MAUSAM, **53**, 1 (January 2002), 109-116

Weather in India

WINTER SEASON (January-February 2001)*

1. Introduction

Rainfall occurred over entire country except Gujarat State during the season. Rain/snowfall also occurred over northeast and north India during the season. Severe cold wave conditions[1] prevailed in some parts of northwest and central India on few days in January. Cold wave conditions[1] also prevailed on many days in northwest and central India during January and in the first week of February.

Gujarat State experienced a devastating earthquake on 26 January 2001.

2. Season's rainfall

The season's rainfall was excess[2] in 5 (Andaman & Nicobar Islands, Nagaland- Manipur-Mizoram-Tripura, Konkan & Goa, Madhya Maharashtra and Kerala); normal[2] in 2 (Assam & Meghalaya and Marathwada); deficient[2] in 9 (Arunachal Pradesh, Haryana, Vidarbha, Telangana, Tamil Nadu, coastal Karnataka, north interior Karnataka, south interior Karnataka and Lakshadweep) and scanty[2] in remaining 17 meteorological sub-divisions outside Gujarat Region and Saurashtra & Kutch where there was no rain.

The seasonal rainfall distribution is shown in Fig. 1. Table 1 gives monthly as well as seasonal rainfall distribution.

3. January

3.1. *Weather and associated synoptic features*

There were 3 western disturbances, 2 induced cyclonic circulations, 5 other cyclonic circulations, 3 troughs in the upper tropospheric westerlies and 8 other troughs which affected weather in the country during the month. Details of these systems are given in Table 2.

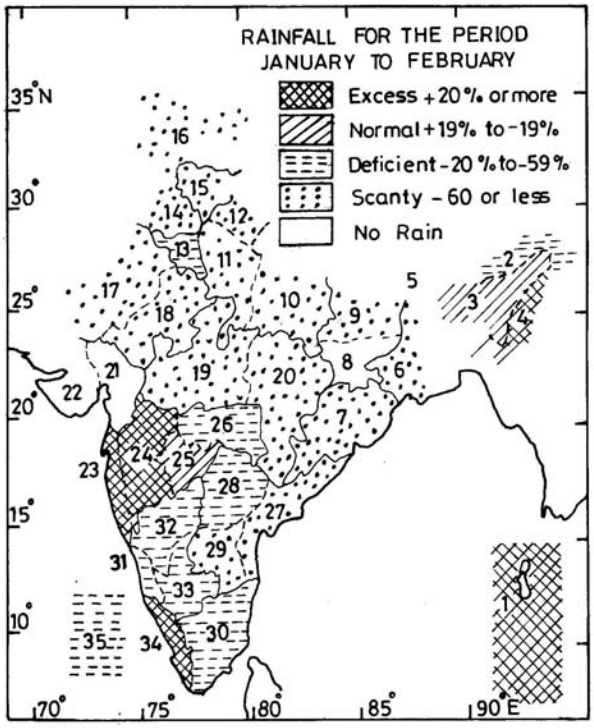

Fig. 1. Rainfall for the period of January & February 2001 as percentage departure from normal. Number on the map & bold letters in legend indicates sub-divisions

1	31	**8**	–92	**15**	–72	**22**	–100	**29**	–76
2	–30	**9**	–93	**16**	–68	**23**	235	**30**	–59
3	–18	**10**	–87	**17**	–82	**24**	35	**31**	–59
4	45	**11**	–80	**18**	–95	**25**	0	**32**	–57
5	–63	**12**	–60	**19**	–68	**26**	–32	**33**	–45
6	–93	**13**	–33	**20**	–81	**27**	–85	**34**	58
7	–89	**14**	–64	**21**	–100	**28**	–52	**35**	–27

[1]Severe cold wave – *Departure from normal minimum temperature is –5° C or less for the regions where normal minimum temperature is less than 10° C and –7° C or less elsewhere.*

