



**Government of India
Earth System Science Organization
Ministry of Earth Sciences
India Meteorological Department**

Press: Dated: 2 Sept, 2023

Sub: Climate Summary for the month of August 2023

1. Monthly Rainfall Scenario (01 to 31 Aug, 2023)

During August 2023, country as a whole received 162.7 mm rainfall, which is 36% less than its Long Period Average (LPA) 254.9 mm based on data 1971-2020. Rainfall over all India was lowest (162.7 mm) since 1901 against previous record of 191.2 mm in 2005. Rainfall over homogeneous region of Central India (165.0 mm) and homogeneous region of South Peninsular India (76.4 mm) was also lowest since 1901 against 172.8mm over central India in 1905 and 89.4 mm over South Peninsula in 1968. Rainfall over homogeneous region of Northwest India (339.3 mm) was 8th lowest since 1901 after 1993 (92.3 mm), 2005 (100.7 mm), 1920 (103.4 mm), 1979 (106.9 mm), 1939 (112.6 mm), 1905 (114.5 mm) and 2009 (120 mm).

Daily variation of the rainfall over the country as a whole during the month of August 2023 with normal (1971-2020) and All India rainfall percentage departure from normal for August during 1901-2023 is shown in the figure 1(a) and 1(b) respectively.

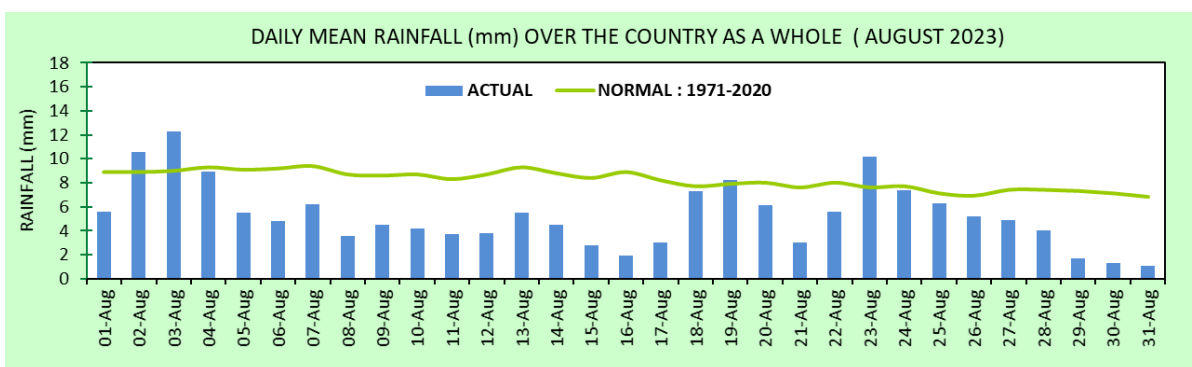


Fig.1 (a): Daily variation of rainfall over the country as a whole during August 2023.

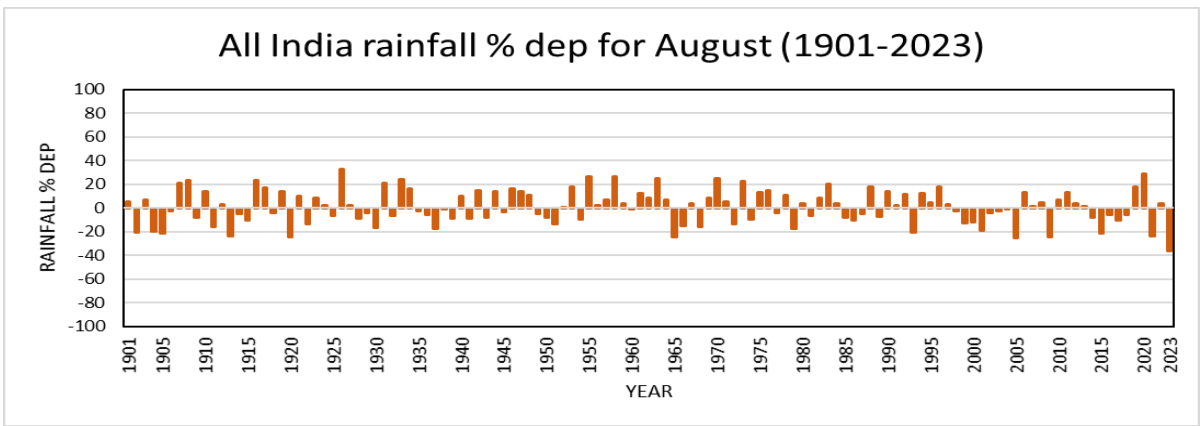


Fig 1(b). All India monthly rainfall percentage departure from normal (1971-2020) for August from 1901-2023.

