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Weather in India

WINTER SEASON (January-February 2012)†

1. Introduction

The winter season of 2012 started with widespread rainfall activity due to interaction of easterly-westerly troughs over most parts of north, northeast and central India which led to abatement of the *cold wave conditions** over most parts of the country. However, the *cold wave/severe cold wave* conditions reinstated and intensified from the second week of January and continued till the end of the season. The severity, period and spatial extent of *cold waves/severe cold waves* were much more as compared to the last year. Normal life in Kashmir valley affected badly due to avalanches, landslides and heavy snowfall during many days of the season. The hilly regions of Pathankot & Hoshiarpur districts of Punjab too witnessed snowfall for the first time in the recorded history.

The weather produced by the easterlies over the southern peninsula reduced considerably towards the second week of January. This led to the cessation of northeast monsoon rains over Tamil Nadu, Kerala and adjoining parts of Andhra Pradesh and Karnataka on 10 January.

The remnant of the Very Severe Cyclonic Storm (Thane), which formed in the last week of December 2011, did not produce much adverse weather and rainfall after crossing north Tamil Nadu coast and gave only isolated rainfall over the south Peninsula. No other intense low pressure system formed during the season.

Dense fog conditions prevailed over northern parts of the country during the first & fourth weeks of January.

2. Seasonal rainfall (January-February)

The seasonal sub-divisionwise rainfall (actual, normal & percentage departure) are given in Table 1. Out of the 36 met-subdivisions of India, the seasonal rainfall was excess in 8, normal in 2, deficient in 12 and scanty in 11 sub-divisions. There was no rain in 3 sub-divisions. The percentage departures falling under various categories *viz*., *excess*, *normal*, *deficient*, *scanty* and *no rain* are shown in Fig. 1.

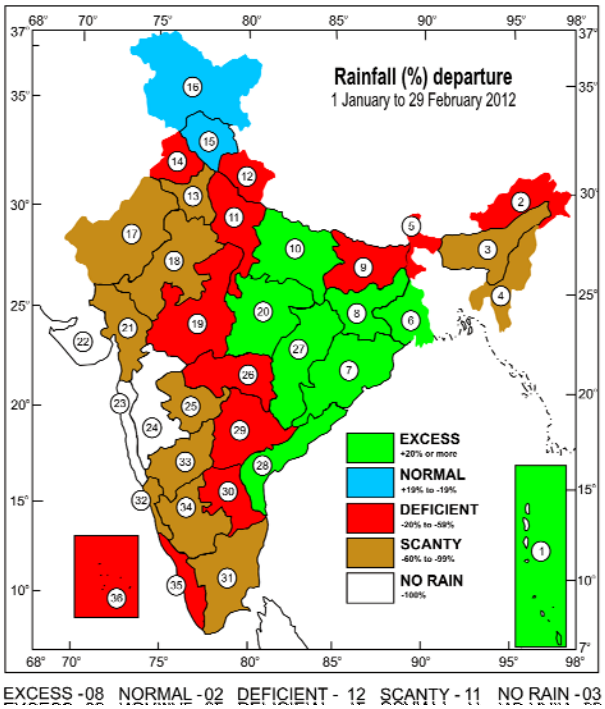

Fig. 1. Sub-divisionwise seasonal rainfall departure from normal (%) for winter season (January to February 2012). Sub-divisions are indicated by number on the map & bold letters in legend. The rainfall anomaly values for these 36 sub-divisions are indicated below :

1	105	**7**	95	**13**	-86	**19**	-48	**25**	-95	**31**	-70
2	-39	**8**	33	**14**	-22	**20**	42	**26**	-40	**32**	-91
3	-70	**9**	-22	**15**	-9	**21**	-89	**27**	124	**33**	-98
4	-80	**10**	46	**16**	11	**22**	-100	**28**	88	**34**	-89
5	-50	**11**	-36	**17**	-95	**23**	-100	**29**	-28	**35**	-30
6	57	**12**	-37	**18**	-82	**24**	-100	**30**	-49	**36**	-46