[1]Cold wave – *Departure from normal minimum temperature –3° C to –4° C for the regions where normal minimum temperature is less than 10° C and –5° to –6° C elsewhere.*

[2]Excess – *Percentage departure from normal rainfall is 20% or more.*

[2]Normal – *Percentage departure from normal rainfall is between –19% to +19%.*

[2]Deficient – *Percentage departure from normal rainfall is between –20% to –59%.*

[2]Scanty – *Percentage departure from normal rainfall is between –60% to –99%*

**Compiled by* : V. Thapliyal, A. B. Mazumdar & V. Krishnan, Meteorological Office, Pune, India

TABLE 1

Sub-divisionwise rainfall (mm) for each month and season as a whole (January-February 2001)

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	129	73	78	28	47	-41	158	120	31
2.	Arunachal Pradesh	31	43	-27	53	77	-32	84	121	-30
3.	Assam & Meghalaya	5	19	-70	33	28	18	38	46	-18
4.	Naga., Mani, Mizo and Tri.	2	18	-90	62	26	138	64	44	45
5.	Sub-Himalayan West Bengal & Sikkim	4	17	-75	11	23	-54	15	41	-63
6.	Gangetic West Bengal	0	14	-99	2	23	-90	2	37	-93
7.	Orissa	2	12	-86	2	25	-90	4	37	-89
8.	Jharkhand	2	19	-90	2	24	-93	4	43	-92
9.	Bihar	2	15	-87	0	16	-99	2	31	-93
10.	East Uttar Pradesh	3	18	-85	2	16	-88	5	34	-87
11.	West Uttar Pradesh	4	22	-82	4	18	-78	8	40	-80
12.	Uttaranchal	29	67	-57	23	63	-64	52	131	-60
13.	Haryana, Chandigarh & Delhi	20	22	-7	7	19	-63	27	41	-33
14.	Punjab	17	29	-42	3	26	-88	20	55	-64
15.	Himachal Pradesh	25	80	-69	18	74	-75	43	154	-72
16.	Jammu & Kashmir	15	78	-80	44	110	-60	60	188	-68
17.	West Rajasthan	1	5	-76	1	5	-88	2	10	-82
18.	East Rajasthan	1	7	-93	0	5	-100	1	11	-96
19.	West Madhya Pradesh	6	12	-49	0	8	-97	7	20	-68
20.	East Madhya Pradesh & Chattisgarh	7	20	-64	1	21	-97	8	41	-81
21.	Gujarat Region	0	2	-100	0	1	-100	0	3	-100
22.	Saurashtra & Kutch	0	1	- 100	0	1	-100	0	2	-100
23.	Konkan & Goa	7	1	426	0	1	- 100	7	2	235
24.	Madhya Maharashtra	8	4	84	0	1	-100	8	6	35
25.	Marathwada	6	3	113	0	3	-100	6	6	0
26.	Vidarbha	16	11	43	0	13	-99	16	24	-32
27.	Coastal Andhra Pradesh	3	9	-68	0	11	-99	3	20	-85
28.	Telangana	5	4	20	0	7	-99	5	11	-52
29.	Rayalaseema	3	8	-61	0	5	-100	3	13	-76
30.	Tamil Nadu	13	34	-62	7	15	-53	20	49	-59
31.	Coastal Karnataka	1	3	-51	0	1	-74	1	4	-59
32.	North Interior Karnataka	2	2	5	0	3	-100	2	5	-57
33.	South interior Karnataka	1	3	-69	3	4	-27	4	7	-45
34.	Kerala	20	15	37	29	17	76	49	31	58
35.	Lakshadweep	5	25	-81	20	9	122	25	35	-27