The time series of actual rainfall since 1901 for All India, Central India, South Peninsular India and Northwest India are given in Fig. 2(a), 2(b), 2(c) and 2(d) respectively.

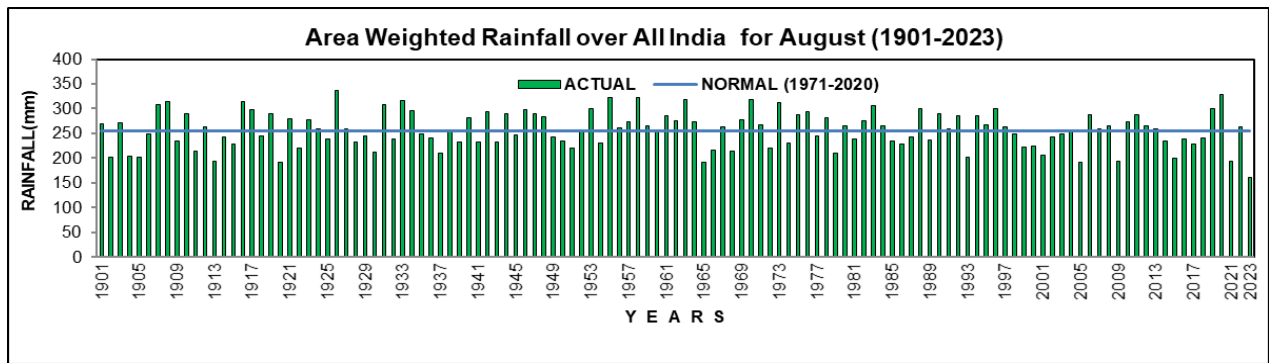


Fig.2 (a): Time series of area weighted rainfall over All India for August (1901 - 2023)

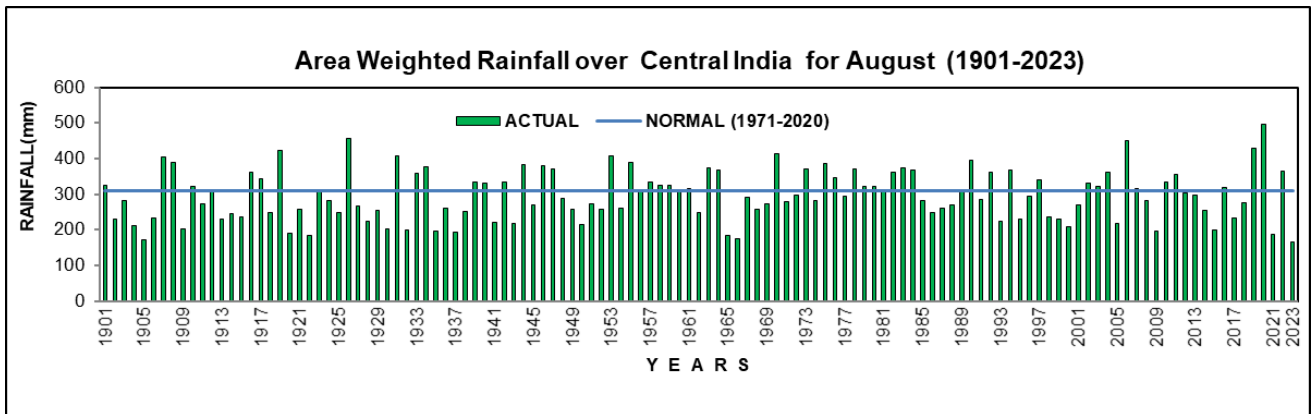


Fig.2 (b): Time series of area weighted rainfall over Central India for August (1901 - 2023)