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 the regional synoptic situations and topography of the region, give rise to precipitation over northwest and northeastern parts of the country during winter season. As per the seasonal scenario, the impact of western disturbances remained confined to the extreme northern parts of Jammu & Kashmir and Himachal Pradesh only. As such, these systems gave rise

* *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 2012)

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	124.0	53.7	131	45.7	29.2	56	169.7	82.9	105
2.	Arunachal Pradesh	45.8	50.1	–9	44.2	98.0	–55	90.0	148.1	–39
3.	Assam & Meghalaya	8.3	16.4	–50	5.7	30.5	–81	14.0	46.9	–70
4.	Naga., Mani., Mizo. and Tri.	6.0	13.7	–56	3.0	30.3	–90	9.0	44.0	–80
5.	Sub-Himalayan West Bengal & Sikkim	20.5	26.6	–23	9.4	33.7	–72	29.9	60.3	–50
6.	Gangetic West Bengal	39.2	13.5	191	14.8	20.9	–29	54.1	34.4	57
7.	Orissa	55.4	10.8	413	6.5	21.0	–69	61.9	31.8	95
8.	Jharkhand	32.6	16.1	103	11.6	17.3	–33	44.3	33.4	33
9.	Bihar	15.2	13.3	14	2.8	9.7	–71	18.1	23.0	–22
10.	East Uttar Pradesh	31.1	16.8	85	11.0	12.1	–9	42.1	28.9	46
11.	West Uttar Pradesh	20.9	18.2	15	0.5	15.1	–97	21.5	33.3	–36
12.	Uttaranchal	53.4	52.1	2	13.4	54.1	–75	66.7	106.2	–37
13.	Haryana, Chandigarh & Delhi	4.6	17.8	–74	0.1	15.1	–99	4.7	32.9	–86
14.	Punjab	35.8	25.2	42	2.9	24.3	–88	38.6	49.5	–22
15.	Himachal Pradesh	112.1	97.5	15	66.4	98.0	–32	178.4	195.5	–9
16.	Jammu & Kashmir	120.2	95.7	26	116.7	117.2	0	236.9	212.9	11
17.	West Rajasthan	0.3	2.9	–89	0.0	4.5	–99	0.3	7.4	–95
18.	East Rajasthan	1.9	5.6	–66	0.0	4.9	–100	1.9	10.5	–82
19.	West Madhya Pradesh	6.7	8.5	–21	0.4	5.1	–93	7.1	13.6	–48
20.	East Madhya Pradesh	48.8	20.0	144	1.3	15.3	–91	50.1	35.3	42
21.	Gujarat region	0.1	0.8	–84	0.0	0.3	–100	0.1	1.1	–89
22.	Saurashtra & Kutch	0.0	0.4	–100	0.0	0.2	–100	0.0	0.6	–100
23.	Konkan & Goa	0.0	0.1	–100	0.0	0.2	–100	0.0	0.3	–100
24.	Madhya Maharashtra	0.0	1.1	–100	0.0	0.8	–100	0.0	1.9	–100
25.	Marathawada	0.3	3.8	–92	0.0	3.0	–99	0.3	6.8	–95
26.	Vidarbha	9.4	10.2	–8	1.0	7.0	–86	10.3	17.2	–40
27.	Chattisgarh	45.7	10.7	327	2.1	10.6	–80	47.8	21.3	124
28.	Coastal Andhra Pradesh	34.7	8.3	318	0.4	10.4	–96	35.1	18.7	88
29.	Telangana	8.1	5.8	40	0.0	5.5	–100	8.1	11.3	–28
30.	Rayalaseema	2.7	3.0	–9	0.6	3.6	–83	3.4	6.6	–49
31.	Tamil Nadu	7.1	17.5	–59	2.1	13.4	–84	9.3	30.9	–70
32.	Coastal Karnataka	0.0	0.7	–100	0.1	0.2	–61	0.1	0.9	–91
33.	North interior Karnataka	0.1	2.2	–97	0.0	1.7	–99	0.1	3.9	–98
34.	South interior Karnataka	0.2	1.4	–86	0.3	3.0	–90	0.5	4.4	–89
35.	Kerala	7.4	8.7	–15	9.1	14.7	–38	16.5	23.4	–30
36.	Lakshadweep	19.2	20.8	–8	0.1	14.7	–99	19.3	35.5	–46

Note : Amounts less than 0.1 mm are rounded off to zero.