Rain/snow occurred either at most places[3] or at many places[3] on 1 to 3 days in Himachal Pradesh and Jammu and Kashmir; and either at a few places[3] or at isolated places[3] on 1 to 3 days in Uttaranchal, Himachal Pradesh and Jammu & Kashmir. Very heavy rain or snow occurred on 1 day in Jammu & Kashmir and heavy rain/snowfall also occurred on 1 day in Himachal Pradesh. Rain/thundershowers also occurred either at most places or at many places on 1 to 4 days in Andaman & Nicobar Islands, Arunachal Pradesh, Assam & Meghalaya, Haryana, Punjab, Konkan & Goa, Madhya Maharashtra and Vidarbha; and either at a few places or at isolated places on 12 to 18 days in Andaman & Nicobar Islands and Tamil Nadu; on 4 to 9 days in Arunachal Pradesh, Assam & Meghalaya, Sub-Himalayan West Bengal & Sikkim, Orissa, Bihar, Rayalaseema and Kerala; and on 1 to 3 days in Gangetic West Bengal, Jharkhand, Haryana,

[3]*At most places – More than 75% of the total stations reporting rainfall/snowfall 2.5 mm or more in a sub-division*
[3]*At many places – 51% to 75% stations reporting rainfall/snowfall more than 2.5 mm*
[3]*At a few places – 26% to 50% stations reporting rainfall/snowfall more than 2.5 mm*
[3]*At isolated places – 25% or less stations reporting rainfall/snowfall more than 2.5 mm*

TABLE 2

Details of the weather systems during January 2001

S. No.	System	Duration	Place of first location	Direction of movement	Place of dissipation	Remarks
(1)	(2)	(3)	(4)	(5)	(6)	(7)
(**A**)	*Western disturbances*					
1.	As an upper air system	4 - 8	North Pakistan & neighbourhood	Northeasterly	North Pakistan and adjoining parts of Jammu & Kashmir	It was observed as an induced low pressure area from 6 to 8 Moved away northeastwards
2.	Upper air system	20 – 24	Western parts of Pakistan and neighbourhood	Do	Jammu & Kashmir and neighbourhood	Moved away northeastwards
3.	Do	27 Jan-1 Feb	North Pakistan and neighbourhood	Do	Do	Do
(**B**)	*Induced cyclonic circulations*					
1.	Mid tropospheric levels	21 – 24	Punjab & neighbourhood	Northeasterly	It moved away on 22 evening. However, an associated cyclonic circulation extended upto mid tropospheric levels on 23 and moved away on 24	
2.	Mid tropospheric levels	29 – 31	West Rajasthan & neighbourhood	Do	Moved away across Himachal Pradesh	A trough from this system in the lower levels ran to north Madhya Maharashtra on 30. The trough was seen from northwest Madhya Pradesh to south Madhya Maharashtra on 31 and less marked on 1 February
(**C**)	*Other cyclonic circulations*					
1.	Lower tropospheric levels	5 – 7	North Bangladesh & neighbourhood	Northeasterly	Assam & Meghalaya & neighbourhood	Moved away eastwards
2.	Do	6 – 9	West Rajasthan & neighbourhood	Easterly	Northwest Madhya Pradesh & neighbourhood	
3.	Mid tropospheric levels	8 – 10	Punjab & neighbourhood	Do	Haryana and adjoining parts of Uttaranchal	Moved away northeastwards
4.	Do	12 – 14	Do	Do	Himachal Pradesh & neighbourhood	Moved away eastwards. A trough in westerlies from this system to north Maharashtra coast was observed on 12. It became less-marked on 13
5.	Do	26 eve. - 27	Do	Northeasterly	Moved away northeastwards	
(**D**)	*Troughs in westerlies*					
1.	Mid and Upper tropospheric levels	3 – 4	Long. 76° E, north of Lat. 20° N.	Easterly	Long. 76° E, north of Lat. 20° N	
2.	Lower tropospheric levels	9 - 10	Northeast Madhya Pradesh & Chattisgarh to north interior Karnataka	Stationary	*In situ*	
3.	Mid and upper tropospheric levels	29 Jan-2 Feb	Long. 62° E, north of Lat. 20° N	Eastnorth-easterly	Long. 71° E, north of Lat. 25° N	
(**E**)	*Other troughs*					
1.	Mid tropospheric levels	8 – 11	South Tamil Nadu to north interior Karnataka	Northwesterly	Lakshadweep to south Maharashtra coast	

TABLE 2 (*Contd*.)