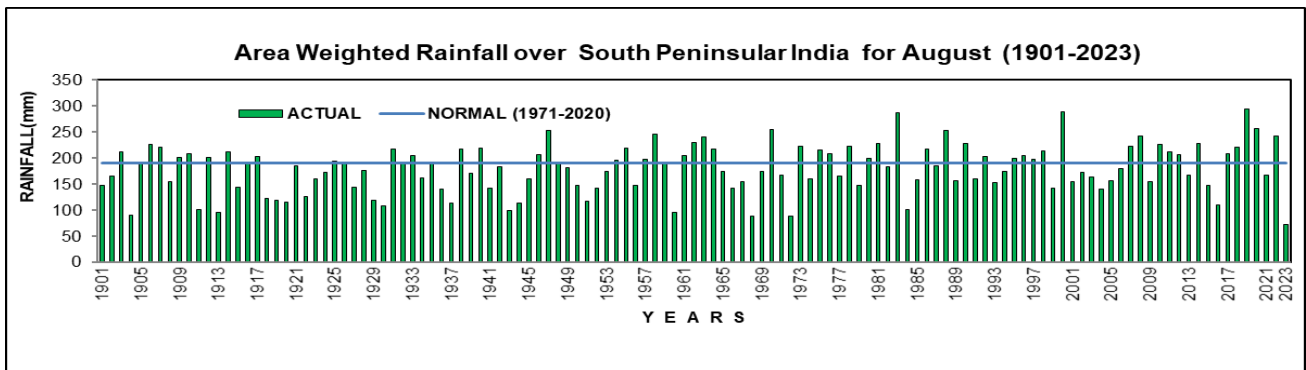


Fig.2 (c): Time series of area weighted rainfall over South Peninsular India for August (1901 - 2023)

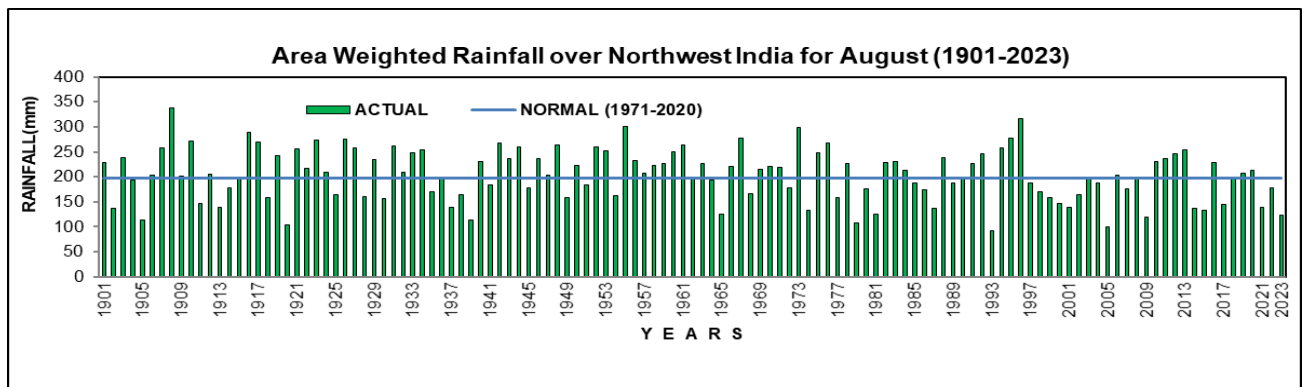


Fig.2 (d): Time series of area weighted rainfall over Northwest India for August (1901 - 2023)

The monthly rainfall for August 2023 is given in the table below:

Regions	Actual Rainfall (mm)	Normal Rainfall (mm)	% Departure from LPA
Country as a whole	162.7	254.9	-36.0
Northwest India	123.8	197.1	-37.0
Central India	165.0	308.8	-47.0
South Peninsula	76.4	190.7	-60.0
East & northeast India	339.3	332.0	2.0

During this month, 3 sub division received excess, 11 normal, 7 deficient rainfall and 15 large deficient rainfall. The rainfall distribution expressed in percentage departure is given in Fig.3.

