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MOES / IMD / CRS / ANNUAL CLIMATE SUMMARY - 2023/01(2024)28



## वार्षिक जलवायु सारांश - 2023

# ANNUAL CLIMATE SUMMARY - 2023

द्वारा जारी / ISSUED BY  
जलवायु निगरानी एवं प्रागुक्ती समूह  
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INDIA METEOROLOGICAL DEPARTMENT

पुणे - 411005  
PUNE - 411005

## COVER PHOTOS

- ① **Heavy Rainfall & Floods :**  
The National Disaster Response Force (NDRF) conducts a rescue operation in an area waterlogged due to heavy rainfall, in Chennai Tuesday | ANI  
(<https://static.theprint.in/wp-content/uploads/2023/12/chennai-floods1.jpg>)
- ② **Heavy Rainfall & Floods :**  
Chennai and its neighbouring districts' routine lives were thrown out of gear due to continuous rain that hammered several parts of the city, causing floods  
([https://media.assettype.com/freepressjournal/2023-12/cb39eb5d-407b-4aeb-b119-582b68d703b4/Untitled\\_design\\_2\\_.jpg](https://media.assettype.com/freepressjournal/2023-12/cb39eb5d-407b-4aeb-b119-582b68d703b4/Untitled_design_2_.jpg))
- ③ **Cold Waves :**  
Cold wave conditions prevailed over parts of north India. (Photo: PTI)  
[https://akm-img-in.tosshub.com/indiatoday/images/story/202301/bonfiresixteen\\_nine\\_0sixteen\\_nine.jpg?VersionId=5h1PIAREv4c2mp6M9YAQF9jYC8AKCC5b&size=690:388](https://akm-img-in.tosshub.com/indiatoday/images/story/202301/bonfiresixteen_nine_0sixteen_nine.jpg?VersionId=5h1PIAREv4c2mp6M9YAQF9jYC8AKCC5b&size=690:388)
- ④ **Floods :**  
A drone visual shows an area that is flooded after the landfall of Cyclone Michaung, in Chennai, Wednesday, Dec. 6, 2023. (PTI)  
([https://www.livemint.com/lmimg/img/2023/12/06/600x338/Chennai\\_floods\\_1701876046780\\_1701876047077.jpg](https://www.livemint.com/lmimg/img/2023/12/06/600x338/Chennai_floods_1701876046780_1701876047077.jpg))
- ⑤ **Hail Storm :**  
A road stretch with lumps of ice following a hailstorm in Kohir of Sangareddy district on Thursday.  
| Photo Credit: PTI  
([https://thi.thgim.com/public/incoming/ebiad8/article66627891.ece/alternates/FREE\\_1200/PTI03\\_16\\_2023\\_000150A.jpg](https://thi.thgim.com/public/incoming/ebiad8/article66627891.ece/alternates/FREE_1200/PTI03_16_2023_000150A.jpg))  
[ From : THE HINDU\_16 MAR 2023\_TELANGANA  
(<https://www.thehindu.com/news/national/telangana/hailstorm-and-rain-batters-many-parts-of-telangana/article66627542.ece>)
- ⑥ **Heavy Rainfall & Floods :**  
Commuters stand at one side of a road after it was flooded due to heavy rains, in Nagpur, Saturday, Sept. 23.(PTI)  
([https://www.hindustantimes.com/ht-img/img/2023/09/23/550x309/PTI09-23-2023-000166A-0\\_1695466471478\\_1695466544986.jpg](https://www.hindustantimes.com/ht-img/img/2023/09/23/550x309/PTI09-23-2023-000166A-0_1695466471478_1695466544986.jpg))



**वार्षिक जलवायु सारांश - २०२३**  
**ANNUAL CLIMATE SUMMARY - 2023**

# Executive Summary

## Annual Climate Summary 2023

1	Document Title	<b>Annual Climate Summary 2023</b>
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16	End Users	Government Officials, Operational Forecasters and Researchers, etc.
17	Abstract	<p>The report discusses the climate condition over Indian region during the year 2023. Notably, global temperatures soared to exceptionally high levels during this period (WMO.No.1347). The India Meteorological Department continuously monitors weather and climate over Indian region.</p> <p>The annual mean land surface air temperature averaged over India during 2023 was +0.65°C above the long-term average (Period 1981-2010). The year 2023 was the 2<sup>nd</sup> warmest year on record since nationwide records commenced in 1901. However, this is lower than the highest warming observed over India during 2016 (anomaly of +0.71°C). The all India mean temperatures during the pre-monsoon (March to May) season was normal with an anomaly of +0.06°C while during other seasons, it was above normal for winter (January to February) season (anomaly of +0.83°C), monsoon (June to September) season (anomaly of +0.74°C) and post-monsoon (October to December) season (anomaly of +1.0°C). Heat wave conditions were observed over most parts of central, northwest India and East and Northeast India during the months of April and June.</p> <p>The 2023 annual rainfall over the country as a whole was 95% of its Long Period Average (LPA) value for the period 1971-2020. The monsoon season rainfall over the country as a whole was 95% of its LPA. The seasonal rainfall during the Northeast monsoon season (October – December) over the NE Monsoon core region of the south peninsula was 94% of its LPA. In 2023, there were 6 cyclones formed over the north Indian Ocean and other extreme weather events also reported many parts of the country</p>
18	Key Words	Southwest Monsoon, SPI, Temperature, Rainfall, Extreme Weather Events and Cyclone.

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## वार्षिक जलवायु सारांश - २०२३

### विशेषताएं :

वर्ष 2023 में देश का औसत तापमान, सन 1981-2010 के औसत से 0.65 डिग्री सेल्शियस (डि.से.) से अधिक रहा। यह साल 1901 से अब तक का दुसरा सबसे ऊष्ण साल रहा। शीत ऋतु के औसत तापमान में वृद्धि (0.83 डि.से.), मानसून ऋतु के औसत तापमान में वृद्धि (0.74 डि.से.), और उत्तर-पूर्व मानसून ऋतु के औसत तापमान में वृद्धि (+1.0 डि.से.) वार्षिक तापमान में वृद्धि का मुख्य कारण है। अब तक के 5 सबसे ऊष्ण साल इस क्रम से हैं : 2016 (विसंगति +0.71 डि.से.), 2023 (0.65 डि.से.), 2009 (+0.55 डि.से.), 2017 (+0.541 डि.से.), 2010 (+0.539 डि.से.)।

दक्षिणी पश्चिमी मानसून ऋतु (जून-सितंबर, जो देश की वर्षा ऋतु का प्रमुख काल माना जाता है) में देशभर में व्यापक रूप से वर्षा सामान्य रही (दीर्घ कालावधि औसत के 95%)। हालांकि सामयिक रूप से वर्षा अस्थायी थी लेकिन फिर भी देश भर में वर्षा का वितरण काफी अच्छा रहा।

अप्रैल और जून के महिनों के दौरान मध्य, उत्तर-पश्चिम भारत और पूर्व और पूर्वोत्तर भारत के अधिकांश हिस्सों में ऊष्ण लहर की स्थिति देखी गई।

दक्षिण प्रायद्वीप (जिसमें 5 प्रभाग आते हैं, और जो उत्तर-पूर्व मानसून वर्षा का मुख्य क्षेत्र है, नामतः तटीय आन्ध्रप्रदेश, रायलसीमा, तमिलनाडु और पुडुचेरी, दक्षिणी आंतरिक कर्नाटक, केरल और माहे) में अक्टूबर से दिसंबर तक पडने वाली उत्तर-पूर्व मानसून वर्षा, सामान्य (दीर्घ कालावधि औसत के 94%) रही।

### **वर्षा :**

2023 में देश भर में वार्षिक वर्षा सामान्य थी। वर्षा का परिमाण दीर्घ कालावधि औसत के 95% रहा। देश के 36 प्रभागों में से 1 प्रभाग में अत्यधिक, 2 प्रभागों में अधिक, 27 प्रभागों में वर्षा सामान्य रही और 6 प्रभागों में वर्षा कम रही।

### **तापमान :**

देश के अधिकतर भागों में अधिकतम, न्यूनतम और औसत तापमान की विसंगति -1.0 डि.से. से +1.0 डि.से. की श्रेणी में रही।

### **चक्रवाती तूफान :**

2023 में बंगाल की खाड़ी में चार और अरब सागर में दो चक्रवाती तूफान हुए। यह चक्रवाती तूफान मई (मोचा), जून (बिपरजोय), अक्टूबर (तेज और हामून), नवंबर (मिधिली) और दिसंबर (मीचांग) में हुए। मानसून ऋतु में 14 कम दबाव के क्षेत्र बने (1 बहुत तीव्र चक्रवाती तूफान, 1 तीव्र अवदाब, 1 अवदाब, 5 सुस्पष्ट निम्न दाब क्षेत्र, 5 निम्न दाब क्षेत्र और 1 भूमिगत निम्न दाब)। इन सभी कम दबाव की प्रणालियों की वजह से संबन्धित स्थानों में अच्छी वर्षा हुई।

### **महत्वपूर्ण मौसम संबंधी घटनाएं :**

भारी वर्षा और बाढ़ संबंधी घटनाओं से 850 से ज्यादा लोगों की मृत्यु की सूचना प्राप्त हुई। आकाशीय बिजली /गर्ज के साथ तूफान से 1330 से ज्यादा लोगों की मृत्यु की सूचना (मानसून पूर्व, मानसून और मानसूनोत्तर ऋतुओं में), देश के विभिन्न भागों से प्राप्त हुई। उष्ण लहर की वजह से महाराष्ट्र, ओडिशा, छत्तीसगढ़, बिहार और झारखंड से 181 लोगों की मृत्यु की सूचना मिली। हिमताप की वजह से जम्मू कश्मीर और लदाख, उत्तराखंड, अरुणाचल प्रदेश और हिमाचल प्रदेश से 21 लोगों की मृत्यु की सूचना मिली।

# Annual Climate Summary 2023

## HIGHLIGHTS:

The annual mean land surface air temperature averaged over India during 2023 was  $+0.65^{\circ}\text{C}$  above the long-term average (Period 1981-2010). The year 2023 was the 2<sup>nd</sup> warmest year on record since nationwide records commenced in 1901. However, this is lower than the highest warming observed over India during 2016 (anomaly of  $+0.71^{\circ}\text{C}$ ).

The all India mean temperatures during the pre-monsoon (March to May) season was normal with an anomaly of  $+0.06^{\circ}\text{C}$  while during other seasons, it was above normal for winter (January to February) season (anomaly of  $+0.83^{\circ}\text{C}$ ), monsoon (June to September) season (anomaly of  $+0.74^{\circ}\text{C}$ ) and post-monsoon (October to December) season (anomaly of  $+1.0^{\circ}\text{C}$ ).

Heat wave conditions were observed over most parts of central, northwest India and East & Northeast India during the months of April and June.

The 2023 annual rainfall over the country as a whole was 95% of its Long Period Average (LPA) value for the period 1971-2020. The monsoon season rainfall over the country as a whole was 95% of its LPA. The seasonal rainfall during the Northeast monsoon season (October – December) over the NE Monsoon core region of the south peninsula was 94% of its LPA.

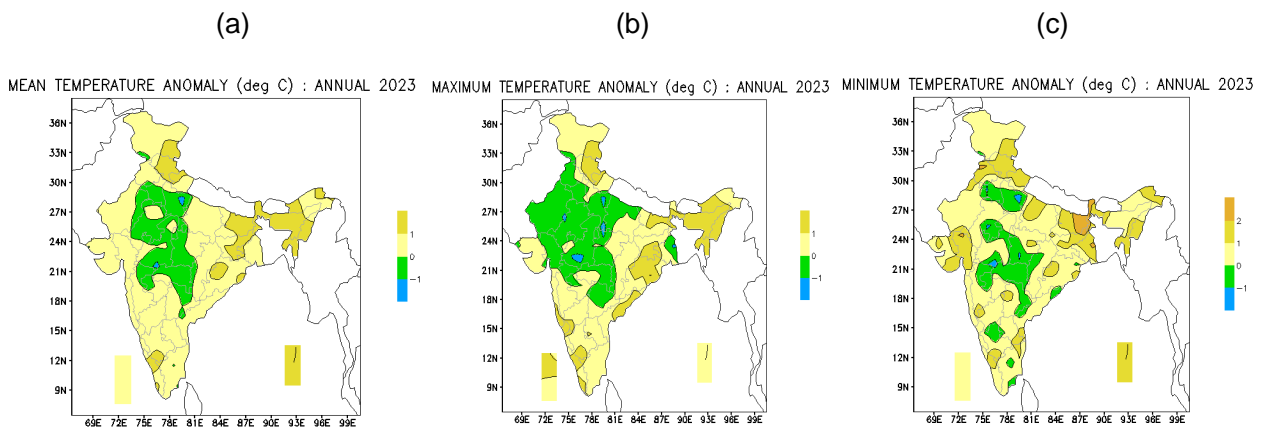
In 2023, there were 6 cyclones formed over the north Indian Ocean. Of these, 3 were Extremely Severe Cyclonic Storm “MOCHA”, “BIPARJOY” & “TEJ”, Two were Severe Cyclonic Storm “MICHAUNG” and MIDHILI, one was Very Severe Cyclonic Storm “HAMOON”. Of these, 4 cyclones Viz. MOCHA, HAMOON, MIDHILI, MICHAUNG formed over the Bay of Bengal & 2 cyclones Viz. BIPARJOY, TEJ formed over Arabian Sea.

Various parts of the country also experienced extreme weather events like extremely heavy rainfall, floods, landslide, lightning, thunderstorm, heat wave, snowfall, cold wave, hailstorm etc. which caused about 2450 deaths, out of which more than 1330 were due to lightning and thunderstorm.

## A) TEMPERATURE

### Annual:

Spatial pattern of annual mean, maximum and minimum temperature anomalies for 2023 are shown in (Fig. 1). During 2023, mean, minimum and maximum temperature anomalies over many parts of the country were generally in the range of  $\pm 1.0^{\circ}\text{C}$ . Mean temperature over parts of Ladakh state, Himachal Pradesh, Uttarakhand, Bihar, West Bengal state, Sikkim state, Arunachal Pradesh, Assam & Meghalaya, Nagaland, Manipur, Mizoram & Tripura, Jharkhand, Odisha, South Interior Karnataka, Kerala & Mahe and Andaman & Nicobar Islands was above normal by about  $1^{\circ}\text{C}$ . Maximum temperature over parts of Ladakh state, Himachal Pradesh, Uttarakhand, Bihar, West Bengal state, Arunachal Pradesh, Assam & Meghalaya, Nagaland, Manipur, Mizoram & Tripura, Jharkhand, Odisha, Coastal Andhra Pradesh & Yanam, Karnataka state, Konkan & Goa, Kerala & Mahe and Lakshadweep was above normal by about  $1^{\circ}\text{C}$ . However, maximum temperature over parts of East Rajasthan, Uttar Pradesh state, Madhya Pradesh state and Gangetic West Bengal was below normal by about  $1^{\circ}\text{C}$ . Minimum temperature over parts of Punjab, Gujarat region, West Bengal state, Sikkim state and Bihar was above normal by about  $2^{\circ}\text{C}$ . However, minimum temperature over parts of Madhya Pradesh state, Haryana, Chandigarh & Delhi and West Uttar Pradesh was below normal by about  $1^{\circ}\text{C}$ .



चित्र. १: २०२३ के लिए वार्षिक तापमान विसंगतियाँ (डिग्री सेल्सियस), (ए) औसत (बी) अधिकतम और (सी) न्यूनतम तापमान (१९८१-२०१० के औसत के आधार पर)

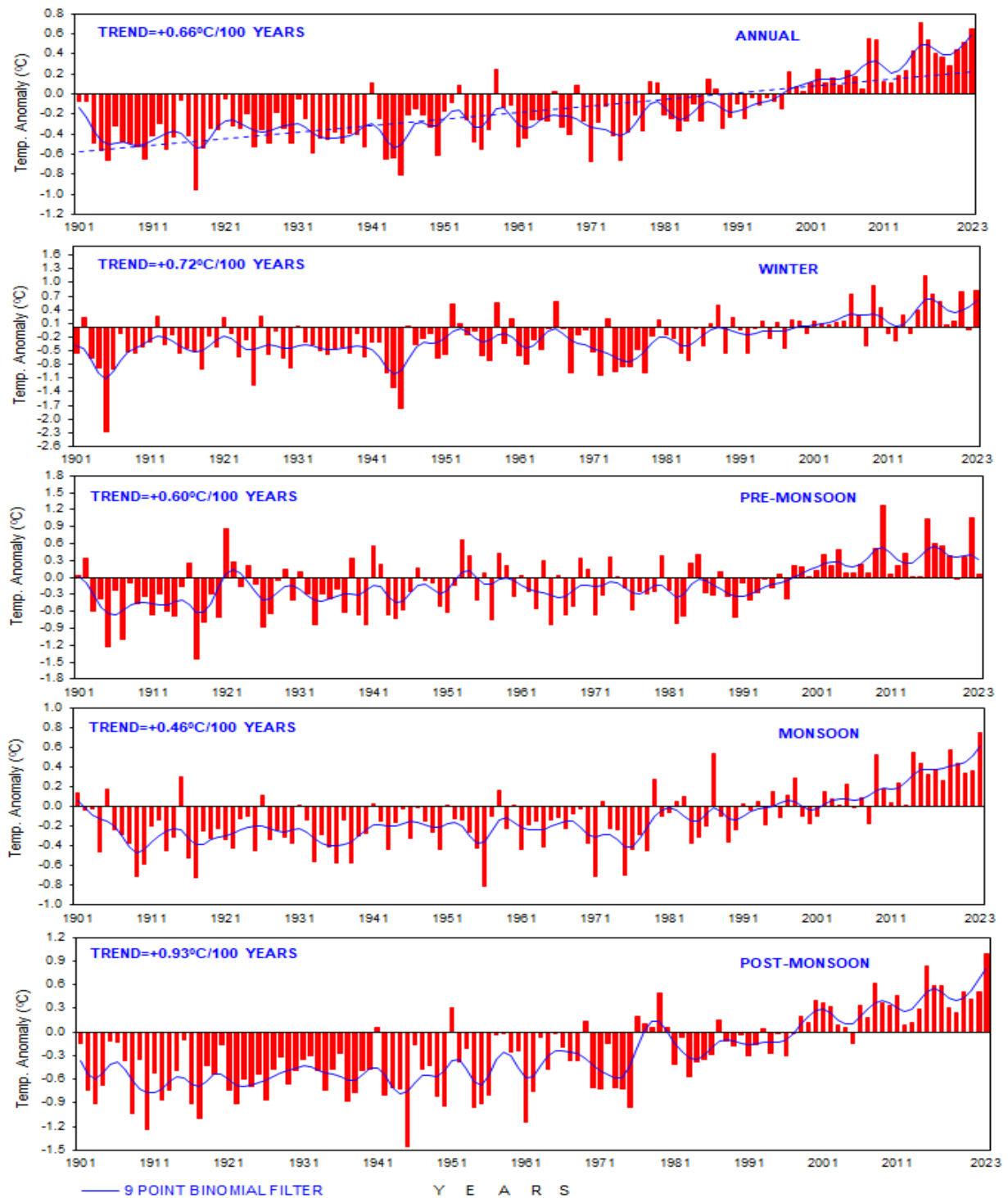
**Fig. 1: Annual temperature anomalies (°C) for 2023 (a) Mean temperature (b) Maximum temperature and (c) Minimum temperature. (Based on 1981-2010 Average)**

The annual mean land surface air temperature for the country during the year 2023 was  $+0.65^{\circ}\text{C}$  above the 1981-2010 average, thus making the year 2023 the second warmest year on record since 1901 (Fig. 2). The five warmest years on record, in descending order were 2016 ( $+0.71^{\circ}\text{C}$ ) 2023( $+0.65^{\circ}\text{C}$ ), 2009( $+0.55^{\circ}\text{C}$ ), 2017 ( $+0.541^{\circ}\text{C}$ ) and 2010 ( $+0.539^{\circ}\text{C}$ ). It may be mentioned that 12 out of the 15 warmest years were during the recent 15 years (2009-2023). The past decade (2013-2022 / 2014-2023) was also the warmest decade on record with the decadal averaged annual mean temperature anomaly (Actual -LPA) of  $+0.41^{\circ}\text{C}$  /  $+0.46^{\circ}\text{C}$ . The country averaged annual mean temperature during 1901-2023 showed a significant increasing trend of  $0.66^{\circ}\text{C}$  / 100 years (Fig. 2). During the year 2023 a significant increasing trend was observed in maximum temperature ( $1.01^{\circ}\text{C}$  / 100 years) and in minimum temperature ( $0.31^{\circ}\text{C}$  / 100 years).

The country averaged seasonal mean temperature was normal during the pre-monsoon season (March-May, with an anomaly of  $+0.06^{\circ}\text{C}$ ), while the winter season (January- February, with an anomaly of  $+0.83^{\circ}\text{C}$ ), monsoon season (June- September, with an anomaly of  $+0.74^{\circ}\text{C}$ ) and post-monsoon season (October- December, with anomaly  $+1.0^{\circ}\text{C}$ ) were above normal.

The monthly mean temperatures for the country during 2023 was above normal for the ten months of the year, except for April and May (anomaly  $0.1^{\circ}\text{C}$ ,  $-0.27^{\circ}\text{C}$  respectively), where it was normal / below normal. The All India mean temperature during the month of February was second highest with an anomaly of  $+1.36^{\circ}\text{C}$ , August was highest with an anomaly of  $+0.90^{\circ}\text{C}$ , September was highest with an anomaly of  $+0.91^{\circ}\text{C}$ , November was highest with an anomaly of  $+1.05^{\circ}\text{C}$  and December was also highest with an anomaly of  $+1.52^{\circ}\text{C}$  since 1901. The maximum temperature was the highest (with an anomaly of  $+1.86^{\circ}\text{C}$ ) and minimum temperature was the fifth highest (with an anomaly of  $+0.87^{\circ}\text{C}$ ) for the month of February since 1901. The maximum temperature was the highest (with an anomaly of  $+1.10^{\circ}\text{C}$ ) and minimum temperature was the second highest (with an anomaly of  $+0.69^{\circ}\text{C}$ ) for the month of August since 1901. The maximum temperature was second highest (with an anomaly of  $+0.86^{\circ}\text{C}$ ) and minimum temperature was highest (with an anomaly of  $+0.96^{\circ}\text{C}$ ) for the month of September since 1901. The maximum temperature was third highest (with an anomaly of  $+0.61^{\circ}\text{C}$ ) and minimum temperature was also third highest (with an anomaly of  $+1.48^{\circ}\text{C}$ ) for the month of November since 1901. The minimum temperature was the second highest (with an anomaly  $+0.57^{\circ}\text{C}$ ) for the month of July since 1901. The maximum temperature was third highest (with an anomaly  $+0.93^{\circ}\text{C}$ ) for the month of October since 1901. The minimum temperature was highest (with an anomaly of  $+1.71^{\circ}\text{C}$ ) for the month of December since 1901.



