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Weather in India

WINTER SEASON (January-February 2010)†

1. Introduction

In contrast to the warm winter witnessed by the country during last year, the winter season of 2010 experienced many cold wave days over the north, central and peninsular India during the month of January. Even though the frequency of cold wave reports was very low all through the month of February, there was no incident of abnormally high maximum temperature report, as happened in last year.

No intense low pressure system formed during the season. Interaction between easterly waves and troughs in mid-latitude westerlies gave rise to precipitation over many parts of the country including central, north and eastern parts during both January and February. Also, western disturbances caused precipitation over north India and troughs in easterlies caused heavy rainfall over the south Peninsula.

In association with the passage of troughs in easterlies across the south peninsula, the region experienced an extended northeast monsoon season, till the rainfall ceased on 18 January.

Fog persisted over the Indo-Gangetic plains on many days during the month of January. Apart from cold wave, Fog also contributed to loss of human lives during the season. The death toll due to vehicular collisions on road as well as rail due to poor visibility in Fog had been large over the northern part of the country, emphasizing the importance of extending weather services specifically to road / rail transport as well in addition to Aviation Services.

2. Seasonal Rainfall (January-February)

The seasonal sub-division wise rainfall (actual, normal and percentage departure) are given in Table 1. The percentage departures falling under various categories *viz*., *excess*, normal, deficient, scanty* and no rain are shown in Fig. 1.

Climatologically, the western disturbances moving from west to east move to northeast India after traveling across the northern states *viz*., Jammu & Kashmir, Punjab, Haryana, Himachal Pradesh and Uttarakhand. These western disturbances, on interacting with local circulation features and topography of the region, give rise to precipitation over northwest and northeastern parts of the country during winter season. This year, along with the systems in westerlies, easterly wave activity also remained prominent all through the season. The interaction between systems in mid-latitude westerlies and tropical easterlies gave rise to precipitation over most parts of country during the second week of January and third week of February.

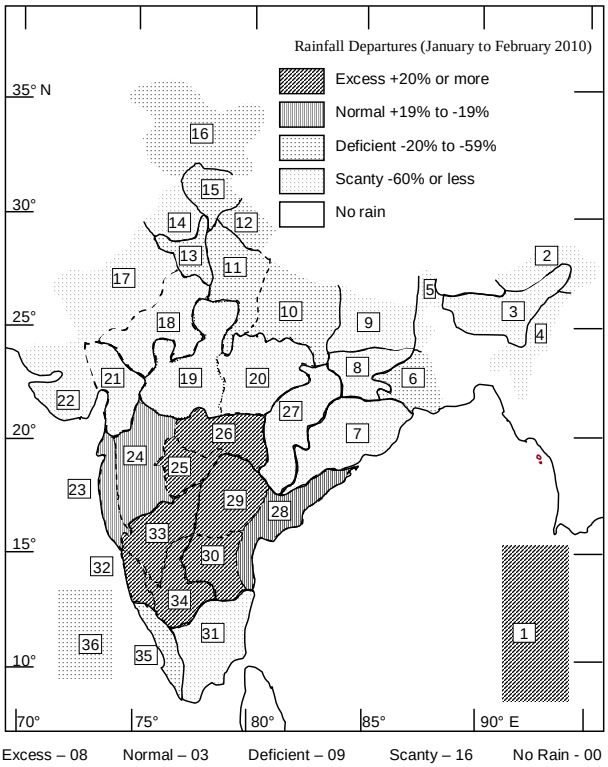

Fig. 1. Sub-divisionwise seasonal rainfall departure from normal (%) for winter season (January to February 2010). Sub-divisions are indicated by number on the map & bold letters in legend. The rainfall anomaly values for these 36 sub-divisions are indicated below :

1	22	**7**	–61	**13**	–57	**19**	–65	**25**	174	**31**	–68
2	–92	**8**	–93	**14**	–71	**20**	–76	**26**	45	**32**	500
3	–92	**9**	–92	**15**	–46	**21**	–93	**27**	–70	**33**	160
4	–71	**10**	–52	**16**	–20	**22**	–90	**28**	10	**34**	77
5	–83	**11**	–55	**17**	–71	**23**	11	**29**	81	**35**	–31
6	–49	**12**	–47	**18**	–72	**24**	–6	**30**	44	**36**	–49

* *Definition of words in italics other than the subtitles is given in Appendix.*

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TABLE 1

Sub-divisionwise rainfall (mm) for each month and season as a whole (January-February 2010)

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	98.2	56.1	75	5.8	29.0	-80	104.0	85.1	22
2.	Arunachal Pradesh	0.4	49.0	-99	10.0	88.9	-89	10.4	137.8	-92
3.	Assam & Meghalaya	0.2	18.2	-99	3.4	27.2	-87	3.6	45.4	-92
4.	Naga., Mani., Mizo. and Tri.	0.9	14.4	-94	10.9	26.6	-59	11.8	41.0	-71
5.	Sub-Himalayan West Bengal & Sikkim	1.7	19.3	-91	6.4	29.6	-78	8.2	48.9	-83
6.	Gangetic West Bengal	2.4	13.4	-82	14.1	18.9	-25	16.6	32.3	-49
7.	Orissa	9.9	12.1	-18	2.4	19.8	-88	12.4	31.9	-61
8.	Jharkhand	0.8	18.2	-96	2.1	20.3	-90	2.9	38.5	-93
9.	Bihar	0.2	16.6	-99	1.9	11.7	-84	2.1	28.3	-92
10.	East Uttar Pradesh	2.9	19.3	-85	12.9	14.0	-8	15.8	33.3	-52
11.	West Uttar Pradesh	3.0	20.1	-85	13.3	16.1	-17	16.3	36.2	-55
12.	Uttaranchal	8.7	60.0	-85	53.1	55.8	-5	61.8	115.8	-47
13.	Haryana, Chandigarh & Delhi	4.8	19.8	-76	10.5	15.9	-34	15.3	35.7	-57
14.	Punjab	2.7	27.3	-90	12.3	23.8	-49	14.9	51.1	-71
15.	Himachal Pradesh	18.2	99.9	-82	85.6	92.2	-7	103.9	192.0	-46
16.	Jammu & Kashmir	33.6	105.9	-68	154.1	128.2	20	187.7	234.1	-20
17.	West Rajasthan	1.1	3.9	-73	1.3	4.3	-69	2.4	8.2	-71
18.	East Rajasthan	1.7	6.4	-73	1.4	4.9	-71	3.2	11.3	-72
19.	West Madhya Pradesh	1.2	11.1	-89	4.7	6.0	-21	5.9	17.1	-65
20.	East Madhya Pradesh	2.4	25.8	-91	8.4	19.0	-56	10.8	44.8	-76
21.	Gujarat region	0.1	1.3	-89	0.0	0.8	-100	0.1	2.1	-93
22.	Saurashtra & Kutch	0.2	0.9	-81	0.0	0.9	-100	0.2	1.9	-90
23.	Konkan & Goa	1.1	0.8	39	0.0	0.2	-100	1.1	1.0	11
24.	Madhya Maharashtra	2.9	2.4	22	0.5	1.2	-59	3.4	3.6	-6
25.	Marathawada	11.4	3.5	226	7.0	3.2	117	18.4	6.7	174
26.	Vidarbha	16.2	11.1	46	15.3	10.7	43	31.5	21.8	45
27.	Chattisgarh	5.3	12.9	-59	2.8	14.4	-81	8.1	27.3	-70
28.	Coastal Andhra Pradesh	14.9	6.7	123	2.1	8.7	-76	17.0	15.4	10
29.	Telangana	11.2	4.4	154	7.2	5.8	25	18.5	10.2	81
30.	Rayalaseema	9.2	3.5	163	0.5	3.2	-84	9.7	6.7	44
31.	Tamil Nadu	11.4	21.0	-46	0.1	14.3	-99	11.5	35.3	-68
32.	Coastal Karnataka	11.7	1.6	647	0.0	0.4	-100	11.7	2.0	500
33.	North interior Karnataka	9.1	1.9	376	2.9	2.7	8	12.0	4.6	160
34.	South interior Karnataka	9.0	2.0	345	0.6	3.4	-82	9.6	5.4	77
35.	Kerala	18.4	11.3	63	1.0	16.8	-94	19.4	28.1	-31
36.	Lakshadweep	18.8	20.4	-8	0.0	16.5	-100	18.8	36.9	-49