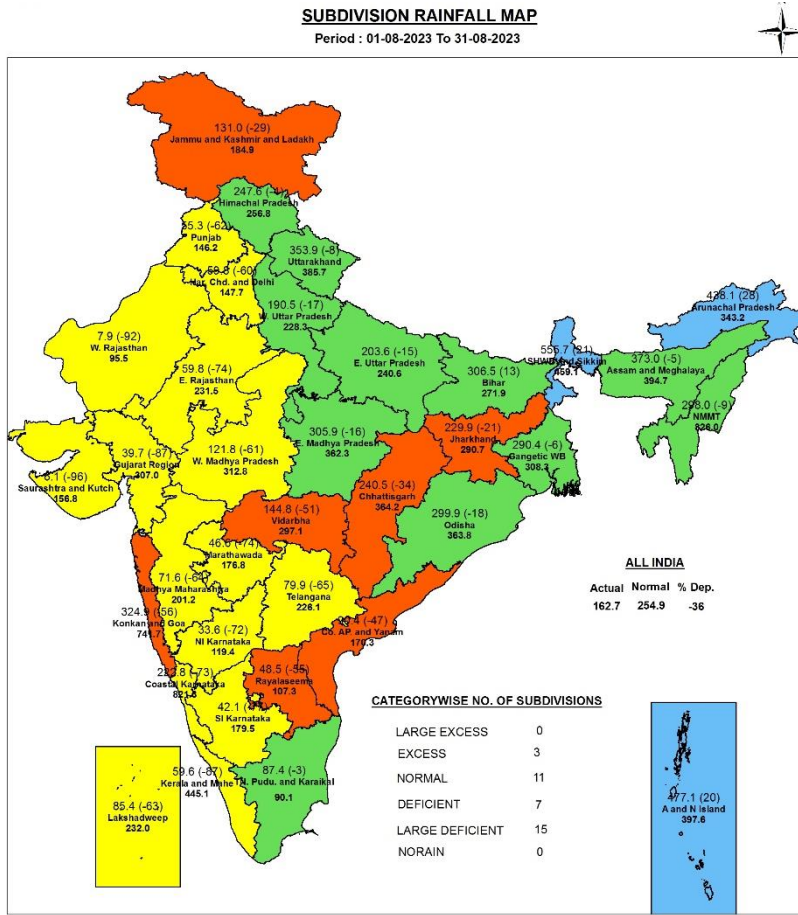


Fig 3: Subdivision-wise rainfall distribution for August 2023.

The observed spatial distribution of rainfall during August 2023, normal rainfall based on data of 1971 to 2020 and rainfall departures from normal during August 2023 are given in Fig.4.

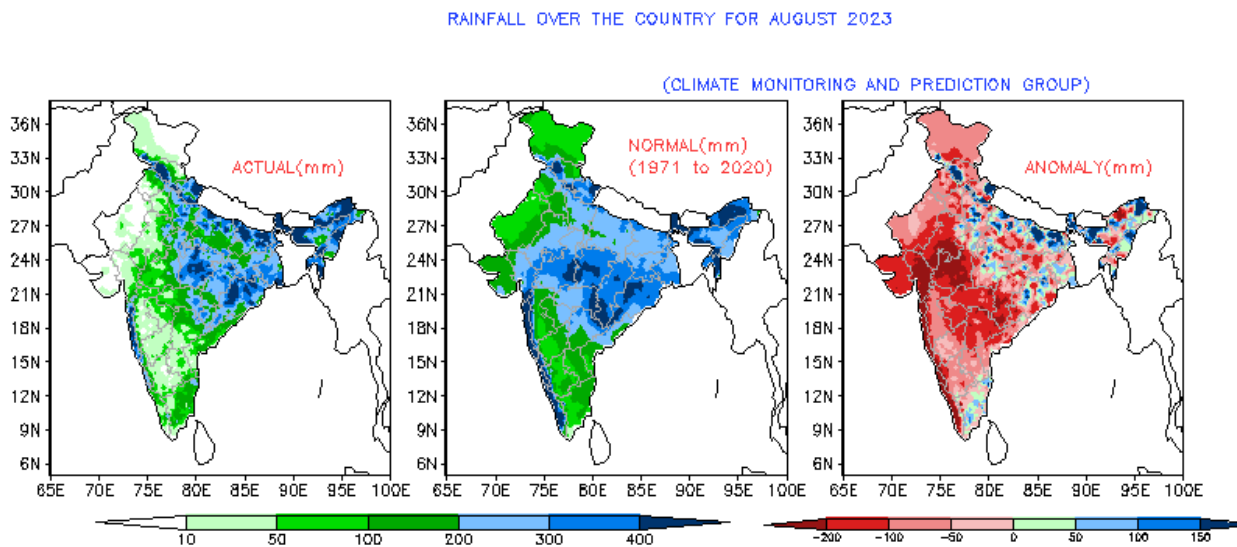
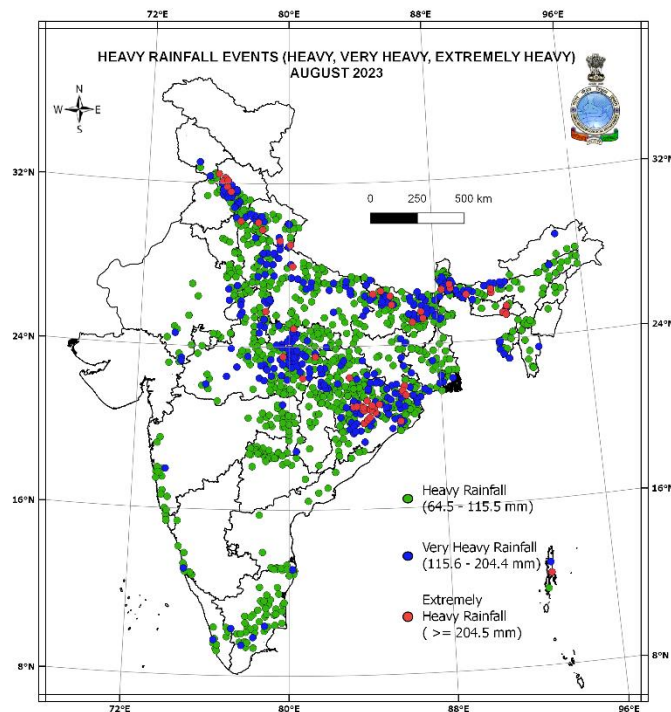