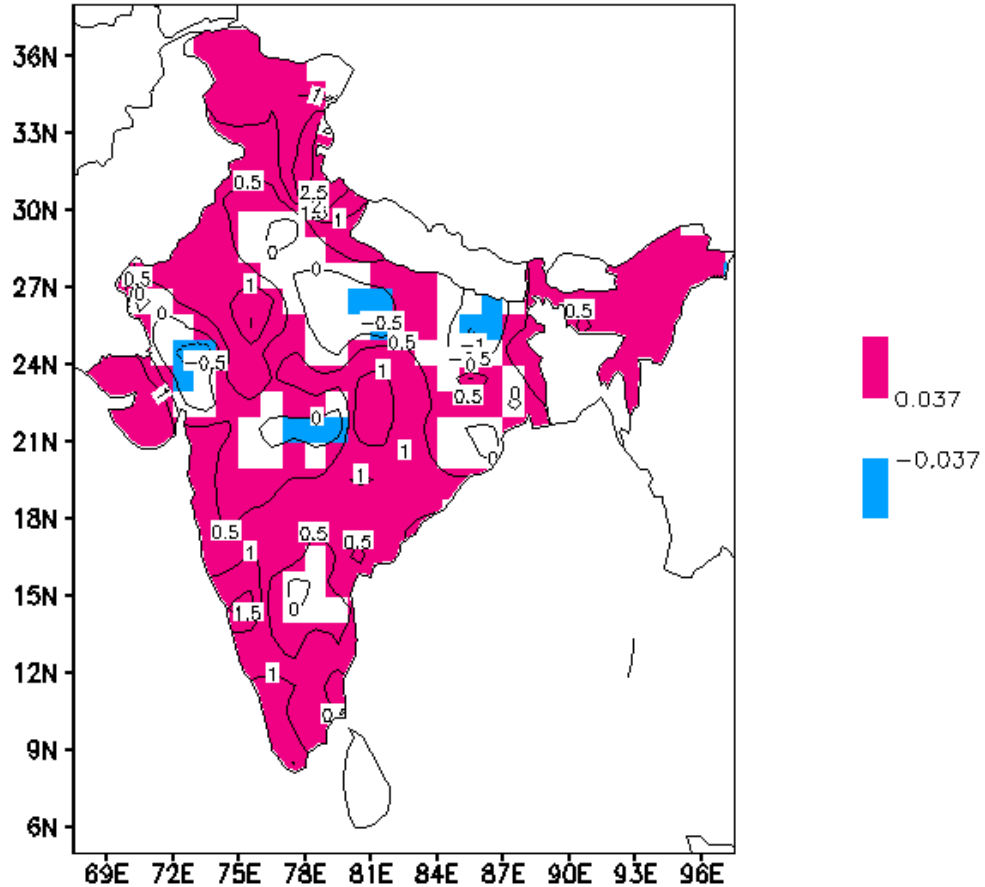


चित्र. २: पुरे भारत की औसत तापमान विसंगतियाँ (ए) वार्षिक (बी) शीतकालीन (सी) प्री-मानसून (डी) मानसून (ई) पोस्ट मानसून १९०१ - २०२३ की अवधि के लिए ऊर्ध्वाधर सलाखों के रूप में दिखाया गया है। ठोस नीले वक्र में द्विपद फ़िल्टर (१९८१ - २०१० के औसत से विचलन) के साथ उप-दशकीय समय पैमाने में बदलाव थे।

**Fig. 2: All India mean temperature anomalies (a) Annual (b) Winter (c) Pre-monsoon (d) SW-monsoon (e) Post-monsoon for the period 1901 - 2023 shown as vertical bars. The solid blue curve exhibits sub-decadal time scale variations that have been smoothed with a Binomial Filter (Departures from the 1981 - 2010 average)**

Spatial pattern of trend in mean annual temperature anomalies based on the data for the period 1901-2023 (Fig. 3) suggests significant positive (increasing) trend over most parts of the country, except for some parts of Bihar, East Uttar Pradesh, East Madhya Pradesh, Vidarbha and Gujarat region, where significant negative (decreasing) trend was observed.

### ANNUAL MEAN TEMP ANOM TREND(1901–2023)



चित्र. ३: वार्षिक औसत तापमान विसंगति रुझान (डिग्री सेल्सियस / १०० वर्ष) को समोच्च रेखाओं के रूप में दिखाया गया है। ९५% स्तर पर महत्वपूर्ण रुझान रंगों के साथ छायांकित हैं। सकारात्मक रुझान लाल रंग में दिखाए जाते हैं जबकि नकारात्मक रुझान नीले रंग में दिखाए जाते हैं। विश्लेषण की अवधि: १९०१-२०२३

Fig. 3: Annual mean temperature anomaly trends ( $^{\circ}\text{C} / 100$  years) are shown as contour lines. The trends significant at 95% level are shaded with colours. Positive trends are shown in red while the negative trends are shown in blue. Period of analysis: 1901 -2023

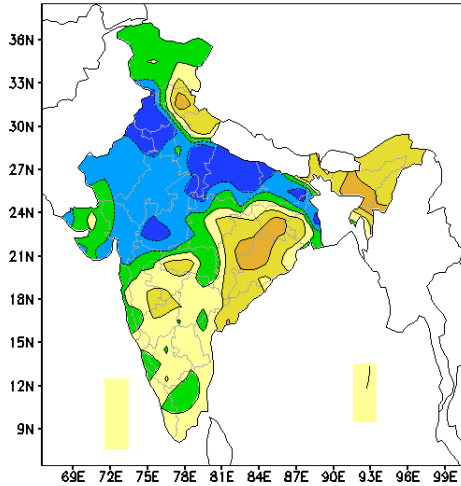
The spatial pattern of monthly maximum and minimum temperature anomalies during each month of the season are discussed below (Figures 4(a) to 4(l)).

#### January - February (Winter Season):

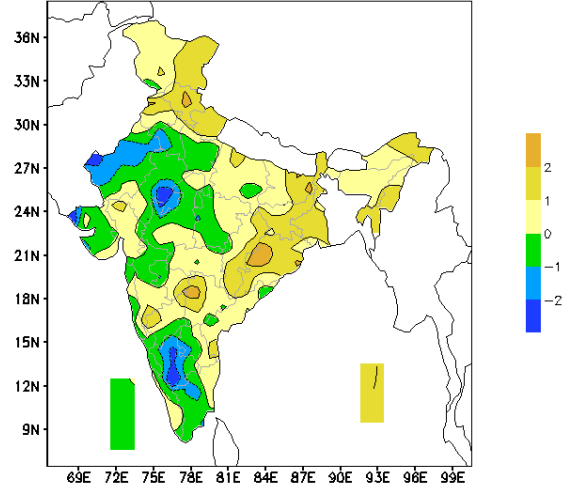
During January, the maximum temperature anomaly was more than  $2^{\circ}\text{C}$  over parts of Himachal Pradesh, Assam & Meghalaya, Manipur, Mizoram, Jharkhand, Chhattisgarh, and Odisha. Maximum temperature anomaly was less than  $-2^{\circ}\text{C}$  over parts of Punjab, West Rajasthan, Haryana, Chandigarh & Delhi, Uttar Pradesh state, West Madhya Pradesh, Bihar, Jharkhand, and Gangatic West Bengal.

The minimum temperature anomaly was more than  $2^{\circ}\text{C}$  over parts of Himachal Pradesh, Bihar, Telangana, Chhattisgarh and Odisha. The minimum temperature anomaly was less than  $-2^{\circ}\text{C}$  over parts of Rajasthan state, Saurashtra & Kutch and South Interior Karnataka.

MAX TEMP ANOMALY (deg C) : JAN 2023



MIN TEMP ANOMALY (deg C) : JAN 2023

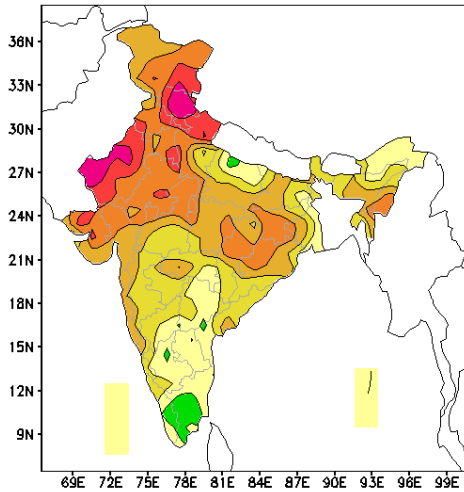


चित्र ४(ए): जनवरी २०२३ के लिए अधिकतम और न्यूनतम तापमान विसंगतियाँ (°C) स्थानिक आलेख  
Fig. 4(a): Maximum and Minimum temperature anomalies (°C) spatial plots for January 2023

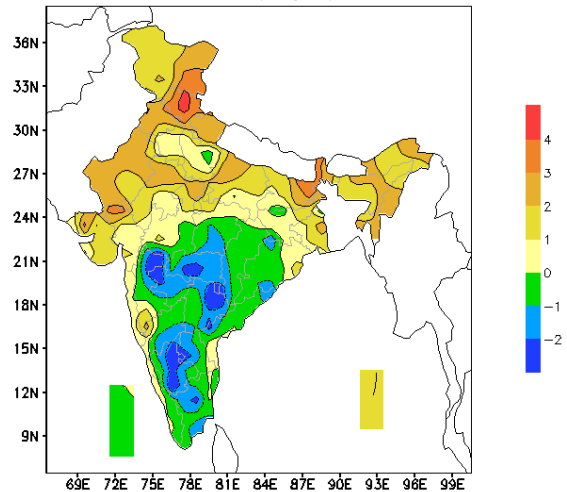
During February, the maximum temperature anomaly was more than 5°C over parts of Ladakh state, Himachal Pradesh and West Rajasthan. Maximum temperature anomaly was more than 4°C over parts of Ladakh state, Himachal Pradesh, Uttarakhand, Rajasthan state, Punjab, Haryana, Chandigarh & Delhi and Saurashtra & Kutch.

The minimum temperature anomaly was more than 4°C over parts of Himachal Pradesh. The minimum temperature anomaly was more than 3°C over parts of Ladakh state, Himachal Pradesh, Bihar, Sub Himalayan West Bengal & Sikkim and Gujarat region. The minimum temperature anomaly was less than -2°C over parts of Madhya Maharashtra, Marathwada, Vidarbha, Telangana, Andhra Pradesh state, South Interior Karnataka and Tamil Nadu, Puducherry & Karaikal.

MAX TEMP ANOMALY (deg C) : FEB 2023



MIN TEMP ANOMALY (deg C) : FEB 2023

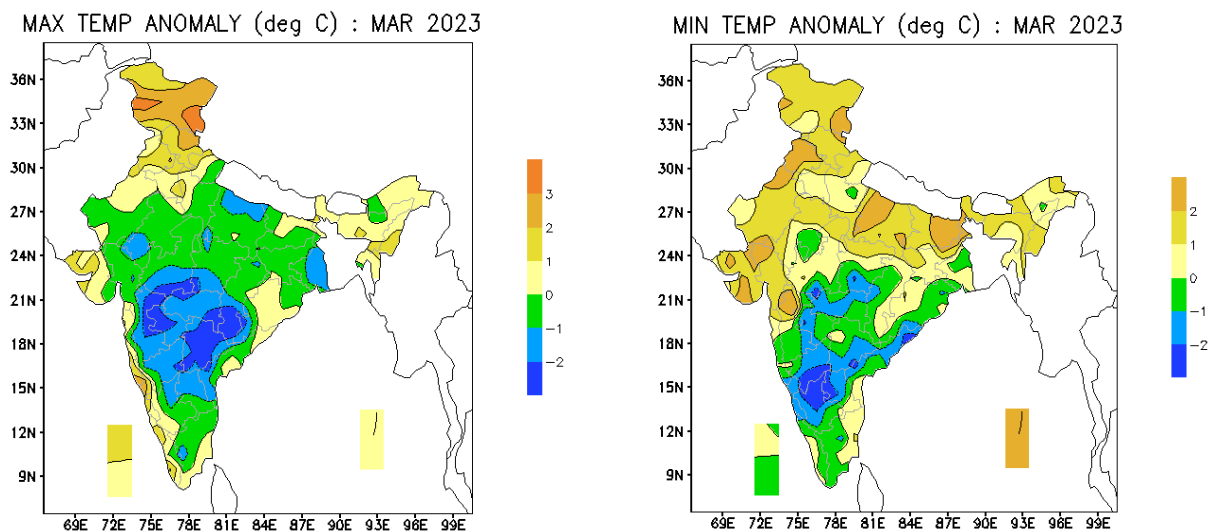


चित्र ४(बी): फरवरी २०२३ के लिए अधिकतम और न्यूनतम तापमान विसंगतियाँ (°C) स्थानिक आलेख  
Fig. 4(b): Maximum and Minimum temperature anomalies (°C) spatial plots for February 2023

### March - May (Pre-Monsoon Season):

During March, the maximum temperature anomaly was more than 3°C over parts of Jammu, Kashmir & Ladakh. Maximum temperature anomaly was more than 2°C over parts of Jammu, Kashmir & Ladakh, Goa state and Coastal Karnataka. Maximum temperature anomaly was less than -2°C over parts of southern Madhya Pradesh state, Madhya Maharashtra, Marathwada, Vidarbha, Chhattisgarh, Odisha, North Interior Karnataka, Coastal Andhra Pradesh & Yanam and Telangana.

The minimum temperature anomaly was more than 2°C over parts of Ladakh state, Punjab, West Rajasthan, Bihar, East Uttar Pradesh, Sub Himalayan West Bengal & Sikkim, Jharkhand, Gujarat state, Madhya Maharashtra and Andaman & Nicobar Islands. The minimum temperature anomaly was less than -2°C over parts of West Madhya Pradesh, South Interior Karnataka, North Interior Karnataka, Telangana and Andhra Pradesh state.

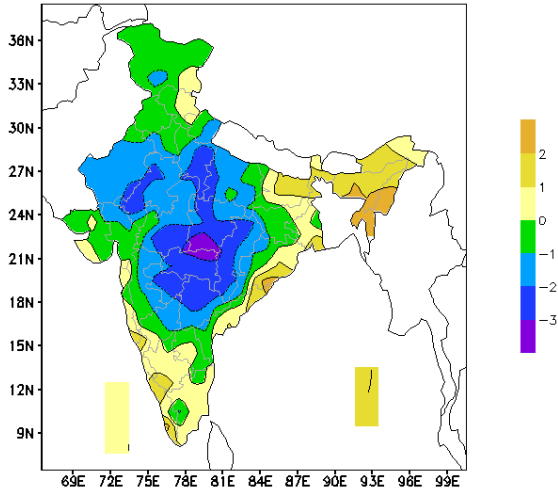


चित्र ४ (सी): मार्च २०२३ के लिए अधिकतम और न्यूनतम तापमान विसंगतियाँ (°C) स्थानिक आलेख  
Fig. 4(c): Maximum and Minimum temperature anomalies (°C) spatial plots for March 2023

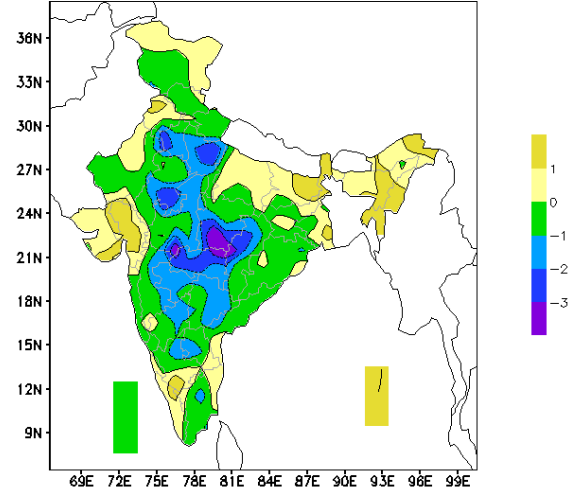
During April, the maximum temperature anomaly was more than 2°C over parts of Nagaland, Manipur, Mizoram, Tripura, Assam & Meghalaya, Odisha, Coastal Andhra Pradesh & Yanam and Kerala & Mahe. Maximum temperature anomaly was less than -3°C over parts of Vidarbha and southern Madhya Pradesh state.

The minimum temperature anomaly was more than 1°C over parts of East & Northeast India, Punjab, Gujarat state, North Interior Karnataka, Kerala & Mahe, Andaman & Nicobar Islands. The minimum temperature anomaly was less than -3°C over parts of southern Madhya Pradesh state, Vidarbha, and Chhattisgarh.

MAX TEMP ANOMALY (deg C) : APR 2023



MIN TEMP ANOMALY (deg C) : APR 2023

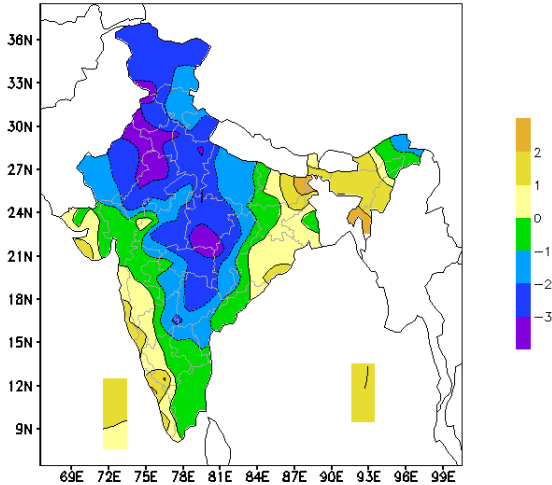


चित्र ४ (डी): अप्रैल २०२३ के लिए अधिकतम और न्यूनतम तापमान विसंगतियाँ (°C) स्थानिक आलेख  
 Fig. 4(d): Maximum and Minimum temperature anomalies (°C) spatial plots for April 2023

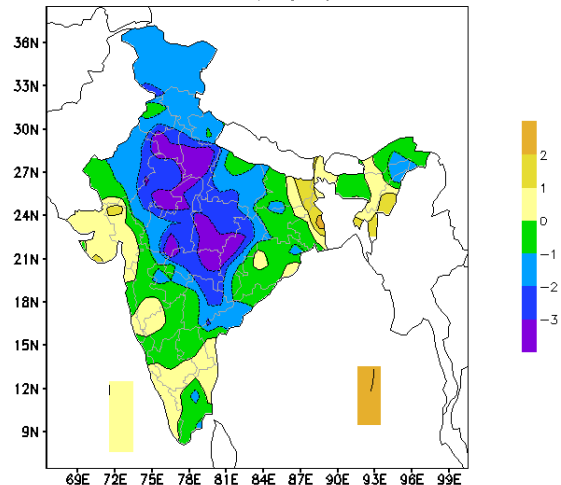
During May, the maximum temperature anomaly was more than 2°C over parts of Mizoram, Tripura, Sub Himalayan West Bengal, Bihar and Kerala & Mahe. Maximum temperature anomaly was less than -3°C over parts of Jammu & Kashmir, Punjab, Haryana, Chandigarh & Delhi, Rajasthan state, East Madhya Pradesh, Chhattisgarh and Vidarbha.

The minimum temperature anomaly was more than 2°C over parts of Gangatic West Bengal and Andaman & Nicobar Islands. Minimum temperature anomaly was less than -3°C over parts of Haryana, Chandigarh & Delhi, Rajasthan state, West Uttar Pradesh, Madhya Pradesh state, Chhattisgarh and Vidarbha.

MAX TEMP ANOMALY (deg C) : MAY 2023



MIN TEMP ANOMALY (deg C) : MAY 2023

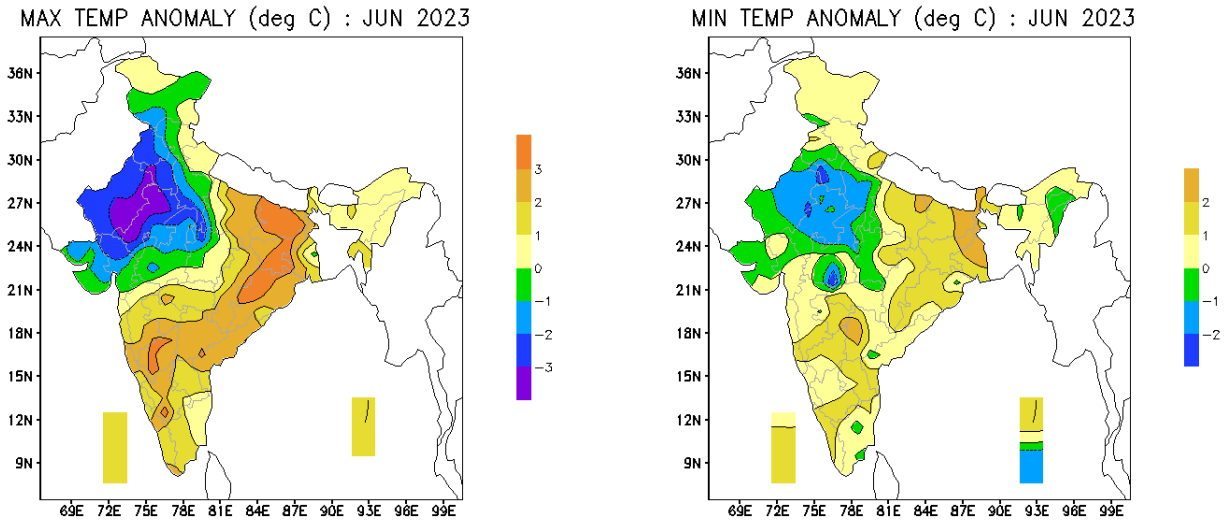


चित्र ४ (ई): मई २०२३ के लिए अधिकतम और न्यूनतम तापमान विसंगतियाँ (°C) स्थानिक आलेख  
 Fig. 4(e): Maximum and Minimum temperature anomalies (°C) spatial plots for May 2023

**June - September (South-west Monsoon Season):**

During June, the maximum temperature anomaly was more than 3°C over parts of Bihar, Jharkhand, Gangatic West Bengal, Chhattisgarh, Odisha, northern Coastal Andhra Pradesh & Yanam, South Interior Karnataka and North Interior Karnataka. Maximum temperature anomaly was less than -3°C over parts of Haryana, Chandigarh & Delhi and Rajasthan state.

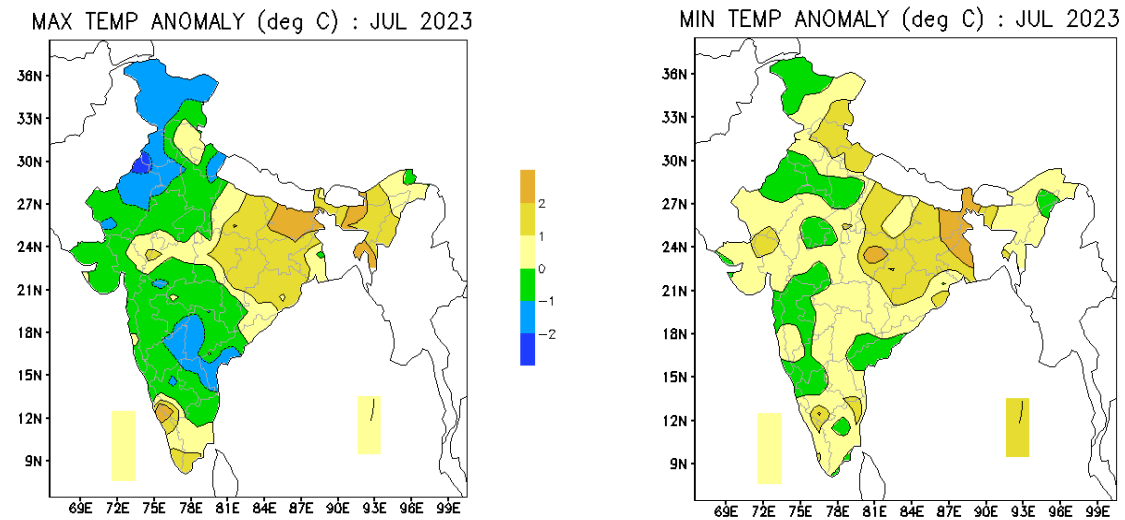
The minimum temperature anomaly was more than 2°C over parts of Gangatic West Bengal state, Sikkim state, Bihar, East Uttar Pradesh, Jharkhand, Marathawada, extreme northern North Interior Karnataka and Telangana. Minimum temperature anomaly was less than -2°C over parts of Haryana, Chandigarh & Delhi, Rajasthan state, and West Madhya Pradesh.