TABLE 2

Details of the weather systems during January 2012

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*						
(a) *Upper air cyclonic circulations*						
1.	Up to 4.5 kms a.s.l.	2 – 9	Northeast Afghanistan & adjoining north Pakistan	Northeast	Jammu & Kashmir and neighbourhood	Moved away on 10
2.	Do	10 – 12	North Pakistan and neighbourhood	Eastnortheast	Do	Moved away on 13
3.	Up to 4.5 kms a.s.l.	13 – 18	Do	Northeast	Eastern parts of Jammu & Kashmir	Moved away on 19
4.	Up to Mid tropospheric level	19 – 25	Northeast Afghanistan & adjoining Pakistan	Do	Do	Moved away on 26
5.	Up to 4.5 kms a.s.l.	26 Jan – 2 Feb	North Pakistan and neighbourhood	Do	Jammu & Kashmir	Moved away on 3 February
(b) *Induced systems*						
(*i*) *As a low pressure area*						
1.	Low Pressure Area	16	Punjab & adjoining Haryana and north Rajasthan	Stationary	*In situ*	Less marked on 17. The associated cyclonic circulation extending upto 3.6 km a.s.l. lay over: Punjab & adj. Haryana on 17, Haryana & neighbourhood on 18, Haryana & adj. west Uttar Pradesh on 19 & 20 and became less marked on 21.
(*ii*) *As induce upper air cyclonic circulations*						
1.	Upto lower tropospheric level	6 – 9	Rajasthan & neighbourhood	Eastnortheast	Northwest Uttar Pradesh & adjoining Uttarakhand	Moved away on 10
2.	Upto Mid tropospheric level	22 – 24	Central Pakistan and adjoining West Rajasthan	Stationary	*In situ*	Less marked on 25
(*iii*) *Other cyclonic circulations*						
1.	Upto 3.1 km a.s.l.	4 – 11	Assam & Meghalaya an neighbourhood	Stationary	*In situ*	Less marked on 12
2.	Upto 1.5 km a.s.l.	25 – 26	Vidarbha and neighbourhood	East	Chattisgarh and neighbourhood	Less marked on 27
3.	Upto lower tropospheric levels	28 – 30	East Rajasthan and adjoining west Madhya Pradesh	Southeast	South Madhya Pradesh and neighbourhood.	Less marked on 31
4.	Upto 3.1 km a.s.l.	29 Jan – 3 Feb	Assam & Meghalaya and neighbourhood	Stationary	*In situ*	Less marked on 4 February
(**B**) *Trough in easterlies*						
1.	Trough of low (mean sea level)	12 – 19	South Andaman Sea and adjoining southeast Bay of Bengal	Northwest	Southeast Bay of Bengal and neighbourhood	Less marked on 20

