) based on the wind chill factor using the Table given in WMO No. 331/ Technical note No. 123. For declaring cold wave etc. WCTn only should be used and when it is $\leq$ 10° C only, cold wave should be considered (this criteria does not hold for coastal stations).

Severe cold wave conditions - departure from normal is –7° C or less for the regions where normal minimum temperature is ≥ 10° C and –6° C or less elsewhere.

Cold wave conditions - departure from normal is –5° C to –6° C where normal minimum temperature ≥ 10° C and –4° C to –5° C elsewhere.

Also cold wave is declared when WCTn is ≤ 0° C irrespective of the normal minimum temperature for those stations whose minimum temperature is above 0° C.

Cold day - when maximum temperature is ≤ 16° C in plains.

Markedly below normal - departure of minimum temperature from normal is –5° C to –6° C for the region where the normal minimum temperature is 10^{O}C or more and –3° C to –4° C elsewhere.

Appreciably below normal - departure of minimum temperature from normal is between –3° C to –4° C for the region where the normal minimum temperature is 10° C or more.

Markedly above normal - departure of minimum temperature from normal is + 5° C to + 6° C.

Appreciably above normal - departure of minimum temperature from normal is between + 3° C to +4° C.