चित्र ४ (एफ): जून २०२३ के लिए अधिकतम और न्यूनतम तापमान विसंगतियाँ (°C) स्थानिक आलेख  
**Fig. 4(f): Maximum and Minimum temperature anomalies (°C) spatial plots for June 2023**

During July, the maximum temperature anomaly was more than 2°C over parts of Bihar, Sub Himalayan West Bengal, Assam & Meghalaya, Arunachal Pradesh, Mizoram, Tripura, Kerala & Mahe and South Interior Karnataka. Maximum temperature anomaly was less than -2°C over parts of Punjab and west Rajasthan.

The minimum temperature anomaly was more than 2°C over parts of West Bengal state, Sikkim state, Jharkhand, and east Madhya Pradesh.

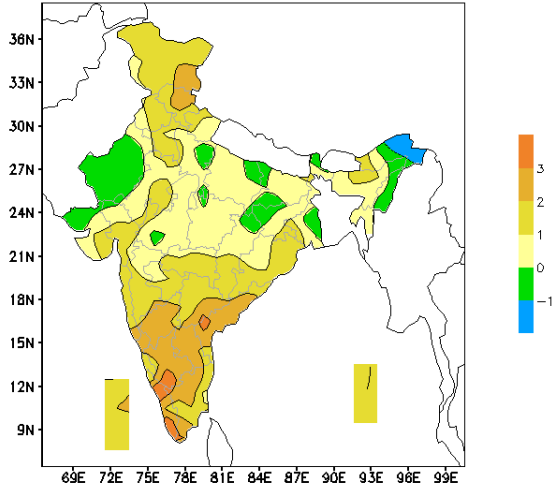


चित्र ४ (जी): जुलाई २०२३ के लिए अधिकतम और न्यूनतम तापमान विसंगतियाँ (°C) स्थानिक आलेख  
**Fig. 4(g): Maximum and Minimum temperature anomalies (°C) spatial plots for July 2023**

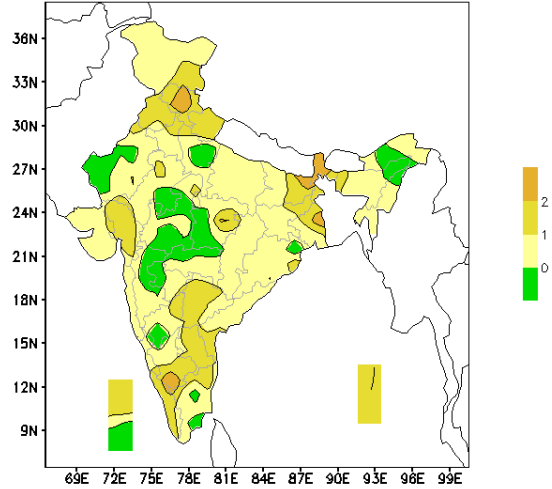
During August, the maximum temperature anomaly was more than 3°C over parts of Coastal Andhra Pradesh & Yanam, Tamil Nadu, Puducherry & Karaikal, South Interior Karnataka and Kerala & Mahe. Maximum temperature anomaly was less than -1°C over parts of Arunachal Pradesh.

The minimum temperature anomaly was more than 2°C over parts of Himachal Pradesh, West Bengal state, Sikkim state, Bihar, Kerala & Mahe, Tamil Nadu, Puducherry & Karaikal and South Interior Karnataka.

MAX TEMP ANOMALY (deg C) : AUG 2023



MIN TEMP ANOMALY (deg C) : AUG 2023

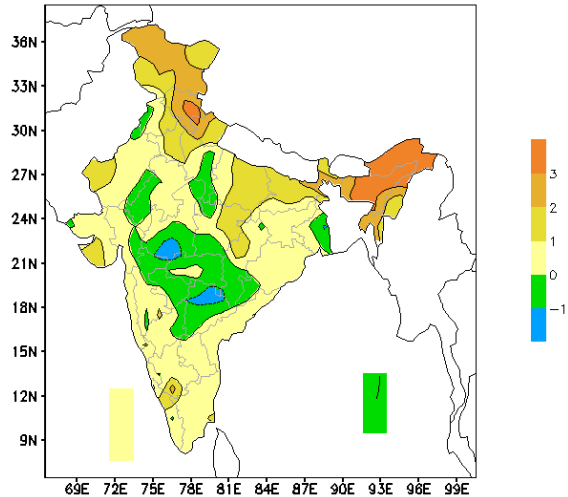


चित्र ४ (एच): अगस्त २०२३ के लिए अधिकतम और न्यूनतम तापमान विसंगतियाँ (°C) स्थानिक आलेख  
Fig. 4(h): Maximum and Minimum temperature anomalies (°C) spatial plots for August 2023

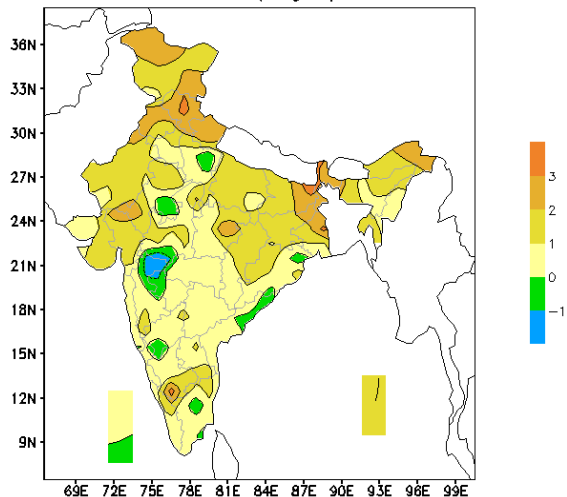
During September, the maximum temperature anomaly was more than 3°C over parts of Himachal Pradesh, Uttarakhand, Arunachal Pradesh, Assam & Meghalaya and Nagaland. Maximum temperature anomaly was less than -1°C over parts of East Madhya Pradesh, Vidarbha and Telangana.

The minimum temperature anomaly was more than 3°C over parts Gangatic West Bengal, Bihar, Himachal Pradesh and South Interior Karnataka. Minimum temperature anomaly was less than -1°C over parts of East Madhya Pradesh, Madhya Maharashtra and Marathwada.

MAX TEMP ANOMALY (deg C) : SEP 2023



MIN TEMP ANOMALY (deg C) : SEP 2023



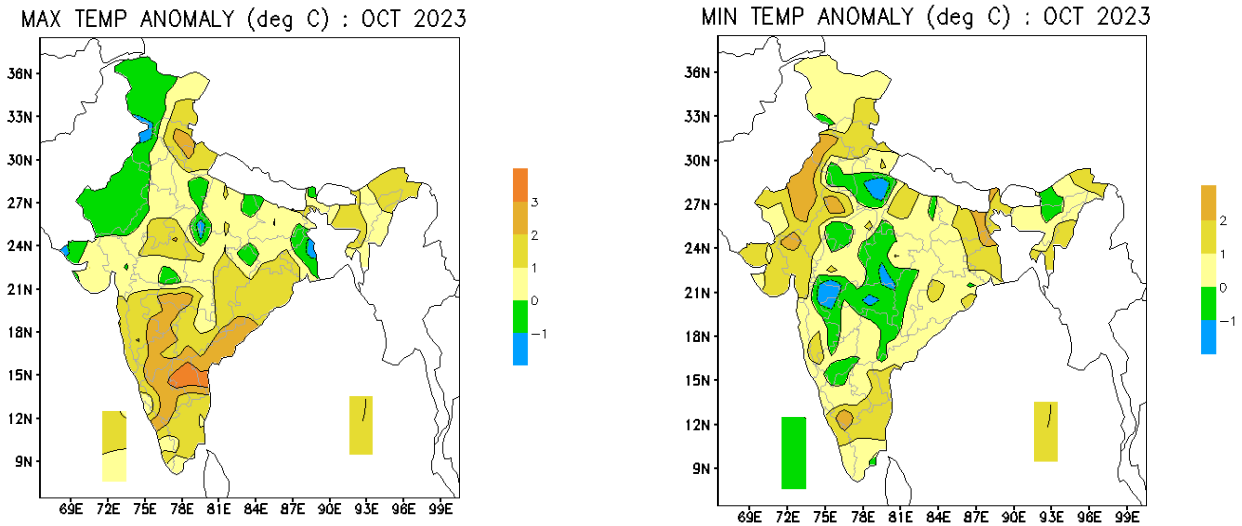
चित्र ४ (आय): सितंबर २०२३ के लिए अधिकतम और न्यूनतम तापमान विसंगतियाँ (°C) स्थानिक आलेख  
Fig. 4(i): Maximum and Minimum temperature anomalies (°C) spatial plots for September 2023

### October - December (Post-Monsoon Season):

During October, the maximum temperature anomaly was more than 3°C over parts of Andhra Pradesh state and South Interior Karnataka. Maximum temperature anomaly was more than 2°C over parts of Himachal Pradesh, Uttarakhand, Maharashtra state (except Konkan), Karnataka state, southern Odisha, Telangana, Andhra Pradesh state and Kerala & Mahe. Maximum temperature

anomaly was less than  $-1^{\circ}\text{C}$  over parts of Jammu & Kashmir state, Punjab, Saurashtra & Kutch, East Uttar Pradesh, East Madhya Pradesh and Gangatic West Bengal.

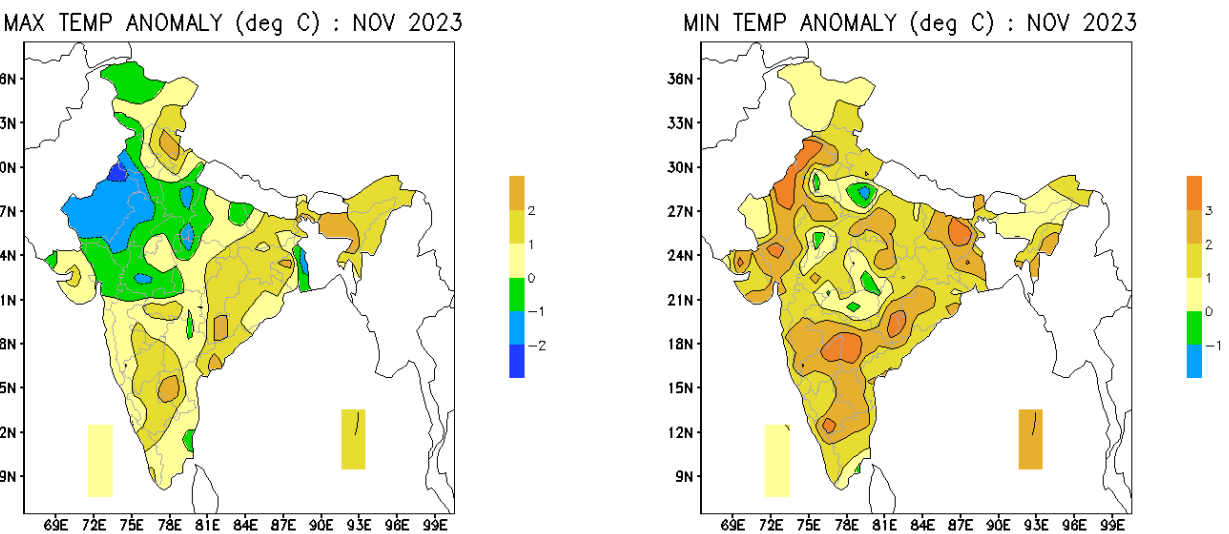
The minimum temperature anomaly was more than  $2^{\circ}\text{C}$  over parts of Punjab, Jharkhand, West Bengal state, Sikkim state, Bihar, Rajasthan state, Gujarat region, Kerala & Mahe and South Interior Karnataka. Minimum temperature anomaly was less than  $-1^{\circ}\text{C}$  over parts of West Uttar Pradesh, Madhya Pradesh state, Maharashtra state (except Konkan).



चित्र ४ (जे): अक्टूबर २०२३ के लिए अधिकतम और न्यूनतम तापमान विसंगतियाँ ( $^{\circ}\text{C}$ ) स्थानिक आलेख  
 Fig. 4(j): Maximum and Minimum temperature anomalies ( $^{\circ}\text{C}$ ) spatial plots for October 2023

During November, the maximum anomaly was more than  $2^{\circ}\text{C}$  over parts of Himachal Pradesh, Uttarakhand, Assam & Meghalaya, West Bengal state, Odisha, Chhattisgarh and Andhra Pradesh state. Maximum temperature anomaly was less than  $-2^{\circ}\text{C}$  over parts of Punjab and West Rajasthan.

The minimum temperature anomaly was more than  $3^{\circ}\text{C}$  over parts of Punjab, West Rajasthan, Gujarat state, Bihar, Jharkhand, Chhattisgarh, Odisha, Gangatic West Bengal, Telangana, North Interior Karnataka and South Interior Karnataka. Minimum temperature anomaly was less than  $-1^{\circ}\text{C}$  over parts of West Uttar Pradesh.



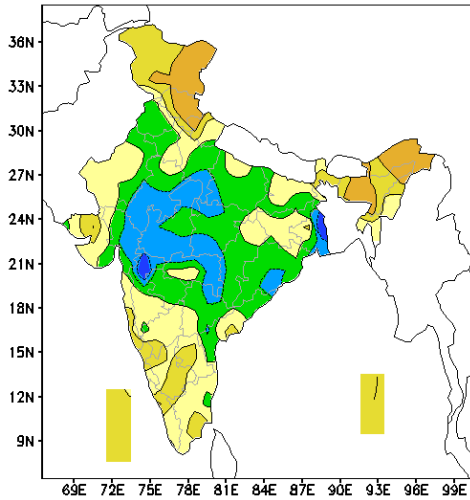
चित्र ४ (के): नवंबर २०२३ के लिए अधिकतम और न्यूनतम तापमान विसंगतियाँ ( $^{\circ}\text{C}$ ) स्थानिक आलेख  
 Fig. 4(k): Maximum and Minimum temperature anomalies ( $^{\circ}\text{C}$ ) spatial plots for November 2023



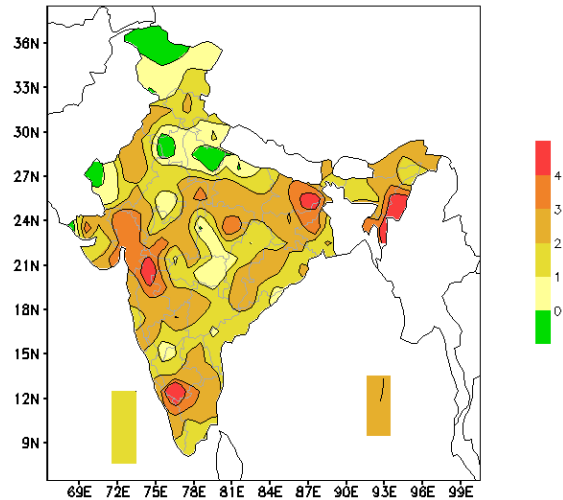
During December, the maximum temperature anomaly was more than 2°C over parts of Jammu, Kashmir & Ladakh, Himachal Pradesh, Uttarakhand, Assam & Meghalaya and Arunachal Pradesh. Maximum temperature anomaly was less than -2°C over parts of Gangatic West Bengal and Madhya Maharashtra.

The minimum temperature anomaly was more than 4°C over parts of Bihar, Jharkhand, Nagaland, Manipur, Mizoram, Madhya Maharashtra, South Interior Karnataka and Kerala & Mahe. Minimum temperature anomaly was more than 3°C over parts of Bihar, Jharkhand, Gangatic West Bengal, Nagaland, Manipur, Mizoram, Tripura, Madhya Pradesh state, East Rajasthan, Gujarat state, Madhya Maharashtra, South Interior Karnataka, Tamil Nadu, Puducherry & Karaikal and Kerala & Mahe.

MAX TEMP ANOMALY (deg C) : DEC 2023

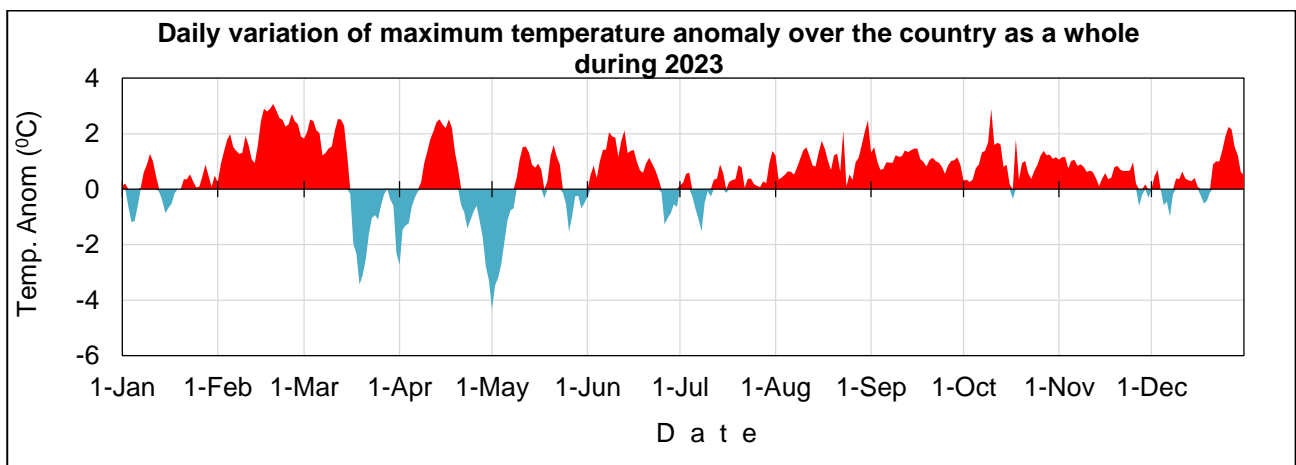


MIN TEMP ANOMALY (deg C) : DEC 2023

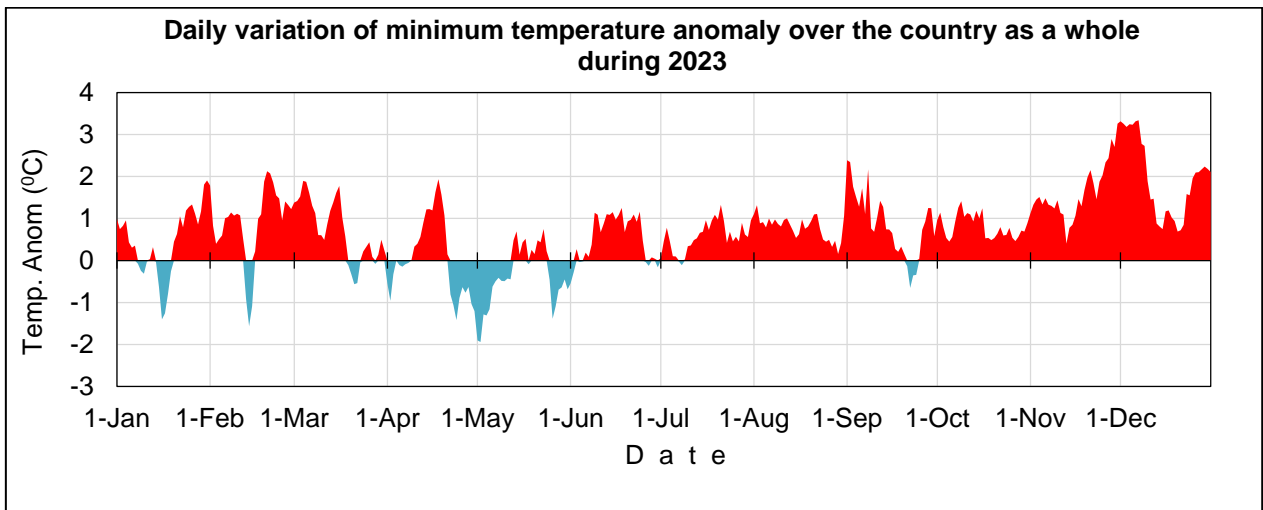


चित्र ४ (एल): दिसंबर २०२३ के लिए अधिकतम और न्यूनतम तापमान विसंगतियाँ (°C) स्थानिक आलेख  
**Fig. 4(l): Maximum and Minimum temperature anomalies (°C) spatial plots for December 2023**

Fig. 5 (a & b) shows daily variation of maximum & minimum temperature anomalies during the year 2023, respectively. The anomalies were computed with respect to the base period of 1981-2010. All India was warmer both in respect of maximum & minimum temperature during all the months for this year except January, March and May.

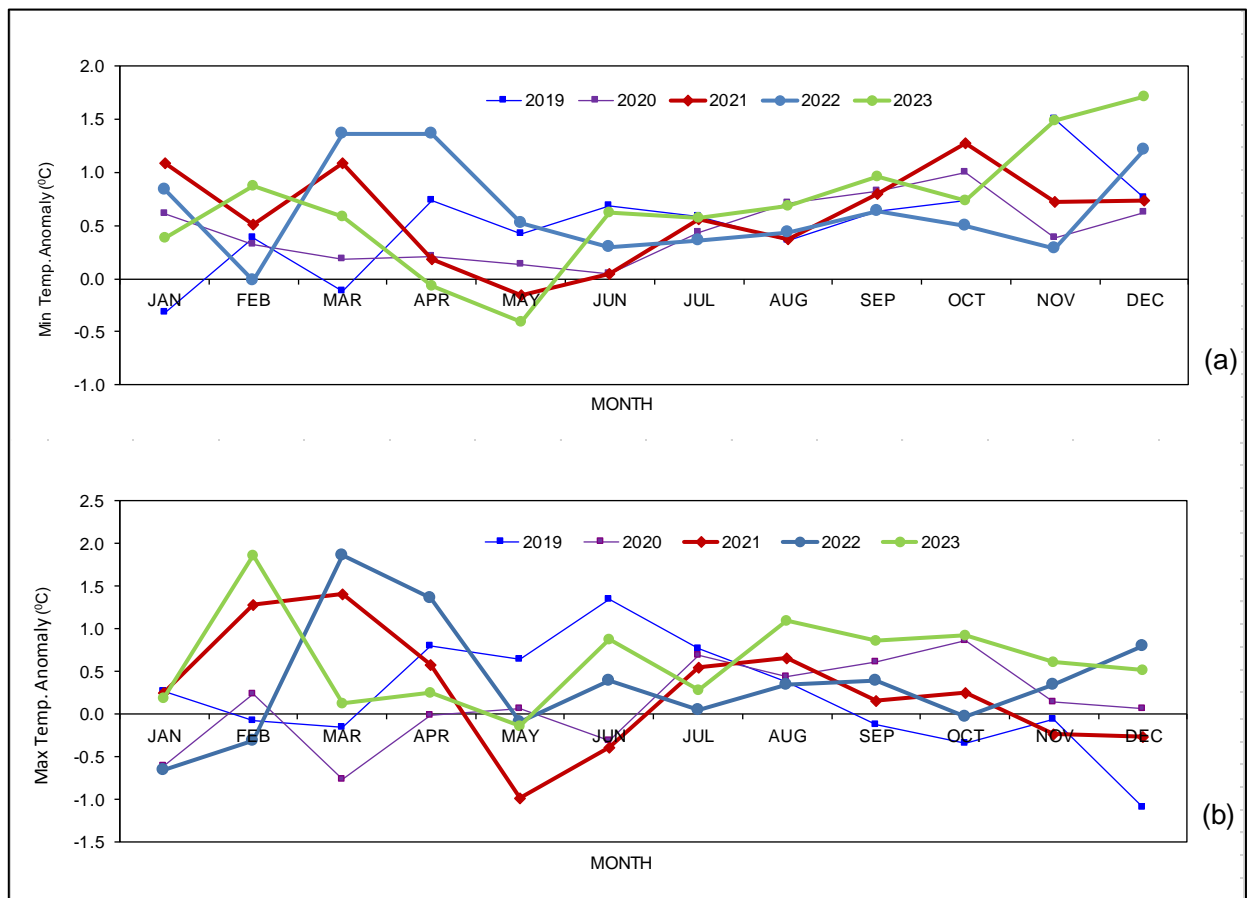


आकृती ५(ए): २०२३ के दौरान भारत में अधिकतम तापमान विसंगतियों की दैनिक भिन्नता  
**Fig. 5(a): Daily variation of maximum temperature anomaly (°C) over the country during 2023**



आकृती ५ (बी): २०२३ के दौरान भारत में न्यूनतम तापमान विसंगतियों की दैनिक भिन्नता  
 Fig. 5(b): Daily variation of minimum temperature anomaly (°C) over the country during 2023

Fig. 6 (a) and (b) respectively shows the monthly minimum and maximum temperature anomaly for the country as a whole during past five years (2019-2023). In respect of minimum temperature, month of February, September and December were warmest in last five years, while February, August, September, October and November were warmest in respect of maximum temperature during the last five years.