** Indicates rainfall amounts 0.1 to 0.4 mm, (amounts less than 0.1 mm are rounded off to zero).

TABLE 2

Details of the weather systems during January 2010

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*)	*Upper air cyclonic circulations*					
1.	Up to mid tropospheric levels	2 – 3	North Pakistan and neighbourhood	Northeast	Jammu & Kashmir	Moved away on 4
2.	Do	4 – 14	Do	Do	Do	Moved away on 15
3.	Upto 3.6 kms a.s.l.	15 – 19	Do	Do	Do	Moved away on 20
4.	Upto 4.5 kms a.s.l.	20 – 21	Do	Do	Do	Moved away on 22
5.	Do	22 – 25	Do	Do	Do	Moved away on 26
6.	Do	26 – 27	Do	Do	Do	Moved away on 28
7.	Do	28 – 30	Do	Do	Do	Moved away on 31
8.	Do	30 Jan – 3 Feb	Do	Do	Do	Moved away on 4 February
(*ii*)	*Induced upper air cyclonic circulations*					
1.	Upto 0.9 km a.s.l.	27 – 29	South Pakistan and adjoining west Rajasthan	Northeast	West Rajasthan and neighbourhood	Less marked on 30
(*iii*)	*Troughs in westerlies*					
1.	Mid & upper tropospheric levels	10 – 12	Long. 65° E, to the north of Lat 20° N.	Northeast	Long. 70° E, to the north of Lat 20° N	Moved away on 13
2.	Do	13	Long. 62° E, to the north of Lat 20° N.	Stationary	*in situ*	Less marked on 14
(**B**)	*Other cyclonic circulations*					
1.	Upto 0.9 km a.s.l.	3 – 8	Coastal Tamil Nadu and adjoining southwest Bay of Bengal	West	Lakshadweep and neighbourhood	Less marked on 9
2.	Do	8 – 9	Do	Westsouthwest	Coastal Tamil Nadu and adjoining Sri Lanka	Less marked on 10
3.	Up to Lower tropospheric levels	10 – 16	Lakshadweep and neighbourhood.	Quasi-Stationary	*In situ*	Less marked on 16
4.	Do	22 – 25	South Tamil Nadu and neighbourhood	West	South Tamil Nadu and adjoining Sri Lanka	Less marked on 26
5.	Do	23 Jan – 9 Feb	Lakshadweep and neighbourhood	Stationary	*In situ*	Less marked on 10 February
(**C**)	*Troughs in easterlies*					
1.	Trough of low (at sea level)	4 – 8	South Andaman Sea and adjoining southeast Bay of Bengal	West	Southeast Bay of Bengal	Less marked on 9
2.	Do	10 – 24	Lakshadweep– Maldives Areas	Oscillatory	Maldive area to south Maharashtra coast	Less marked on 25
3.	Do	16 – 20	South Bay of Bengal	Stationary	*In situ*	Less marked on 21
4.	Do	23 – 26	Southeast Bay of Bengal and neighbourhood	West	Southwest Bay of Bengal and neighbourhood	Less marked on 27
5.	Do	28 – 29	Lakshadweep area to Maharashtra coast	Stationary	*In situ*	Less marked on 30
6.	Do	30 Jan – 4 Feb	South Bay of Bengal	Do	Do	Less marked on 5

TABLE 3

Rainfall distribution in terms of number of days for the month of January 2010

S. No.	Sub–Division	VHR	HR	W	Fw	Sc	Iso	Dry
1.	A & N Islands	–	1	2	1	5	7	16
2.	Arunachal Pradesh	–	–	–	–	–	–	31
3.	Assam & Meghalaya	–	–	–	–	–	2	29
4.	Naga., Mani, Mizo and Tri.	–	–	–	–	–	1	30
5.	S. H. W. B. & Sikkim	–	–	–	–	–	–	31
6.	Gangetic West Bengal	–	–	–	–	–	1	30
7.	Orissa	–	–	–	–	1	1	29
8.	Jharkhand	–	–	–	–	–	1	30
9.	Bihar	–	–	–	–	–	1	30
10.	East Uttar Pradesh	–	–	–	–	2	–	29
11.	West Uttar Pradesh	–	–	–	–	1	–	30
12.	Uttarakhand	–	–	–	1	1	1	28
13.	Haryana, Chandigarh & Delhi	–	–	–	–	1	1	29
14.	Punjab	–	–	–	1	1	4	25
15.	Himachal Pradesh	–	–	1	–	3	3	24
16.	Jammu & Kashmir	–	–	1	2	–	–	28
17.	West Rajasthan	–	–	–	1	–	–	30
18.	East Rajasthan	–	–	–	–	1	2	28
19.	West Madhya Pradesh	–	–	–	–	–	4	27
20.	East Madhya Pradesh	–	–	–	–	–	2	29
21.	Gujarat Region	–	–	–	–	–	1	30
22.	Saurashtra & Kutch	–	–	–	–	–	1	30
23.	Konkan & Goa	–	–	–	–	1	–	30
24.	Madhya Maharashtra	–	–	–	–	–	2	29
25.	Marathwada	–	–	–	–	2	–	28
26.	Vidarbha	–	–	1	1	–	–	29
27.	Chattisgarh	–	–	–	1	–	1	29
28.	Coastal Andhra Pradesh	–	1	–	–	–	10	20
29.	Telangana	–	1	–	–	2	4	25
30.	Rayalaseema	–	–	–	–	–	4	27
31.	Tamil Nadu	–	1	–	–	1	8	22
32.	Coastal Karnataka	–	–	–	–	1	4	26
33.	North Interior Karnataka	–	–	–	–	2	7	22
34.	South Interior Karnataka	–	–	–	–	1	5	25
35.	Kerala	1		–	–	–	7	24
36.	Lakshadweep	–	–	–	–	2	3	26