(1)	(2)	(3)	(4)	(5)	(6)	(7)
2.	Lower levels	9 – 12	Southwest Bay & neighbourhood	Stationary	*In situ*	
3.	Do	10 – 20	South Andaman Sea	Westerly	Southwest Bay off Sri Lanka coast	
4.	Lower levels	12 – 15	Southeast Rajasthan to south interior Karnataka	Northeasterly	East Madhya Pradesh & Chattisgarh to south Maharashtra	
5.	Do	15 – 22	South Kerala to southeast Rajasthan	Quasi-stationary	Lakshadweep area to Maharashtra coast	
6.	Do	19 – 30	South Andaman Sea and neighbourhood	Stationary	*In situ*	
7.	Lower tropospheric levels	21 – 27	Southwest Bay off Tamil Nadu coast	Stationary	Merged with trough over southwest Bay and neighbourhood on 27	Merged with trough over southwest Bay and neighbourhood on 27
8.	Do	27 Jan-3 Feb	Southwest Bay and neighbourhood	Westerly	Maharashtra coast to Kerala coast	

Punjab, west Rajasthan, east Rajasthan, west Madhya Pradesh, east Madhya Pradesh & Chattisgarh, Madhya Maharashtra, Vidarbha, coastal Andhra Pradesh, Telangana, coastal Karnataka, north interior Karnataka, south interior Karnataka and Lakshadweep. Very heavy rain[4] occurred on 1 day in Tamil Nadu and heavy rain[4] also occurred on 1 day in Kerala.

3.2. *Month's rainfall*

Accumulated monthly rainfall was excess in 7 (Andaman & Nicobar Islands, Konkan & Goa, Madhya Maharashtra, Marathwada, Vidarbha, Telangana and Kerala); normal in 2 (Haryana and north interior Karnataka); deficient in 5 (Arunachal Pradesh, Uttaranchal, Punjab, west Madhya Pradesh and coastal Karnataka) and scanty in 19 (Assam & Meghalaya, Nagaland – Manipur – Mizoram – Tripura, Sub-Himalayan West Bengal & Sikkim, Gangetic West Bengal, Orissa, Jharkhand, Bihar, east Uttar Pradesh, west Uttar Pradesh, Himachal Pradesh, Jammu & Kashmir, west Rajasthan, east Rajasthan, east Madhya Pradesh & Chattisgarh, coastal Andhra Pradesh, Rayalaseema, Tamil Nadu, south interior Karnataka and Lakshadweep) meteorological sub-divisions. There was no rain in the remaining 2 (Gujarat Region and Saurashtra & Kutch) meteorological sub-divisions.

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

3.3. *Temperature*

Severe cold wave conditions prevailed on 5 to 7 days in some parts of Bihar and east Uttar Pradesh and on 2 to 4 days in Jharkhand, west Uttar Pradesh, Haryana, Punjab, Jammu & Kashmir, west Rajasthan, east Rajasthan and west Madhya Pradesh. Cold wave conditions also prevailed on 10 to 15 days in some parts of Jharkhand, Bihar, east Uttar Pradesh, west Uttar Pradesh, Haryana, Punjab, Jammu & Kashmir, west Rajasthan, east Rajasthan, west Madhya Pradesh and Gujarat Region; on 4 to 9 days in some parts of Orissa, east Madhya Pradesh & Chattisgarh and Vidarbha and on 1 to 3 days in some parts of Nagaland – Manipur – Mizoram – Tripura, Sub-Himalayan West Bengal & Sikkim, Uttaranchal, Himachal Pradesh, Madhya Maharashtra, Marathwada, Telangana and Rayalaseema. Night temperatures were generally appreciably below normal[5] or below normal almost throughout the month in northern and northwestern parts of the country and over Maharashtra & Goa States and Andhra Pradesh in the last week of the month. They were generally appreciably[6] to markedly above normal[7] from 11th to 23rd January over Gujarat State, Maharashtra & Goa states and Andhra Pradesh.