TABLE 3

Details of the weather systems during February 2012

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 4.5 kms a.s.l.	3 – 8	North Pakistan and adjoining Afghanistan	Northeast	Eastern parts of Jammu & Kashmir	Moved away on 9
2.	Do	9 – 15	Northeast Afghanistan and adjoining Pakistan	Do	Do	Moved away on 16
3.	Upto Mid tropospheric levels	13 – 23	Central parts of Afghanistan	Do	Northeastern parts of Jammu & Kashmir `	Moved away on 24
4.	Do	23 – 29	Northeast Afghanistan and neighbourhood	Do	Northern parts of Jammu & Kashmir	Moved away on 1 March
(*ii*) *Induced cyclonic circulations*						
1.	Upto lower tropospheric levels	11– 13	Central Pakistan and adjoining northwest Rajasthan	Northeast	Northwest Rajasthan and adjoining Haryana	Less marked on 14
(*iii*) *Troughs in westerlies*						
1.	Mid & upper tropospheric levels	4 – 9	Long. 64° E, to the north of Lat. 27° N at 7.6 kms a.s.l.	Eastnorth - east	Long. 85° E, to the north of Lat. 28° N.	Moved away on 10
2.	Mid & upper tropospheric levels	14 – 17	Long. 65° E, to the north of Lat. 30° at 7.6 kms a.s.l.	East	Long. 80° E, to the north of Lat. 30° N	Moved away on 18
3.	Mid & upper tropospheric levels	21–24	Long. 64° E, to the north of Lat. 35° at 7.6 kms a.s.l.	Eastsouth - east	Long. 70° E, to the north of Lat. 30°	Less marked on 25
(**B**) *Troughs in easterlies*						
1.	At mean sea level	6 – 12	Southwest Bay of Bengal off south Tamil Nadu-Sri Lanka coasts	West	Lakshadweep area off Kerala coast	Less marked on 13
2.	Do	13–15	South Andaman Sea and adjoining southeast Bay of Bengal	West	Southwest and adjoining southeast Bay of Bengal	Less marked on 16
3.	Do	19–27	South Andaman Sea and adjoining Tenasserim coast	West	Comorin area adjoining southwest Bay of Bengal	Less marked on 28
4.	Do	28 Feb – 29 Feb	Equatorial Indian Ocean & adjoining southeast Bay of Bengal	Stationary	*In situ*	Less marked on 1 March
(**C**) *Other cyclonic circulations*						
1.	Upto 2.1 kms a.s.l.	3 – 4	West Rajasthan & neighbourhood	Stationary	*In situ*	Less marked on 5
2.	Upto Mid tropospheric levels	2 – 3	South Tamil Nadu and adjoining Sri Lanka	Do	Do	Less marked on 4
3.	Upto 3.6 kms a.s.l.	28 Feb – 2 Mar	Lakshadweep area & neighbourhood	Do	Do	Less marked on 3 March

to precipitation mainly over these two regions resulting in *deficient* rainfall situation over the remaining regions. Also, E'ly-W'ly interaction was confined only to the first & last weeks of January and also failed to produce any significant precipitation over a larger area. This situation led to the seasonal deficit of rainfall over many parts of the country.

TABLE 4

Some representative amounts of rainfall in cm for the months of January & February 2012