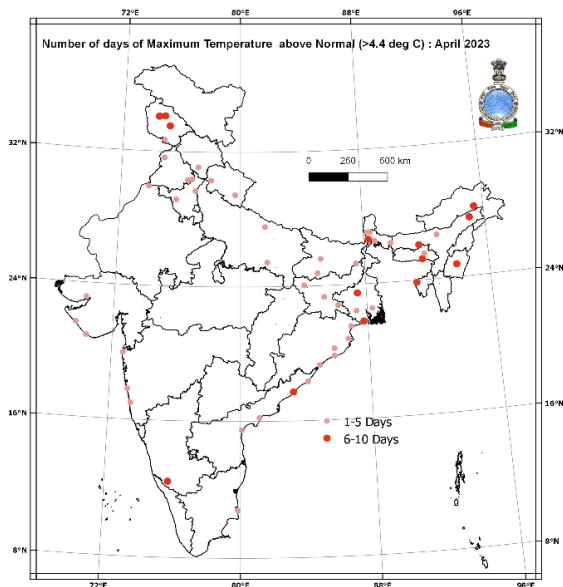
चित्र ६: औसत मासिक (ए) न्यूनतम (बी) अधिकतम तापमान विसंगतियाँ (२०१९-२०२३)  
 Fig. 6: Mean monthly (a) minimum (b) maximum temperature anomalies (2019-2023)

## Heat Wave Conditions:

In the month of April, the heat wave/severe heat wave conditions were observed mainly over parts of Bihar, Gangetic West Bengal, Sub Himalayan West Bengal & Sikkim, Coastal Andhra Pradesh, Odisha, Punjab, Haryana, Chandigarh & Delhi, Jharkhand and Uttar Pradesh during 13 - 19 April.

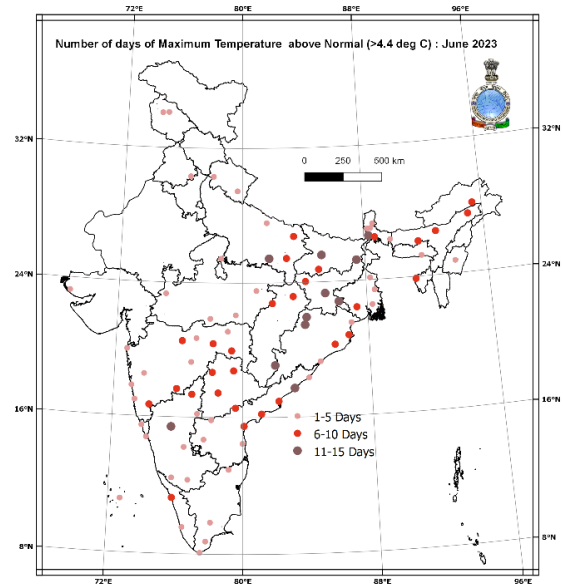
In the month of June, the heat wave/severe heat wave conditions were observed mainly over parts of east and northeast India, northwest India, Gujarat Region, Madhya Pradesh state and Andaman and Nicobar Islands.

Maximum temperature was above normal by  $4.4^{\circ}\text{C}$  mainly over most parts of East & Northeast India, Northwest India, some parts of Central India and South Peninsular India during April 2023. Maximum temperature was above normal by  $4.4^{\circ}\text{C}$  mainly over most parts of East & Northeast India, South Peninsular India, Central India and some parts North India during June 2023. Figure 7(a) and 7(b) show the stations with number of days, which were above normal ( $>4.4^{\circ}\text{C}$ ) maximum temperatures during April and June 2023.



चित्र ७ (ए): अप्रैल २०२३ के लिए पूरे देश में अधिकतम तापमान सामान्य ( $>4.4$  डिग्री सेल्सियस) से ऊपर है

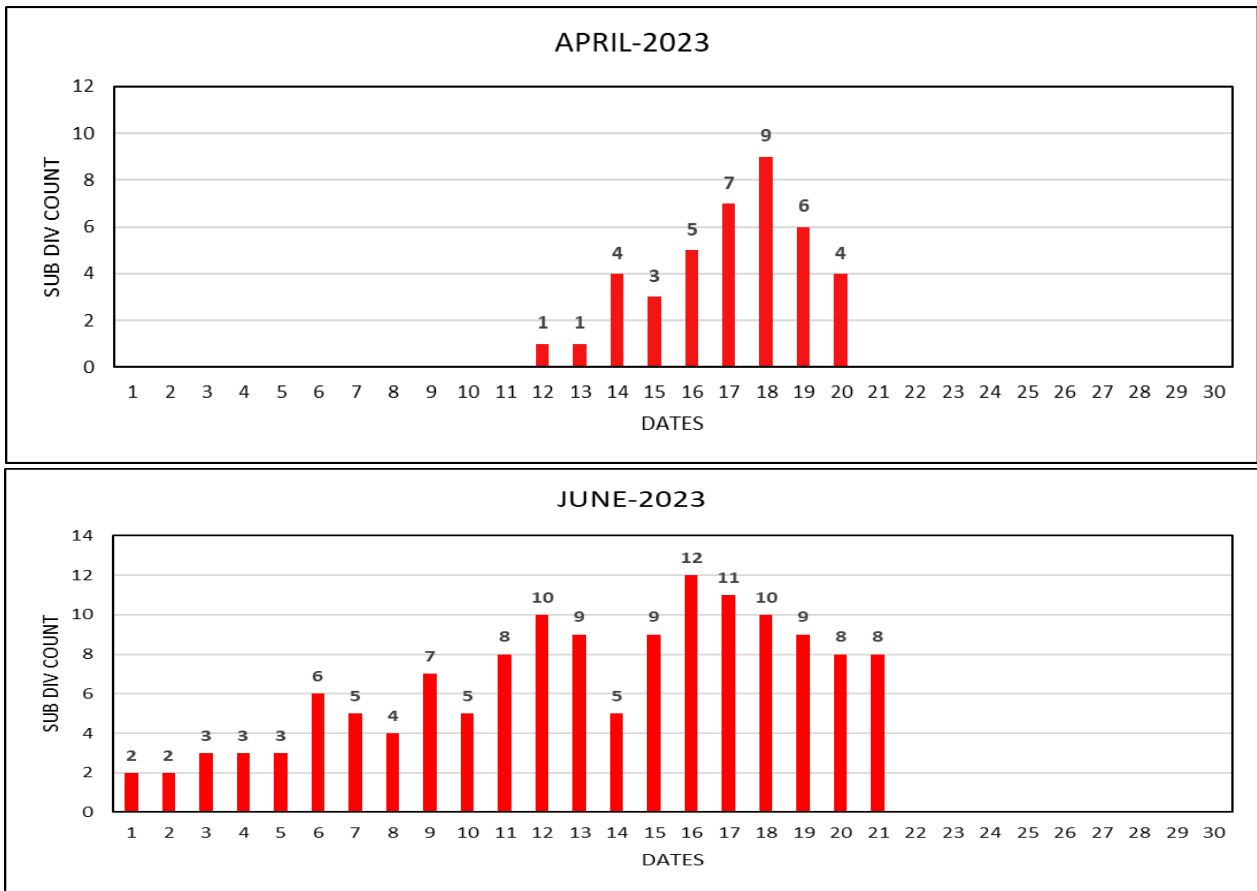
Fig. 7 (a): The Maximum temperature above normal ( $>4.4^{\circ}\text{C}$ ) over the country as a whole for April 2023



चित्र ७ (बी): जून २०२३ के लिए पूरे देश में अधिकतम तापमान सामान्य ( $>4.4$  डिग्री सेल्सियस) से ऊपर है

Fig. 7 (b): The Maximum temperature above normal ( $>4.4^{\circ}\text{C}$ ) over the country as a whole for June 2023

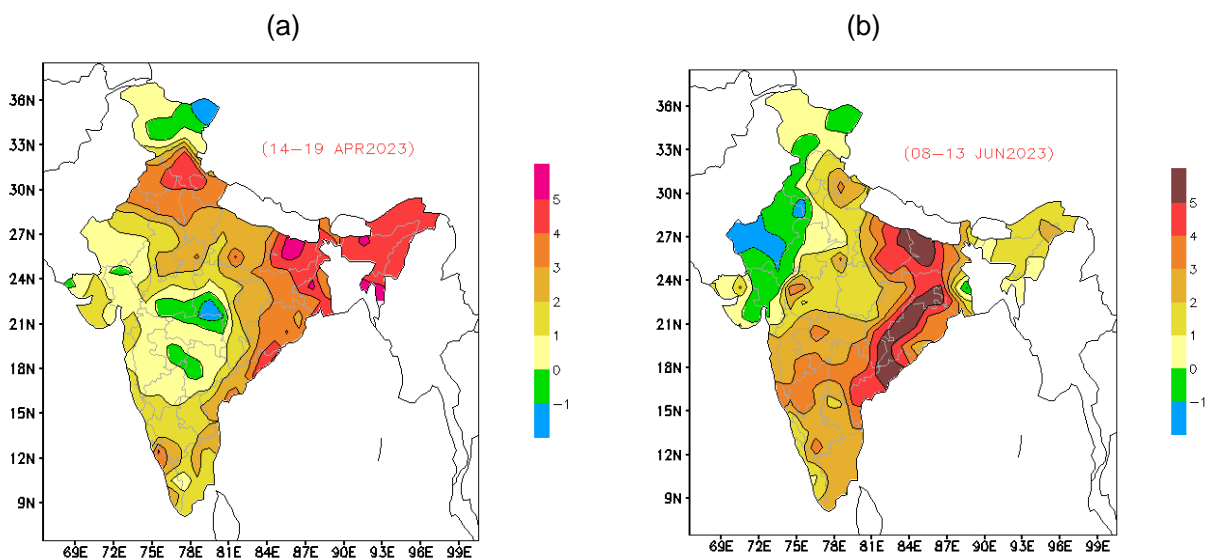
Number of subdivisions that reported heat wave / severe heat wave during April and June 2023 is shown in the fig. 8.



चित्र ८: अप्रैल और जून २०२३ के दौरान उप-प्रभागवार हीट वेव की गिनती

Fig. 8: Number of subdivisions that reported heat wave / severe heat wave during April and June 2023.

Fig. 9(a,b) shows the maximum temperature anomaly diagram for the duration when heat wave condition was at its peak during 14-19 April 2023 and 08-13 June 2023.

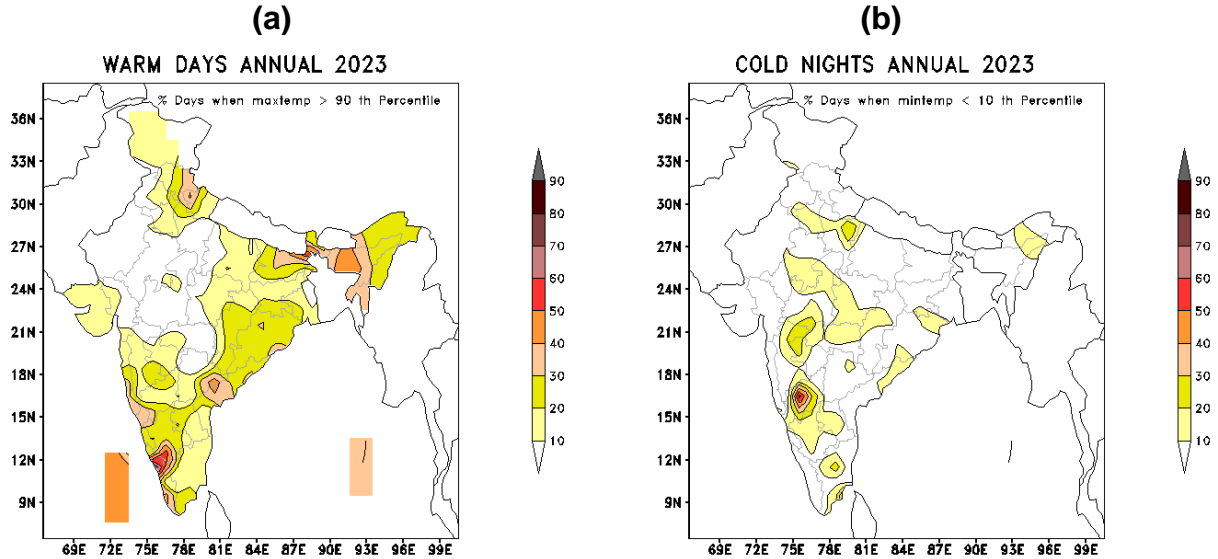


चित्र ९: हीट वेव अवधि के दौरान अधिकतम तापमान विसंगति (°C) (ए) १४-१९ अप्रैल २०२३ (बी) ०८-१३ जून २०२३

Fig. 9: Maximum temperature anomaly (°C) during heat wave period (a) 14-19 April 2023 (b) 08-13 June 2023

## WARM DAYS AND COLD NIGHTS:

Fig. 10(a) and 10(b) show the percentage of days when maximum (minimum) temperature was more (less) than 90<sup>th</sup> (10<sup>th</sup>) percentile. Maximum temperature was more than 90<sup>th</sup> percentile over parts of Assam & Meghalaya, Coastal Andhra Pradesh, Telangana, Lakshadweep, Kerala & Mahe and South Interior Karnataka for more than 40% of the days of the year. Over parts of North Interior Karnataka minimum temperature was less than 10<sup>th</sup> percentile for more than 50% of the days of the year.



चित्र १०: (ए) उन दिनों का प्रतिशत जब अधिकतम तापमान > 90 वें प्रतिशत

(बी) उन दिनों का प्रतिशत जब न्यूनतम तापमान < 10 वें प्रतिशत

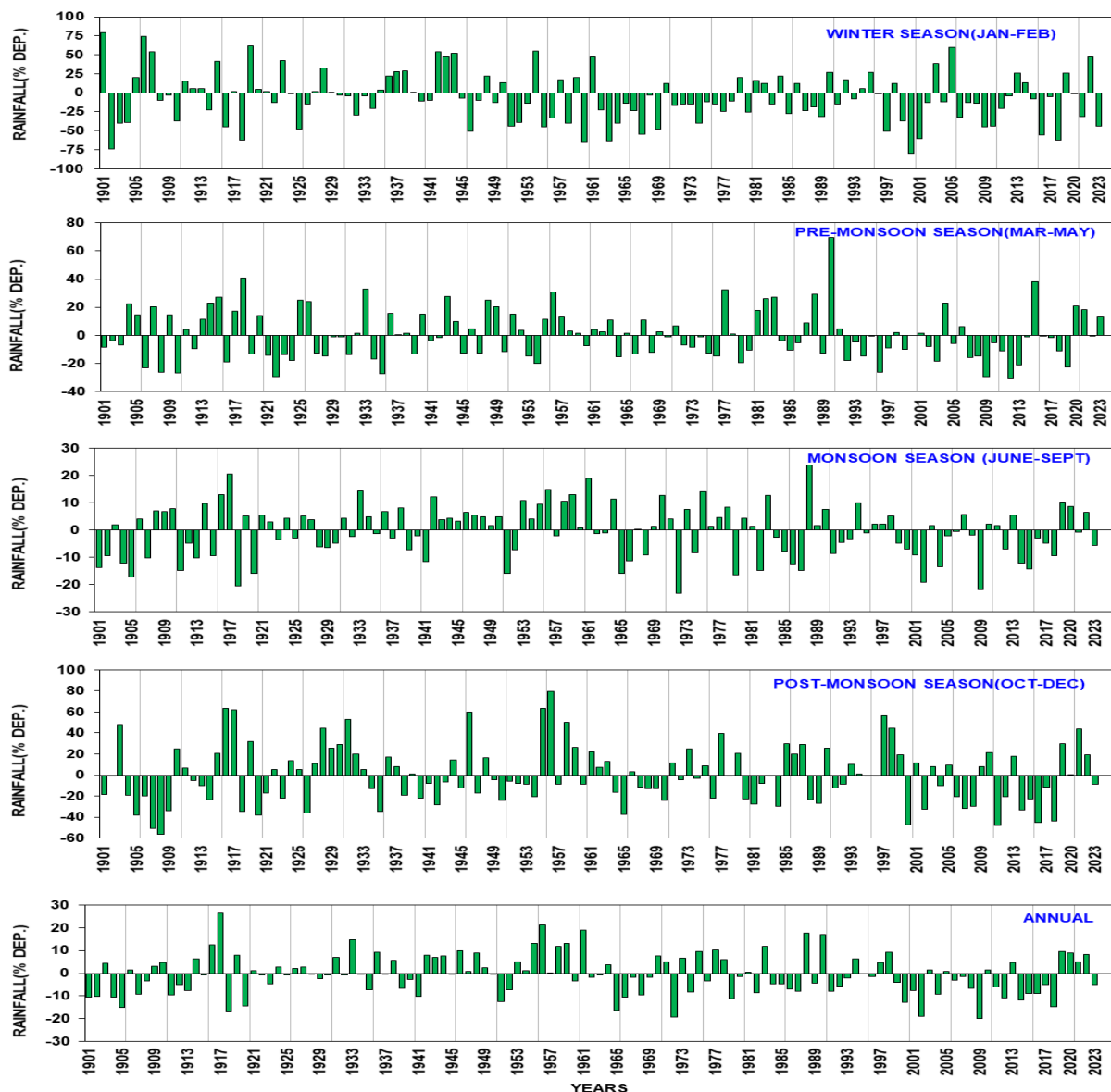
Fig. 10: (a) PERCENTAGE OF DAYS WHEN MAXIMUM TEMPERATURE > 90TH PERCENTILE  
(b) PERCENTAGE OF DAYS WHEN MINIMUM TEMPERATURE < 10TH PERCENTILE

## B) RAINFALL:

Time series of percentage departure of area weighted seasonal and annual rainfall over the country as a whole are shown in Fig. 11. In 2023, annual rainfall over the country as a whole was 95 % of its LPA value.

Season wise rainfall distribution over the country as a whole is listed below:

- Winter (January to February): **56% of LPA**
- Pre-monsoon (March to May): **113% of LPA**
- Monsoon (June to September): **95% of LPA**
- Post-monsoon (Oct to Dec): **91 % of LPA**



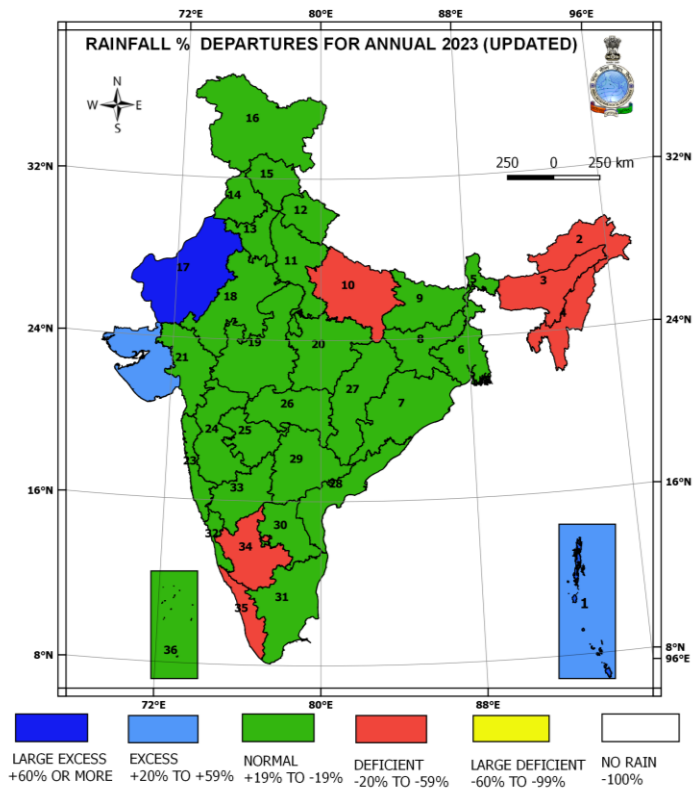
चित्र ११: पूरे देश में क्षेत्र भारित (मौसमी और वार्षिक) वर्षा का प्रतिशत विचलन (1901-2023)

Fig. 11: Percentage departure of area weighted (Seasonal and Annual) rainfall over the country as a whole for 1901-2023. (Climatology period 1971-2020)

**Annual:**

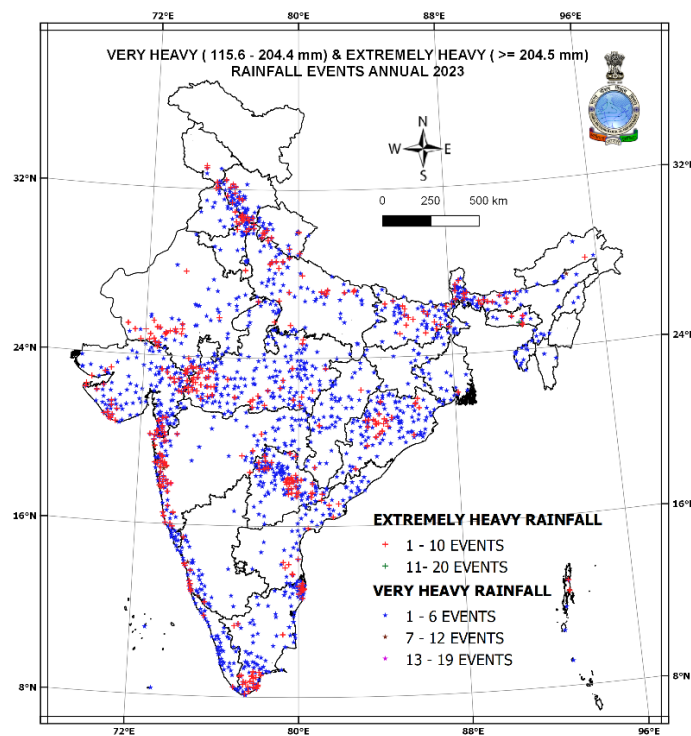
Rainfall activity over the country as a whole was 95% of LPA during the year. Out of 36 meteorological subdivisions, 30 received large excess/excess/normal rainfall and remaining 6 subdivisions (Arunachal Pradesh, Assam & Meghalaya, Nagaland, Manipur, Mizoram & Tripura, East Uttar Pradesh, South Interior Karnataka and Kerala & Mahe) received deficient rainfall. Fig. 12 shows percentage departure for Annual 2023.

At the end of year, of the four homogeneous regions, South Peninsular India received 95% of its LPA, Central India received 102% of its LPA, Northwest India received 103% of its LPA, while East & Northeast India received 80% of its LPA rainfall.