Fig 4: Observed spatial Rainfall pattern for the month of August 2023 over India and their departure from normal (1971 to 2020 period).

2. Frequency of Heavy Rainfall events

During August 2023, country experienced one exceptionally heavy rainfall event. The extremely heavy rainfall events (> 204.4 mm of rainfall) were recorded mainly over Himachal Pradesh, Uttarakhand, Assam & Meghalaya, Sub Himalayan West Bengal & Sikkim, Bihar, Odisha and East Madhya Pradesh. The location of occurrence of extremely heavy, very heavy and heavy rainfall events is shown in the Figure 5.

Out of total 1197 stations, 58 stations reported extremely heavy rainfall (> 204.4 mm), 307 stations reported very heavy rainfall (115.6 to 204.4 mm) and 832 stations reported heavy rainfall (64.5 to 115.5 mm of rainfall) during this month.



(Only highest category of rainfall event considered for a station)

Fig 5: The location of occurrences of heavy rainfall events in the month August 2023.

Chief Synoptic weather features observed during August 2023.

During August 2023, one Deep depression and one low pressure area (17- 20 August) formed over Bay of Bengal. Fig 6 shows track of the deep depression formed during August 2023.

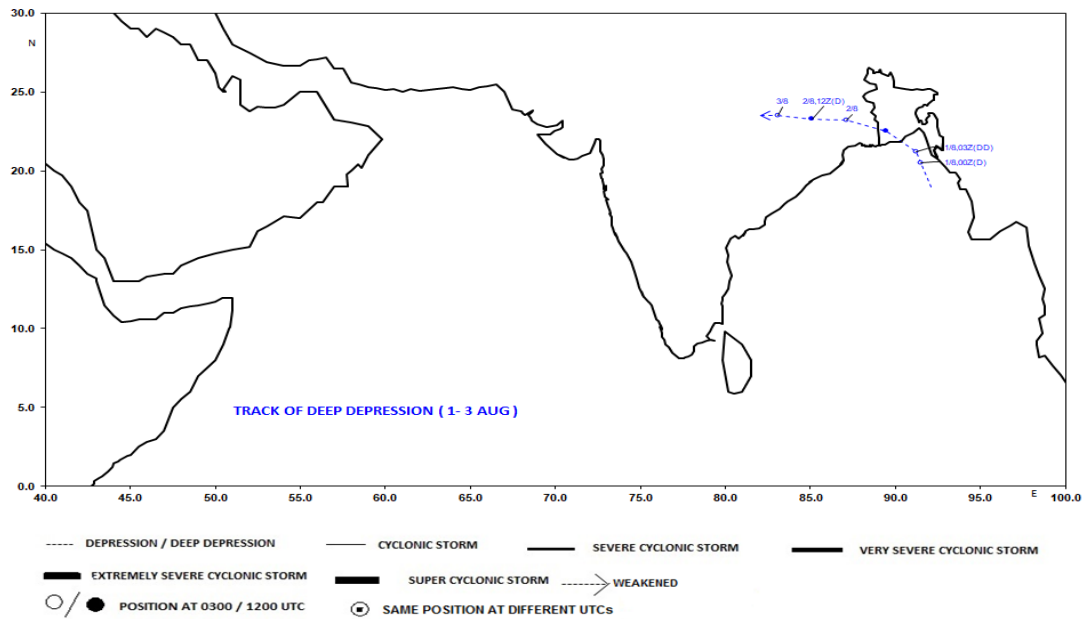


Fig 6: Track of deep depression formed during August 2023

Monsoon Trough which is the main component of monsoon, was highly unfavourable in August 2023 as it lay mostly to the north of normal position. Weak/Break monsoon was mainly prevailed during 5-16 and 27-31 August 2023. Only a total of 2 low pressure system against normal of 5 formed in the month. Total of 9 Low pressure system days was observed in the month against normal of 16.3 days. In