Date	January	February
1.	Avanigadda & Rupbas 8 each, Bapatla & Kayamkulam 6 each, Mancompu 5, Coonoor & Minicoy 4 each, Sagar, Bramhapuri & Raipur 3 each, Gwalior, Nainital, Agra, Aligarh, Pilibhit & Pendra 2 each, Bareilly 1	Lakhani, Desaiganj & Sakoli 3 each, Pachmarhi 2, Grand Anaicut 1
2.	Avanigadda 13, Repalle 9, Seoni & Fatehpur 7 each, Faizabad 6, Ranchi & Lucknow 5 each, Khowai, Champa & Pendra 4 each, Desaiganj & Sundargarh 3 each, Ambikapur, Dhanora, Armori & Bomdila 2 each	Port Blair 11, Nancowry 2, Hut Bay, Maya Bandar & Long Island 1 each
3.	Berhampur, Gopalpur & Tuting 3 each, Imphal, Lengpui, Aizwal, Amraghat, Cherrapunjee, Tezu & Bomdila 1 each	Hut Bay 2, Long Island 1
4.	Chandipur, Passighat, Digha, Mangan & Tuting 1 each	Poonch 3, Quazigund, Pahalgam, Kupwara, Banihal & Srinagar 2 each, Gulmarg 1
5.	Bhalukpong & Mangan 3 each, Alipingal, Nayagarh, Margherita, Manali & Nahar Katia 2 each, Passighat & Bhuntar 1 each	Poonch 6, Batote 5, Banihal, Dharamsala, Palampur, Kupwara, Saloni, Tissa & Manali 3 each, Ludhiana & Champawat 1 each
6.	Gulmarg & Poonch 2 each, Kalyani, Tuting, Chinsura, Padampur & Gund 1 each	Srinagar, Udhampur & Batote 2 each, Kalpa, Baderwah, Pahalgam, Quazigund & Banihal 1 each
7.	Banihal 15, Rengali 10, Rajhani 9, Nakodar & Mukerian 8 each, Kankadahad 7, Malakapur, Madhopur & Hemgiri 6 each, Manali 3, Champa, Tehri, Dehradun, Bulandshahar & Kanpur 1 each	Nil
8	Phulbani 6, Bilaspur & Sukinda 5 each, Korai 4, Kolkata, Una, Baderwah & Govindpura 3 each, Basirhat, Sundernagar, Dharmasala & Ambala 2 each, Champa & Chandigarh 1 each	Fatehpur 4, Lucknow, Kalpa, Seobagh, Bahraich & Uthrala 3 each, Uttarkashi 2, Manali, Dehradun, Mandi, Gohar, Basti & Faizabad 1 each
9.	Ghatagaon 18, Kaptipada 8, Uluberia & Kolkata 7 each, Chamba 4, Pamban 3, Jamshedpur, Shimla, Mandi, Sundernagar & Raipur 2 each, Tehri & Batote 1 each	Mangan & Biswan 3 each, Cooch Behar, Gangtok, Barpeta, Beky Rd Bridge, AIE NH Xing & Bahraich, 2 each, Tawang, Tuting, Joshimath, Uttar Kashi & Tuticorin1 each
10.	Telkoi 7, Kamakhyanagar 6, Rampurhat 3, D.P. Ghat, Govindpura, Purihansa & Changlang 2 each, Padrauna & Jamshedpur 1 each	Amini 6, Konni & Ambasamudram 3 each, Golaghat, Aryankavu & Manimuthar 2 each, Tuting, Passighat, Kayamkulam & Kolachel 1 each
11.	Kaveli 17, Sivagiri 13, Athgarh 11, Periakulam, Vijayawada & Vinjamur 7 each, Mundali 6, Nancowry & Tuting 2 each, Durgachack & Digha 1 each	Ambasamudram 4, Aluva & Kanjirapally 3 each, Tuting, Piravom, Thalasserry, Sivagiri & Bodinayakanur 2 each
12.	Car Nicobar 16, Nancowry 5, Atmakur 4, Kanniyakumari 3, Owk & Shriharikotta 2 each, Tehri, Uttarkashi, Manali, Shimla, Pamidi, Chennai AP, Palayamkottai, Nellore, Ongole & Patlikonda 1 each	Varkala 11, Cherthala 7, Manimuthar 5, Shenkottah 4, Alapuzha & Kottayam 3 each, Sargur, Poonch & Tenkasi 2 each, Mahendragarh, Gopalpur & Kashinagar 1 each
13.	Nancowry 5, Car Nicobar & Karaikal 2 each, Hut Bay & Munsiyari 1 each	Solang Nala & Dhundi 9 each, Bhang Manali 7, Pahalgam 5, Manali 4, Quazigund, Banihal 3, Dharmasala & Jammu 2 each, Car Nicobar, Anini & Changlang 1 each
14.	Hut Bay 7, Long Island 5, Port Blair & Poonch 3 each, Diana 1	Dhundi 13, Solang Nala 9, Bhang Manali & Quazigund 5 each, Banihal 3, Manali & Srinagar 2 each, Kalpa &, Dharmasala 1 each
15.	Car Nicobar 14, Hut Bay 8, Kupwara & Poonch 3 each, Nancowry, Konibal, Banihal, Quazigund & Gulmarg 2 each	Pahalgam 5, Saloni 4, Baderwah, Kukernag & Kalpa 2 each, D P Ghat & Kalaikunda 1 each
16.	Car Nicobar, Barkot, Purola & Katra 6 each, Banihal, Chamoli, Dunda & Uttarkashi 5 each, Udhampur, Katra, Jammu & Kupwara 4 each, Amritsar 3, Ludhiana 2, Nancowry, Mawana, Taranagar & Rohtak 1 each	Jaipur & Tikabali 5 each, Purihansa & Mohanpur 4 each, Sambalpur & Pendra 3 each, Ambikapur 2
17.	Quazigund 6, Nancowry, R.S. Dam site & Dharmasala 5 each, Pahalgam 4, Jammu, Shaper Kandy, Una & Chamba 3 each, Madhopur, Malakapur & Vinjamur 2 each, Hardee, Chibrama, Misrikh & Aonla 1 each	Dudhi & Mandira dam 3 each, Karanjia, Simula & Tusuma 2 each, Tuting 1
18.	Munsiyari, Sundernagar & Golaghat 1 each	Amini & Tuting 3 each, Gangtok, Tadong & Margherita 1 each
19.	Saloni 7, Chamba 4, Mandi 2, Sabour, Tuting, Dharmasala, Baderwah, Quazigund & Manali 1 each	Passighat 2, Roing & Pahalgam 1 each