चित्र १२: २०२३ के लिए उप-प्रभागवार वार्षिक वर्षा प्रतिशत विचलन  
**Fig. 12: Sub- division wise Annual rainfall percentage departure for 2023**

Fig. 13 shows the location and frequency of occurrence of Very heavy (115.6 - 204.4 mm) & Extremely heavy (more than 204.4 mm) rainfall events during the year 2023.



चित्र १३: वार्षिक बहुत भारी और अत्यधिक भारी वर्षा की घटनाएं  
**Fig. 13: Annual very heavy and extremely heavy rainfall events**

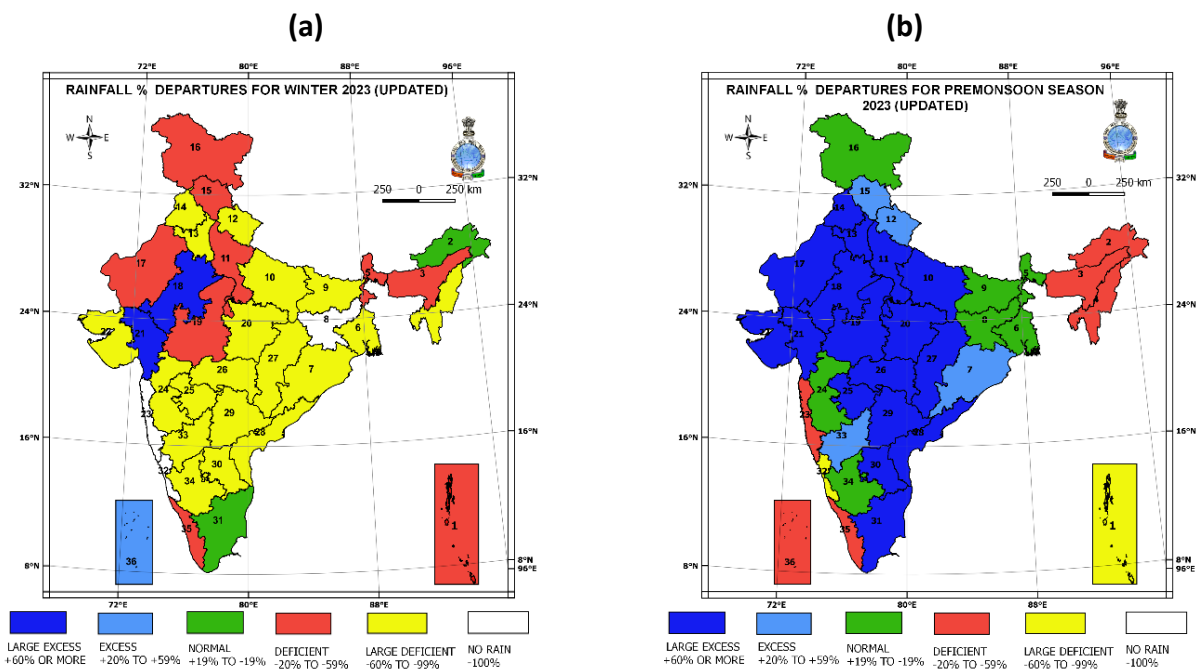
## Season Wise Rainfall Distribution:

Rainfall realized during winter season was 56% of LPA. It was 87% of LPA during January and it was 33% of LPA during February. During winter season, out of 36 meteorological subdivisions, 2 received large excess rainfall, one received excess rainfall, 2 normal rainfall, 9 received deficient rainfall, 19 received large deficient rainfall and 3 sub divisions did not receive any rain. Fig. 14(a) shows percentage departure for winter season 2023.

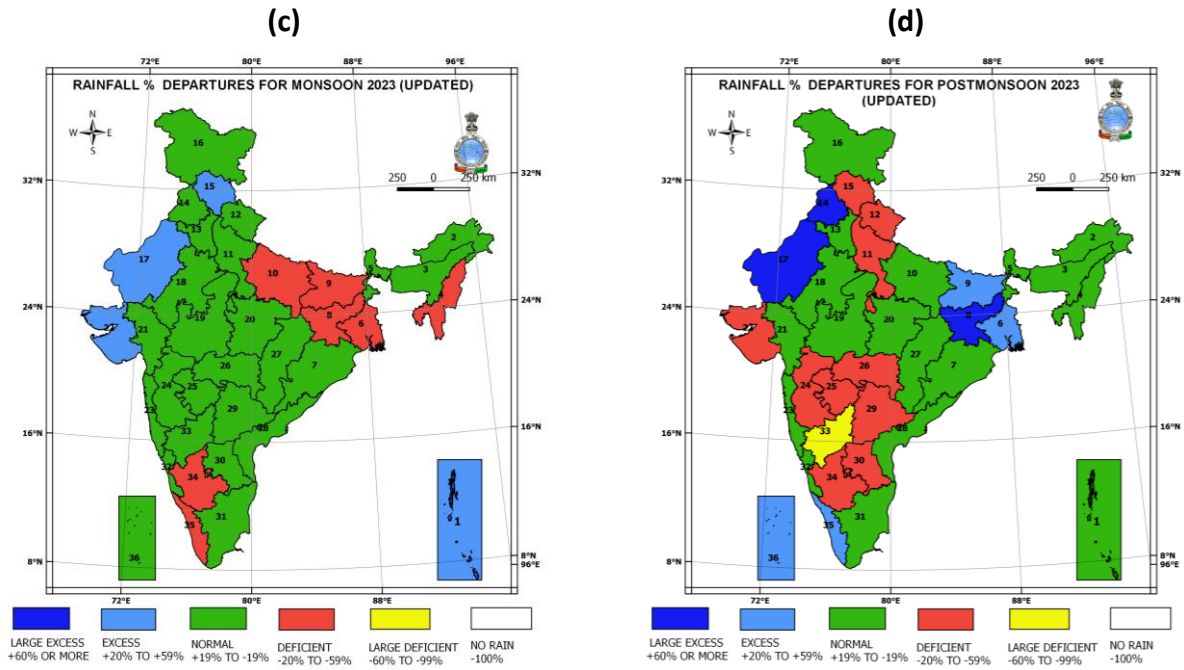
Rainfall realized during Pre-monsoon season was 113% of its LPA. It was 126% of its LPA, 108% of its LPA and 111% of its LPA during March, April and May respectively. During Pre-monsoon season, out of 36 meteorological subdivisions, 17 received large excess rainfall, 4 received excess rainfall, 7 received normal rainfall, 6 received deficient rainfall and 2 received large deficient rainfall. Fig 14(b) shows percentage departure for pre monsoon season 2023.

Rainfall realized during Monsoon season was 95% of its LPA. It was 101% of its LPA over northwest India, 100 % of its LPA over central India, 82% of its LPA over east & northeast India and 92% of its LPA over south peninsula. Most sub-divisions of the country received excess/normal rainfall except Nagaland, Manipur, Mizoram & Tripura, Jharkhand, Bihar, East Uttar Pradesh, South Interior Karnataka and Kerala & Mahe. During the season, out of 36 meteorological subdivisions, 4 subdivisions received excess rainfall, 25 received normal rainfall and the remaining 7 subdivisions received deficient rainfall. Fig. 14(c) shows percentage departure for South west monsoon season 2023.

Rainfall realized over the country as a whole during the Post-monsoon season was 91% of its LPA. It was 67% of its LPA, 117% of its LPA and 160% of its LPA during October, November and December month respectively. During the season many subdivisions received large excess/excess/normal rainfall except West Uttar Pradesh, Uttarakhand, Himachal Pradesh, Saurashtra & Kutch, Madhya Maharashtra, Marathwada, Vidarbha, Telangana, Rayalaseema, North and south Interior Karnataka. During the season, out of 36 meteorological subdivisions, 3 received large excess rainfall, 4 received excess rainfall, 18 received normal rainfall, 10 received deficient rainfall and one subdivisions received large deficient rainfall. Fig. 14(d).







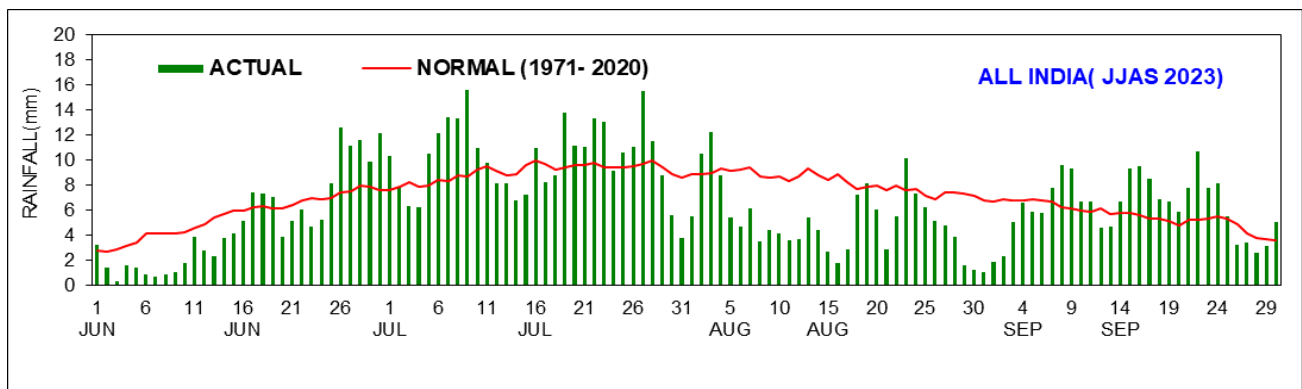
चित्र १४: (ए) शीतकालीन मौसम (बी) प्री-मानसून सीजन (सी) दक्षिण-पश्चिम मानसून (डी) मानसून पश्चात 2023 के लिए उप-प्रभागवार वर्षा प्रतिशत विचलन

Fig. 14: Sub-division wise rainfall percentage departure for (a) Winter Season (b) Pre-Monsoon Season (c) South-West Monsoon Season (d) Post-Monsoon Season 2023

### Daily Rainfall variation during Monsoon Season:

Daily area weight averaged rainfall (mm) over the country as a whole during the monsoon season 2023 (1<sup>st</sup> Jun. to 30<sup>th</sup> Sep.) and its long term average (1971-2020) values are shown in Fig. 15(a). For the country as a whole, rainfall averaged was above or near normal on 10 days during June, 19 days during July, 4 days during August and 18 days during September.

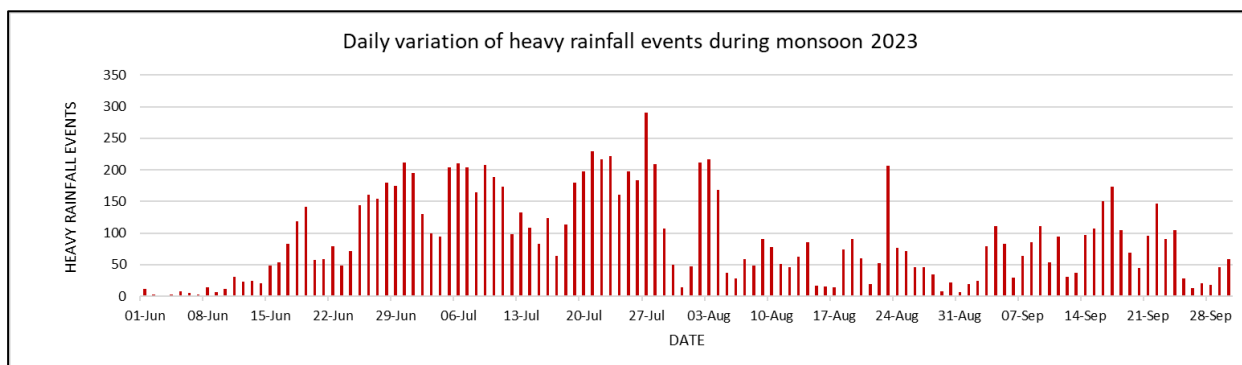
On almost 13 occasions including the continuous periods of 7 - 9 July, 8 - 9 September, 15 -17 September it was more than one and half times its normal value. It was below normal at a stretch on 1-16 June, 20 - 24 June, 4 - 18 August, 24 August - 6 September, 26 - 29 September.



चित्र १५ (ए): पूरे देश में दैनिक क्षेत्र भारित वर्षा (मिमी) और इसका दीर्घकालिन औसत (1971-2020) (निरंतर रेखा) 1 जून - 30 सितंबर 2023

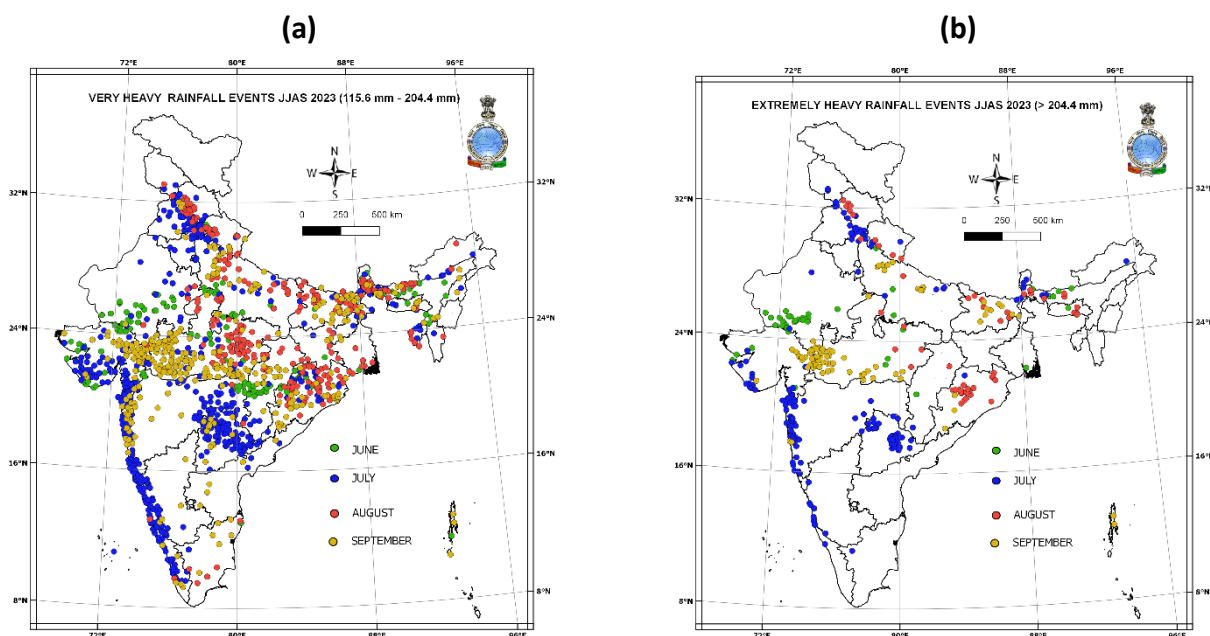
Fig. 15(a): Daily Area Weight averaged Rainfall (mm) over the country as a whole (vertical bars) and its long term average (1971-2020) (continuous line) 1 June - 30 September 2023

In the month of June and July 2023 country witnessed more number of heavy rainfall events as shown in figure 15 (b).



चित्र १५ (बी): 1 जून - 30 सितंबर २०२३ के दौरान भारी वर्षा की घटनाओं की दैनिक भिन्नता  
**Fig. 15(b): Daily variation of heavy rainfall events during 1 June - 30 September 2023**

There were many extreme rainfall events observed during 2023 southwest monsoon season. The location of heavy and extremely heavy rainfall events during 2023 southwest monsoon season is given in Fig. 16(a,b). Extremely heavy rainfall events were observed in June mainly over Rajasthan due to the extremely severe cyclonic storm “BIPARJOY”. During July, the extremely heavy rainfall events were more realized over Konkan & Goa, coastal Karnataka, Uttarakhand, Himachal Pradesh, and Telangana due to the formation of low pressure systems. In the month of August, the extremely heavy rainfall events were more realized over Odisha and Gangetic West Bengal due to the formation of one Deep depression and one low pressure area over the Bay of Bengal. Also, two western disturbances (WDs) caused very heavy to extremely heavy rainfalls and floods over Himachal and Uttarakhand mainly by triggering southerly/south-westerly winds from the Arabian Sea. During September, the extremely heavy rainfall events were more realized over Madhya Pradesh, Bihar and West Uttar Pradesh due to the formation of low pressure areas over the Bay of Bengal.

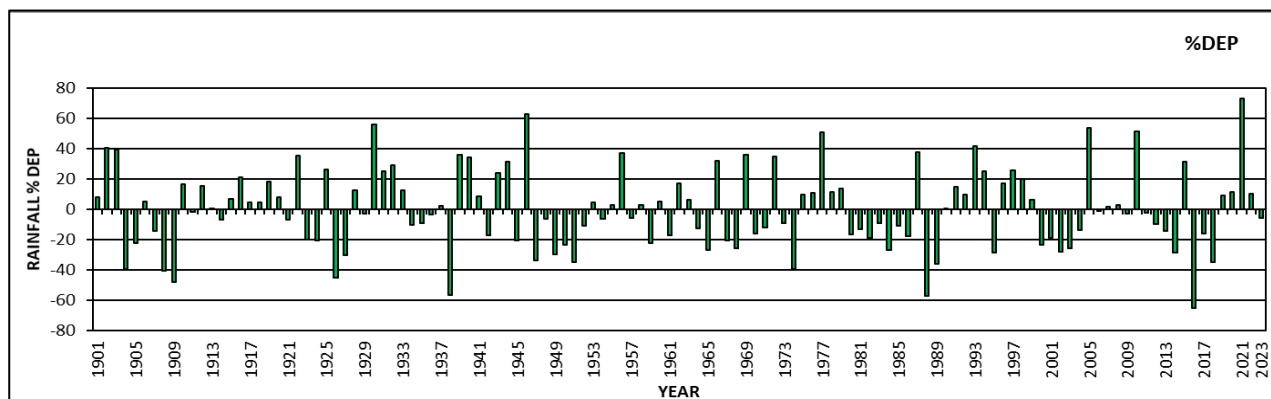


चित्र १६(ए,बी): मानसून के दौरान बहुत भारी और अत्यधिक भारी वर्षा की घटनाएं  
**Fig. 16(a,b): Very heavy and extremely heavy rainfall events during Monsoon Season**

## Rainfall during Post-monsoon season:

Rainfall activity over core region of the South Peninsular India (comprising of 5 subdivisions viz. Coastal Andhra Pradesh, Rayalaseema, Tamil Nadu, Puducherry & Karaikal, South Interior Karnataka and Kerala & Mahe) during the season as a whole was 94% of its LPA.

Time series of northeast monsoon seasonal rainfall over the core region of south peninsula is shown in Fig 17.



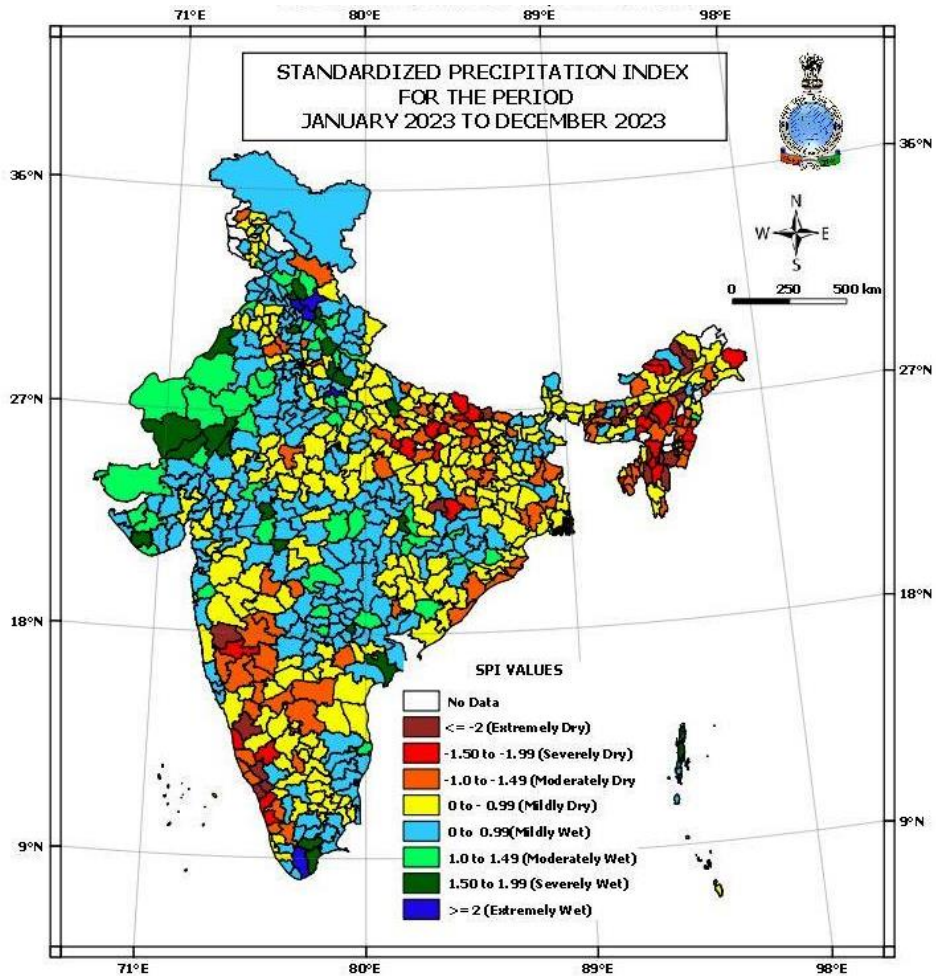
चित्र १७: दक्षिण प्रायद्वीप के कोर जोन (1901-2023) पर मानसून के बाद के मौसम (अक्टूबर से दिसंबर) के दौरान वर्षा का प्रतिशत विचलन

FIG. 17: Percentage departure of rainfall during the Post-monsoon season (October to December) over the core zone of South Peninsula (1901-2023)

## C) Standardized Precipitation Index

The Standardized Precipitation Index (SPI) is an index used for measuring drought and is based on precipitation. This index is negative for dry, and positive for wet conditions. As the dry or wet conditions become more severe, the index becomes more negative or positive. Fig.18 gives the district wise SPI values for the year 2023.

Cumulative SPI values of January to December indicate extremely wet-severely wet conditions over parts of Uttar Pradesh state, Rajasthan state, West Madhya Pradesh, Saurashtra & Kutch, Coastal Andhra Pradesh, Haryana, Chandigarh & Delhi, Chhattisgarh, Tamil Nadu, Telangana, A & N Islands, Himachal Pradesh and Uttarakhand, while extremely dry-severely dry conditions were observed over parts of East Uttar Pradesh, Bihar, South Interior Karnataka, Chhattisgarh, Madhya Maharashtra, Coastal Karnataka, Arunachal Pradesh, Assam & Meghalaya, Kerala and Nagaland, Manipur Mizoram & Tripura.



चित्र १८: जनवरी-दिसंबर 2023 की अवधि के लिए मानकीकृत वर्षा सूचकांक  
Fig. 18: Standardized Precipitation Index for the period January- December 2023

#### D) TROPICAL STORMS / DEPRESSIONS IN THE INDIAN SEAS

In 2023, there were 6 cyclones formed over the north Indian Ocean. Of these, 3 were Extremely Severe Cyclonic Storm “MOCHA”, “BIPARJOY” & “TEJ”, Two were Severe Cyclonic Storm “MICHAUNG” and MIDHILI, one was Very Severe Cyclonic Storm “HAMOON”. Of these, 4 cyclones Viz. MOCHA, HAMOON, MIDHILI, MICHAUNG formed over the Bay of Bengal & 2 cyclones Viz. BIPARJOY, TEJ formed over Arabian Sea.