VHR – Very Heavy Rainfall, HR – Heavy Rain, W – Widespread, Fw – Fairly Widespread, Sc – Scattered, Iso - Isolated

TABLE 4

Dates of occurrence of cold wave/severe cold wave and various categories of minimum temperatures – January 2010

Sub-division		Dates (Number of days)						
No.	Name	Severe cold wave	Cold wave	Cold Day	Appreciably to markedly below normal	Below normal	Above normal	Appreciably to markedly above normal
2.	Arunachal Pradesh	Nil	16, 17 (2)	Nil	Nil	13, 16, 18 (3)	Nil	Nil
3.	Assam & Meghalaya	Nil	6, 23, 26 (3)	16, 17 (2)	2, 3, 5, 10-12, 18, 22, 24, 27-29 (12)	1, 9, 19-21, 23, 30 (7)	16, 21, 30 (3)	14, 18, 23, 24, 31 (5)
4.	Naga., Mani, Mizo and Tri.	Nil	Nil	Nil	9 (1)	9, 13 (2)	5, 17, 18, 27 (4)	2, 19, 20, 25, 26 (5)
5.	S. H. W. B. & Sikkim	Nil	6 (1)	13, 16 (2)	5-7, 22 (4)	1-3, 9, 12, 14, 18, 21, 24 (9)	4, 9, 10, 30 (4)	6, 16-18, 20, 23, 25, 27, 30 (9)
6.	Gangetic West Bengal	Nil	Nil	Nil	22 (1)	1-5, 9, 12, 13, 18, 20, 21, 23-25, 28 (15)	Nil	Nil
7.	Orissa	Nil	2, 3, 6, 7, 25, 26, 31 (7)	Nil	2-4, 6-8, 21-24, 26, 27, 29-31 (15)	5, 17-21, 24, 28, 31 (9)	9 (1)	10, 12, 14, 15 (4)
8.	Jharkhand	Nil	2, 3, 7, 8, 18, 21-23 (8)	17 (1)	2-4, 6-9, 17, 19-21, 24-27, 29-31 (18)	16, 18, 23, 28 (4)	Nil	14 (1)
9.	Bihar	Nil	7, 8, 13, 19, 21, 24-26 (8)	3, 6, 12, 18, 23, 25 (6)	6-9, 11, 12, 17, 21, 22, 24, 25, 27-29 (14)	3, 11, 18-20, 23 (6)	Nil	Nil
10.	East Uttar Pradesh	Nil	7, 8, 11, 13, 19, 21-23, 26, 28 (10)	1, 3, 5, 6, 10-14, 16-21, 23-25 (18)	7, 8, 19, 21, 23-28, 31 (11)	3, 9, 13, 17-19, 28, 29 (8)	5, 30 (2)	Nil
11.	West Uttar Pradesh	Nil	3, 7, 18, 23 (4)	1, 3, 5, 6, 10-14, 17-21 (14)	1, 7, 12, 21, 22 (5)	2, 8, 11, 13, 17, 19, 20, 23-26 (11)	6, 29, 30 (3)	31 (1)
12.	Uttarakhand	Nil	Nil	Nil	2 (1)	1, 14, 15, 21 (4)	1, 12, 19, 22, 28, 29 (6)	3, 5, 10, 18, 24, 31 (6)
13.	Haryana, Chandigarh & Delhi	Nil	1, 6, 14, 23 (4)	5-8, 10-14, 18-20, 22 (13)	7, 11, 13, 14, 16, 24 (6)	21, 23 (2)	4, 5, 13 (3)	2, 9, 18, 25, 26, 29, 30 (7)
14.	Punjab	23 (1)	1-3, 8, 16, 19-22, 24, 25 (11)	5, 7, 8, 10-14, 18-23 (14)	6, 7, 15, 16, 21, 26 (6)	4, 14, 21, 23, 27 (5)	30 (1)	29 (1)
15.	Himachal Pradesh	Nil	1, 2, 6 (3)	11, 13 (2)	7, 10, 13, 31 (4)	3, 11, 14, 17, 19, 21, 25 (7)	9 (1)	5, 12, 18, 22, 24, 26-29 (9)
16.	Jammu & Kashmir	Nil	12, 14, 16, 20-23, 26 (8)	6, 11, 13 (3)	1, 2, 5, 7, 10, 14, 15, 18, 19, 21 (10)	4, 8, 9, 11, 13-15, 21, 24, 25, 30 (11)	28 (1)	13, 17, 25, 29, 31 (5)
17.	West Rajasthan	Nil	10, 11 (2)	Nil	5, 8, 10, 11, 13, 14 (6)	14, 16 (2)	2, 17, 18, 21 (4)	1-4, 6-8, 20, 22-31 (18)
18.	East Rajasthan	Nil	1, 5, 10-12, 14, 19, 21, 31 (9)	Nil	5, 6, 10, 11, 14, 15 (6)	7, 9, 14-16, 18 (6)	2, 17, 21 (3)	2-4, 6, 20, 22-30 (14)
19.	West Madhya Pradesh	6 (1)	2, 7, 16, 17, 21 (5)	14 (1)	1, 6-8, 10, 11, 15, 19, 21, 24, 25, 27 (12)	1, 5, 9, 14-16, 18, 21, 22, 24, 30 (11)	4, 27 (2)	3, 12, 13, 25, 28-31 (8)
20.	East Madhya Pradesh	Nil	1, 5, 6, 11, 16, 18-20, 26-29 (12)	14 (1)	2, 6-8, 10, 11, 15, 17, 19, 21, 22, 25, 27, 28 (14)	3, 9, 15, 16, 18, 20-23, 28 (9)	Nil	12-14, 30 (4)
21.	Gujarat Region	Nil	Nil	Nil	Nil	14, 16 (2)	4, 16, 18, 21, 28 (5)	1-3, 7, 9-12, 17, 19-31 (22)

