



## Weather in India

### WINTER SEASON (January-February 2024)<sup>†</sup>

#### 1. Introduction

In the winter season 2024, January experienced the cold wave/severe cold wave conditions mainly over parts of East Madhya Pradesh, Rajasthan, Uttar Pradesh, Himachal Pradesh, Jharkhand, Punjab, Sub Himalayan West Bengal & Sikkim, Haryana, Chandigarh & Delhi and Uttarakhand while in February, cold wave observed for 4-5 days over Punjab and Haryana.

The Northeast monsoon rains ceased over Tamil Nadu, Puducherry, Karaikal, Kerala, Mahe, adjoining areas of coastal Andhra Pradesh, Yanam, Rayalaseema and South interior Karnataka with effect from 14<sup>th</sup> January 2024.

The core of Sub-Tropical Westerly Jet (STWJ) was seen between Latitude 24°N and 29°N throughout the season. *Very dense to dense fog* was observed over Northwest India on many days during the season.

The mean temperature for the winter season 2024 was 19.74°C with an anomaly of 0.37°C and it was 14<sup>th</sup> highest since 1901. The mean temperature over South Peninsular India (26.23°C with an anomaly of 1.10°C) was the highest and Central India (22.37°C with an anomaly of 0.92°C) was the 3<sup>rd</sup> highest after the year 2016 (22.74°C) since 1901.

Over the country, the maximum temperature was normal and minimum temperature was above normal during winter season. Over South Peninsular India, the maximum temperature was the 2<sup>nd</sup> highest (31.79°C with an anomaly of 0.62°C) after the year 2016 (31.84°C) and minimum temperature was the highest (20.66°C with an anomaly of 1.58°C) since 1901. Over Central India the minimum temperature was the highest (15.41°C with an anomaly of 1.65°C) since 1901. The country as a whole, the minimum temperature was the highest (13.50°C with an anomaly of 0.86°C) since 1901.

(\* Definitions of terms in italics (other than subtitles) are given in Appendix.)

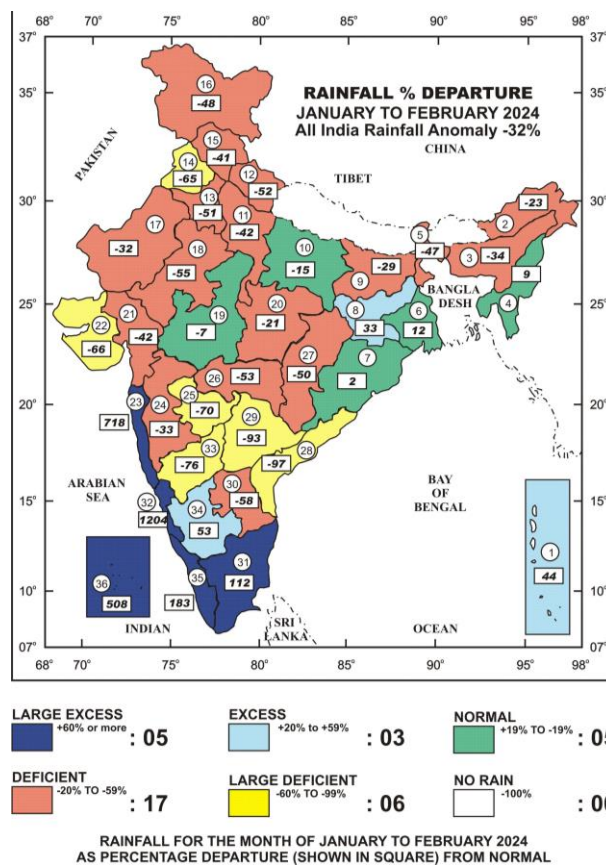


Fig. 1. Sub-divisionwise seasonal rainfall departure from normal (%) for post monsoon season (January to February, 2024)

#### 2. Seasonal Rainfall (January-February)

The seasonal rainfall over the country as a whole was below normal with precipitation of 68% of LPA. Similarly, the rainfall/snowfall over homogenous regions of Northwest India and central India was less than normal. However, East & North East India received normal and south peninsula received above normal rainfall. Considering homogeneous region wise, it was 77% of its LPA over Central India, 120% of its LPA over South peninsula, 83% of its LPA over East & North East India

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TABLE 1

Sub-division wise rainfall (mm) for each month and season as a whole (January - February 2024)

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	112.4	56.4	99%	2.7	23.7	-89%	115.1	80.1	44%
2.	Arunachal Pradesh	9.3	45.8	-80%	92.6	87.3	6%	101.9	133.1	-23%
3.	Assam & Meghalaya	1.2	13.8	-91%	26.7	28.3	-6%	27.9	42.1	-34%
4.	Naga., Mani., Mizo. and Tri.	0.9	10.4	-91%	33.8	21.5	57%	34.8	31.9	9%
5.	Sub-Himalayan West Bengal & Sikkim	5.5	15.3	-64%	17.8	28.3	-37%	23.3	43.6	-47%
6.	Gangetic West Bengal	14.6	12.7	15%	18.1	16.6	9%	32.7	29.3	12%
7.	Orissa	14.3	10.6	35%	11.2	14.5	-23%	25.5	25.1	2%
8.	Jharkhand	8.2	11.0	-25%	25.5	14.4	77%	33.8	25.4	33%
9.	Bihar	1.0	9.4	-90%	13.1	10.4	26%	14.0	19.8	-29%
10.	East Uttar Pradesh	3.5	12.1	-71%	17.8	13.1	36%	21.3	25.2	-15%
11.	West Uttar Pradesh	1.1	12.9	-91%	16.7	17.6	-5%	17.8	30.5	-42%
12.	Uttarakhand	0.1	42.2	-99%	49.2	59.5	-17%	49.3	101.7	-52%
13.	Haryana, Chandigarh & Delhi	0.0	14.6	-99%	15.6	17.4	-10%	15.6	32.0	-51%
14.	Punjab	1.2	20.3	-94%	15.4	27.1	-43%	16.6	47.4	-65%
15.	Himachal Pradesh	7.0	85.3	-92%	102.9	101.8	1%	109.9	187.1	-41%
16.	Jammu & Kashmir and Ladakh	8.7	95.1	-91%	108.4	130.4	-17%	117.1	225.5	-48%
17.	West Rajasthan	0.2	3.1	-92%	5.5	5.4	3%	5.8	8.5	-32%
18.	East Rajasthan	0.7	5.0	-86%	4.3	5.9	-28%	5.0	10.9	-55%
19.	West Madhya Pradesh	7.3	6.9	5%	5.8	7.1	-19%	13.0	14.0	-7%
20.	East Madhya Pradesh	8.6	15.8	-46%	17.7	17.6	1%	26.3	33.4	-21%
21.	Gujarat Region	0.9	1.0	-13%	0.0	0.5	-100%	0.9	1.5	-42%
22.	Saurashtra & Kutch & Diu	0.3	0.4	-35%	0.0	0.4	-98%	0.3	0.8	-66%
23.	Konkan & Goa	4.9	0.4	1126%	0.0	0.2	-100%	4.9	0.6	718%
24.	Madhya Maharashtra	1.2	1.5	-18%	0.6	1.3	-51%	1.9	2.8	-33%
25.	Marathwada	0.5	4.0	-87%	1.4	2.4	-42%	1.9	6.4	-70%
26.	Vidarbha	1.6	9.9	-84%	6.3	7.0	-10%	7.9	16.9	-53%
27.	Chhattisgarh	4.5	12.1	-63%	6.4	9.8	-34%	11.0	21.9	-50%
28.	Coastal Andhra Pradesh & Yanam	0.6	9.7	-94%	0.2	12.5	-99%	0.7	22.2	-97%
29.	Telangana	0.1	9.3	-99%	1.1	6.7	-83%	1.2	16.0	-93%
30.	Rayalaseema	3.6	4.0	-9%	0.0	4.8	-99%	3.7	8.8	-58%
31.	Tamil Nadu, Pudcherry & Karaikal	50.5	12.3	311%	2.0	12.5	-84%	52.5	24.8	112%
32.	Coastal Karnataka	39.1	1.7	2202%	0.0	1.3	-100%	39.1	3.0	1204%
33.	North Interior Karnataka	1.1	2.6	-59%	0.0	1.8	-100%	1.1	4.4	-76%
34.	South Interior Karnataka	8.7	2.1	314%	0.0	3.6	-100%	8.7	5.7	53%
35.	Kerala & Mahe	59.0	7.4	697%	0.6	13.7	-95%	59.6	21.1	183%
36.	Lakshadweep	156.8	15.8	893%	0.0	10.0	-100%	156.8	25.8	508%