Among these 6 cyclones, MOCHA formed in the pre-monsoon season during 9<sup>th</sup> to 15<sup>th</sup> May, BIPARJOY formed in the monsoon season & remaining 4 cyclones TEJ, HAMOON, MIDHILI, MICHAUNG formed in the post-monsoon season.

During winter season, one depression formed over southeast and adjoining southwest Bay of Bengal which moved towards south Srilanka.

During pre-monsoon season, an Extremely Severe Cyclonic Storm “MOCHA” FORMED OVER Bay of Bengal during the period 9 - 15 May.

During the monsoon season, fourteen low pressure systems (1 ESCS, 1 Deep Depression, 1 Depressions, 5 well marked low pressure areas, 5 low pressure areas and 1 land low pressure areas)

were formed. The frequency and place of origin of these low pressure systems formed over the Indian region during the monsoon season is shown in the table below.

Month /Systems	CS and above	DD	D	WML	LPA	LAND LPA	TOTAL
June	1 (AS)	0	0	2(BOB)	0	0	3
July	0	1(BOB)	0	1	2(BOB)	1	5
August	0	0	0	0	1(BOB)	0	1
September	0	0	1(AS)	2(BOB)	2(BOB)	0	5
	(AS : Arabian Sea)			(BOB : Bay of Bengal)			

**CS:** Cyclonic Storm, **DD:** Deep Depression, **D:** Depression, **WML:** Well Marked low, **LPA:** Low Pressure Area, **Land LPA:** Land low pressure Area

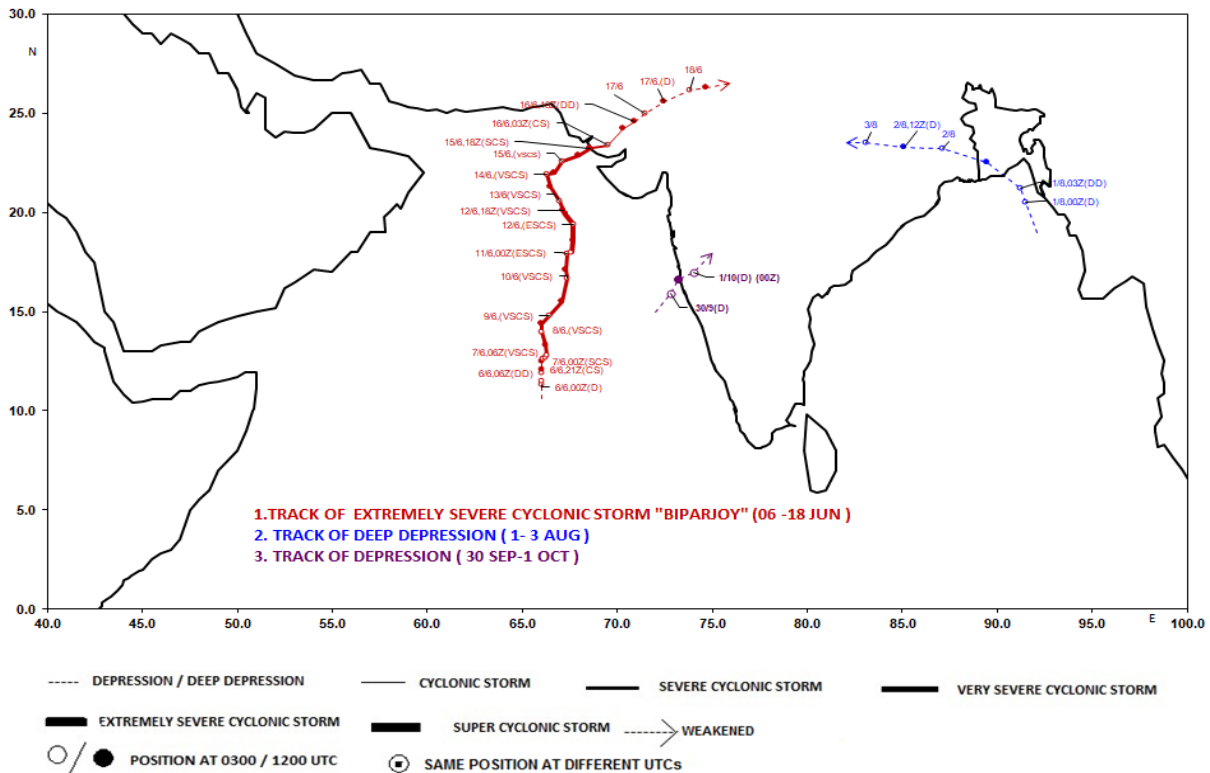
During the post monsoon season, six low pressure systems (1 ESCS, 1 VSCS, 2 SCS and 2 low pressure area) were formed. The frequency and place of origin of these low pressure systems formed over the Indian region during the post monsoon season is shown in the table below.

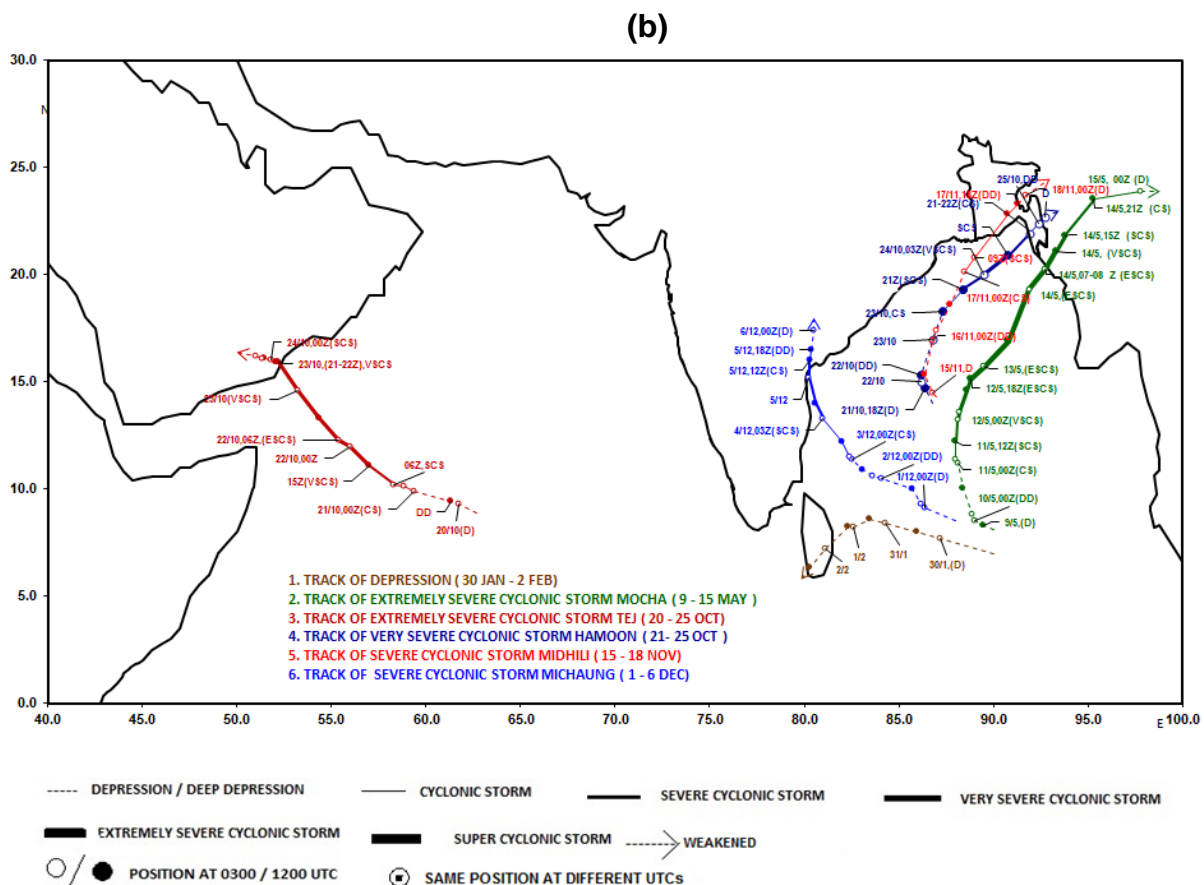
Month /Systems	CS and above	DD	D	WML	LPA
October	1 (BOB),1(AS)				
November	1 (BOB)				1(AS)
December	1 (BOB)				1(AS)
	(AS : Arabian Sea)		(BOB : Bay of Bengal)		

**CS:** Cyclonic Storm, **DD:** Deep Depression, **D:** Depression, **WML:** Well Marked low, **LPA:** Low Pressure Area

Fig. 19(a) and 19(b) respectively show track of these systems formed during the monsoon and other seasons in the year 2023.

(a)

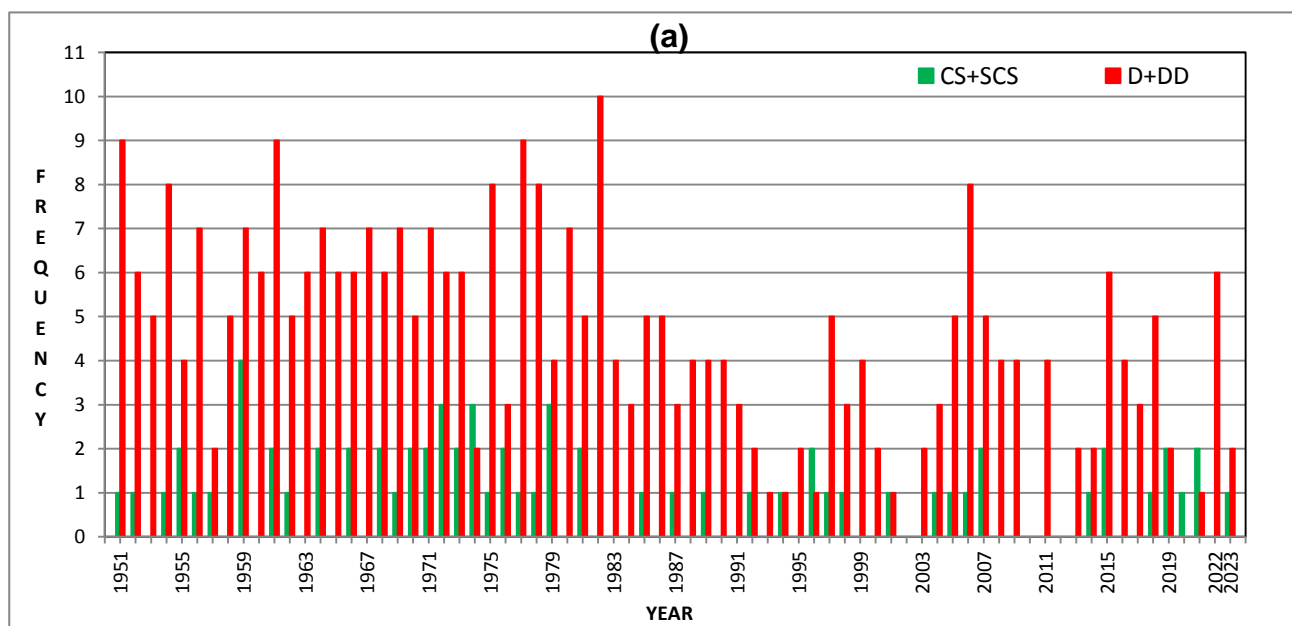




**चित्र १९ : २०२३ के दौरान बने डिप्रेषन और चक्रवाती तूफानों के ट्रैक  
(ए) मानसून मौसम (बी) अन्य मौसम**

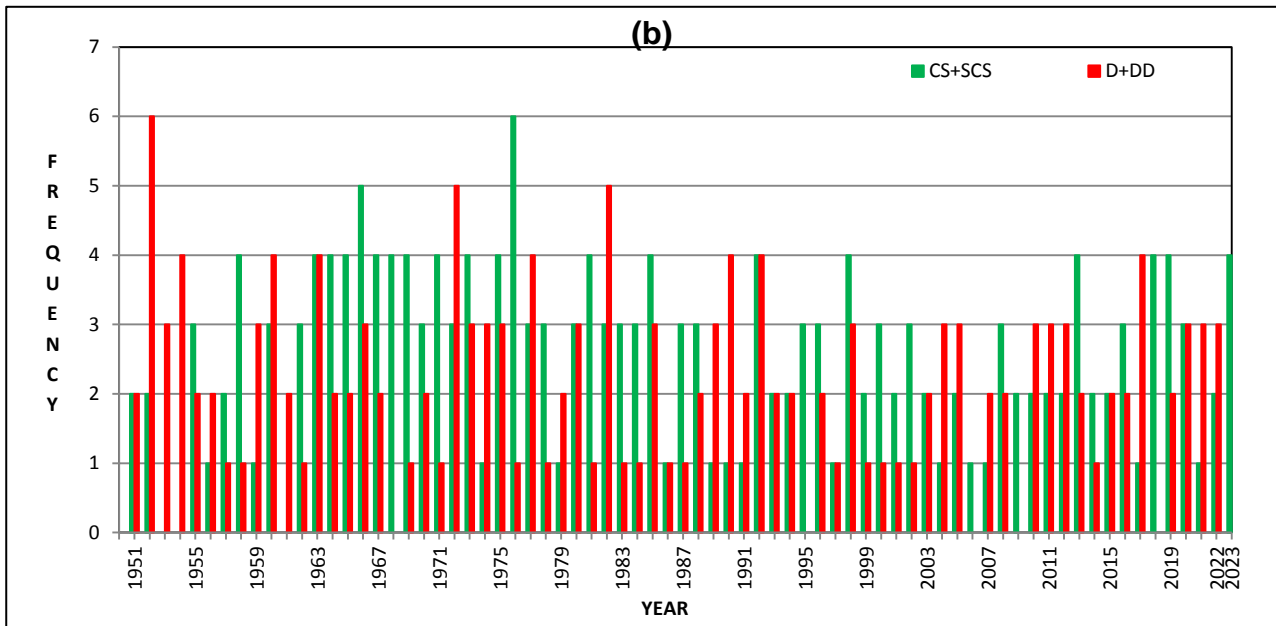
**FIG. 19: TRACKS OF DEPRESSIONS AND CYCLONIC STORMS FORMED DURING 2023  
(a) MONSOON SEASON (b) OTHER SEASONS**

Frequency of depressions and cyclonic storms formed over the north Indian Ocean and Land (1951-2023) during the monsoon and post monsoon is shown in Fig. 20(a) and 20(b) respectively.



**चित्र २०(ए): मानसून का मौसम (जून-सितंबर)**

**Fig. 20(a): MONSOON SEASON (JUNE-SEPTEMBER)**



चित्र २०(बी): मानसून के बाद का मौसम (अक्टूबर-दिसंबर)  
 Fig. 20(b): POST MONSOON SEASON (OCTOBER-DECEMBER)

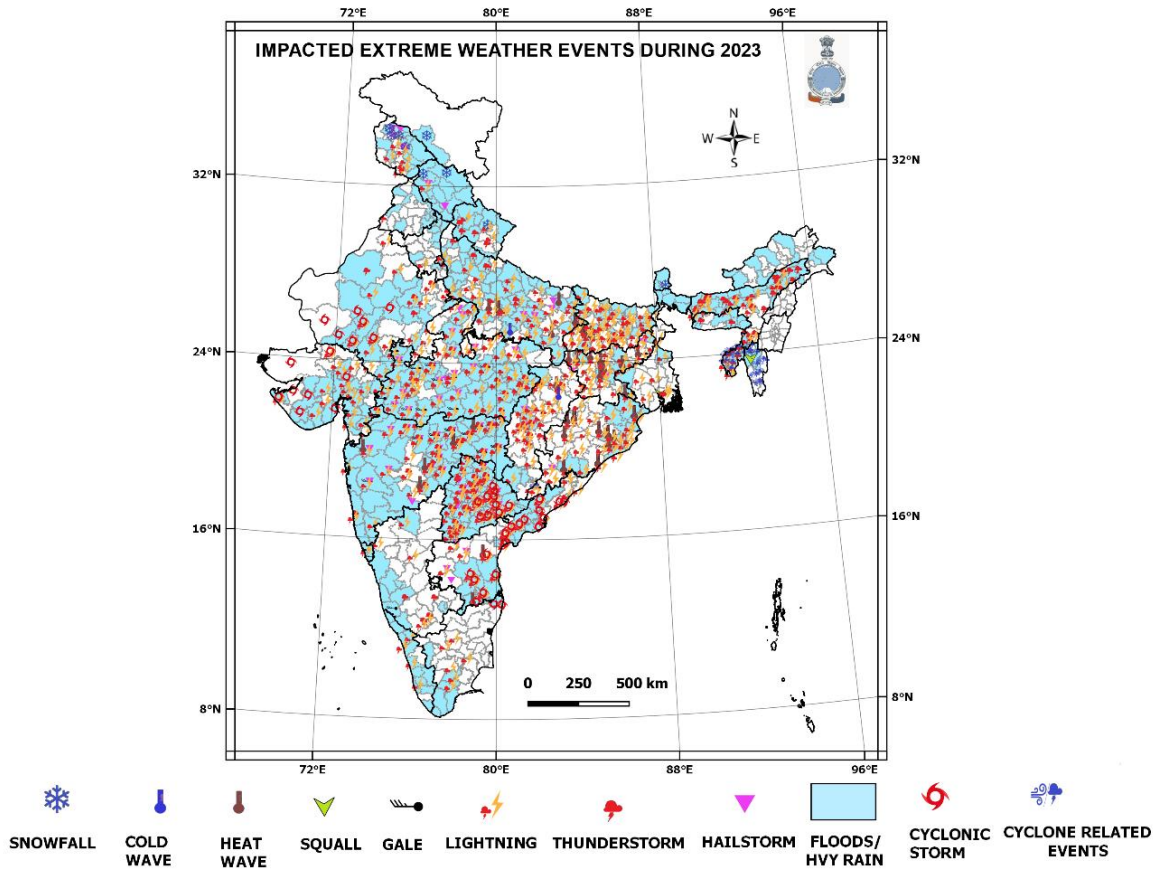
चित्र २०(ए,बी): उत्तर हिंद महासागर और भूमि पर बने दबाव और चक्रवाती तूफानों की वारंवरीता (१९५१-२०२३)

Fig. 20 (a, b): Frequency of depressions and cyclonic storms formed over the North Indian Ocean & land (1951-2023) (Source: Cyclone e-atlas, RSMC New Delhi)

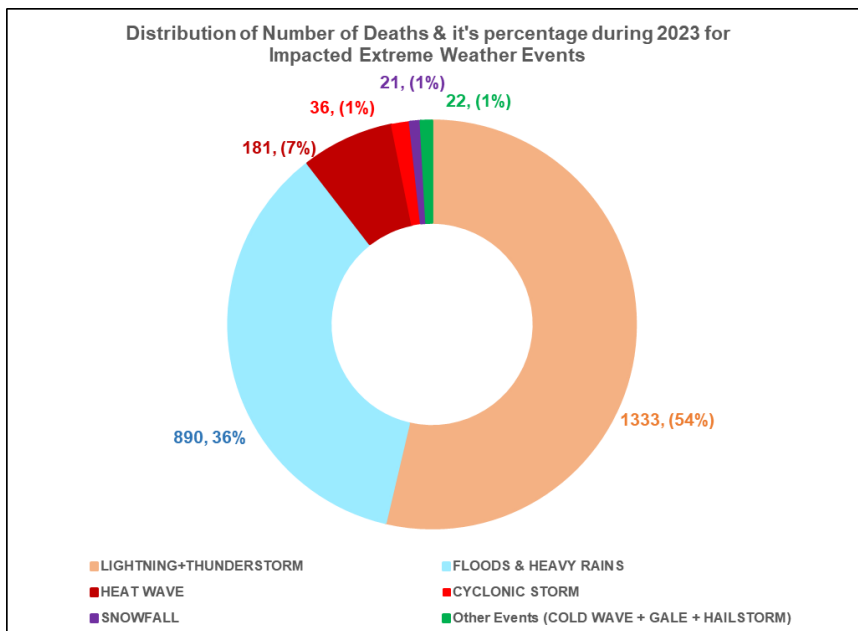
**Impacted Extreme Weather Events during 2023:**

Other than Tropical Cyclones, various parts of the country also experienced Extreme Weather Events like extremely heavy rainfall, floods, landslide, lightning, thunderstorm, heat wave, snowfall, cold wave, hailstorm, etc. Few of them are listed below and given in the Table No. 6. The casualties caused by these extreme events mentioned here are based on the media and the government reports from disaster Management Authorities.

Deaths due to Impacted Extreme Weather Events & associated loss of life, Distribution of the Number of Deaths & its percentage, State-wise Distribution of the Number of Deaths and State-wise Number of Districts affected during 2023, month wise event wise distribution are shown in Fig. 21, 22, 23, 24, 25 respectively.