TABLE 4 (*Contd.*)

Sub-division No.	Name	Dates (Number of days) Severe cold wave	Cold wave	Cold Day	Appreciably to markedly below normal	Below normal	Above normal	Appreciably to markedly above normal
22.	Saurashtra & Kutch	Nil	Nil	Nil	5, 19 (2)	14, 16 (2)	16, 21, 28 (3)	1-3, 7, 9-12, 17, 18, 20-22, 24-30 (22)
23.	Konkan & Goa	Nil	Nil	Nil	Nil	24 (1)	1, 4, 5, 9, 10, 13, 17, 19, 21, 22, 25, 27-31 (16)	2-4, 7, 8, 11, 12, 16, 20, 23, 28 (11)
24.	Madhya Maharashtra	Nil	6, 10, 15-18, 24 (7)	Nil	1, 8, 14, 15, 17, 19, 22, 27, 28, 30, 31 (11)	3, 5, 18, 23, 25 (5)	2, 6, 15, 19, 30 (5)	1-5, 7, 9-17, 29, 31 (16)
25.	Marathwada	Nil	22-24 (3)	Nil	1, 7, 8, 20, 21, 27, 28, 30, 31 (9)	3, 14, 23, 25, 28 (5)	16, 19 (2)	4, 9-13, 16-18, 29 (10)
26.	Vidarbha	8 (1)	6, 7, 10, 16, 17, 19, 20, 22-25, 29, 30 (13)	Nil	1-3, 6, 7, 15-23, 25, 26, 28-31 (20)	9, 28, 31 (3)	Nil	4, 11-13 (4)
27.	Chattisgarh	18 (1)	1, 3, 6, 7, 17-19, 20-22, 31 (10)	Nil	2, 3, 6, 7, 9, 17, 19, 20-23, 30 (12)	2, 4, 16, 20, 23, 25, 27, 29, 30 (9)	Nil	11-14 (4)
28.	Coastal Andhra Pradesh	Nil	Nil	Nil	4, 5, 20, 31 (4)	20-23, 25 (4)	1, 8, 10, 19, 20, 27, 29 (7)	2, 9-18 (11)
29.	Telangana	Nil	7, 20-23, 26, 30 (7)	Nil	7, 8, 18, 20-24, 31 (9)	25, 27, 30 (3)	1, 10, 16 (3)	9-15, 17, 29 (9)
30.	Rayalaseema	Nil	Nil	Nil	3, 23, 24 (3)	5, 7, 21 (3)	1, 10, 27 (3)	9, 10, 12-19 (10)
31.	Tamil Nadu	Nil	Nil	Nil	5, 22, 23 (3)	5, 6, 21, 24, 30 (5)	1-3, 8, 9, 11, 12, 14, 15, 17-19, 26-29, 31 (17)	7, 10, 12-15, 19 (7)
32.	Coastal Karnataka	Nil	Nil	Nil	19 (1)	22, 24 (2)	3, 10, 12, 29, 30 (5)	1, 2, 10-16, 18, 31 (11)
33.	North Interior Karnataka	Nil	7, 20, 22, 23, 27 (5)	Nil	5, 7, 21-24, 28, 31 (8)	25, 27, 31 (3)	2, 3, 10, 12, 19 (5)	1, 10-15, 17 (8)
34.	South Interior Karnataka	Nil	Nil	Nil	4, 7, 24, 26, 28 (5)	6, 22, 23, 25, 27, 31 (6)	2, 3, 10, 12, 18 (5)	1, 9-15, 19, 20 (10)
35.	Kerala	Nil	Nil	Nil	24 (1)	16 (1)	1, 2, 5, 9, 13, 19 (6)	10 (1)

The region under the northeast Monsoon regime, *viz*., Tamil Nadu, Kerala and adjoining areas of Karnataka and Andhra Pradesh, as stated earlier, experienced an extended rainfall season up to 18 January, in the presence of active troughs in easterlies. This situation resulted in the *excess* rainfall over south peninsula by the end of the season.

3. Monthly features

3.1. *January*

3.1.1. *Weather and associated synoptic features*

As given in Table 2, there were 11 systems in westerlies (including 8 upper air cyclonic circulations, 1 induced cyclonic circulation and 2 troughs in mid and upper tropospheric levels), 5 upper air cyclonic circulations and 6 troughs in easterlies affecting the weather over the country.

The resultant sub-divisionwise spatial rainfall distribution and frequency of *heavy* and *very heavy* rainfall are given in Table 3.

3.1.2. *Monthly rainfall*

The sub-divisionwise percentage departures of monthly rainfall are given in Table 1. Principal amounts of rainfall during the month of January are given in Table 8.

TABLE 5

Details of the weather systems during February 2010

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*)	*Low pressure area*					
	At sea level	8 - 9	Central Pakistan and neighbourhood	Stationary	*In situ*	Less marked on 10. Associated cyclonic circulation extended upto mid tropospheric levels over Pakistan and neighbourhood. It moved away northeastwards across Jammu & Kashmir and neighbourhood on 14
(*ii*)	*Upper air cyclonic circulations*					
1	Up to mid tropospheric levels	1 – 2	North Pakistan and neighbourhood	Northeast	Jammu & Kashmir and neighbourhood	Moved away on 3
2.	Do	2 – 3	North Pakistan and adjoining Jammu & Kashmir	Do	Jammu & Kashmir and neighbourhood	Moved away on 4
3		4 – 9	Do	Do	Do	Moved away on 10
4	Do	13 – 15	North Pakistan and neighbourhood	Northeast	Jammu & Kashmir and neighbourhood	Moved away on 16
5	Do	15 – 18	North Pakistan and adjoining Jammu & Kashmir	Do	Do	Moved away on 19
6	Do	18 – 22	North Afgthanistan and adjoining Pakistan	Do	Do	Moved away on 23
7	Do	22 – 24	North Pakistan and adjoining Jammu & Kashmir	Do	Do	Moved away on 25
8	Do	25 – 28	Do	Do	Do	Moved away on 1 March
9	Do	27 Feb – 2 Mar	Do	Do	Do	Moved away on 3 March
(*iii*)	*Induced cyclonic circulations*					
1	Between 0.9 & 3.1 km.a.s.l.	16	South Pakistan and neighbourhood	Stationary	*In situ*	Less marked on 17
2	Up to mid tropospheric levels	22 – 23	South Pakistan and adjoining west Rajasthan	Northeast	West Rajasthan and neighbourhood	Less marked on 24
(*iv*)	*Troughs in the westerlies*					
1	Mid and upper tropospheric levels	22	Long. 62^{o} E, to the north of Lat 20^{o} N.	Stationary	*In situ*	Less marked on 23
(**B**)	*Other cyclonic circulations*					
1.	Upto 2.1 kms a.s.l.	6 – 7	Tamil Nadu and adjoining Sri Lanka	Stationary	*In situ*	Less marked on 8
2.	Upto 1.5 kms a.s.l.	11	Madhya Maharashtra and neighbourhood	Do	Do	Less marked on 12
3.	Upto 0.9 km a.s.l.	12	Lakshadweep and neighbourhood	Do	Do	Less marked on 13

TABLE 5 (*Contd*.)