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

TABLE 2

## Details of the weather systems during January 2024

S. No.	System	Duration	Place of initial Location	Direction of movement	Place of final location	Remarks
(1)	(2)	(3)	(4)	(5)	(6)	(7)
<b>(A) Western disturbances /Eastward moving systems</b>						
<i>(i) As a Upper air cyclonic circulation</i>						
1.	Between 3.1 and 4.5 km above m.s.l.	3-7	Jammu and adjoining north Pakistan	East	Southwest Uttar Pradesh at 1.5 km above m.s.l.	Became less marked on 8
2.	At 3.1 km with a trough aloft in middle tropospheric westerlies at 5.8 km above m.s.l.	29	WD over north Pakistan and neighbourhood TR aloft roughly along Long. 72°E to the north of Lat. 32°N	Stationary	<i>In situ</i>	WD became less marked on 30. Trough aloft moved away east-northeastwards on 30
<i>(ii) As a trough</i>						
1.	At 3.1 km above m.s.l.	5	Roughly along Long. 68°E to the north of Lat. 32°N	East-northeast	-	Moved away east-northeastwards on 6
2.	At 5.8 kms a.s.l.	7-10	Ran roughly along Long. 56°E to the north of Lat. 28°N	Do	Trough aloft at Roughly along Long. 75°E to the north of Lat. 28°N. and WD as a cyclonic circulation over northwest Uttar Pradesh and neighbourhood	Trough aloft moved away east northeastwards on 10. and WD moved away east northeastwards on 11
3.	Do	11-13	Ran roughly along Long. 55°E to the north of Lat. 32°N.	Do	Ran roughly along Long. 62°E to the north of Lat. 32°N	Moved away east northeastwards on 14
4.	Do	20	Ran roughly along Long. 75°E to the north of Lat. 35°N.	Do	-	Moved away east-northeastwards on 21
5.	Do	25 mor - 26	Ran roughly along Long. 57°E to the north of Lat. 34°N	Northeast	Ran roughly along Long. 70°E to the north of Lat. 32°N	Moved away east-northeastwards on 27
6.	Do	28 Jan mor - 1 Feb	Ran roughly along Long. 50°E to the north of Lat. 30°N	Do	Ran roughly along Long. 72°E to the north of Lat. 30°N on 1 <sup>st</sup> February	Moved away northeastwards on 2 <sup>nd</sup> morning
<i>(iii) As an induced cyclonic circulation</i>						
1.	At 0.9 km above m.s.l.	31 Jan - 1 Feb	Central Pakistan and adjoining Rajasthan	Northeast	Northwest Rajasthan and neighbourhood	Became less marked on 2 February
<b>(B) Other upper air cyclonic circulations</b>						
1.	At 3.1 km above m.s.l.	2	Haryana and neighbourhood	West and then east	Northeast Rajasthan and neighbourhood	Merged with the cyclonic circulation west Uttar Pradesh and neighbourhood on 6
2.	At 1.5 km above m.s.l.	2	Northeast Bihar	Stationary	<i>In situ</i>	Became less marked on 3.
3.	Upto mid-tropospheric levels	2-3	Southwest Bay of Bengal off south Sri Lanka coast	Do	Do	Became less marked on 4.

TABLE 2 (Contd.)

(1)	(2)	(3)	(4)	(5)	(6)	(7)
4.	At 3.1 km above m.s.l.	8	North Punjab and neighbourhood on 8	Southeast	-	Merged with the cyclonic circulation over Haryana and neighbourhood on 9
5.	Upto 3.1 km above m.s.l.	9	East equatorial Indian Ocean centered at Lat 2.8°N and Long 82.2°E	Southwest	East equatorial Indian Ocean centered at Lat 2.0°N and Long. 76°E	Became unimportant for the Indian region on 11
6.	At 1.5 km above m.s.l.	10	Kerala coast	Stationary	<i>In situ</i>	Became less marked on 11
7.	Between 4.5 & 5.8 km above m.s.l.	12	Comorin area and adjoining Maldives	Do	<i>In situ</i>	Became less marked on 13
8.	At 1.5 km above m.s.l.	13	Sri Lanka and neighbourhood	Do	<i>In situ</i>	Became less marked on 14
9.	Upto 1.5 km above m.s.l.	14-18	South Bangladesh and neighbourhood	Northeast	South Assam and neighbourhood	Became less marked on 19
10.	At 0.9 km above m.s.l.	15	Southwest Bay of Bengal off Sri Lanka coast	Stationary	<i>In situ</i>	Became less marked on 16
11.	Between 1.5 & 3.1 km above m.s.l.	16	Comorin area	Do	Do	Became less marked on 17
12.	At 0.9 km above m.s.l.	17	Northwest Rajasthan and neighbourhood	Do	Do	Became less marked on 18
13.	At 3.1 km above m.s.l.	17	Maldives area	Do	Do	Became less marked on 18
14.	Between 1.5 km & 3.1 km above m.s.l.	17-18	Northwest Uttar Pradesh and neighbourhood	Do	Do	Became less marked on 19 morning
15.	At 0.9 km above m.s.l.	18-19	Southeast Arabian sea and adjoining equatorial Indian Ocean	Do	Do	Became less marked on 20
16.	At 1.5 km above m.s.l.	19-22	North Madhya Maharashtra	West	Eastcentral Arabian sea off north Maharashtra coast	Became less marked on 23
17.	Between 1.5 and 3.1 km above m.s.l.	20	North Haryana and neighbourhood	Stationary	<i>In situ</i>	Became less marked on 21
18.	At 1.5 km above m.s.l.	21-22	North Bangladesh and neighbourhood	East	Northeast Bangladesh	Became less marked on 23
19.	At 0.9 km above m.s.l.	22-24	South Chhattisgarh and neighbourhood	West	East Vidarbha and neighbourhood	Became less marked on 25
20.	At 3.1 km above m.s.l.	23	South Assam and neighbourhood	Stationary	<i>In situ</i>	Became less marked on 24
21.	At 3.1 km above m.s.l.	23-25	Northwest Uttar Pradesh and neighbourhood	West	Over northeast Rajasthan and neighbourhood	Became less marked on 26
22.	At 1.5 km above m.s.l.	24	Eastcentral Arabian Sea off north Maharashtra coast	Stationary	<i>In situ</i>	Became less marked on 25
23.	At 0.9 km above m.s.l.	25	South interior Karnataka and neighbourhood	Do	Do	Became less marked on 26

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TABLE 2 (Contd.)

(1)	(2)	(3)	(4)	(5)	(6)	(7)
24.	At 0.9 km above m.s.l.	26	West Rajasthan and neighbourhood	Stationary	<i>In situ</i>	became less marked on 27
25.	Between 1.5 and 3.1 km above m.s.l.	26	North Bangladesh and neighbourhood	Do	Do	Became less marked on 27
26.	Upto 1.5 km above m.s.l.	29 <sup>th</sup> mor	Northwest Rajasthan and adjoining Punjab, Haryana	Do	Do	Became less marked on 30
27.	At 1.5 km above m.s.l.	30	South Assam and neighbourhood	Northeast	East Assam and neighbourhood	Became less marked on 3 Feb
28.	At 0.9 km above m.s.l.	30	West Bihar and neighbourhood	Stationary	<i>In situ</i>	Became less marked on 31 Jan
29.	At 0.9 km above m.s.l.	31 Jan	Bangladesh	Do	Do	Became less marked on 1 Feb
<b>(C) Other troughs</b>						
1.	At 1.5 km above m.s.l.	2	Ran from central parts of Uttar Pradesh to southwest Madhya Pradesh	Stationary	<i>In situ</i>	Became less marked on 3
2.	Southwest-northeast oriented trough Upto 1.5 km a.s.l.	3-6	From cyclonic circulation associated with the low pressure area over southeast Arabian sea to north Kerala-south Karnataka coasts	West	From the cyclonic circulation over Lakshadweep area and neighbourhood to Vidarbha across south Konkan, south Madhya Maharashtra at 0.9 km above m.s.l.	Became less marked on 7
3.	Upto 1.5 km a.s.l.	3-6	From north Konkan to the cyclonic circulation over south Haryana	Oscillatory	From south Gujarat to cyclonic circulation over west Uttar Pradesh and neighbourhood across west Madhya Pradesh	Became less marked on 7
4.	At 1.5 km above m.s.l.	7	Ran from the cyclonic circulation over west Uttar Pradesh to north Gujarat	Stationary	<i>In situ</i>	Became less marked on 8
5.	Do	7	Ran from the cyclonic circulation over southeast Arabian Sea to Gujarat coast	Do	Do	Became less marked on 8
6.	Do	5-8	Ran from south Sri Lanka to southwest and adjoining westcentral Bay of Bengal	Northwest	From south Sri Lanka to north coastal Tamil Nadu	Became less marked on 9
7.	Upto 1.5 km above m.s.l.	9	Ran from the cyclonic circulation over southeast and adjoining eastcentral Arabian sea to south Gujarat across northeast Arabian Sea	Stationary	<i>In situ</i>	Became less marked on 10

TABLE 2 (Contd.)

(1)	(2)	(3)	(4)	(5)	(6)	(7)
8.	At 0.9 km above m.s.l. TR in easterlies	16	Ran from north interior Karnataka to east Vidarbha	Oscillatory	Ran from south interior Karnataka to cyclonic circulation over south Chhattisgarh across north interior Karnataka, Telangana and Vidarbha	Became less marked on 23
9.	At 0.9 km above m.s.l.	24-25	Ran from south interior Karnataka to interior Odisha across north interior Karnataka, cyclonic circulation over Vidarbha, south Chhattisgarh	Southeast	From the cyclonic circulation over south Interior Karnataka to south Odisha coast across Telangana	Became less marked on 26
10.	Do	26	Ran from Maldives area to south interior Karnataka across Kerala	Stationary	<i>In situ</i>	Became less marked on 27
11.	Do	31 Jan	Ran from the cyclonic circulation over Bangladesh to north Odisha across Gangetic West Bengal	Do	Do	Became less marked on 1 <sup>st</sup> February

and 54% of its LPA over Northwest India. The precipitation over the country and the homogenous regions for the season was below normal except in homogenous region of East & Northeast India and South Peninsular India where it was normal. Except many subdivisions from south peninsula, Nagaland, Manipur, Mizoram & Tripura, Gangetic West Bengal, Jharkhand, Odisha, East Uttar Pradesh and West Madhya Pradesh, all the remaining sub-divisions received deficient/large deficient rainfall.