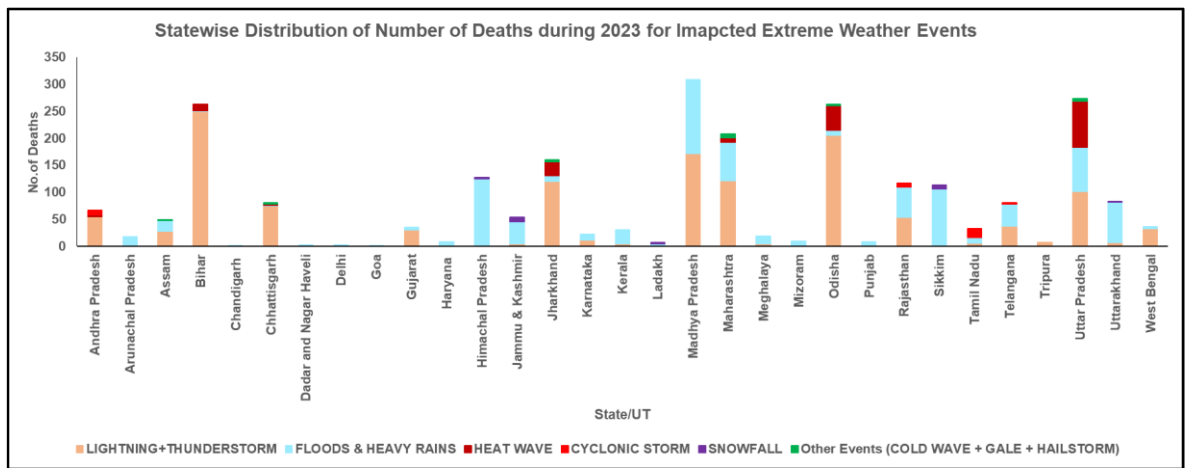


चित्र २१: २०२३ के दौरान प्रभावित चरम मौसम की घटनाओं के कारण हुई मौतें  
 Fig. 21: Deaths due to Impacted Extreme Weather Events occurred during 2023

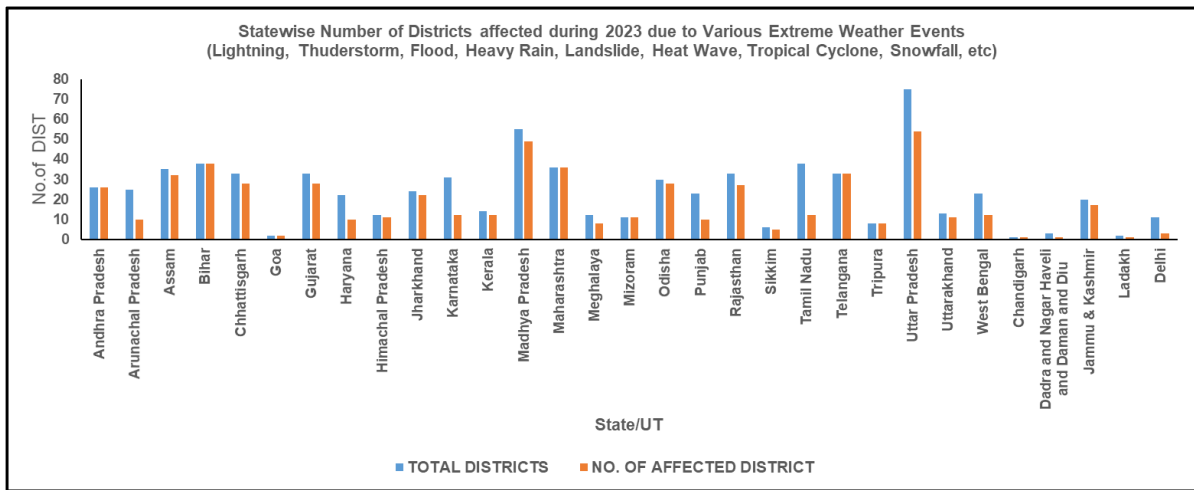


चित्र. २२: प्रभावित चरम मौसम की घटनाओं के कारण २०२३ के दौरान मौतों की संख्या और इसके प्रतिशत का वितरण  
 Fig. 22: Distribution of the Number of Deaths & its percentage during 2023 for Impacted Extreme Weather Events

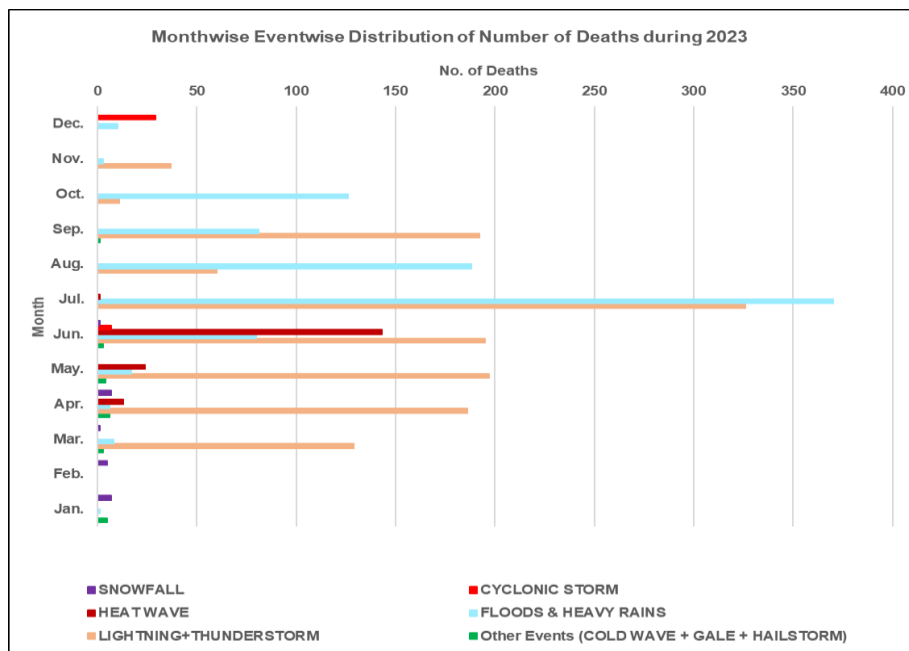




चित्र २३: प्रभावित चरम मौसम की घटनाओं के कारण २०२३ के दौरान मौतों की संख्या राज्यवार वितरण  
 Fig. 23: State-wise Distribution of the Number of Deaths during 2023 for Impacted Extreme Weather Events



चित्र २४: विभिन्न चरम मौसम की घटनाओं के कारण २०२३ के दौरा प्रभावित जिलों की राज्यवार संख्या  
 Fig. 24: State-wise Number of Districts affected during 2023 due to various Extreme Weather Events



चित्र २५: २०२३ के दौरान मौतों की संख्या का माहवार घटनावार वितरण  
 Fig. 25: Month wise Event wise Distribution of Number of Deaths during 2023

Sub-division wise seasonal and annual rainfall statistic is given in Table 1 and its spatial distribution is shown

तालिका - १ / TABLE - 1

वर्ष २०२३ के लिए मौसम संबंधी उप-प्रभागवार मौसमी और वार्षिक वर्षा के आंकड़े

METEOROLOGICAL SUB-DIVISIONWISE SEASONAL AND ANNUAL RAINFALL STATISTICS FOR THE YEAR 2023

S.NO	SUB-DIVISION	WINTER UPDATED				PREMONSOON UPDATED				MONSOON UPDATED				POST MONSOON UPDATED				ANNUAL UPDATED			
		ACT	NORMAL	%DEP	CAT	ACT	NORMAL	%DEP	CAT	ACT	NORMAL	%DEP	CAT	ACT	NORMAL	%DEP	CAT	ACT	NORMAL	%DEP	CAT
1	A & N ISLANDS	51.1	80.1	-36.2	D	161.3	455.9	-65	LD	2528.8	1631.7	55	E	769.6	670.5	15	N	3510.8	2838.2	24	E
2	ARUNACHAL PRADESH	109.4	133.1	-17.8	N	446.9	757.3	-41	D	1491.9	1675.1	-11	N	201.2	241.5	-17	N	2249.3	2807.0	-20	D
3	ASSAM & MEGHALAYA	22.2	42.1	-47.2	D	347.0	582.6	-40	D	1467.8	1762.2	-17	N	178.6	190.1	-6	N	2015.6	2577.0	-22	D
4	NAG., MANI., MIZO., TRIP	0.7	31.9	-97.7	LD	228.0	477.0	-52	D	963.3	1301.7	-26	D	177.6	199.1	-11	N	1369.3	2009.7	-32	D
5	S.H.W.B.&SIKKIM	29.3	43.6	-32.9	D	369.0	438.4	-16	N	2021.0	1889.5	7	N	199.0	168.3	18	N	2618.2	2539.8	3	N
6	GANGATIC W.B.	0.3	29.3	-98.8	LD	191.6	187.9	2	N	909.0	1166.8	-22	D	226.6	175.0	29	E	1327.6	1559.0	-15	N
7	ORISSA	0.1	25.1	-99.0	LD	178.2	128.6	39	E	1115.4	1150.2	-3	N	119.9	140.8	-15	N	1413.6	1444.7	-2	N
8	JHARKHAND	0.0	25.4	-100.0	NR	96.0	83.3	15	N	751.3	1022.9	-27	D	174.8	89.1	96	LE	1022.1	1220.7	-16	N
9	BIHAR	0.2	19.8	-99.0	LD	74.6	85.3	-12	N	760.6	992.2	-23	D	102.7	67.1	53	E	938.1	1164.4	-19	N
10	EAST U.P.	4.3	25.2	-83.0	LD	63.8	33.6	90	LE	569.8	799.2	-29	D	47.7	42.3	13	N	685.3	900.3	-24	D
11	WEST U.P.	13.6	30.5	-55.5	D	88.9	32.7	172	LE	696.2	672.0	4	N	18.6	30.1	-38	D	817.2	765.3	7	N
12	UTTARANCHAL	37.2	101.7	-63.5	LD	225.8	158.2	43	E	1203.3	1162.7	3	N	26.6	55.0	-52	D	1492.9	1477.6	1	N
13	HAR., CHANDI., DELHI	11.8	32.0	-63.1	LD	110.3	45.0	145	LE	425.7	430.7	-1	N	17.5	19.4	-10	N	565.3	527.1	7	N
14	PUNJAB	15.2	47.4	-67.9	LD	127.6	54.2	135	LE	416.4	439.8	-5	N	40.1	24.1	66	LE	599.2	565.5	6	N
15	HIMACHAL PRADESH	116.3	187.1	-37.8	D	288.3	240.7	20	E	881.8	734.4	20	E	44.7	82.9	-46	D	1331.1	1245.1	7	N
16	JAMMU & KASHMIR	175.8	225.5	-22.0	D	310.0	330.0	-6	N	570.7	549.1	4	N	131.0	127.7	3	N	1198.4	1232.3	-3	N
17	WEST RAJASTHAN	5.2	8.5	-38.6	D	100.7	24.7	308	LE	401.7	283.6	42	E	22.4	12.1	86	LE	530.1	328.9	61	LE
18	EAST RAJASTHAN	22.8	10.9	109.6	LE	89.0	21.2	320	LE	622.7	626.6	-1	N	24.2	25.9	-7	N	758.7	684.6	11	N
19	WEST M.P.	6.5	14.0	-53.6	D	68.2	13.5	405	LE	907.1	877.3	3	N	42.3	46.5	-9	N	1024.1	951.3	8	N
20	EAST M.P.	4.2	33.4	-87.4	LD	92.7	23.7	291	LE	998.6	1043.4	-4	N	51.4	55.7	-8	N	1146.8	1156.2	-1	N
21	GUJARAT REGION	3.0	1.5	101.7	LE	28.89	5.5	425.3	LE	908.4	927.5	-2	N	38.0	32.8	16	N	968.1	967.3	0	N
22	SAURASHTRA & KUTCH	0.3	0.8	-59.7	LD	45.8	3.1	1378	LE	795.7	539.9	47	E	15.8	28.6	-45	D	857.6	572.4	50	E
23	KONKAN & GOA	0.0	0.6	-100.0	NR	18.0	29.4	-39	D	3182.1	2870.8	11	N	117.8	140.7	-16	N	3317.9	3041.5	9	N
24	MADHYA M'RASHTRA	0.0	2.8	-99.0	LD	30.6	26.4	16	N	654.3	747.4	-12	N	57.1	103.5	-45	D	742.0	880.1	-16	N
25	MARATHAWADA	0.6	6.4	-91.0	LD	45.4	25.6	77	LE	569.7	642.8	-11	N	58.5	96.7	-40	D	674.2	771.5	-13	N
26	VIDARBHA	0.5	16.9	-97.1	LD	129.7	27.0	380	LE	922.6	937.3	-2	N	50.5	76.2	-34	D	1103.2	1057.4	4	N
27	CHATTISGARH	0.1	21.9	-99.0	LD	109.8	37.0	197	LE	1060.1	1132.2	-6	N	62.5	75.5	-17	N	1232.5	1266.6	-3	N
28	COASTAL A.P.	1.4	22.2	-93.6	LD	187.6	96.2	95	LE	584.2	601.4	-3	N	267.6	322.9	-17	N	1036.8	1042.7	-1	N
29	TELANGANA	0.4	16.0	-97.7	LD	158.6	63.8	149	LE	846.9	734.8	15	N	52.8	124.1	-57	D	1058.7	938.7	13	N
30	RAYALASEEMA	0.2	8.8	-97.9	LD	145.4	79.5	83	LE	357.0	408.6	-13	N	164.7	236.4	-30	D	667.3	733.3	-9	N
31	TAMIL NADU	20.6	24.8	-16.8	N	202.5	124.9	62	LE	354.3	328.4	8	N	459.0	443.3	4	N	1036.5	921.4	12	N
32	COASTAL KARNATAKA	0.0	3.0	-100.0	NR	59.6	155.2	-62	LD	2699.8	3093.9	-13	N	221.8	264.0	-16	N	2981.1	3516.1	-15	N
33	N.I.KARNATAKA	0.2	4.4	-94.9	LD	104.4	79.6	31	E	429.5	480.8	-11	N	43.6	131.5	-67	LD	577.7	696.3	-17	N
34	S.I.KARNATAKA	1.3	5.7	-76.5	LD	155.9	142.8	9	N	489.8	678.4	-28	D	142.5	199.0	-28	D	789.6	1025.9	-23	D
35	KERALA	15.1	21.1	-28.3	D	236.9	359.0	-34	D	1326.6	2018.7	-34	D	624.8	491.9	27	E	2203.5	2890.7	-24	D
36	LAKSHADWEEP	34.4	25.8	33.3	E	100.3	197.0	-49	D	872.7	1026.6	-15	N	448.5	334.9	34	E	1455.9	1584.3	-8	N

तालिका - २ / TABLE - 2

वर्ष २०२३ के लिए स्टेशनवार वार्षिक तापमान और वर्षा चरम सीमा  
STATION WISE ANNUAL TEMPERATURE AND RAINFALL EXTREMES# FOR THE YEAR 2023

S.NO.	STATION NAME	MIN	DATE	MAX	DATE	HIGHEST 24 Hr.	DATE
		(°C)	(MONTH_DATE)	(°C)	(MONTH_DATE)	RAINFALL(mm)	(MONTH_DATE)
1	Agartala AP	8	01_19, 01_20	40	05_10	142.2	08_07
2	Cherrapunji*	3	01_18	31.6	09_05	426.2	06_16
3	Dibrugarh AP	7.3	01_06	37.8	09_04	88.2	09_20
4	Guwahati AP	8.9	01_20	38.9	06_07	53.7	07_21
5	Imphal AP	2.2	01_20	35.9	06_05	51.8	11_18
6	Passighat	12.8	01_19	37.5	09_30	213.2	07_29
7	Shillong*	1.2	01_18	29.1	04_19	95.8	08_27
8	Tezpur	9.2	01_19	39	06_08	81.8	07_21
9	Baghdogra AP	7.4	01_09	41.9	06_07	214.4	08_25
10	Berhampore	9	01_11	41.8	04_20	52	06_18, 08_26
11	Kolkata	10.9	01_06	41	04_14	84	08_02
12	Cooch Behar AP	6.3	01_17	38	06_02	167.6	09_25
13	Contai	10	01_06, 01_08	40.6	04_17	79	06_27
14	Darjeeling*	0.8	01_18	26.2	09_05	126.2	08_25
15	Gangtok*	4.1	01_20	26.9	06_08	115.1	06_16
16	Jalpaiguri	6.4	01_09	38.6	06_07	143.3	06_22
17	Kalimpong*	6.8	01_18, 01_19, 01_20, 01_21	30.5	06_08	128	10_04
18	Krishnanagar	9.2	01_08	41.2	04_19	56.2	12_08
19	Midnapore	10.3	01_06	42	04_20	129.2	10_01
20	Panagarh		N.A.			52.2	05_19
21	Balasore	9.7	01_07	41.1	04_20	137.7	08_02
22	Bhubaneswar AP	10.5	01_08	44.6	06_16	259.2	08_01
23	Chandbali	11.6	01_07	41.8	04_20, 05_10	88.9	08_01
24	Gopalpur	13.3	01_08	39.4	04_16	108.4	04_02
25	Jharsugda AP	5.6	01_07	45.6	06_09	128.4	07_16
26	Puri	14.5	01_07	38.3	04_12	90	08_01
27	Sambalpur	9.3	01_08	46.1	06_12	171.4	06_25
28	Daltonganj	4.1	01_08	45	05_21	62.8	10_02
29	Gaya AP	2.9	01_08	44.5	06_18	73.8	09_04
30	Jamshedpur AP	9.8	01_07, 01_11	44.2	05_21	84.2	08_01
31	Patna AP	5.5	01_17	44.7	06_17	142.8	06_30
32	Purnea	6.4	01_18	43.5	06_07	171.8	08_08
33	Ranchi AP	6.8	01_06	41.4	06_16	62.6	10_04
34	Allahabad AP	3.2	01_08	45.7	05_21	61	07_01
35	Bahraich	6.5	01_07	42	06_13, 06_19	102.2	09_12
36	Bareilly	2.9	01_07, 01_18	41.8	05_22	129	08_23
37	Dehar Dun	4.5	01_04	39.5	06_13	175.1	08_14
38	Gorakhpur	3.6	01_12	43.7	06_18	133.2	08_10
39	Jhansi	3.6	01_18, 01_19	46.5	05_22	109.4	09_09
40	Lucknow AP	4.1	01_08	43.2	05_21	93.9	09_11
41	Mukteshwar**	-0.3	01_03	28.8	06_13	77.1	09_11
42	Varansai	3.5	01_09	44.5	06_13	82.2	08_07
43	Ambala	4.8	01_06	43.5	05_22	224.1	07_09
44	Chandigarh	3.3	01_18	43.1	05_22	302.2	07_09
45	Hissar	-1.3	01_17	45.1	05_23	42	05_31
46	Karnal	2	01_16	42.7	05_22	99	07_26
47	New Delhi AP	1.4	01_16	43.7	05_22	153	07_09
48	Amritsar AP	1.2	01_14	43.8	05_22	113.2	06_26
49	Patiala	2	01_17	45	05_22	134.7	07_10
50	Shimla*	0.6	01_14, 01_17	28.8	05_22	132.1	08_23
51	Banihal*	-2.7	01_15	32.9	09_07	103.8	07_08
52	Gulmarg*	-13.5	02_12	26	06_22	54.8	01_25
53	Jammu AP	3	01_05	42	05_22	109.4	07_19
54	Srinagar*	-6.4	01_05	35	06_23	91.2	08_14
55	Ajmer	3.6	01_16	42.9	05_13	149.1	06_20
56	Barmer	6	01_15	45.7	05_12, 05_13	65	06_29
57	Bikaner	0	01_06	45.5	05_20, 05_21	72.8	05_29
58	Ganganagar	2.6	01_16	44.8	05_21	90.6	07_24
59	Jaipur AP	3.6	01_06	43.5	05_13	62.6	07_10
60	Jaisalmer	2.3	01_15	46	05_13	84.2	10_17

TABLE - 2 (contd.)

61	Jodhpur AP	4.8	01_15	44.4	05_13	91.3	06_18
62	Kota AP	3.6	01_06	45.4	05_13	71	06_25
63	Udaipur	2	01_16	42.4	05_13	132.8	08_21
64	Ambikapur	4.6	01_07	41.8	05_22	105.8	08_03
65	Betul	5.2	01_08	41.4	05_21	197.2	09_16
66	Bhopal(AP)	6.2	01_08	43.3	05_14	77.2	06_26
67	Guna	3	01_06, 01_07	44.4	05_13	77.3	07_16
68	Gwalior	2.3	01_18	44.8	05_22, 04_23	76	06_30
69	Indore(AP)	7.3	01_04	42.7	05_13	171	09_16
70	Jabalpur	3.6	01_08	42.5	05_21	168.1	08_02
71	Jagdarpur	7.1	01_08	41.4	06_03	61.2	07_23
72	Khandwa	8	12_22, 12_26, 12_27	43.5	05_14	162	09_17
73	Nowgong	-1	01_08	45	05_22	124.6	08_05
74	Pendra	6	01_07	41.6	06_12	154.4	07_29
75	Ratlam	5	01_16	45.5	05_12	242	09_17
76	Sagar	4.6	01_06	43.4	05_13	142	07_15
77	Satna	3	01_07	43.6	05_21	75	08_03
78	Seoni	8	01_08	40.4	05_14, 05_23	145.6	09_15
79	Umaria	1.5	01_08	43.4	05_21, 05_23	148.6	08_02
80	Ahmedabad AP	7.6	01_16	44.7	05_13	188	07_23
81	Baroda	8.4	01_14	43.8	05_11	70.5	07_01
82	Bhavnagar AP	10	01_16	43.5	05_14	148.8	07_28
83	Bhuj AP	7.6	01_15, 01_16	43.4	05_10, 05_11	126.4	06_16
84	Deesa	6.9	01_05	43.7	05_11	131.1	06_18
85	Dwarka	12	01_15	36.6	11_02, 11_06	237	07_21
86	Naliya	1.4	01_15	42.2	06_11	135.2	07_09
87	New Kandala	9.1	01_16	40.2	05_15	164.7	06_17
88	Porbandar AP	6.2	01_16	43.5	05_11	181.2	07_08
89	Rajkot AP	7.3	01_16	43.9	05_10	86.9	06_17
90	Surat	12	01_17	42.6	05_11	144.5	07_20
91	Veraval	12.1	01_15	38.2	10_23, 10_24	520.2	07_19
92	Akola	10.4	01_09	45.6	05_13	76.6	07_23
93	Ahmadnagar			N.A.		24.6	12_01
94	Aurangabad AP	5.7	01_09	41.8	05_13	97.3	09_22
95	Buldhana	10	01_09	41.2	05_13, 05_22	49.9	09_22
96	Chandrapur	9.2	12_21	44.2	06_04	199.1	07_19
97	Dahanu	13.1	01_15	39.2	06_10	305.3	07_20
98	Harnai	17.3	01_15, 01_23	37	10_27	209.8	09_08
99	Jalgaon	5	01_09	45	05_13	90	11_27
100	Kolhapur	14.2	01_10	39.6	05_19	47.7	07_23
101	Mahabaleshwar*	11.1	01_09	34.6	05_29	314.8	07_20
102	Malegaon			N.A.		44	09_24
103	Mumbai	16.2	01_15	37.4	03_11	223.2	07_27
104	Nagpur AP	8	01_08	44.3	05_14	164	07_27
105	Panjim	16.4	06_29	38.4	03_08	202.9	06_28
106	Parbhani	9.5	01_09	44.7	05_13	101.9	07_05
107	Pune	7.4	01_10	41	05_11	37.9	09_27
108	Ratnagiri	15.5	01_12	39.4	02_17	200.5	07_27
109	Sholapur	12	01_09	43.5	05_21	71.2	06_25
110	Yeotmal	8.5	01_09	43.5	05_14	236.2	07_22
111	Anantpur	11.9	01_09	43.2	04_19	48.2	09_04
112	Hyderabad AP	11.3	01_09	42.4	06_03	85.8	09_05
113	Kakinada	16.6	01_09	43.9	06_16	137.7	12_06
114	Kalingapatnam	11.2	01_08	43.9	06_16	65.5	07_27
115	Kurnool	13.5	01_09	43.5	04_18	69.6	05_01
116	Machilipatnam	17.5	01_10	43.3	05_15	157	12_05
117	Nellore	19.5	01_09	43	05_16	218.1	12_05
118	Nizamabad	12.5	01_09	43	06_02	114.3	07_28
119	Ongole	18.5	01_09	44.6	05_17	118.2	12_05
120	Ramgundam	9.6	01_08	43	05_14, 06_09	137.9	07_27
121	Rentachintala	12.5	01_09	45.2	05_16	77	09_03
122	Visakhapatnam AP	13.6	01_09	44.6	06_10	70.4	12_06
123	Chennai AP	18.4	01_15	42.7	05_16	250.1	12_04
124	Coimbatore	16.8	01_20	38.7	04_14, 04_19	108.2	12_09
125	Cuddalore	19.2	01_16	40.3	06_02	109.4	05_02
126	Kanyakumari	20	12_18	36.6	05_28, 06_15	173.5	12_18
127	Kodaikanal*	5.4	02_27, 03_06	24.7	05_14	103.4	12_18

TABLE - 2 (contd.)