(1)	(2)	(3)	(4)	(5)	(6)	(7)
4.	Upto 0.9 km a.s.l.	14 – 15	Madhya Maharashtra and neighbourhood	Northeast	Vidarbha and neighbourhood	Less marked on 16
5.	Do	20 – 23	South Madhya Maharashtra and adjoining interior Karnataka	Quasi-stationary	Interior Karnataka and neighbourhood	Less marked on 24
6.	Upto 1.5 kms a.s.l.	20 Feb – 2 Mar	Lakshadweep area and neighbourhood	Stationary	*In situ*	Less marked on 3 March
7.	Upto 3.6 kms a.s.l.	21 – 22	Assam & Meghalaya and neighbourhood	Do	Do	Less marked on 23
8.	Upto 0.9 km a.s.l.	23 – 24	West Madhya Pradesh and neighbourhood	Northeast	East Madhya Pradesh and neighbourhood	Less marked on 25
(**C**)	*Trough in the easterlies*					
1.	Trough of low (at sea level)	6 – 7	Maldives area to south Karnataka coast	Stationary	*In situ*	Less marked on 8
2.	Do	11 – 14	Commorin area and adjoining south coastal Tamil Nadu	Oscillatory	Maldives area to Karnataka coast	Less marked on 15
3.	Do	18 – 19	Commorin area and neighbourhood	Do	Maldives area to Karnataka coast	Less marked on 20
4.	Do	20 – 21	South Andaman Sea and neighbourhood	West	South Andaman Sea and adjoining southeast Bay of Bengal	Less marked on 22
(**D**)	*Other Troughs*					
1.	Trough / wind discontinuity	15 – 17	Madhya Maharashtra to Lakshadweep area	Northeast	Marathwada to southeast Arabian Sea	Less marked on 18
2.	Do	25 – 27	Assam & Meghalaya to Lakshadweep area	Oscillatory	Assam & Meghalaya to Lakashadweep area	Less marked on 28

Western disturbances caused precipitation over northwest and northern parts of the country during the first week of the month. Troughs in easterlies caused *excess* rainfall over the islands and parts of south peninsula during the subsequent period. Also an easterly – westerly interaction gave rise to precipitation over most parts of the country towards the end of the second week of January.

3.1.3. *Temperature*

The dates of occurrence of *cold waves* and dates on which the minimum temperature remained *appreciably to markedly above/below normal* as well as *above/below normal* are given in Table 4. Same date appearing in two different columns of sub-divisions may be reckoned as occurrence of that category over parts of the sub-divisions. Minimum temperatures were normal for the rest of the days.

The month's and the season's lowest minimum temperature over the plains was 1° C recorded at Amritsar (Punjab) on 18 January 2010.

3.1.4. *Disastrous weather events and damage*

Cold wave claimed 658 human lives in north India including 336 in Uttar Pradesh, 283 in Bihar, 37 in Jharkhand and 2 in Vidarbha during January. Dense fog affected the rail, air and road traffic in north India and also disrupted air and rail traffic in Delhi. Fog related mishaps

TABLE 6

Rainfall distribution in terms of number of days for the month of February 2010

S. No.	Sub-Division	VHR	HR	W	Fw	Sc	Iso	Dry
1.	A & N Islands	–	–	–	–	–	4	24
2.	Arunachal Pradesh	–	–	–	1	2	7	18
3.	Assam & Meghalaya	–	–	–	–	–	4	24
4.	Naga., Mani, Mizo and Tri.	–	–	–	–	2	2	24
5.	S. H. W. B. & Sikkim	–	–	–	–	1	2	25
6.	Gangetic West Bengal	–	–	–	1	–	3	24
7.	Orissa	–	–	–	–	–	7	21
8.	Jharkhand	–	–	–	–	–	2	26
9.	Bihar	–	–	–	–	–	1	27
10.	East Uttar Pradesh	–	–	1	1	1	1	24
11.	West Uttar Pradesh	–	–	–	2	–	2	24
12.	Uttarakhand	–	1	2	–	1	1	24
13.	Haryana, Chandigarh & Delhi	–	–	1	–	1	3	23
14.	Punjab	–	–	1	–	1	4	22
15.	Himachal Pradesh	–	1	1	–	1	9	17
16.	Jammu & Kashmir	2	–	3	3	–	7	15
17.	West Rajasthan	–	–	–	–	–	1	27
18.	East Rajasthan	–	–	–	–	–	3	25
19.	West Madhya Pradesh	–	–	1	–	–	5	22
20.	East Madhya Pradesh	–	–	–	1	1	4	22
21.	Gujarat Region	–	–	–	–	–	–	28
22.	Saurashtra & Kutch	–	–	–	–	–	–	28
23.	Konkan & Goa	–	–	–	–	–	–	28
24.	Madhya Maharashtra	–	–	–	–	–	6	22
25.	Marathwada	–	–	–	–	–	6	22
26.	Vidarbha	–	–	–	–	2	4	22
27.	Chattisgarh	–	–	–	–	1	3	24
28.	Coastal Andhra Pradesh	–	–	–	–	–	5	23
29.	Telangana	–	–	–	–	2	6	20
30.	Rayalaseema	–	–	–	–	–	–	28
31.	Tamil Nadu	–	–	–	–	–	–	28
32.	Coastal Karnataka	–	–	–	–	–	–	28
33.	North Interior Karnataka	–	–	–	–	–	7	21
34.	South Interior Karnataka	–	–	–	–	–	1	27
35.	Kerala	–	–	–	–	–	4	24
36.	Lakshadweep	–	–	–	–	–	–	28

VHR – Very Heavy Rainfall, HR – Heavy Rain, W – Widespread, Fw – Fairly Widespread, Sc – Scattered, Iso - Isolated

TABLE 7

Dates of occurrence of cold wave/severe cold wave and various categories of minimum temperatures – February 2010