[4]*Very heavy rainfall/snowfall – Rainfall/snowfall amounts reported is more than or equal to 12.5 cm*
[4]*Heavy rainfall/snowfall – Rainfall/snowfall amounts reported is more than 6.4 and less than 12.5 cm*
[5]*Appreciably below normal – Departure from normal minimum temperature is –3° C to –4 ° C for regions where normal minimum temperature is 10° C or more; Below normal: Departure from normal minimum temperature is –2° C*
[6]*Appreciably above normal – Departure from normal minimum temperature is +3° C to +4° C*
[7]*Markedly above normal – Departure from normal minimum temperature is +5° C or above*

TABLE 3

Details of the weather systems during February 2001

S. No. (1)	System (2)	Duration (3)	Place of first location (4)	Direction of movement (5)	Place of dissipation (6)	Remarks (7)
(**A**)	*Low pressure area*					
1.	Low pressure area	14 – 18	Northwest Rajasthan and adjoining Pakistan	Eastnorth-easterly	East Uttar Pradesh and adjoining Bihar	It was first observed as a cyclonic circulation over southwest Pakistan and neighbourhood on 13 It was observed as a low pressure area on 14 & 15 and again as a cyclonic circulation over Haryana and adjoining Uttar Pradesh Associated cyclonic circulation extended upto 2.1 kms. a.s.l. A trough from this system was seen to Marathwada on 14 in the lower tropospheric levels
2.	Do	25 – 27	Central Uttar Pradesh and adjoining Madhya Pradesh	Easterly	Jharkhand and adjoining Gangetic West Bengal	Associated cyclonic circulation extended upto lower levels. The cyclonic circulation was seen over Sub-Himalayan West Bengal 28 February and 1 March and subsequently became less marked thereafter
(**B**)	*Western disturbances*					
1.	Upper air system	2 – 6	North Pakistan and adjoining parts of Jammu & Kashmir	Northeasterly	Jammu & Kashmir and neighbourhood	Moved away northeastwards
2.	Do	17 – 20	Do	Do	Jammu & Kashmir	Do
3.	As a low pressure area	20 – 23	North Pakistan and neighbourhood	Do	Jammu & Kashmir and neighbourhood	Do
4.	Upper air system	22 – 27	Central Pakistan and neighbourhood	Do	Do	Do
5.	Do	26 – 28	Pakistan and adjoining Afghanistan	Do	Central Pakistan and adjoining Jammu & Kashmir	Do
(**C**)	*Induced cyclonic circulations*					
1.	Lower levels	23 – 26	Central Pakistan and adjoining west Rajasthan and Punjab	Northeasterly	Central parts of Rajasthan and neighbourhood	
2.	Do	25 – 27	Central Pakistan and neighbourhood	Do	North Rajasthan and neighbourhood	It lay as a trough from Kutch to south Tamil Nadu across Marathwada and interior Karnataka in the lower levels on 27
(**D**)	*Other cyclonic circulations*					
1.	Lower tropospheric levels	2 – 5	North Bangladesh and neighbourhood	Stationary	*In situ*	
2.	Mid tropospheric levels	5 – 7	Northwest Madhya Pradesh	Easterly	Chattisgarh and neighbourhood	A trough from this system to south Kerala was observed in the lower levels on 5 & 6 and from north interior Karnataka to Kerala on 7. The trough became less marked on 8
3.	Lower levels	7 – 7 eve	West Rajasthan and neighbourhood	Stationary	*In situ*	
4.	Lower tropospheric levels	8 – 15	Sub-Himalayan West Bengal & Sikkim and neighbourhood	Do	Do	
5.	Mid tropospheric levels	28 Feb - 1 Mar	Southern parts of west Madhya Pradesh and adjoining Vidarbha	Do	Do	A north-south trough from the system was observed in the lower levels to south Tamil Nadu on 28

TABLE 3 (*Contd*.)