The monthly and seasonal sub-divisional rainfall (actual, normal and percentage departure) are presented in Table 1 and associated synoptic features are given in Table 2 & 3. Also, representative amount of rainfall on a day-to-day basis are presented in Table 4. The percentage departure falling under various categories, viz., large excess, excess, normal, deficient, large deficient and no rain are shown in Fig. 1. Out of the 36 meteorological sub-divisions of India, the seasonal rainfall was large excess in 5, excess in 3, normal in 5, deficient in 17 sub-divisions and large deficient in 6 sub-divisions.

### 3. Monthly features

#### 3.1. January

##### 3.1.1 Storms and Depressions

No intense low pressure system formed during the month.

##### 3.1.2. Weather and associated synoptic features

As given in Table 2, 9 western disturbances (including 2 upper air cyclonic circulation, 6 troughs and 1 induced cyclonic circulation), 29 upper air cyclonic circulations and 11 troughs which affected the weather over the country during the month of January.

Due to the absence of significant winds at surface across northern Plains of India and adjoining central part of India, the dense to very dense fog (visibility <200 m) conditions along with low cloud cover, continued to prevail across many parts of Indo-Gangetic plains and

TABLE 3

## Details of the weather systems during February 2024

S. No.	System	Duration	Place of initial Location	Direction of movement	Place of final location	Remarks
(1)	(2)	(3)	(4)	(5)	(6)	(7)
<b>(A) Western disturbances / Eastward moving systems</b>						
<i>(i) Upper air cyclonic circulation</i>						
1.	At 3.1 km above m.s.l.	18-21	North Pakistan and neighbourhood	East-northeast	Ran roughly along Long. 77°E to the north of Lat. 30°N	It moved away east northeastwards on 22
<i>(ii) As a trough in westerlies</i>						
1.	At 5.8 km above m.s.l.	3 <sup>rd</sup> mor	Ran roughly along Long. 58°E to the north Lat. 30°N	East	Ran roughly along Long. 72°E to the north Lat. 32°N	It lay as a cyclonic circulation over north Pakistan and adjoining Jammu division and Punjab at 3.1 km above m.s.l. with trough aloft and became less marked on 7. However, the trough became less marked on 5 <sup>th</sup> night
2.	At 5.8 km above m.s.l.	7	Ran roughly along Long. 70°E to the north of Lat. 30°N	Northeast	Ran roughly along Long. 72°E to the north of Lat. 30°N	Moved away northeastwards on 8 <sup>th</sup> morning
3.	At 5.8 kms a.s.l.	7-10	Ran roughly along Long. 56°E to the north of Lat. 28°N	East-northeast	Trough aloft at Roughly along Long. 75°E to the north of Lat. 28°N and WD as a cyclonic circulation over northwest Uttar Pradesh and neighbourhood	Trough aloft moved away east northeastwards on 10. and WD moved away east northeastwards on 11
4.	At 5.8 km above m.s.l.	12 <sup>th</sup> mor -15	Ran roughly along long. 55°E to the north of Lat. 25°N	East-northeast	Ran roughly along Long. 83°E to the north of Lat. 24°N	It lay as a northeast-southwest trough on 14 <sup>th</sup> and 15 <sup>th</sup> . Moved away east-northeastwards on 16
5.	Do	18 <sup>th</sup> mor - 19	Ran roughly along Long. 51°E to the north of Lat. 30°N	Do	Ran roughly along Long. 65°E to the north of Lat. 30°N	It moved away east-northeastwards on 20 <sup>th</sup>
6.	Do	22	Ran roughly along Long. 70°E to the north of Lat. 32°N on 22 <sup>nd</sup>	Do	-	Moved away east-northeastwards on 23 <sup>rd</sup>
7.	Do	23-25	Ran roughly along Long. 65°E to the north of Lat. 32°N	East	Ran roughly along Long. 83°E to the north of Lat. 25°N on 25 <sup>th</sup>	Became less marked on 26
8.	Do	25 <sup>th</sup> night	Ran roughly along Long. 50°E to the north of Lat. 30°N	Do	Ran roughly along Long. 57°E to the north of Lat. 30°N	It merged with the WD as a northeast-southwest TR in mid and upper tropospheric westerlies on 28 <sup>th</sup> morning and then lay as a cyclonic circulation over northwest Iran and neighbourhood which extended upto 9.6 km above m.s.l. on 28
9.	Do	Mor on 28 <sup>th</sup>	As a northeast-southwest trough which ran between Long. 45°E/Lat. 28°N and Long. 68°E/Lat. 40°N	East-northeast	Ran roughly along Long. 74°E and Lat. 30°N	It lay as a cyclonic circulation over northwest Iran and neighbourhood which extended upto 9.6 km above m.s.l. on 28 <sup>th</sup> over northeast Iran and neighbourhood between 3.1 km and 9.6 km above m. s. l. on 29 <sup>th</sup> February, over northwest Afghanistan and neighbourhood between 3.1 and 12.6 km above m.s.l. on 1 <sup>st</sup> March It lay over central Afghanistan and neighbourhood between on 2 Mar, lay over east Afghanistan and neighbourhood from 2 eve to 3 Mar. It lay as a TR on 4 Mar. which moved away east-northeastwards on 5 March

TABLE 3 (Contd.)

(1)	(2)	(3)	(4)	(5)	(6)	(7)
<i>(iii) As an induced cyclonic circulation</i>						
1.	At 0.9 km above m.s.l.	3-4	Southwest Rajasthan and adjoining Pakistan	North	Northwest Rajasthan and adjoining Pakistan	Became less marked on 5
2.	Between 1.5 and 3.1 km above m.s.l.	13-14	South Haryana and neighbourhood	East	Northwest Uttar Pradesh and neighbourhood	Became less marked on 15 <sup>th</sup> morning
3.	Upto 1.5 km above m.s.l.	18 <sup>th</sup> mor - 21	Central Pakistan	Do	Northwest Uttar Pradesh and neighbourhood	Became less marked on 22 <sup>nd</sup> morning
<i>(B) Other upper air cyclonic circulations</i>						
1.	Upto 1.5 km above m.s.l.	4-5	East Bangladesh and neighbourhood	North	East Assam and neighbourhood	Became less marked on 6
2.	At 0.9 km above m.s.l.	6-7	Southeast Madhya Pradesh and neighbourhood	South	East Vidarbha and neighbourhood	Became less marked on 8
3.	At 0.9 km above m.s.l.	6	Over sub-Himalayan West Bengal and neighbourhood	Stationary	<i>In situ</i>	Became less marked on 7
4.	Between 1.5 & 3.1 km above m.s.l.	9	Northwest Uttar Pradesh and neighbourhood	Do	Do	Became less marked on 10
5.	At 1.5 km above m.s.l.	10-12	South Gujarat region and neighbourhood	Do	Do	Became less marked on 13
6.	At 3.1 km above m.s.l.	11	South Assam	Do	Do	Became less marked on 12
7.	At 0.9 km above m.s.l.	12-14	Marathwada and neighbourhood	West	Central parts of Madhya Maharashtra and neighbourhood	Became less marked on 15
8.	Do	12	Punjab and neighbourhood	Stationary	<i>In situ</i>	Became less marked on 13
9.	At 1.5 km above m.s.l.	12	West Vidarbha and neighbourhood	Do	Do	Became less marked on 13
10.	At 0.9 km above m.s.l.	15	Central parts of Chhattisgarh and neighbourhood	Do	Do	Became less marked on 16
11.	Upto 1.5 km above m.s.l.	15-17	North Bangladesh and neighbourhood	East	Northeast Assam and neighbourhood	Became less marked on 18
12.	At 1.5 km above m.s.l.	20	North Bangladesh	Stationary	<i>In situ</i>	Became less marked on 22
13.	Do	21	Northeast Assam and neighbourhood	Do	Do	Became less marked on 22
14.	At 0.9 km above m.s.l.	22-23	North Chhattisgarh	South	South Chhattisgarh and neighbourhood	Became less marked on 24
15.	Upto 1.5 km above m.s.l.	23	South Telangana and neighbourhood	Stationary	<i>In situ</i>	Became less marked on 24
16.	At 1.5 km above m.s.l.	24	Central Rajasthan and neighbourhood	Do	Do	Became less marked on 25
17.	At 0.9 km above m.s.l.	24	Marathwada and neighbourhood	Do	Do	Became less marked on 25



TABLE 3 (Contd.)