TABLE 4 (Contd.)

Date	January	February
20	Salón & Batote 4 each, Kukernag, Govindpura & Chamba 3 each, Bankura & Tusuma 2 each, Anini & Tuting 1 each	Car Nicobar 3, Bhadrak, Chandbali & Kupwara 1 each
21	Anini 4, Tuting 3, Anantnag, Lakhipur & Balasore 2 each, Shopian, Guwahati & Kohima 1 each	Banihal 2
22	Passighat & Anini 2 each, Dibrugarh 1	Gulmarg, Konibal & Banihal 3 each, Nancowry 1
23	Kupwara & Kalpa 1 each	Banihal 4, Gulmarg & Kupwara 3 each, Quazigund 2
24	Nancowry 1	Quazigund 1
25	Car Nicobar 1	N. Lakhimpur 1
26	Pendra 3, Kukernag, Betul & Minicoy 1 each	Amini 1
27	Nancowry 3, Mangan, Deomali, Betul & Jabalpur 1 each	Amini 3, Roing & Tuting 2 each.
28	Rairakhol 3, Nayagarh 2, Visakhapatnam, Anini, Sivagiri, Seoni & Deomali 1 each	Nil
29	Laikera 5, Naktideul & Birmaharajpur 4 each, Mandla, Pachmarhi & Pendra 2 each, Mangan, Seoni, Betul & Narsingpur 1 each	Tuting 4, Belonia & Amini 2 each, Gharmura, Dholai, Udaipur, Subroom & Panisagar 1 each
30	Aska 5, G. Udayagiri & Gunupur 3 each, Asola & Machilipatnam 1 each.	-
31	Chennai & Phiringia 2 each, Champa & Ariyalur 1 each	-

3. Monthly features

3.1. *January*

3.1.1. *Weather and associated synoptic features*

As given in Table 2, 8 systems in westerlies (including 1 induced low pressure area, 5 upper air cyclonic circulations and 2 induced cyclonic circulations), 4 cyclonic circulations and 1 trough of low formed during the month.

3.1.2. *Monthly rainfall*

The sub-divisionwise percentage departures of monthly rainfall are given in Table 1. Out of the 36 met-subdivisions of India, the month's rainfall was *excess* in 11, normal in 9, *deficient* in 5 and *scanty* in 7 sub-divisions. There was no rain in 4 sub-divisions. Some representative amounts of rainfall during the month of January are given in Table 4.

Due to the interaction of troughs in westerlies and easterlies, during the first & last week of the month, the typical winter pattern of dry weather over northern parts of peninsular India and central India was rather absent during the month. Northeast India, Rajasthan, Gujarat State, Karnataka, Tamil Nadu and most parts of Maharashtra received *deficient*/*scanty* rainfall.