(1)	(2)	(3)	(4)	(5)	(6)	(7)
6.	Lower tropospheric levels	12 – 13	Northwest Rajasthan and adjoining Pakistan	Northeast	Moved across Himachal Pradesh	
7.	Mid tropospheric levels	16 – 18	Northwest Madhya Pradesh and neighbourhood	Eastwards	East Madhya Pradesh and Chattisgarh	
(**E**)	*Troughs in easterlies*					
1.	Lower tropospheric levels	18 – 21	South Tamil Nadu to southwest Madhya Pradesh	Quasi-stationary	South Tamil Nadu to Chattisgarh across Telangana and interior Karnataka	
(**F**)	*Troughs in westerlies*					
1.	Mid and upper tropospheric levels	13 – 18	Long. 65° E, north of Lat. 20° N	Southeasterly	Long. 77° E, north of Lat. 15° N	
2.	Do	25 – 27	Long. 74° E, north of Lat. 28° N	Easterly	Long. 78° E, north of Lat. 30° N	Moved away eastwards
3.	Do	28 Feb. – 6 Mar.	Long. 70° E, north of Lat. 23° N	Do	Long. 72° E, north of Lat. 20° N	
(**G**)	*Other troughs*					
1.	Lower levels	2 – 5	Southwest Bay off Sri Lanka coast	Northwesterly	West Madhya Pradesh to south Kerala	
2.	Do	14 – 18	Do	Stationary	*In situ*	
3.	Do	19 – 21	Long. 89° E, north of Lat. 22° N	Easterly	West Bengal and neighbourhood	Moved away eastwards
4.	Do	21 – 25	Central Uttar Pradesh to south Tamil Nadu across Chattisgarh, Vidarbha and interior Karnataka	Do	Sub-Himalayan West Bengal & Sikkim to north Bay	
5.	Do	23 – 24	Chattisgarh to south Tamil Nadu across Telangana and Rayalaseema	Stationary	*In situ*	
6.	Do	27 – 28	Marathwada to Gangetic West Bengal across Vidarbha, Chattisgarh and Orissa	Do	*In situ*	

The season's lowest minimum temperature over plains of the country was minus 0.8° C recorded at Amritsar (Punjab) on 10 January, 2001 and at Adampur (Punjab) on 28 January, 2001.

3.4. *Disastrous natural events and damages*

3.4.1. *Damages due to Bhuj earthquake of 26 January 2001*

On the morning of 26 January, 2001, the nation's 52nd Republic Day, a devastating earthquake of intensity of 6.9 on Richter Scale occurred at 08 hrs and 46 min. and 42.9 sec. IST with epicentre at Lat. 23.40° N and Long. 70.28° E in the Kutch district of state of Gujarat. Bhuj town and the village Bhachau 60 km east of Bhuj were the worst affected and many other areas of Gujarat including the city of Ahmedabad, were badly affected.

The Kutch region is a seismogenic domain which has witnessed five earthquakes of magnitude 6 and above. Among these, the most devastating was the 1819 Kutch earthquake followed by Anjar earthquake of 1956.