Sub-division		Dates (Number of days)						
No.	Name	Severe cold wave	Cold wave	Cold Day	Appreciably to markedly below normal	Below normal	Above normal	Appreciably to markedly above normal
2.	Arunachal Pradesh	Nil	Nil	Nil	Nil	Nil	1 (1)	10 (1)
3.	Assam & Meghalaya	Nil	Nil	Nil	2, 5, 6, 8, 9, 16, 18, 19, 21, 26 (10)	1, 3, 4, 6, 7, 15, 26 (7)	10, 13, 14, 24-26 (6)	11, 13, 18, 23, 28 (5)
4.	Naga., Mani, Mizo and Tri.	Nil	Nil	Nil	2, 5 (2)	1, 3, 4, 6-8, 20 (6)	13, 16, 27 (3)	14, 17, 18, 25, 26 (5)
5.	S. H. W. B. & Sikkim	Nil	Nil	Nil	3-6, 8, 15, 18-20 (9)	1, 4, 7 (3)	1, 13, 14, 17, 20, 21 (6)	8, 10-12, 16, 22-24, 27, 28 (10)
6.	Gangetic West Bengal	Nil	Nil	Nil	9 (1)	4, 6 (2)	13, 20, 22 (3)	10-12, 15-18, 23-25, 27, 28 (12)
7.	Orissa	Nil	Nil	Nil	1, 3, 6 (3)	2, 5-9, 22 (7)	4, 15, 16, 19, 26, 28 (6)	10-12, 14-18, 20, 21-27 (16)
8.	Jharkhand	Nil	Nil	Nil	1, 5, 20-22 (5)	1, 6, 8, 18, 19 (5)	11, 13, 24, 25, 27 (5)	10, 12, 14, 16, 17, 26 (6)
9.	Bihar	Nil	Nil	Nil	21, 22 (2)	1, 2, 4, 5, 20, 22 (6)	3, 16-18, 26-28 (7)	9, 10, 12, 14, 16, 24 (6)
10.	East Uttar Pradesh	Nil	Nil	Nil	5, 16, 18-20 (5)	6, 15, 21, 22 (4)	2, 6, 13, 17, 24 (5)	8-12, 14, 23, 25, 27, 28 (10)
11.	West Uttar Pradesh	Nil	Nil	Nil	Nil	18-20 (3)	2, 8, 14, 16, 17, 22, 24, 26 (8)	9-13, 16, 23, 25, 27, 28 (10)
12.	Uttarakhand	Nil	Nil	Nil	Nil	10 (1)	12, 22, 26 (3)	8, 9, 23, 27, 28 (5)
13.	Haryana, Chandigarh & Delhi	Nil	15 (1)	Nil	2, 14, 16, 18-20 (6)	1, 3, 10, 15 (4)	6, 10, 21, 24, 25 (5)	6-9, 13, 23, 26-28 (8)
14.	Punjab	Nil	Nil	Nil	1, 15, 16, 18 (4)	2, 10, 15 (3)	21 (1)	6-9, 22-24, 26-28 (10)
15.	Himachal Pradesh	Nil	9 (1)	Nil	1-3, 14, 15, 18-20 (8)	10, 15, 25 (3)	8 (1)	6, 7, 21, 22, 26, 27 (6)
16.	Jammu & Kashmir	Nil	Nil	Nil	18, 19 (2)	5, 6, 9, 10, 14, 20, 21 (7)	8, 16, 21, 22 (5)	6, 24, 26-28 (5)
17.	West Rajasthan	Nil	20 (1)	Nil	10-12, 15, 17, 18 (6)	10, 11, 16, 18, 19 (5)	2, 4, 6, 15 (4)	1-9, 13, 20-28 (19)
18.	East Rajasthan	Nil	20 (1)	Nil	Nil	10, 11, 17-19 (5)	4, 6, 15 (3)	1-9, 12, 13, 16, 20-28 (21)
19.	West Madhya Pradesh	Nil	Nil	Nil	18-20, 27 (4)	7, 20, 21, 24-26 (6)	1, 4, 10, 22, 24, 26 (6)	1-4, 8-17, 22, 23, 27, 28 (18)
20.	East Madhya Pradesh	Nil	Nil	Nil	18, 20 (2)	5, 7, 20, 21, 26 (5)	4, 10, 15, 22, 26 (5)	3, 4, 8-14, 16, 17, 22-24, 27, 28 (16)
21.	Gujarat Region	Nil	Nil	Nil	16, 18, 19 (3)	25 (1)	1, 4, 15, 17, 18 (5)	2-14, 21-24, 26, 27 (19)
22.	Saurashtra & Kutch	Nil	Nil	Nil	10, 13, 14, 16, 18, 19 (6)	10, 12, 14 (3)	4, 17, 25 (3)	1-9, 11, 21-24, 26, 27 (16)

TABLE 7 (*Contd.*)

Sub-division		Dates (Number of days)						
No.	Name	Severe cold wave	Cold wave	Cold Day	Appreciably to markedly below normal	Below normal	Above normal	Appreciably to markedly above normal
23.	Konkan & Goa	Nil	Nil	Nil	25, 26 (2)	20, 27 (2)	1-3, 12, 16, 18, 22 (7)	6-10, 17-19 (8)
24.	Madhya Maharashtra	Nil	Nil	Nil	1, 2, 14, 18, 19, 25, 26, 28 (8)	3, 7, 20, 24, 27 (5)	1, 2, 3, 8, 15, 21 (6)	4-13, 15-23, 28 (20)
25.	Marathawada	Nil	Nil	Nil	Nil	1, 24, 25 (3)	12 (1)	3, 4, 6, 8, 10, 11, 13-23, 27, 28 (19)
26.	Vidarbha	Nil	Nil	Nil	2, 5, 8, 18, 23, 28 (6)	1, 7, 11, 19, 24 (5)	3, 9, 20, 27 (4)	4, 10, 12-17, 22 (9)
27.	Chattisgarh	Nil	Nil	Nil	1, 2, 5, 18-21 (7)	1, 6-8, 18, 22, 28 (7)	3, 21-23, 26 (5)	10, 13-17, 19, 20, 24, 26 (10)
28.	Coastal Andhra Pradesh	Nil	Nil	Nil	1, 8, 9, 11 (4)	3, 8, 10, 12-14 (6)	2, 16, 19, 20, 27 (5)	21-26 (6)
29.	Telangana	Nil	Nil	Nil	7, 28 (2)	7 (1)	2-4, 9, 10, 12 (6)	13-27 (15)
30.	Rayalaseema	Nil	Nil	Nil	4, 5 (2)	1, 3, 6, 8, 20 (5)	12, 13, 17, 24, 26, 27 (6)	21, 22 (2)
31.	Tamil Nadu	Nil	Nil	Nil	5, 9 (2)	2-7, 9, 16 (8)	12-14, 16-19, 21, 22-24, 28 (12)	7, 15, 18, 19, 24-26 (7)
32.	Coastal Karnataka	Nil	Nil	Nil	Nil	5, 7, 8, 17, 25 (5)	14, 16, 18, 19, 23, 24, 28 (7)	19-21 (3)
33.	North Interior Karnataka	Nil	Nil	Nil	1-3, 24, 27 (5)	4, 7, 9, 13, 16, 17, 25, 26 (8)	14, 18, 19, 23, 28 (5)	7, 15, 19-23 (7)
34.	South Interior Karnataka	Nil	Nil	Nil	1, 5, 9 (3)	3, 6-10, 17, 27 (8)	14, 19, 23, 25, 27, 28 (6)	13, 15, 19-24, 26 (9)
35.	Kerala	Nil	Nil	Nil	Nil	5-8 (4)	13, 16, 18, 20 (4)	19, 22 (2)