the month, there was almost absence of formation of Off-shore trough, off the west coast. Hence, rainfall activities over west- coast of India and over Gujarat were highly sub-dued in the month. Over the north India, a total of 5 Western Disturbances (WDs) (1-6, 7-9, 13-16, 16-20 and 21-30 Aug 2023) affected weather over north India against Normal as 2-3 WDs. Most of them were seen to the north of 30degN and hence caused rainfall mainly western Himalayan states of Himachal Pradesh and Uttarakhand. Two WDs caused very heavy to extremely heavy rainfalls and floods mainly during 7-16 Aug and 22-23 Aug by triggering southerly/southwesterly winds from Arabian Sea.

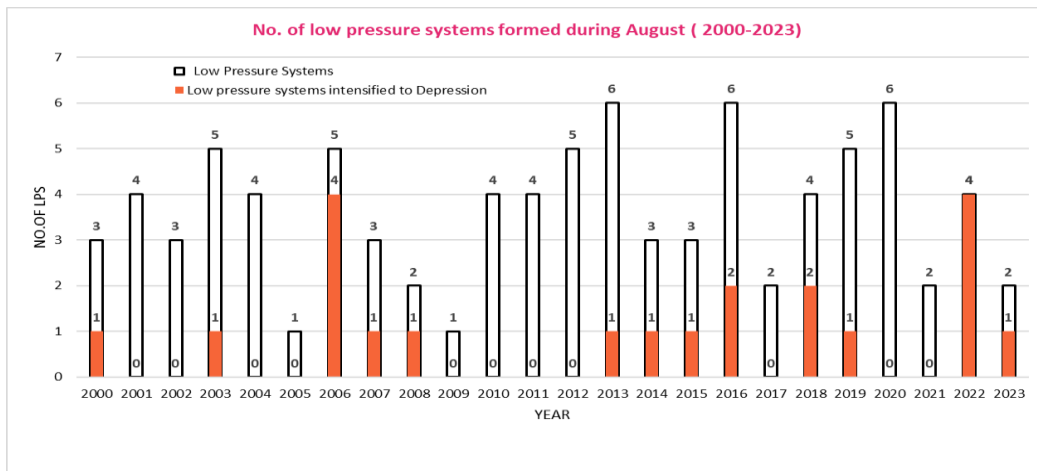


Fig 7: Number of low-pressure systems during August from 2000 to 2023

5. Characteristics of Temperatures for the month of August 2023

The average maximum, average minimum and mean temperature for the country as a whole during August 2023 were 32.19 °C, 24.70 °C and 28.45 °C respectively, against the normal of 31.09 °C, 24.01 °C and 27.55 °C based on period of 1981-2010. Thus, the average maximum temperature, average minimum temperature and mean temperature were above normal by 1.10 °C, 0.69 °C and 0.90 °C respectively for the country as a whole. The climatological data based on the period of 1981 to 2010 are used to calculate the normal and hence the anomaly (Actual average temperature in 2023 - normal temperature based on data of 1981-2010). The daily variation of maximum and minimum temperature anomaly over the country as a whole for August 2023 is shown in the figure 8(a) and (b). It was mostly above normal by 1-2degC mainly during 9-23 August and then during 27-31 August.