(1)	(2)	(3)	(4)	(5)	(6)	(7)
18.	At 1.5 km above m.s.l.	26-27	East Assam and neighbourhood	South	Northeast Bangladesh and neighbourhood	Became less marked on 28
19.	At 3.1 km above m.s.l.	27	Haryana and neighbourhood	Stationary	<i>In situ</i>	Became less marked on 28
20.	Upto 1.5 km above m.s.l.	29 Feb - 1 Mar	Northeast Bihar and neighbourhood	Do	Do	Became less marked on 2 March
<b>(C) Other Troughs/Wind Discontinuity</b>						
1.	At 0.9 km above m.s.l.	1-2	West Vidarbha to north Tamil Nadu across Marathwada and interior Karnataka	Quasi-Stationary	Ran from east Vidarbha to south interior Karnataka across Marathwada and interior Karnataka	Became less marked on 3
2.	At 0.9 km above m.s.l.	6-7	From the cyclonic circulation over southeast Madhya Pradesh to north interior Karnataka across Vidarbha and Marathwada	Do	From east Vidarbha and neighbourhood to north interior Karnataka across Telangana	Became less marked on 8
3.	At 1.5 km above m.s.l.	7-8	Ran roughly along Long. 90°E to the north of Lat. 25°N	Stationary	<i>In situ</i>	Became less marked on 9
4.	At 0.9 km above m.s.l.	10	Ran from east central Arabian sea off Karnataka coast to south Gujarat region across north interior Karnataka and Madhya Maharashtra	Do	Do	Became less marked on 11
5.	Do	11	Ran from south interior Karnataka to west Vidarbha across north interior Karnataka and Marathwada	Do	Do	Became less marked on 12
6.	Do	14	Ran from the cyclonic circulation over central places over Madhya Maharashtra and neighbourhood to northeast Uttar Pradesh across Madhya Pradesh	Do	Do	Became less marked on 15
7.	Do	15-17	Ran from north interior Karnataka to the cyclonic circulation over central parts of Chhattisgarh and neighbourhood across north Telangana and south Vidarbha	West	Ran from coastal Karnataka to south Gujarat across Konkan and Goa	Became less marked on 18
8.	At 3.1 km above m.s.l.	17	Ran roughly along Long. 92°E to the north of Lat. 26°N	Quasi-Stationary	Ran roughly along Long. 93°E to the north of Lat. 26°N	Became less marked on 19
9.	Do	20	Ran roughly along Long. 93°E to the north of Lat. 22°N	Stationary	<i>In situ</i>	Became less marked on 21

TABLE 3 (Contd.)

(1)	(2)	(3)	(4)	(5)	(6)	(7)
10.	At 0.9 km above m.s.l.	21	A trough/wind discontinuity ran from southeast Madhya Pradesh to Tamil Nadu across Vidarbha, Telangana and Rayalaseema	West	From Vidarbha to north Kerala across Marathwada and Karnataka on 26 <sup>th</sup> morning	Became less marked on 26
11.	Do	24	Ran from cyclonic circulation over Marathwada and neighbourhood to coastal Andhra Pradesh across Vidarbha and south Chhattisgarh	Stationary	Lay as a wind discontinuity from the cyclonic circulation over Marathwada and neighbourhood to coastal Andhra Pradesh across Vidarbha and south Chhattisgarh on 25 <sup>th</sup> morning	Became less marked on 25
12.	At 3.1 km above m.s.l.	25	Ran roughly along Long. 93°E to the north of Lat. 25°N	Do	<i>In situ</i>	Moved away east-northeastwards on 26
13.	At 0.9 km above m.s.l. on 26 <sup>th</sup>	26	Maldives to north interior Karnataka across Kerala and south interior Karnataka	Do	Do	Became less marked on 27
14.	Upto 1.5 km above m.s.l.	27	Ran from northeast Bihar to the cyclonic circulation over northeast Bangladesh and neighbourhood	Do	Do	Became less marked on 28
15.	Do	26-27	Ran from eastcentral Arabian Sea to southwest Madhya Pradesh across northeast Arabian Sea and south Gujarat	Northwest	Ran from northeast Arabian sea to east Rajasthan across central parts of Gujarat	Became less marked on 28
16.	At 0.9 km above m.s.l.	27-29	Ran from south interior Karnataka to Madhya Maharashtra across Konkan	West	Ran from north Kerala to Konkan	Became less marked on 1 <sup>st</sup> March
17.	At 3.1 km above m.s.l.	28-29	Ran roughly along Long. 93°E to the north of Lat. 25°N	Stationary	<i>In situ</i>	Became less marked on 1 <sup>st</sup> March

northwest India during the month and was also extended upto north-eastern region. It was mainly observed over Punjab, Haryana, Chandigarh & Delhi, north Rajasthan, Uttar Pradesh, north Bihar, Assam, Tripura and northern parts of Madhya Pradesh in most dates of the month, though partial weakening of the main fog layer was observed due to rainfall and convective cloud formation over parts of east central India and south Bihar during first

week of the month. Persistent fog and low cloud layer caused continuous absence of sunlight in these regions and hence cold day to severe cold day conditions prevailed over Punjab, Haryana, Chandigarh & Delhi, north Rajasthan and Uttar Pradesh during 1<sup>st</sup> fortnight of the month. It may be noted that, this fog and low clouds cover started since 25 Dec, 2023 in the region and was also persisted throughout the month.

TABLE 4

Some representative amounts of rainfall in cm for January and February 2024 (3 cm and above)