128	Madurai AP	17.6	01_20	41.7	07_30, 08_06	55.8	11_05
129	Nagapattinam	19.9	01_16	40.3	06_16	131.4	11_30
130	Palayamkottai	20.8	02_16	40.6	08_28	442	12_18
131	Pamban	18.1	02_12	36.2	06_14	88.4	11_23
132	Salem	14.1	02_23	41.2	04_18	85.6	09_01
133	Tiruchirapalli AP	18.4	01_16	40.3	04_20, 05_16	42.2	08_10
134	Vellore	15.8	01_11	42.3	05_15	85.1	07_13
135	Bangalore*	12.8	01_15	36.5	04_18	88.9	09_01
136	Chitradurga	11.1	01_12	39.1	04_19	44.6	09_02
137	Gadag	12	02_15	39.9	04_19	65.8	09_01
138	Gulbarga	11.4	01_09	42.6	06_02	72	04_28
139	Honavar	16.6	02_17	39.4	03_04	177.1	07_05
140	Karwar	16.5	01_11, 01_12	40.2	03_04	178.8	07_06
141	Mangalore AP	19.4	01_12	36.9	03_02, 03_05	192.8	07_06
142	Mysore	9	01_13, 01_16	36.6	04_20	38	05_02
143	Raichur	11.6	01_10	41.4	06_03	69.8	04_29
144	Alapuzha	21.1	01_21	37.2	04_17, 04_22	131.2	10_15
145	Cochi AP	21.4	01_12	34.6	12_29	123.2	07_05
146	Kozhikode	21.6	01_12	37.4	04_13, 04_17, 05_15	148.5	07_05
147	Thiruvananthapuram	19.6	01_13	36.6	03_31	118.4	10_15
148	Car Nicobar			N.A		102	11_25
149	Port Blair	19.8	01_15	35.9	04_21	154	09_28
150	Amini Divi	21.8	01_11, 01_12	37.6	06_03	153.3	07_08
151	Minicoy	20.5	01_21	35	04_30, 05_17, 05_25	146.8	12_19

(\*: Hill Stations) (#: Based on Real-time data)

### तालिका - ३ / TABLE - 3

पूरे भारत के लिए 2023 के दौरान तापमान (जनवरी से दिसंबर, वार्षिक और मौसमी)

1901 के बाद से अपने शीर्ष रैंक के साथ

Temperatures during 2023 (January to December, Annual and seasonal) for all India with its top ranks since 1901

MONTH	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL	JF	MAM	JJAS	OND
AI MEAN	19.93	23.01	25.41	28.14	29.47	29.99	28.40	28.45	28.22	26.85	24.27	21.60	26.15	21.47	27.68	28.77	24.24
ANOMALY	0.29	1.36	0.36	0.10	-0.27	0.75	0.43	0.90	0.91	0.83	1.05	1.11	0.65	0.83	0.06	0.74	1.00
RANK since 1901	21	2	25	51	90	7	7	1	1	5	1	1	2	3	45	1	1
AI MAX	25.79	29.66	31.37	34.19	35.03	34.60	31.91	32.19	32.22	32.09	29.64	27.04	31.31	27.72	33.53	32.73	29.59
ANOMALY	0.19	1.86	0.13	0.26	-0.14	0.87	0.29	1.10	0.86	0.93	0.61	0.51	0.62	1.02	0.08	0.78	0.68
RANK since 1901	29	1	39	28	63	10	16	1	2	3	3	7	3	4	41	2	3
AI MIN	14.07	16.37	19.46	22.08	23.92	25.39	24.90	24.70	24.22	21.62	18.89	16.16	20.98	15.22	21.82	24.80	18.89
ANOMALY	0.38	0.87	0.59	-0.07	-0.40	0.62	0.57	0.69	0.96	0.73	1.48	1.71	0.68	0.63	0.04	0.71	1.31
RANK since 1901	30	5	14	71	107	8	2	2	1	10	3	1	1	6	57	1	1

तालिका - ४ / TABLE - 4

2023 के दौरान अब तक का उच्चतम अधिकतम तापमान  
Ever recorded Highest Maximum Temperature during 2023

MONTH	STATION NAME	NEW	DATE	PREVIOUS	MM/DD/YYYY
		RECORD. (°C)#		RECORD (°C)	
JANUARY	Guwahati AP	30	30	29.8	27-01-2019
	Passighat	29.8	30	29.6	30-01-1973
	Sambalpur	33.9 @	26	33.9	28-01-2009
	Kanyakumari	35.2	1	34.4	31-01-1983
FEBRUARY	Shimla	23.2	18	22.6	20-02-2006
	Kota AP	37.4	20	37	26-02-1973
	Bhuj AP	40.3	16	39	19-02-2017
	Naliya	38.6	18	38.2	19-02-2017
	Porbandar AP	39	17	38.7	19-02-2017
	Ratnagiri	39.4	17	39.3	25-02-2017
	Honavar	39.4	4	38.8	06-03-2013
MARCH	Karwar	40.2	4	39.6	01-03-2000
	Gopalpur	39.4	16	37.8	12-04-1994
APRIL	Visakhapatnam AP	41.6	18	40.6	01-04-2014
	Cherrapunji	28.5	27	28.3	25-04-2014
	Imphal AP	35.8	30	35.6	29-05-2012
MAY	Cherrapunji	29.9	8	29.7	09-06-2018
	Imphal AP	35.9	5	35.6	06-06-1979
	Purnea	43.5	7	43	02-06-2007
	Dahanu	39.2	10	38.5	12-06-2014
	Kalingapatnam	43.9	16	42.3	18-06-2009
	Kanyakumari	36.6	15	36.2	12-06-1996
	Kozhikode	36.4	5	36.2	01-06-2015
	Amini Divi	37.6	3	36.2	01-06-1998
JUNE	Rentachintala	41.6	1	41.3	20-07-1992
	Tuticorin	39.8 @	14	39.8	05-07-2014
	Minicoy	33.6 @	31	33.6	07-07-2019
AUGUST	AROGYAVARAM	35 @	28,30	35	08-08-2006
	BANGLURU(A)	32.6	30	32.2	28-08-2002
	CHANDBALI	37.6	31	37.5	31-08-2005
	DIGHA	37	29,30	36.6	02-08-2020
	HARNAI	32.3 @	12	32.3	15-08-2009
	JAMSHEDPUR(A)	37	16	36.7	07-08-2000
	JHARSUGUDA(A)	36.4	31	36.2	03-08-1972
	JORHAT (PET)	37.6	2	37.5	22-08-2016
	K.PARAMATHY	40	16,24,26	38.8	09-08-2021
	KANYAKUMARI	38	4	36.7	15-08-2010
	KARWAR	33.8	30	33.4	23-08-2014
	KORAPUT	34.1	12	31.6	30-08-2016
	KOTTAYAM	35.5 @	23,24	35.5	29-08-2020
	KOZHICODE	32.9	30	32.2	23-08-2014
	LENGPUI	35.6	1	35.5	12-08-2019
	LUMDING	40.6	1	39	08-08-1979
	MADURAI	40.4	3	40	28-08-1990
	MADURAI(A)	41.7	6	40.6	23-08-2004
	MINICOY	34.7	26	33.4	08-08-2019
	NARSAPUR	37.8	8	37.6	07-08-2009
	PALAKKAD (PALGHAT)	35.4	23	34.6	02-08-2017
	PALAYAMKOTTAI	40.6	28	39.5	13-08-1976
	PUNALUR	36.5	26	34.8	28-08-2003
	RENTACHINTALA	40.4	6	40	23-08-2016
	THIRUVANANTHPURAM (TRIVANDRUM)	35.7	22	35	16-08-2022
	THRISSUR	34	23	33.3	19-08-2015
	TUTICORIN	40	3,4	39.8	03-08-1997
VALPARAI PTO	28 @	28,29	28	23-08-2014	
VISAKHAPATNAM	38.8 @	13	38.8	15-08-1989	
SEPTEMBER	AMS SHIMLA	29.2	7	27.5	29-09-2009
	ANANTHAPUR	38.2 @	1	38.2	04-09-2015
	BHAGALPUR	38.6 @	17	38.6	24-09-1982
	CHANDBALI	37.7 @	1	37.7	10-09-1968
	CHERRAPUNJI	31.6	5	31.1	06-09-1969
	DHARMASALA EMO	31 @	6,7	31	20-09-2022
	DIU	37	30	36.8	30-09-2001
	FURSATGANJ	38	2,3	37.8	05-09-2015
	GOALPARA	38.2	5	37.1	22-09-1967
	GULBARGA	37.4 @	1	37.4	05-09-2015
	GUWAHATI / BORJHAR(A)	38.2	4	37.8	28-9-2009
	JAGDALPUR	34.4	1	34.2	09-09-2006
	JAISELMER	43.5	9	43.3	10-09-1949
	JAMSHEDPUR(A)	37	2	36.5	18-09-2020
	KAILASHAHAR AERO	38	5	37.2	18-09-2015
	KANNUR (CANNANORE)	34.7	1	34.2	26-09-2015
	KARWAR	34.4	2	34	25-09-2015

	KUKERNAG	32	12	31.2	07-09-2005
	LENGPUI	35.7 @	5	35.7	20-09-2018
	LUMDING	40	4	37.2	01-09-1951
	MAJBAT	37.4 @	5	37.4	12-09-1985
	MUKTESWAR (KUMAUN)	27.1	2	26.8	03-09-1968
	NAJIBABAD	37.5	7	36.9	01-09-2011
	NARSAPUR	37	27	35.6	30-09-2010
	PALAKKAD (PALGHAT)	35.9 @	1	35.9	25-09-2015
	PENDRA ROAD	35.2	2	34.6	03-09-1996
	QUAZI GUND	33.2	12	32.8	13-09-2019
	RAJNANDGAON	36	1,2	35.4	02-09-1992
	SEISMO RIDGE	38.8	7	38.5	06-09-2022
	SHIRALI	34.5	8	34.3	30-09-2019
	SILCHAR	39.4	4	39.2	02-09-2005
	SOLAPUR	38	1	37.8	06-09-2015
	SUNDERNAGAR	34.4 @	6	34.4	12-09-2015
	WASHIM	36.2	26	35.7	28-09-2009
OCTOBER	AMS SHIMLA	28 @	8	28	02-10-2020
	BAPTLA	36.4	3	36	11-10-2010
	BHUNTAR(A)	33.6	8	33.4	02-10-2020
	DHARMASALA EMO	31	8	30.5	07-10-1983
	ERODE	39.2	6	38.6	02-10-2002
	GOLAGHAT	35 @	3	35	12-10-2015
	HARNAI	38.5	5	37	26-10-1977
	JAMSHEDPUR(A)	36.4	11	36.2	27-10-2004
	K.PARAMATHY	39	6,9	38.5	01-10-2021
	KAVALI	40.1	6	38.6	12-10-2018
	MANDYA	33.6	7	33.5	14-10-2007
	MIDNAPORE	36.5	12	36.1	10-10-1907
	MINICOY	34.3	17	33.3	03-10-1931
	MUKTESWAR (KUMAUN)	25.6	5	25.5	07-10-1974
	PARADIP (CWR)	36.5	11	36	10-10-2006
	PASIGHAT(A)	36.7	2	36.2	19-10-2021
	PURI	36.2	12	36.1	02-10-1899
	SHIRALI	36.6	20,21,22	36.2	28-10-2006
	SULTANPUR	35.7 @	9	35.7	08-10-2006
	VISAKHAPATNAM	37.6	4	37.2	08-10-1965
NOVEMBER	CANNING	35	3	33.6	26-11-1997
	DAHANU	37.8 @	25	37.8	23-11-1948
	DEHRA DUN	31	1	30.6	01-11-1952
	DIGHA	34.6	1	34.5	07-11-1989
	ERODE	36.2 @	21	36.2	18-11-1998
	KHAMMAM	36	3	35.4	04-11-1965
	KORAPUT	38	1	32.2	19-11-2020
	LUMDING	34.2	2,3	33	04-11-1983
	MANDLA	34.4	5	34	02-11-1966
	MINICOY	34.5	18	33.2	15-11-1987
	PURI	34.4	2	34.2	06-11-1989
	RAJNANDGAON	33.5	10,11,12	33.2	06-11-1981
	SILCHAR	35.2	1	35	29-11-1900
	WASHIM	35.2	17	35	07-11-2010
	YAVATMAL	35.5	13	34.9	08-11-1976
	Imphal AP	35.4	10	31.4	03-11-2014
	DECEMBER	AMBIKAPUR	29.6	3	29.5
BAHRAICH		32	3	31.7	01-12-1896
BANGLURU		31.2	6	31.1	17-12-2003
GORAKHPUR PBO		30.6	3	30.5	02-12-1984
KARAIKAL		33.3	5	32.7	12-12-2010
KHAMMAM		34.6 @	1,3	34.6	01-12-1972
KOCHI I.A.F.		35.3 @	29	35.3	30-12-2022
KORAPUT		31	2	30.9	31-12-2015
LUCKNOW/AMAUSI(A)		30.2	3	29.9	04-12-1976
LUMDING		31.6	3	31	05-12-1972
MADURAI(A)		36.6	5	34.8	14-12-2016
MATHERAN		31	27,31	30.9	02-12-1977
MINICOY		34.3	6	33.3	13-12-1972
MYSORE		32.1 @	7	32.1	28-12-2018
PAMBAN		33.9 @	6	33.9	29-12-1906
PATNA(A)		32	3	29.3	03-12-2005
SHAHJAHANPUR		29.8	3	29.3	01-12-2021
THIRUVANANTHPURAM (A) (TRIVANDRUM)		35.2	29	34.4	17-12-2007
THIRUVANANTHPURAM (TRIVANDRUM)		36.2	29	35.5	28-12-2006
VALPARAI PTO		30 @	23	30	14-12-2009

“@” Equals Previous Record

“#” BASED ON REAL TIME AVAILABLE DATA

**तालिका - ५ / TABLE -5**  
**2023 के दौरान अब तक की उच्चतम वर्षा**  
**Ever recorded Highest Rainfall during 2023**

MONTH	STATION NAME	NEW	DATE	PREVIOUS	MM/DD/YYYY
		RECORD <sup>1</sup> in mm		RECORD in mm	
JANUARY	SIKAR	44.0	30	39.8	10-01-1982
	RADHANPUR	28.0	29	19.0	24-01-1977
FEBRUARY	ITANAGAR	28.8	8	13.7	17-02-2011
MARCH	GOALPARA	80.7	20	68.0	19-03-2011
	JALPAIGURI	75.0	21	68.6	07-03-1926
	KORAPUT	122.0	19	47.0	12-03-2006
	MUZAFFARPUR	34.0	19	31.3	20-03-1969
	BHIND	22.0	18	20.0	27-03-1974
	GANDHINAGAR	21.0	20	8.0	27-03-2020
	MATHERAN	21.6	21	1.6	11-03-1978
	T.B.I.A.(THANE- BELA)	34.0	21	4.6	10-03-2006
	MUMBAI (SANTACRUZ (A))	16.6	21	11.9	10-03-2006
	BHAWANIPATNA	35.8	23	34.2	19-04-1988
APRIL	RAISEN-AWS	13.4	9	8.1	25-04-1978
	SANTACRUZ - IMD OBSY	14.6	13	7.2	22-04-1974
	JAISALMER	59.8	30	56.4	18-04-1995
	KHARGONE-AWS	45.4	29	21.9	13-04-2015
	KORAPUT	57.5	10	50.4	12-05-2019
MAY	HAMIRPUR OBSY	35.0	2	28.9	07-05-2016
	ROORKEE	72.2	4	57.7	30-05-1910
	PHALODI	40.2	29	38.1	22-05-1920
	ERINPURA/JAWAI DAM	77.0	29	44.2	07-05-2008
	BHIND-AWS	40.0	31	18.1	17-05-1973
	DATIA-AWS	76.2	1	23.2	06-05-1981
	WARDHA	32.5	3	30.0	17-05-1999
	WASHIM	59.2	3	7.0	11-05-2014
	ADILABAD	47.6	1	32.0	09-05-1981
	ANGUL	170.0	26	161.2	15-06-1990
	NAJIBABAD (T)	205.0	25	93.5	12-06-1984
	SRIGANGANAGAR TEHSIL SR	109.0	26	99.1	14-06-1938
JUNE	ERINPURA/JAWAI DAM	239.0	19	78.3	25-06-1977
	NARSINGHPUR-AWS	218.0	28	217.6	27-06-1977
	MAHUVA	225.0	30	179.6	30-06-1959
	OKHA	228.1	17	190.0	30-06-1980
	UDGIR - IMD PARTTIME	66.0	25	65.4	18-06-2012
	AMBALA	224.1	9	211.7	16-07-2001
	DELHI RIDGE	134.5	9	124.0	11-07-2003
	CHANDIGARH	302.2	9	262.0	18-07-2000
JULY	BILASPUR SADAR	130.0	9	103.2	26-07-2012
	MANALI	131.3	9	100.0	13-07-1993
	PAHALGAM	73.3	8	71.2	27-07-1987
	LEH I.A.F.	17.6	9	17.4	14-07-1980
	KATRA	315.4	19	292.4	31-07-2019
	MAHUVA	302.0	28	167.9	15-07-1957
	VERAVAL	520.2	19	503.8	16-07-2009
	YEOTMAL	236.2	22	196.4	28-07-2005
	HANAMKONDA	242.2	27	227.8	13-07-1903
	SABOUR	187.0	22	162.5	28-09-1995
	SUPAUL	217.4	24	167.0	27-09-1975
	MALANJKHAND	166.6	15	140.3	11-09-1992
	SEPTEMBER	DHAR-AWS	301.3	17	161.4
MANDVI		64.0	7	61.0	14-09-1961
BILASPUR		135.6	15	83.8	19-09-2008
DURG		170.4	23	130.4	15-09-1983
RAJNANDGAON		110.0	15	103.0	05-09-1994
ITANAGAR		103.4	3	94.1	08-10-2009
CHURK		161.4	3	128.0	04-10-2001
BANIHAL		77.4	17	63.7	20-10-2015
JAISALMER		84.2	17	23.6	04-10-2019
K.PARAMATHI		139.0	15	125.6	26-10-2001
NOVEMBER	TRIVANDRUM AERO	211.4	15	175.2	17-10-1977
	KHARGONE-AWS	84.0	27	57.6	01-11-1981
	MANDVI	116.0	27	103.6	02-11-1981
	GANDHINAGAR	22.0	27	13.0	18-11-2010
	NANDED - IMD PARTTIME	64.2	27	47.5	19-11-1987
	UDGIR - IMD PARTTIME	45.0	9	35.6	22-11-2010
	WASHIM	55.8	27	46.0	14-11-2010
	VALPARAI PTO	83.8	5	81.4	08-11-2009
	KOCHI C.I.A.L.	187.4	5	145.8	05-11-2015
	HAMIRPUR OBSY	57.0	30	21.0	19-11-2010
	KOHIMA	26.8	8	21.3	01-12-1988
DECEMBER	KORAPUT	67.2	6	57.4	18-12-2018
	BHIND-AWS	28.0	1	3.3	10-12-1972
	SHEOPUR-AWS	52.0	4	27.2	12-12-1987
	BILASPUR	24.4	6	18.6	09-12-2010
	KAKINADA	137.7	6	130.3	01-12-1882
	TUNI	124.2	6	99.2	16-12-2003
	NANDIGAMA	115.2	6	50.0	16-12-2003
	KAVALI	145.1	5	113.4	06-12-2018
	NELLORE	218.1	5	189.2	16-12-1902
	NARSAPURAM	213.2	6	100.3	07-12-2010
	VALPARAI PTO	53.0	8	47.6	01-12-2008
	KANYAKUMARI	173.5	18	130.5	07-12-1980
	PALAYAMKOTTAI	442.0	18	200.7	10-12-1931

# BASED ON REAL TIME AVAILABLE DATA



**तालिका - ६ / TABLE - 6**

**HIGH IMPACTED WEATHER EVENTS OCCURRED DURING 2023 ALONG WITH ASSOCIATED LOSS OF LIFE AND DATES**

<b>Event</b>	<b>Number of Casualties</b>	<b>Season</b>	<b>Date</b>	<b>State / Union Territory Affected</b>
<b>Lightning &amp; Thunderstorm</b>	1333	Whole year	4 Jan. to 5 Dec.	Andhra Pradesh, Assam, Bihar, Chhattisgarh, Gujarat, Haryana, Himachal Pradesh, Jharkhand, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Meghalaya, Odisha, Rajasthan, Tamil Nadu, Telangana, Tripura, Uttar Pradesh, Uttarakhand, West Bengal, Jammu & Kashmir
<b>Floods &amp; Heavy Rain</b>	890	Whole year	15 Jan. to 19 Dec.	Arunachal Pradesh, Assam, Bihar, Chhattisgarh, Goa, Gujarat, Haryana, Himachal Pradesh, Jharkhand, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Meghalaya, Mizoram, Odisha, Punjab, Rajasthan, Sikkim, Tamil Nadu, Telangana, Uttar Pradesh, Uttarakhand, West Bengal, Chandigarh, Dadar and Nagar Haveli, Delhi, Jammu & Kashmir, Ladakh
<b>Heat Wave</b>	181	Pre-Monsoon & Monsoon	6, 10, 14 to 16, 18, 19, 22, 28, 29 Apr.; 6, 9 to 12, 14 to 16, 18 to 21, 23, 24 May; 7, 10 to 12, 14 to 20 Jun.; 4 Jul.	Andhra Pradesh, Bihar, Chhattisgarh, Jharkhand, Maharashtra, Odisha, Uttar Pradesh
<b>Snowfall</b>	21	Winter, Pre-Monsoon & Monsoon	11, 12, 30 Jan.; 1, 5, 17 Feb.; 14, 28 Mar.; 4 Apr.; 4 Jun.	Himachal Pradesh, Sikkim, Uttarakhand, Jammu & Kashmir, Ladakh
<b>Gale</b>	14	Pre-Monsoon & Monsoon	17 Mar.; 17 Apr.; 15, 16, 18 May; 1, 10 Jun.; 6 Sep.	Jharkhand, Maharashtra, Odisha
<b>Cold Wave</b>	5	Winter	6, 10 Jan.	Chhattisgarh, Uttar Pradesh
<b>Hailstorm</b>	3	Pre-Monsoon	18 to 20 Mar.; 19 Apr.	Assam, Chhattisgarh
<b>Extremely Severe Cyclonic Storm "BIPARJOY"</b>	7	Monsoon	6 to 19 Jun.	Rajasthan
<b>Severe Cyclonic Storm "MICHAUNG"</b>	29	Post Monsoon	1 to 6 Dec.	Andhra Pradesh, Tamil Nadu, Telangana

While,

- a) Tripura State also affected due to Severe Cyclonic Storm “MIDHILI” during 15 to 18 November.
- b) Mizoram state also affected due to Extremely Severe Cyclonic Storm MOCHA during 9 to 15 May.
- c) Damage reported from some districts of Gujarat due to Extremely Severe Cyclonic Storm “BIPARJOY”.
- d) Malkangiri district of Odisha state also affected due to Severe Cyclonic Storm “MICHAUNG”.
- e) Andhra Pradesh, Himachal Pradesh, Jammu & Kashmir, Jharkhand, Madhya Pradesh, Odisha, Telangana, Tripura, Uttar Pradesh State/Union Territory also affected due to Hailstorm during 7 to 9, 11, 15 to 21, 27 March; 6 to 9, 15, 19, 21 to 28, 30 April; 6, 25, 26 May; 15 Oct.; 26, 28 November (during Pre-Monsoon & Post Monsoon season).
- f) Chhattisgarh, Goa, Karnataka, Madhya Pradesh State/Union Territory also affected due to Gale during 17, 19, 20 March; 7, 15, 17, 22, 27 April; 1, 3, 15, 16, 18, 21 May; 1, 10, 11 June; 5, 23 July; 6 September (during Pre-Monsoon & Monsoon season).
- g) Mizoram, West Bengal States also affected due to Squall during 5, 15 May (during Pre-Monsoon season).
- h) Goa & Punjab states were also affected due to Lightning & Thunderstorm activity during 8 November & 24 November respectively.
- i) Some districts of Andhra Pradesh also affected during 20 Jul. to 1 Aug. and some districts of Tripura during 31 March.; 18 May; 15, 17 to 19 June; 8, 31 July; 8, 18, 31 August due to Heavy Rains & Floods activities.
- j) Andaman and Nicobar, Chandigarh, Dadra and Nagar Haveli were also affected due to Extreme heavy rains activities.
- k) Dadra and Nagar Haveli is also reported in the Rainfall and Flood Situation of CWC report.

**References:**

1. State of the Global Climate 2023, 2023, World Meteorological Organization (WMO), WMO.No. 1347

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## वार्षिक जलवायु सारांश - 2023

### ANNUAL CLIMATE SUMMARY - 2023

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