including train collisions and road accidents claimed 10 lives in Uttar Pradesh, 4 in Rajasthan, 3 in Delhi and one each in Haryana and West Bengal.

3.2. *February*

3.2.1. *Weather and associated synoptic features*

As is seen from Table 5, there were 13 western disturbances (including a low pressure area, 9 upper air cyclonic circulations, 2 induced cyclonic circulations and 1 trough in westerlies), 8 upper air cyclonic circulations, 4 troughs in the easterlies and 2 other troughs which affected the weather over the country during month of February.

The resultant sub-divisionwise spatial rainfall distribution and frequency of *heavy* and *very heavy* rainfall are given in Table 6.

3.2.2. *Monthly rainfall*

Sub-divisionwise percentage departure and principal amounts of rainfall for the month of February are given in Tables 1 and 8 respectively.

TABLE 8

Principal amounts of rainfall (in cm) over different stations for the months of January and February 2010

Date	January	February
1.	Belgaum 2	Nil
2.	Nil	Nil
3.	Barmer, Mount Abu & Deesa 1 each	Nil
4.	Nancowry 5, Quazi Gund & Banihal 2 each, Dehra Dun, Tehri, Srinagar, Jammu, Karnal, Chandigarh, Ludhiana, Patiala, Shimla, Sundernagar, Una, Car Nicobar, Nahan & Dehra Gopipur 1 each	Pachmarhi & Gondia 1 each
5.	Nancowry & Car Nicobar 2 each	Betul, Malegaon, Gondia & Jagdalpur 1 each
6.	Maya Bandar 9, Port Blair 5, Hut Bay 2, Long Island 1	Gulmarg & Pahalgam 3 each, Banihal, Kupwara, Batote & Badarwah 2 each, Srinagar & Quazigund 1 each
7.	Maya Bandar 4, Port Blair 3, Long Islands 1	Batote 6, Banihal, Pahalgam, Dhundhi & Sangla 4 each, Bhang & Gulmarg 3 each, Kupwara 2, Srinagar, Badarwah & Katra 1 each
8.	Maya Bandar, Long Island & Vedaranniyam 1 each	Gulmarg 15, Batote 9, Dhundhi 8, Solangnala 7, Bhang 6, Bhuntar & Banjar 5 each, Gohar, Jogindernagar & Banihal 4 each, Karsog, Kalpa, Rohru, Sangla, Rampur Bushar, Baijnath, Palampur, Patsio, Kukernag & Pahalgam 3 each, Kupwara, Badarwah, Shimla & Sundernagar 2 each, Katra, Quazigund, Srinagar & Udhampur 1 each
9.	Maya Bandar, Nagapattinam, Vedaranniyam & Karaikal 4 each, Long Island & Car Nicobar 1 each	Batote & Banihal 13 each, Dhundi 12, Solangnala 9, Dharamsala, Bhang, Quazigund & Badarwah 8 each, Bhuntar, Gohar, Karsog, Gulmarg & Tehri 7 each, Rampur, Bushar, Kandaghat, Baijnath & R. S. dam site 6 each, Mukteshwar, Shahpur Kandi, Sunnibhajji, Kotkhai, Kalpa, Banjar, Shimla, Rajgarh, Palampur, Kukernag& Pahalgam 5 each, Madhopur, Patsio, Sundernagar, Jogindernagar, Kasol, Kahu, Kathua, Kupwara, Anantnag & Srinagar 4 each, Sangrur, Pathankot, Amb, Kumarsain, Rohru, Theog, Keylong, Mandi, Sangla, Renuka, Bangana, Nagrota Surian, Arki, Aghar, Sujanpurtira, Guler, Solan, Kasauli, Dharampur& Avantipur 3 each, Konibal & Jammu 2 each, Katra & Udhampur 1 each
10.	Thiruvananthapuram 13, Nedumangad & Neyyattinkara 8 each, Tuticorin 7, Varkala 6, Mavelikara 3, Vythiri, Maya Bandar & Puducherry 2 each, Nancowry, Kollengode, Kodungallur, Kanyakumari & Adirampattinam 1 each	Dharamsala, Dhundhi, Bhoranj, Tehri & Roorkee 3 each, Katra, Gulmarg & Dehra Dun 2 each, Badarwah, Kukernag, Pahalgam, Batote, Banihal, Srinagar, Udhampur, Bahraich, Gorakhpur, Lucknow, Bareilly & Jhansi 1 each
11.	Irinjalakuda 6, Vellore & Taliparamba 5 each, Kanyakumari 4, Neyyattinkara, Chalakudy & Ambalavayal 3 each, Nedumangad 2, Kollam, Thiruvananthapuram, Mananthavady, Vythiri, Palayamkottai, Tuticorin, Agumbe & Chickmagalur 1 each	Kupwara 1
12.	Akot & Tiwsa 5 each, Amini Divi 3, Mangrulpir, Anjangaon, Malegaon, Darwha, Telhara, Nandura, Motala, Dabholim & Solapur 2 each, Washim, Amraoti, Buldhana, Pusad, Yeotmal, Manora, Sangrampur, Bhopal, Osmanabad & Bagalkote 1 each	Khajuraho 3, Banda, Tikamgarh & Rajgarh 2 each, Jhansi, Allahabad, Lucknow, Guna, Ujjain & Nowgong 1 each
13.	Bellary 7, Kalamb 5, Gadchiroli, Murtijapur & Umrer 4 each, Khamgaon, Mauda, Yeotmal, Akola, Kochi, Belgaum & Konni 3 each, Seoli, Wani, Bhiwapur, Deoli, Gondia, Digras, Kanjirappally, Bharatpur, Solapur, Narsapur, Thanjavur & Banda 2 each, Naraingarh, Ayanagar, Idukki, Agathi, Amini Divi, Lucknow & Sultanpur 1 each	Tuting, Kupwara, Patna, New Delhi, Varanasi AP, Allahabad, Sultanpur, Gorakhpur, Satna & Nowgaon 1 each
14.	Parvathipuram 11, Yellandu 9, Terlam 8, Bobbili 7, Coonoor 5, Chalakudy & Gopalpur 4 each, Chengannur, Konni & Nalgonda 3 each, Mancompu, Sangla & Kotkhai 2 each, Shimla, Jubble & Kalpa 1 each	Tuting 2, Gulmarg 1

TABLE 8 (*Contd*.)