Date	Some representative amounts of rainfall in cm for January 2024 (3 cm and above)
1 Jan	Agathi 4
2 Jan	Amini 4
3 Jan	Car Nicobar IAF 6, Car Nicobar 5, Cheruthazham ARG and Minicoy 4 each, Kozhikode 3
4 Jan	Thekkadi 7, Periyar 5, Taluk Office Pandalur, Pilavakkal, Kota, Idukki, Myladumpara ARG and Peermade 4 each, Servalar Dam, Honavar, Irikkurand Agathi and Minicoy 3 each
5 Jan	Keerampara ARG 13, Poonjar AWS and Kozhikode 11 each, Peraiyur, Thodupuzha and Minicoy 10 each, Kodungallur, Chalakudi and Vellanikkara 9 each, Rajapalayam, Neeleswaram ARG and Perumpavur 8 each, Chinnakalar, Valparai PTO, Srivilliputhur, Watrap, Karipur Ap., Kurudamannil and Vilangankunnu ARG 7 each, Cincona, Kannur, Alwaye PWD, Neryamangalam ARG and Vadakkancherry 6 each, Sholayar, Sivakasi, Kanjirappally, Anakayam ARG, Angadipuram, Ottapalam, Irinjalkuda and Vyanthala ARG 5 each, Elumalai, Andipatti, Pwd, Pilavakkal, Panambur, Idukki, Kottayam, Quilandi, Perinthalamanna, Alathur, Mankara AWS, Mannarkkad, Agathi and Amini 4 each, Periyanaickenpalayam, SiruvaniAdivaram, Tnau Coimbatore, Valparai Pap, Valparai Taluk Office, Nilakottai, Billimalai Estate, Burliar, Sivagiri, Bodinaikkanur, Aranmanaipudur, Vaigai Dam, Sothuparai, Manjalar, Mangaluru AP, Kalasa, Kottigehara, Mavelikara, Irikkur, North Paravur AWS, Piravam, Munnar Kseb, Peermade To, Nilambur, Kollamkode, Parumbikulam, Pattembi, Thritla, Enamakal and Periakulum 3 each
6 Jan	Kakkachi and Nlumukku 10 each , Manjolai 9, Alwaye PWD and Perumpavur 7 each, Poonjar AWS and Kodungallur 6 each, Parasia, Umreth, Ottapadiram and Kochi C.i.a.l. 5 each, Godadongri, Oothu, Myladumpara ARG and Shirali 4 each, Junnardeo, Mada, Sultanpur, Maniyachiand Honavar, Kumta and Thodupuzha 3 each
7 Jan	Sivakasi 11, Konanur 8, Sirkali and Nlumukku 7 each, Pilavakkal 6, Annamalai Nagar, Karaikal, Tarangambadi, Nagapattinam, Kakkachi, Kannadaian Anicut, Manimutharu, Manjolai, Oothu, Papanasam, Srivilliputhur, Vembakottai, Sulya, C R Patna, Alwaye PWD, Kochi C.i.a.l. and Neyyattinkara 5 each, Mahabalipuram, Chidambaram, Sembanarkoil PWD, Servalar Dam, Nannilam, Rajapalayam and Vaikom 4 each, Chatra, Simdega, Chinnakalar, K.m.koil, Parangipettai, Elumalai, Kollidam, Mayiladuthurai, Kinnakorai, Ramanadhi Dam, Andipatti, Ambasamudram, Valangaiman, Marakkanam, Watrap, Gokak, Tiptur, Kannur, Vellarikkundu AWS, Kuppady, Manantoddy and Periakulum 3 each
8 Jan	Sirkali 24, Chidambaram 23, Velankanni 22, Nagapattinam and Tiruvarur 21 each, Bhuvanagiri and Kollidam 19 each, Nannilam 17, Annamalai Nagar and Sethiathope 15 each, Cuddalore, K.m.koil, Karaikal andTirupoondi 14 each, Kothavacherry, Pudukcherry, Kodavasal and Marakkanam 13 each, Mahabalipuram, Collectorate, Lalpet and Vanur 12 each, Mayiladuthurai, Manalmedu, Kumbakonam, Thiruvaidamaruthur and Valangaiman 11 each, Cheyyur, Maduranthagam, SatyabamaUty ARG, Kurinjipadi, Parangipettai, Thalaigayyer, Lower Anaicut and Pandavaiyar Head 10 each, Jayamkondam, Thirukalukundram, Srimushnam, Vadakuthu, Tarangambadi, Manjalaru, Needamangalam, Rsl-1 Vallam, Rsl-2 Kanjanur, Rsl-2 Koliyanur, Rsl-2 Soorapattu, Rsl-2 Nemoor, Tindivanam and Vilupuram 9 each, Kelambakkam, Suthamalli Dam, Vanamadevi, Ponneri and Rsl-2 Valavanur 8 each, Chengalpattu, Alandur, Chennai AP, Taramani ARG, Kuppanatham, Src Kudithangi, Uthiramerur, Thirukuvalai, Thanjai Papanasam, Mannargudi, Gingee, Rsl-2 Kedar, Rsl-2 Mundiypakkam, Rsl-3 Anandhapuram and Rsl-3 Semmedu 7 each, Thirupporur, Cd Hospital Tondaipet, Sholinganallur, Me Mathur, Panruti, Pelandurai, VirdhachalamKvk AWS, Ulundurpet, Avadi, Mavelikara and Vedaranniyar 6 each, Thirumanur, Sendurai, Anna University, Anna Uty ARG, Chennai (n) , Dgp Office, Mgr Nagar, Virudachalam, Kancheepuram, Kundrathur, Walajabad, Sembanarkoil PWD, Neivasal Thenpathi, Tiruvaiyaru, Keelpennathur, BaslManampoondi, Rsl-3 Valathy and Karumadi AWS 5 each, Ayanavaram Taluk Office, Perambur, Vepur, Dscl Rshivandhiyam, Sriperumbudur, Kodiayakarai, Arakonam, Ayyampettai, Thanjavur, Orthanad, Nlumukku, Chembarabakkam, TirurKvk AWS, Tiruvallur, Vandavasi, Basl Mugaiyur, Rsl-3 Avalurpettai, Mangaluru AP, Kayamkulam ARG, Vyanthala ARG and Ariyalur 4 each, Chennai Collectorate Bu, Kattumayilur, Kilacheruvai, Lakkur, BaslManalurpet, DsclKalayanallur, DsclThiyagadurgam, Kcs Mill-1 Moongilthura, Tirukoilur, Sankarapuram, Labbaikudikadu, Panapakkam, Veeraganoor, Gadana Dam, Kurungulam, Kakkachi, Vettikadu, Oothu, Ambathur, Red Hills, Puzhal ARG, Thamarapakkam, Chetpet, Scs Mill Arasoor, Mani, Panambur, Chemberi AWS, Alwaye PWD, Thiruvalla AWS, Kallakurichi and Thanjavur 3 each
9 Jan	Marakkanam 19, Cheyyur 13, Maduranthagam 12, Tindivanam 9, Gingee 7, Mahabalipuram,Thirukalukundram, Kcs Mill-1 Kadavanur, Velankanni, Rsl-3 Semmedu and Vanur 6 each, Kankavli, Rameshwar ARG, Chengalpattu, Uthiramerur, Wallajah, RslVallam, Rsl-2 Nemoor, Rsl-3 Anandhapuram, Mangaluru, Mangaluru AP, Perumpavur, Kanjirappally, Quilandi and Chalakudi 5 each, Thirupporur, K.m.koil, Kancheepuram, Walajabad, Karaikal, Mayiladuthurai, Tirupoondi, Coonoor PTO, Kaveripakkam, Panapakkam, Ayyampettai, Lower Anaicut, Oothu, Chetpet, Vandavasi, Vembakkam, Needamangalam, Rsl-2 Mundiypakkam, Rsl-3 Avalurpettai, Rsl-3Valathy, Rajapalayam, Pilavakkal, Panambur and Coonoor 4 each, Kothavacherry, Me Mathur, Lalpet, Pelandurai, Harur, Kodumudi, Sriperumbudur, Nagapattinam, Burliar, Kinnakorai, Pudukcherry, Arcot, Kalavai PWD, Ranipet, Budalur, Madukkur, Kakkachi, Manjolai, Nlumukku, Arani, Cheyyar, Keelpennathur, Nannilam, Tiruvarur, Basl Manampoondi, BaslMugaiyur, Rsl-2 Kedar, Rsl-2 Koliyanur, Rsl-2 Valavanur, Taliparamba, Thattathumala AWS, Irinjalkuda and Devgad 3 each
10 Jan	Amaravathy Dam 12, Palani 11, Thirumoorthi Dam and Thirumoorthy Ib 10 each, Dindigul, Ramanathapuram and Thangachimadam 9 each, Nlumukku and Oothu 8 each, Rameswaram and Kakkachi 7 each, Pamban 6, Pwd Makkinampatti, Vedasandur, Kodaikannal Boat Club, Mandapam, Ramnadu Kvk AWS, Madathukulam, Uppar Dam and Peruvannamuzhi ARG 5 each, Aliyar, Odanchatram, Kinnakorai, Kadalai, Ralinokam, Manjolai, Dharmasthala, Kota, Vellarikkundu AWS, Pookot and Vytthiri 4 each, Pollachi, Nilakottai, Kodaikanal, Adar Estate, Coonoor PTO, KilKotagiri Estate, Kodanad, Viralimalai, Kamudhi, Kamudhi ARG,

TABLE 4 (Contd.)

Date	Some representative amounts of rainfall in cm for January 2024 (3 cm and above)
	Mudukulatur, Paramakudi, Thekkadi, Sothuparai, Manjalar, Papanasam, Dharapuram, Pwd, Udumalpet, Vattamalai Reservoir, Vellakoil, Kayalpattinam, Manapparai, Kovilpatti, Ponnaniyar Dam, Sulya, Kundapur, Gersoppa, Thalaguppa, Tyagarthi, Kovilkadavu AWS, Kozhikode, Pothundy Dam AWS, Kalpeta AWS, Padinjarathara Dam AWS and Coonoor 3 each
11 Jan	Nlumukku 15, Oothu 13, Kakkachi 12, Manjolai 9, Radhapuram 4, Kottaram 3
12 Jan	Nil
13 Jan	Nil
14 Jan	Nil
15 Jan	Nil
16 Jan	Nil
17 Jan	Nil
18 Jan	Simdega and Chakradharpur 5 each, Sonua and Manoharpur 4 each, Dumri, Gheropara and Sri Niketan 3 each
19 Jan	Jaganathpur Bau Kvk AWS, Jamda, Burdwan PTO and Joda 3 each
20 Jan	Velankanni 3
21 Jan	Thiruvalla AWS 4
22 Jan	Hindol 5, Bhuban 3
23 Jan	Nil
24 Jan	Bilaigarh and Sambalpur 3 each
25 Jan	Chendipada, Bhuban, Mahendragarh, Mohana, Berhampur, Ganjam, Polsara, Patrapur, Kujanga, Swam-patna, Joshipur, Raruana, Gop, Krishnaprasad, Puri, Rairakhol, Contai, Digha, AmfuKakdwip and Telkoi 3 each
26 Jan	IAF Car Nicobar 3
27 Jan	PortBlair 9
28 Jan	HutBay15, Long Island 3
29 Jan	MayaBandar 7
30 Jan	Port Blair 3
31 Jan	Kalyani Smo 6, Trivandrum AP 5, Tezu 4, Saloni, Udaipur and Bagati 3 each
1 Feb	Tuticorin, Banihal, Bhoranj, Mehre (barsar) and Kothi 5 each, Srivilliputhur, Qazi Gund, Rajouri ARG, Govindpura AWS, Rohru, President House and Bilari 4 each, Thenmala ARG, Ayikudi, Sivakasi, Anantnag, Gulmarg R.s., Jammu, Jammu AWS, Pehowa, Rai REV, DhariwalIrr, Tibri, Gurdaspur AMFU, Nakodar, Phangota, Patti, Chuari, Aghar, Ghamroor, Bhuntar AP, Seo Bagh, Karsog, Rampur Bushar, Kataula, Safdarjung, Narela AWS, Delhi University Obs, Moradabad, Milak, Chandausi, Basirhat (pt) , Bahadurgarh, Ghumarwin, Bangana R, Jagadhari, Joshimath, Kapurthala, Udampur, Batote, Kukernagh and Katra 3 each
2 Feb	NagrotaSurian and B P Ghat 6 each, Kunderipallam and Vembakottai 5 each, Kalugumalai, Kadambur, Kayathar, Kahu, Bilaspur AWS, HMO Shillaro, Shimla AP, Arki, Sankalan and Chandigarh IAF 4 each, Perumkadavila ARG, Bhavanisagar, Rajapalayam, Bandipora AWS, Govindpura AWS, ReasiKvk AWS, Naraingarh, Chandigarh, Chandigarh AWS, Dadupur, Ludhiana, Ludhiana Irr, Ranjit Sagar Dam Site, Phangota, Barthin, Bharmaur, Nadaun, Dharmsala, Baijnath, Guler, Palampur, Bhuntar AP, Manali, Kothi, Seo Bagh, Tinder, Jogindarnagar, Karsog, Mandi, Pandoh, Sundarnagar, Khadralla, Kataula, Rohru, Renuka/Dadhau, Kandaghat, Kasauli, Matijuri, Haripur, Mori, Purola, Singhik, Mangan, Kalaikunda (Iaf), BerthinAgro, Sangraha, Mussoorie and Batote 3 each
3 Feb	Tamenglong 6, Mangan and Sankalan 5 each, Kibithu and Singhik 4 each, Oyan ARG, NamsaiKvk AWS, Kabu Basti, Kamba AWS and Dhemaji 3 each
4 Feb	Dalhousi Alha AWS and Bijahi 4 each, Saloni 3
5 Feb	Karsog, Sundarnagar and Solan 6 each, Bhoranj, Baijnath, Bhuntar AP, Baldwara, Jogindarnagar, Kataula, Renuka/Dadhau, Tiuni, Sangraha and Mussoorie 5 each, Tajewala, Banjar, Seo Bagh, Mandi, Rajgarh, Mori, Ghumarwin, HMO Kasol, Jubbal, Fatehpur and Chandigarh IAF 4 each, Rajnagar, Raipur SR, Dausa, Sangner Tehsil SR, Naraingarh, Barthin, Bilaspur AWS, Dalhousi Alha AWS, Mehre (barsar) , Hamirpur AWS, Palampur, Pandoh, Khadralla, Sarahan, Simla, Paonta, Pachhad, Arki, Kasauli, Chakrata, Haripur, Deoprayag, Tehri (CWC), Barkot, Dunda, Purola, Fursatganj, Kanpur, Kalpi Tehsil, Berthin Agro, Sunibhajji, Sadhaura, Joshimath, Manali, Batote, Dholpur and Kanpur A. 3 each
6 Feb	KabuBasti 5, Narendranagar, Mangan and Yingkiang 3 each