The Bhuj earthquake was followed by a number of aftershocks of slight to moderate magnitude. Till

TABLE 4

Principal amounts of rainfall in cm over different stations for the month of January and February 2001

Date	January	February
1	Alapuzha 6, Narwana 5, Guhla, Nawashahar & Akola 4 each, Patiala, Dharampur, Una, Ratnagiri, Yeotmal & Tondi 3 each, Nancowry, Jalgaon & Nanded 2 each, New Delhi, Churu, Panjim, Pune, Aurangabad, Kodaikanal, Karwar & Bidar 1 each	Kodaikanal 4, Adirampattinam 1
2	Nedumangad 7, Dehra Dun, Chandigarh & Medak 3 each, Pehowa, New Delhi, Dharampur, Kodaikanal & Kolar Gold Fields 2 each, Bareilly, Raipur, Hyderabad & Thiruvananthapuram 1 each	Piravom 6, Kondul 5, Amini Divi & Kottayam 2 each, Palayamkottai, Kanyakumari & Kochi 1 each
3	Kondul 3, Kanjalwan 2, Car Nicobar & Zedgali 1 each	Palayamkottai 2, Kochi 1
4	Nil	Kochi 1
5	Ongole & Gannavaram 3 each, Seppa 1	Kondul & Punalur 3 each, Kochi 1
6	Nil	Pattambi & Kochi 2 each, Punalur 1
7	Port Blair & Kondul 1 each	Nil
8	Nil	Nil
9	Port Blair 4	Nil
10	Port Blair 5, Kondul & Hut Bay 1 each	Nil
11	Nil	Nil
12	Nil	Nil
13	Nil	Nil
14	Nil	Kondul, Pahalgam & Quazigund 1 each
15	Nil	Bareilly, Pantanagar, Rampur, Srinagar & Banihal 1 each
16	Car Nicobar, Nancowry, Kondul & Kozhikode 3 each	Mukteswar 1
17	Kondul, Port Blair & Car Nicobar 1 each	Tuticorin 1
18	Nil	Kondul & Thiruvananthapuram 1 each
19	Kondul 7, Pamban 3, Nancowry 1	Car Nicobar 4, North Lakhimpur 2, Dibrugarh 1
20	Nancowry 4, Firm Base & Bimbet LC 1 each	Punalur 2
21	Kondul & Car Nicobar 1 each	Punalur 3, Dhundi 2, Shimla & Kathua 1 each
22	Dhundi 8, Kothai 5, Jogindernagar 4, Dehra Dun, Bhuntar, Shimla, Pahalgam, Quazigund & Srinagar 2 each	Dibrugarh 3, Gangtok & Balasore 2 each, North Lakhimpur 1
23	Dehra Dun, Shimla, Bhuntar & Srinagar 2 each, Jammu 1	Dhundi & Pahalgam 1 each
24	Dibrugarh & Thiruvananthapuram 1 each	Darjeeling 3, Bhanjar, Manali, Srinagar & Banihal 1 each
25	Nil	Imphal & Bhiwani 2 each, Hissar, Rohtak, New Delhi, Dhundi & Suratgarh 1 each
26	Kondul 2	Shillong, Dhundi & Banihal 3 each, Batote 2, Gangtok, Tadong, Bhuntar, Shimla & Srinagar 1 each
27	Kondul & Kochi 2 each	Agartala 7, Imphal 4, Guwahati 1
28	Nil	Golaghat & Pahalgam 1 each
29	Kondul 2, Car Nicobar 1	
30	Nil	
31	Tondi & Pamban 4 each, Tuticorin 2, Kondul, Palayamkottai, Kodaikanal & Aryankavu 1 each	

28 February, 2001, 457 aftershocks of magnitude 3 and above had been recorded by IMD's national network.

In Kutch, Ahmedabad, Rajkot, Jamnagar, Surindranagar and Banaskantha districts of Gujarat state, human death toll was 18,253 and the cattle loss was of the order on 20,623. A total of about 10.8 lakh houses were damaged or destroyed in 7904 villages of 182 Talukas, thereby, affecting a population of nearly 1.58 crore, directly or indirectly.

The Bhuj earthquake is one of the great seismic events and is the most destructive of the recorded events so far in India, in terms of socio-economic losses.