In general, rain/snow occurred over the northwestern states due to passage of western disturbances during the second and the third week of the month.

3.1.3. *Temperature*

Severe cold wave/cold wave/cold day conditions occurred on a few days over major parts of the country except the coastal belt. Minimum temperatures generally remained *appreciably below/below normal* over the country all through the month except a few days in first fortnight, when they were *appreciably above/above normal* over some parts of the country.

Analogous to December 2011, Kashmir valley continued to reel under extreme cold. Many places *viz*.; Leh (minus 25.0° C, on 30th), Kargil (minus 23.4° C on 30th) and Pahalgam (minus 16.5° C, on 21st) reported sub-zero temperatures. Even hilly regions of Pathankot and Hoshiarpur districts of Punjab witnessed snowfall for the first time in the recorded history.

The month's and the season's lowest minimum temperature over the plains of the country was minus 1.1° C recorded at Churu (west Rajasthan) on 21st January 2012.

3.1.4. *Disastrous weather events and damage*

Heavy snowfall and avalanche in the western Himalayan region disrupted normal life in Kashmir valley and claimed 41 lives including 5 soldiers and 2 troopers who were buried in an avalanche. Due to heavy rain & snow, the Jammu-Srinagar National Highway was closed for many days in first half of the month. *Cold wave/severe*

cold wave claimed 26 lives in Jharkhand, 15 in Andhra Pradesh, 13 in Uttar Pradesh and 5 in Bihar. Poor visibility and thick fog affected normal life and train services in north India. It also claimed 17 lives in Haryana and 6 in Odisha. Lightning/hailstorm claimed 2 lives in Madhya Pradesh.

3.2. *February*

3.2.1. *Storms and depressions*

No intense low pressure system formed over the Indian seas during the month.

3.2.2. *Other synoptic features and associated weather*

As seen from Table 3, there were 8 western disturbances (including 4 upper air cyclonic circulations, 1 induced cyclonic circulation and 3 troughs in westerlies), 3 upper air cyclonic circulations, 4 troughs in the easterlies which affected the weather over the country during month of February.

3.2.3. *Monthly rainfall*

The representative amounts of rainfall during the month of February are given in Table 4.

Out of the 36 met-subdivisions of India, the month's rainfall was excess in 1, normal in 2, *deficient* in 5 and *scanty* in 22 sub-divisions. There was no rain in 6 sub-divisions.

Due to the absence of favourable interaction between synoptic systems in westerlies and easterlies, and north-south wind discontinuity, large deficiency in rainfall occurred almost all over the country except over Andaman & Nicobar Islands and east Uttar Pradesh. In spite of frequent western disturbances, rain or snow was mainly confined only to Jammu & Kashmir, which received normal precipitation.

3.2.4. *Temperature*

February, being a transition period from winter to summer, the weather over most parts of the country is normally very comfortable. This year, due to the absence of conducive conditions for moisture incursion, *cold wave/severe cold wave* epochs continued till the end of the month over many parts of the country.

During the month, the lowest minimum temperature recorded over the plains of the country was minus 1.00 C recorded at Churu & Jawai Dam (west Rajasthan) on 09 February.

3.2.5. *Disastrous weather events and damage*

Avalanche/landslide claimed 27 lives in Jammu & Kashmir (19 in avalanche and 8 in landslides) and 2 in Himachal Pradesh. Due to snowfall and heavy rains, the 300 km long Jammu-Srinagar National Highway remained closed on many days during the month. Cold wave claimed 4 lives each in Jharkhand & Chhattisgarh and 1 each in Himachal Pradesh & Madhya Pradesh. Also, standing crops got damaged due to frost in Madhya Pradesh.

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 %.
No Rain	- Percentage departure from normal rainfall is –100 %.

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 $\geq$ 10° C and from –4 °C to –5 °C elsewhere. Also cold wave is declared when WCTn is $\leq$ 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.