WEATHER IN INDIA

**TABLE 4 (Contd.)**

Date	Some representative amounts of rainfall in cm for January 2024 (3 cm and above)
7 Feb	Nil
8 Feb	Nil
9 Feb	Nil
10 Feb	Nil
11 Feb	Nil
12 Feb	Umari 6, Barghat, Shahdole (Sohagpur), Reamal and Komna 3 each
13 Feb	Mandar 4, Bijuri, Gaurihar, Bahri, Kusmi, Prayagraj PBO and Meja 3 each
14 Feb	Rafiganj 6, Mauganj, Churk and Robertsganj 4 each, Sihawal 3
15 Feb	Barachatti, Garu, Icar Namkum, Ranchi AP and Mandar 3 each
16 Feb	Sausar 5, Chakulia and Rairangpur 3 each
17 Feb	Nil
18 Feb	Itanagar 3
19 Feb	Banihal 6, Baramulla AWS, Kupwara Kvk AWS, Govindpura AWS and Kukumsheri AWS 5 each, Gulmarg R.s., Tissa, PTO Koksar, Udaipur, Poonch, Kupwara and Batote 4 each, Bandipora ARG, Bandipora AWS, Baramulla Kvk AWS, Tengmarg, Bhaderwah ARG, Nowgam, Rajouri ARG, PTO Gondla, Margherita ARG and Badarwah 3 each
20 Feb	Kargil 19, Bhaderwah ARG 10, Govindpura AWS 9, Qazi Gund, Banihal and Tissa 8 each, Saloni, Manali and Chamba AWS 7 each, Gulmarg R.s., Kufri AWS and Badarwah 6 each, Verinag, Pahalgam AWS, Bandipora AWS, Ranjit Sagar Dam Site, Dalhousi Alha AWS, Chuari and Batote 5 each, Jaisalmer, Bandipora ARG, Baramulla AWS, Baramulla Kvk AWS, Shalimar Agro, Phangota, PTO Gondla, Kukumsheri AWS, Chhatrari, Joshimath, Pahalgam and Kupwara 4 each, Anantnag AWS, Tengmarg, Rajouri ARG, Rajouri, Srinagar, Srinagar Agro AWS, R M Bagh ARG, Rambagh AWS, Shahpur Kandi, Bharmaur, Kothi, HMO Hansa, Banbasa, Bhatwari, Jajpur, Keylong, Udampur, Gund, Srinagar IAF and Kukernagh 3 each
21 Feb	Banihal and Kukernagh 7 each, Gulmarg RS and Qazi Gund 5 each, Anantnag and Batote 4 each, Kargil, Rajouri ARG, Govindpura AWS, Saloni, Manali, Kothi, Gopalganj, Kibithu, Dhemaji, Ram SanehiGhat Tehsil, Burdwan PTO, Fatehpur, Srinagar IAF and Badarwah 3 each
22 Feb	Pasighat AP 7, Tuting 6, Oyan ARG, Lakhipur and Kanchanpur 5 each, Kibithu, A P Ghat and Lakhipur ARG 4 each, Silchar, Jonai ARG, Cherrapunji, Shella, B P Ghat, Dholla Bazar, Jiagaon, Nongstein and Nachu ARG 3 each
23 Feb	Dharmanagar/Panisagar 8, Gharmura, KvkDhalai, A D Nagar AWS and Arundhutinagar 7 each, Kibithu, Khowai, Mamit ARG and Kailashahar AP 6 each, Tuting, Dholai, Kamalpur, Kolasib ARG and Kanchanpur 5 each, Amraghat, Silchar, Lakhipur ARG, Cherrapunji (rkm) , Matijuri, Halflong, Chottabekra, Kohima, TeningNsdma AWS, TseminyuNsdma AWS, Haflong AWS, Kolasib AWS, Harinagar ARG and Mawsynram 4 each, Hawaii, Pasighat AP, Dhemaji, Cherrapunji, Khliehriat, Chauldhowaghat, Chouldhuwaghat ARG, Jharnapani, Imphal AP, Kiphire, Kohima Sadar Nsdma AWS, Paren, Phek, Tamenglong, Ukhrul, Ukhrul AWS, Agartala AP, Lembuchhera, Lamphet ARG and Khowai AWS 3 each
24 Feb	Tuting 7, Nachu ARG 5, Kolasib ARG and Kolasib AWS 3 each
25 Feb	Banpur 11, Belaguntha 10, Madhabarida 9, Buguda and Chilika 5 each, Bhanjnar 4, Mandapam and Berhampur 3 each
26 Feb	Sankheimundi 12, Polsara 7, Madanpur Rampur 5, Dilawarpur and Belgaon 4 each, Nirmal, Hindol, Lanjigarh and Umarkote 3 each
27 Feb	Chand 7, Godadongri 5, Bichhua 4, Burhanpur, Jhirnya, Chindwara-aws, Dharni, Telhara and Murtajapur 3 each
28 Feb	NavibaghAet, Anuppur-aws, Ajaigarh and Tiring 5 each, Salwani, Kotma, Palera, Manora, Kolebira, Bargarh, Hindol, Koksara, Rairakhol and Mandar 4 each, Bhainsdehi, Rajnagar, Mandla, Lakhnadon, Channodi, Bilaspur, Marwahi, DiyakelKhuntiKvk AWS, Sohela, Khajuripada, Dabugan, Dhankauda and Murhu 3 each
29 Feb	Phiringia 3

Season's 1<sup>st</sup> active Western Disturbance (WD) affected northwest India from 28 Jan. It caused light to moderate rain/snow over Kashmir and adjoining areas of Himachal Pradesh and Punjab during last week of January.

No Significant cold wave was reported over any part of the country during the 1<sup>st</sup> week. Cold wave to severe cold wave conditions prevailed mainly during mid of the month over plains of north and northwest India. Thus, Cold wave to severe cold wave conditions prevailed over Punjab, Haryana, Chandigarh & Delhi, Uttar Pradesh, Rajasthan. Cold wave at isolated places over Uttar Pradesh, Rajasthan and Haryana, Chandigarh & Delhi during most dates of the 3<sup>rd</sup> week and over some parts of Punjab, Himachal Pradesh, Haryana, Chandigarh & Delhi, Uttar Pradesh, north Rajasthan and north Madhya Pradesh during the last week.

During January, moderate to strong El Niño conditions prevailed over equatorial Pacific and the sea surface temperatures (SSTs) were above normal over most parts of the central and eastern equatorial Pacific Ocean. Simultaneously, strong positive Indian Ocean Dipole (IOD) conditions was observed over the Indian Ocean. The Madden Julian Oscillation (MJO) was in active phase 3 with amplitude greater than 1 during first week of January, thereafter it shifted to phase 4 and 5.

### 3.1.3. Monthly rainfall

During the January 2024, rainfall realized over the country as a whole was 42% of its LPA. Most of the subdivisions received deficient/large deficient rainfall, except a few from the south peninsula which received large excess rainfall. During the month, out of 36 meteorological subdivisions, 7 received large excess rainfall, 1 received excess rainfall, 5 received normal rainfall, 4 received deficient rainfall and 19 received largely deficient rainfall. Table 1 shows the sub-division wise rainfall statistics for January 2024.

The monthly precipitation over the country was less than normal (42% of L.P.A.) while it was large deficient over Northwest (9% of L.P.A.), East & Northeast India (31% of L.P.A.), deficient over Central India (71% of L.P.A.) and large excess over South Peninsular India, which was 233% of L.P.A.

All India Rainfall (7.2 mm) during January was 9<sup>th</sup> lowest since 1901. Prior lowest rainfall years are 2007 (2.3 mm), 2018 (2.9 mm), 1946 (4.4 mm), 1914 (4.7 mm), 1916 (5.1 mm), 1913(6.5 mm), 1963(6.9 mm) and 1937 (7 mm). Rainfall over Northwest India (3.1 mm) was 2<sup>nd</sup> lowest since 1901 and rainfall over South peninsular India

(18.2 mm) was 22<sup>nd</sup> highest since 1901 but 3<sup>rd</sup> highest since 2001.