3.4.2. Apart from the above damage, cold wave took a toll of 128 human lives in Bihar and 99 in Uttar Pradesh.

4. February

4.1. *Weather and associated synoptic features*

Two low pressure areas, 5 western disturbances, 2 induced cyclonic circulations, 7 other cyclonic circulations, 1 trough in easterlies, 3 trough in westerlies and 6 other troughs affected weather in India during the month of February. Details of these systems are given in Table 3.

Rain/snow occurred either at most places or at many places on 1 to 2 days in Himachal Pradesh and Jammu & Kashmir; and either at a few places or at isolated places on 5 to 7 days in Uttaranchal, Himachal Pradesh and Jammu & Kashmir. Rain/thundershowers occurred either at most places or at many places on 1 to 4 days in Arunachal Pradesh, Assam & Meghalaya, Nagaland-Manipur-Mizoram-Tripura, Sub-Himalayan West Bengal & Sikkim, Haryana, Kerala and Lakshadweep; and either at a few places or at isolated places on 8 to 12 days in Andaman & Nicobar Islands, Assam & Meghalaya, Sub-Himalayan West Bengal & Sikkim, Tamil Nadu and Kerala; on 4 to 7 days in Arunachal Pradesh, Nagaland-Manipur-Mizoram-Tripura and Punjab and on 1 to 3 days in Gangetic West Bengal, Orissa, Jharkhand, Bihar east Uttar Pradesh, west Uttar Pradesh, Haryana, west Rajasthan, west Madhya Pradesh, east Madhya Pradesh & Chattisgarh, coastal Karnataka, south interior Karnataka and Lakshadweep. Heavy rain also occurred on one day each in Assam & Meghalaya and Nagaland-Manipur-Mizoram-Tripura.

4.2. *Month's rainfall*

Rainfall during the month of February was excess in 3 (Nagaland-Manipur-Mizoram-Tripura, Kerala and Lakshadweep), normal in 1 (Assam & Meghalaya), deficient in 5 (Andaman & Nicobar Islands, Arunachal Pradesh, Sub-Himalayan West Bengal & Sikkim, Tamil Nadu and south interior Karnataka) and scanty in 18 meteorological sub-divisions outside (east Rajasthan, Gujarat Region, Saurashtra & Kutch, Konkan & Goa, Madhya Maharashtra, Marathwada, Rayalaseema and north interior Karnataka) where there was no rain.

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

4.3. *Temperature*

Severe cold wave conditions prevailed on 1 day each in some parts of east Uttar Pradesh, Haryana, Punjab, east Rajasthan, west Madhya Pradesh and east Madhya Pradesh & Chattisgarh. Cold wave conditions also prevailed on 5 to 9 days in some parts of west Uttar Pradesh, Haryana and Punjab and on 1 to 4 days in Jharkhand, Bihar, east Uttar Pradesh, Uttaranchal, Jammu & Kashmir, west Rajasthan, east Rajasthan, west Madhya Pradesh, east Madhya Pradesh & Chattisgarh, Gujarat Region, Saurashtra & Kutch, Madhya Maharashtra and Vidarbha. Night temperatures were appreciably below normal or below normal over most parts of the country during the first half of the month and appreciably above normal to markedly above normal over most parts of the country during the later half.

During the month, the lowest temperature of minus 0.8^{o} C was recorded at Amritsar (Punjab) on 1 and 2 February and at Adampur (Punjab) on 2 February, 2001.

4.4. *Disastrous weather events and damages*

According to press reports, in Orissa, tornado took a toll of 2 persons. In Assam, 1 person died due to squall which damaged several houses, uprooted many trees and affected standing crops. Thunderstorms/hailstorms injured hundreds of persons, disrupted rail line, uprooted many trees and caused damage to standing crops in West Bengal. In Himachal Pradesh and especially Capital Shimla experienced storm/snowfall in the month which damaged Kuccha houses and hoarding etc.