Date	January	February
15.	Hut Bay 3, Nandigama, Thalasserry & Kudulu 1 each	Tuting & Udgir 1 each
16.	Raichur 2, Nancowry 1	Tuting, Gheropara, Gulmarg, Kupwara, Sriniketan, Sambalpur, Ambikapur, Wardha, Yeotmal, Umaria, Nizamabad & Udgir 1 each
17.	Bapatla 1	Harinkhola 5, Kharidwar & Kansabati Dam 3 each, Tusuma, Kolkata & Wardha 2 each, Bankura, Sriniketan, Ranchi, Yeotmal, Umaria & Mandla 1 each
18.	Nil	Bankura & Tusuma 2 each, Margherita, Tezu, Purihansa, Lakhipur, Jorhat & Krishananagar 1 each
19.	Nil	Amraghat & Tuting 2 each, Passighat, Nawarangpur & Kosagumda 1 each
20.	Minicoy 2	Koraput, Jeypore, Krishnanagar & Medak 1 each
21.	Nil	Nancowry 2
22.	Nil	Nancowry 2, Hingoli 1
23.	Nil	Dharamsala & Jogindernagar 4 each, Thoeg 3, Baijnath & Arki 2 each, Dehra Dun, Billoli, Kandhar, Shimla, Dubwali, Darwha & Ganganagar 1 each
24.	Nancowry 3	Gondpimpri 3, Mechuka, Sindewahi & Bramhapuri 2 each, Kashinagar, Etpalli, Dibrugarh, Tehri, Chandrapur & Nizamabad 1 each
25.	Car Nicobar 1	Digha 4, Nancowry 3, Barrackpur, Contai & Uthagamandalam 2 each, Puri, Passighat & Kuppady 1 each
26.	Imphal 1	Kupwara, Passighat & Kohima 1 each
27.	Nil	Kupwara 3, Pahalgam, Kuppady & Ambavalayal 2 each, Sevoke, Khanitar, Chengannur, Gulmarg, Banihal & Srinagar 1 each
28.	Hut Bay 1	Neora 2, Nagrakata, Tadong, Rangiya & Gangtok 1 each
29.	Banihal 2, Kupwara, Batote, Gulmarg, Quazigund, Katra & Srinagar 1 each	–
30.	Pahalgam 6, Dhundi 4, Anantnag, Quazigund & Banihal 3 each, Badarwah, Batote, Kukernag, Awantipur, Katra, Konibal, Solangnala, Khairi & Hut Bay 2 each, Gulmarg, Srinagar & Kupwara 1 each	–
31.	Nil	–

A western disturbance caused heavy precipitation over northwest India during the second week of the month. During the subsequent week, a zone of wind confluence gave rise to rainfall over the central and eastern parts of the country, while the northern parts received light rain/snow due to eastward moving systems. Also perturbations in the easterly and westerly wind regimes caused precipitation over the southern and northern parts of the country respectively, during the later half of the month. An interaction between the two wind regimes caused isolated rainfall over the central parts towards the end of the month.

3.2.3. *Temperature*

The frequency of *cold wave* occurrence was comparatively less. The occurrence of *cold wave* incidences was restricted to the northwestern parts of the country during the month.

The dates of occurrence of *cold waves* and dates on which the minimum temperature remained *appreciably to markedly above/below normal* as well as *above/below normal* are given in Table 7.

During the month, the lowest minimum temperature of 4° C was recorded at Karnal (Haryana) on 1 February 2010.

3.2.4. *Disastrous weather events and damage*

Avalanche claimed the lives of 17 soldiers in Gulmarg heights in north Kashmir. Kashmir valley remained cut off from the rest of the country as rain/snow blocked vehicular traffic during the first week of February. Also, lightning claimed the life of one soldier near Line of Control in Kupwara district of Kashmir. Six workers were killed and 12 others injured in a massive landslide in Kinnaur district of Shimla. Hail storm and thunder squall claimed one life each over Vidarbha and Jharkhand and damaged houses and standing crops in West Bengal, Bihar and Vidarbha.

Appendix

Definitions of the terms given in '*Italics*'

Rainfall

Excess	- percentage departure from normal is + 20 % or more.
Normal	- percentage departure from normal is –19 % to + 19 %.
Deficient	- percentage departure from normal is –20 % to –59 %.
Scanty	- percentage departure from normal is –60 % to –99 %.
W :*Widespread (At most places)*	- 76 % or more stations of a meteorological sub-division reporting at least 2.5 mm rainfall.
FW : *Fairly widespread (At many places)*	- 51% to 75 % stations of a meteorological sub-division reporting at least 2.5 mm rainfall.
Sc : *Scattered (At a few places)*	- 26 % to 50% stations of a meteorological sub-division reporting at least 2.5 mm rainfall.
Iso : *Isolated (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 rainfall	- rainfall amount 12.5 cm to 24.4 cm.

Temperatures

As per the revised criteria for declaring cold wave, the actual minimum temperature of a station is 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 is used and when it is $\leq$ 10° C only, cold wave is considered (this criteria does not hold for coastal stations).

Severe cold wave conditions	- departure of WCT_n from normal minimum temperature is −7° C or less for the regions where normal minimum temperature is $\geq$ 10° C and −6° C or less elsewhere.
Cold wave conditions	- departure of WCTn from normal minimum temperature is from –5° C to –6° C where normal minimum temperature > 10° C and from –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.
Cold day conditions	maximum day temperature is less than 16° C over the plains.
Markedly below normal	- departure of minimum temperature from normal is from –5° C to –6° C for the region where the normal minimum temperature is 10° C or more and from –3° C to –4° C elsewhere.
Appreciably below normal	- departure of minimum temperature from normal is from –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 from + 5° C to + 6° C.
Appreciably above normal	- departure of minimum temperature from normal is from + 3° C to + 4° C.
Above normal	- departure of minimum temperature from normal is + 2° C.