### 3.1.4. Temperature

In the month of January, the mean temperature over the country was 18.37°C with an anomaly of 0.34°C. Over South Peninsular India the mean temperature was highest (25.32°C with an anomaly of 1.0°C) and minimum temperature was the 2<sup>nd</sup> highest (20.15°C with an anomaly of 1.74°C) since 1901. Over Central India the minimum temperature was the 3<sup>rd</sup> highest (14.19°C with an anomaly of 1.67°C) since 1901.

Maximum temperatures were below normal over most parts of the country, except some parts of north India, northeast India, central India, south peninsular India and both the islands. Maximum temperature anomaly was more than 2°C over parts of Jammu, Kashmir & Ladakh. Maximum temperature anomaly was less than -5°C over parts of Punjab, West Rajasthan, Haryana, Chandigarh & Delhi and West Uttar Pradesh.

Minimum temperatures were above normal over most parts of the country, except some parts of northwest India and East & Northeast India. Minimum temperature anomaly was more than 3°C over parts of Chhattisgarh, Odisha, Telangana, Madhya Maharashtra, North Interior Karnataka, South Interior Karnataka and Kerala & Mahe. Minimum temperature anomaly was less than -1°C over parts of West Rajasthan, West Uttar Pradesh and Haryana, Chandigarh & Delhi.

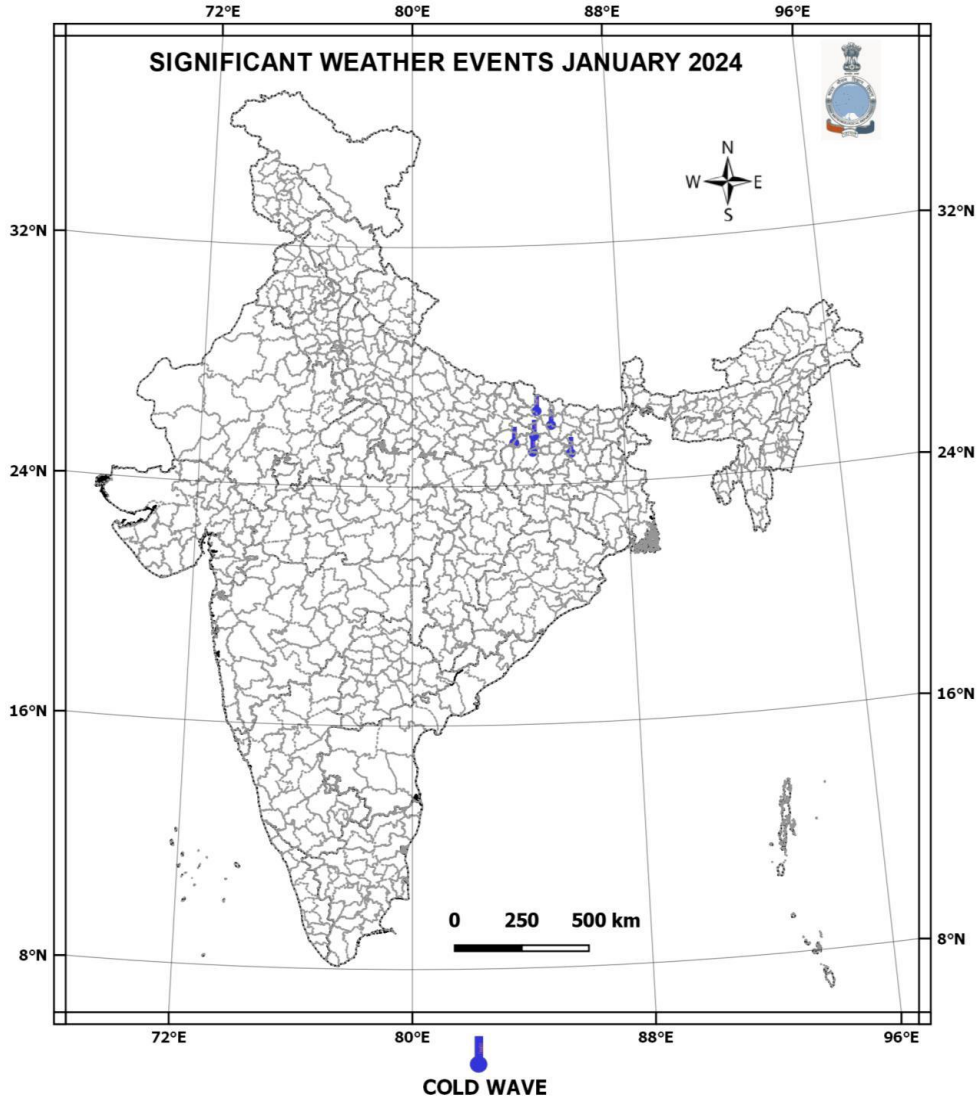
In January 2024, the cold wave/severe cold wave conditions were observed mainly over northern, northwestern India and central India which mainly covered parts of East Madhya Pradesh, Rajasthan, Uttar Pradesh, Himachal Pradesh, Jharkhand, Punjab, Sub Himalayan West Bengal & Sikkim, Haryana, Chandigarh & Delhi and Uttarakhand.

The lowest minimum temperature of -0.5°C was reported at Sikar (east Rajasthan) on 11<sup>th</sup> January over the plains of the country.

### 3.1.5. Damages associated with Disastrous weather events

Fig. 2 shows significant weather events during January (based on real-time media reports).

**COLD WAVE** : During January, 6 persons were reportedly claimed dead due to cold wave in Arwal, Buxar, East Champaran, Lakhisarai, Muzaffarpur, Saran districts of Bihar on 10 & 24 January.



**Fig. 2.** Significant weather events in January 2024  
(Source : IMD, Climate Summary for the month of January 2024)

### 3.2. February

#### 3.2.1. Storms and Depressions

No intense low pressure system formed during the month.

#### 3.2.2. Weather and associated synoptic features

As given in Table 3, 13 western disturbances (1 upper air cyclonic circulation, 9 troughs in westerlies and 3 induced cyclonic circulations), 19 other upper air cyclonic circulations and 17 other troughs/wind discontinuities formed, which affected the weather over the country during the month of February.

Active Western Disturbances (WD) and the induced Cyclonic circulation caused heavy to very heavy rainfall/snowfall at isolated places over Jammu-Kashmir-Ladakh-Gilgit-Baltistan-Muzaffarabad, heavy rainfall at isolated places over Himachal Pradesh and light to moderate rainfall/thunderstorms over adjoining plains of northwest India during the month. It also caused hailstorm at isolated places over Himachal Pradesh, Uttar Pradesh, Uttarakhand, Punjab, Haryana and north Rajasthan. Due to the trough in westerly and support from lower level winds with moisture incursions from north Bay of Bengal, Heavy rainfall was recorded at isolated places over Arunachal Pradesh. The cyclonic circulations over central India & the trough upto northeast Uttar Pradesh across Madhya Pradesh caused isolated light to moderate rainfall

accompanied with Thunderstorm and Hailstorm over Vidarbha, Jharkhand, Chhattisgarh and Odisha during first fortnight of the month.

Northern India experienced dense to very dense fog at isolated pockets upto the third week of the month. However, no Dense fog conditions reported over any parts of the country during the last week of the month.

Cold wave conditions prevailed at isolated pockets of northern parts of the country during 1<sup>st</sup> fortnight of the month.

Moderate to strong El Niño conditions were prevailing over equatorial Pacific with above average sea surface temperatures (SST) over most parts of the central and eastern equatorial Pacific Ocean and strong positive Indian Ocean Dipole (IOD) conditions were prevailed over the Indian Ocean during the 1<sup>st</sup> week of the month.

Madden Julian Oscillation (MJO) meandered between phases 7 and 8 with amplitude decaying near to 1 and entered into phase 1 during the end of second week. Thus, MJO was not likely to favor any cyclogenesis over the North Indian Ocean (NIO) during this period. However, it provided support towards enhancement of convective activity over peninsular India and southeast Arabian sea & adjoining areas. After that it moved eastward from phase 8 to phase 4 across phases 1, 2 and 3 with very low amplitude less than 1 and in phase 4 during end of the month with amplitude more than 1.

### 3.2.3. Monthly rainfall

During the February 2024, rainfall realized over the country as a whole was 87% of its LPA. Rainfall over homogeneous regions of northeast India, northwest India, central India and south peninsular India was 113%, 88%, 82% and 9% of its LPA, respectively. During this month, out of the 36 meteorological sub-divisions, 1 sub-division (Jharkhand) recorded large excess rainfall, 3 sub-divisions received excess rainfall, 12 sub-divisions received normal rainfall, 7 sub-divisions received deficient rainfall, 7 sub divisions received large deficient rainfall and no rain in 6 sub-divisions. Table 1 shows the sub-division wise rainfall statistics for February 2024.

### 3.2.4. Temperature

In the month of February, the mean temperature over the country was 21.10°C with an anomaly of 0.4°C. The minimum temperature over the country was the 2<sup>nd</sup> highest (14.61°C with an anomaly of 0.79°C) since 1901. Over South Peninsular India, the mean temperature was the highest (27.13°C with an anomaly of 1.20°C) since

1901 whereas both maximum and minimum temperatures were the highest (33.09°C with an anomaly of 0.97°C and 21.17°C with an anomaly of 1.43°C respectively) since 1901. Over Central India, the minimum temperature was the highest (16.62°C with an anomaly of 1.63°C) since 1901.

Maximum temperatures were below normal over most parts of the country, except some parts of Central India, south peninsular India and both the islands. Maximum temperature anomaly was more than 2°C over parts of Kerala & Mahe and north interior Karnataka. Maximum temperature anomaly was less than -1°C over northern & northeast India, Uttarakhand, Haryana, Rajasthan, Uttar Pradesh, northern parts of Madhya Pradesh, Bihar, Arunachal Pradesh, Assam, Nagaland, West Bengal and Jharkhand.

Minimum temperatures were above normal over most parts of the country, except some parts of northwest India and East & Northeast India. Minimum temperature anomaly was more than 3°C over parts of Chhattisgarh, Odisha and north Madhya Maharashtra. Minimum temperature anomaly was less than -1°C over parts of Jammu, Kashmir & Ladakh, Punjab, West Rajasthan, Uttar Pradesh state, Haryana, Chandigarh & Delhi, Arunachal Pradesh, Assam state and Nagaland.

In February 2024, Cold wave conditions prevailed for 4-5 days over Punjab and Haryana during first 10 days.

The lowest minimum temperature of 1.0°C was recorded at Fursatganj (East Uttar Pradesh) on 1<sup>st</sup> February 2024 over the plains of the country.

### 3.2.5. Damages associated with Disastrous weather events

Fig. 3 shows significant weather events during February (based on real-time media reports).

During the month, a total number of 6 persons were reportedly claimed dead & one person reportedly claimed missing. The details of casualties given below, which are based on real time media reports.

**Snowfall** : Total one person reportedly claimed dead & one missing at Gulmarg (Jammu & Kashmir), during February, because of Snowfall on 22<sup>nd</sup> February.

**Lightning** : Total 2 persons reportedly claimed dead at Shahdol (Madhya Pradesh) on 27<sup>th</sup> February.

**Heavy Rains & Landslides** : A total of 3 persons [2 at Shimla (Himachal Pradesh) on 6<sup>th</sup> Feb and 1 at Ramban



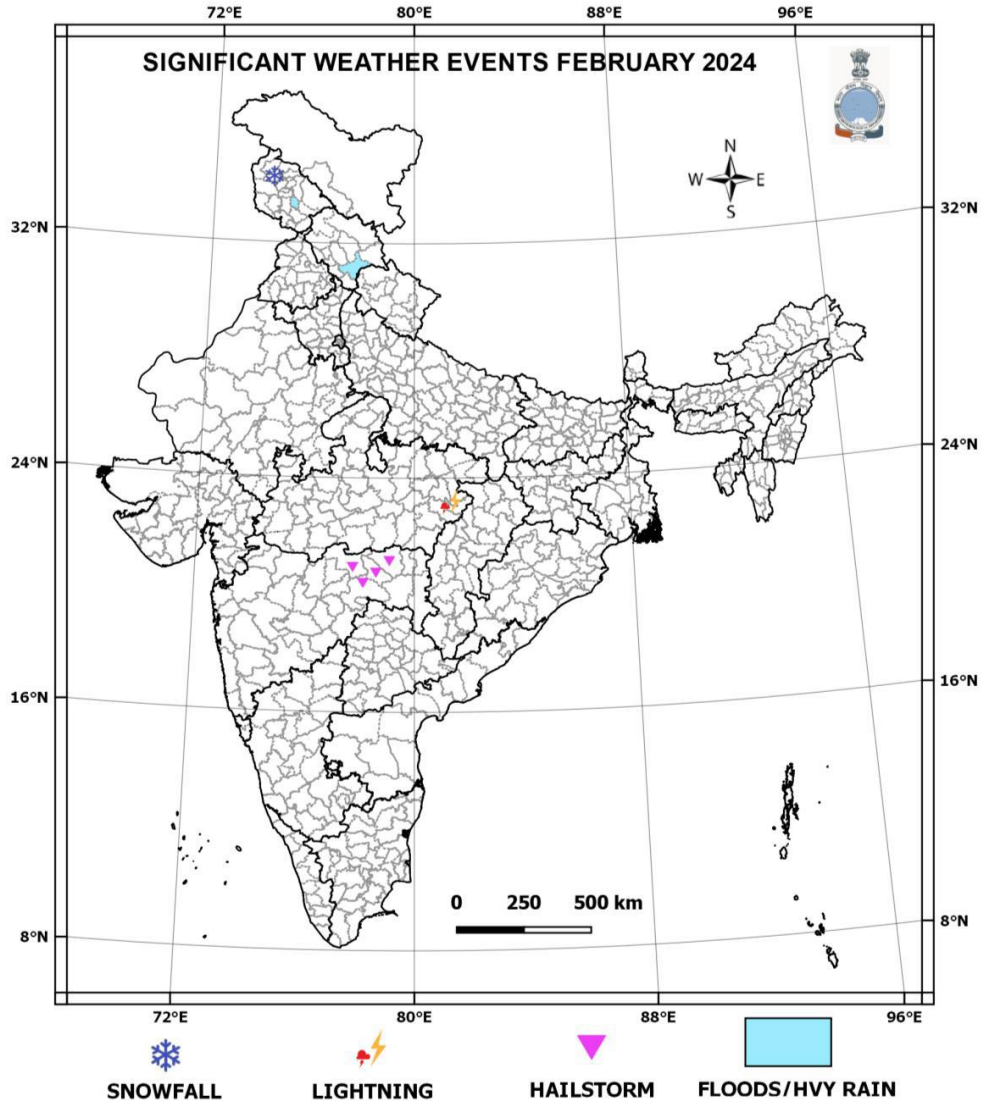


Fig. 3. Significant weather events in February 2024  
 (Source : IMD, Climate Summary for the month of February 2024)

(Jammu & Kashmir) on 22<sup>nd</sup> Feb] were reportedly claimed dead during February 2024 because of Landslides.

*Hailstorm* : Damage to crops reported from Amaravati, Nagpur, Wardha, & Yavatmal districts of Maharashtra due to hailstorm on 10<sup>th</sup> February, 2024.

The inputs from the Offices of India Meteorological Department, viz., (i) Director General of Meteorology (Hydromet), New Delhi and (ii) Climate Research and Services, Pune are gratefully acknowledged. Thanks to Smt. P. P. Kulkarni Met. A. for her help in bringing out this summary.

**Appendix**

**Definitions of the terms given in ‘Italics’**

<b>(A) Rainfall</b>	
(i) Percentage departure from normal	
<i>Large excess</i>	: + 60% or more
<i>Excess</i>	: +20% to +59%
<i>Normal</i>	: -19% to +19%
<i>Deficient</i>	: -20% to -59%

<i>Large deficient</i>	: -60% to -99%
<i>No Rain</i>	: -100%
<i>(ii) Intensity (during the 24 hours period ending at 0300 UTC)</i>	
<i>Very light</i>	0.1 to 2.4 mm
<i>Light</i>	2.5 to 15.5 mm
<i>Heavy rainfall</i>	: 6.5 cm to 11.5 cm
<i>Very heavy rainfall</i>	: 11.6 cm to 20.4 cm
<i>Extremely heavy rainfall</i>	: 20.5 cm and above
<i>Heavy snowfall</i>	: 64.5 cm to 115.5 cm

**(B) Temperatures**

Cold Wave is considered when minimum temperature of a station is 10 °C or less for plains and 0 °C or less for Hilly regions

*(a) Based on Departure*

<i>Cold wave</i>	: Negative Departure from normal is 4.5 °C to 6.4 °C
<i>Severe Cold Wave</i>	: Negative Departure from normal is more than 6.4 °C

Based on Actual Minimum temperature (for plain stations only)

<i>Cold wave</i>	: When minimum temperature is $\leq 04$ °C
<i>Severe Cold Wave</i>	: When minimum temperature is $\leq 02$ °C

*(b) Cold Day*

It should be considered when minimum temperature is 10 °C or less for plains and 0 °C or less for Hilly regions

<i>Cold wave</i>	: Maximum temperature Departure is -4.5 °C to -6.4 °C
<i>Severe Cold Wave</i>	: Maximum temperature Departure is < -6.4 °C
<i>Markedly below normal</i>	: departure of minimum temperature from normal is from -5 °C or less
<i>Appreciably below normal</i>	: departure of minimum temperature from normal is from -3.1 °C to -5 °C
<i>Below normal</i>	: departure from normal is -1.6 °C to -3.0 °C
<i>Normal</i>	: departure from normal is -1.5 °C to +1.5 °C
<i>Above Normal</i>	: departure of minimum temperature from normal is +1.6 °C to 3.0 °C
<i>Appreciably above normal</i>	: departure of the minimum temperature from normal is from +3.1 °C to +5.0 °C
<i>Markedly above normal</i>	: departure of the minimum temperature from normal is +5 °C or more
<i>(C) Fog</i>	
<i>Dense Fog</i>	: When the visibility is between 50-200 m
<i>Very Dense Fog</i>	: When the visibility is < 50 m