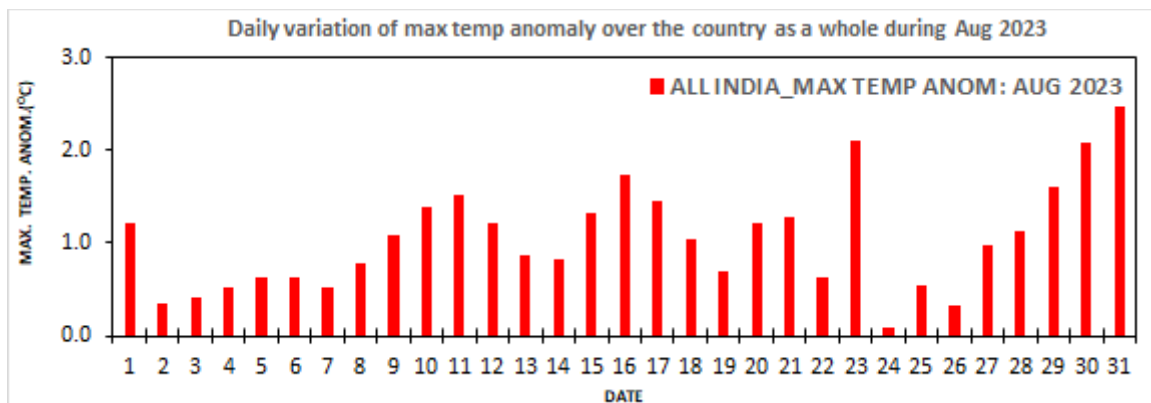


Fig 8(a): Daily variation of maximum temperature anomaly over the country as a whole for August 2023.

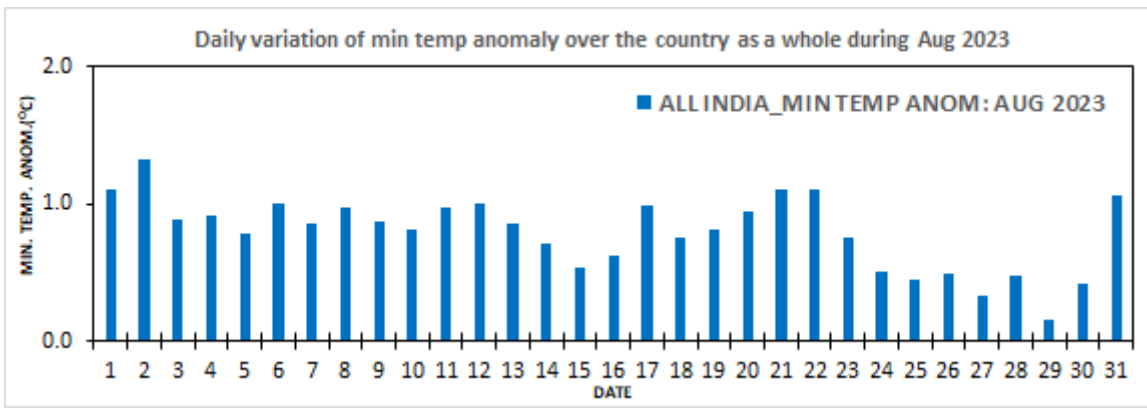


Fig 8(b): Daily variation of minimum temperature anomaly over the country as a whole for August 2023.

Figure 9 shows time series of monthly average maximum, average minimum and mean temperature over the country as a whole for the month of August 1901-2023. Over the country during August, the average maximum temperature was ever highest at 32.19°C since 1901 against the earlier record of 31.92°C in 2009 for the month of August. The average minimum temperature was the 2nd highest (24.70°C with an anomaly of 0.69°C) after the year 2020(24.73°C) since 1901. The mean temperature was highest at 28.45°C since 1901 against the earlier record of 28.19°C in 2009.

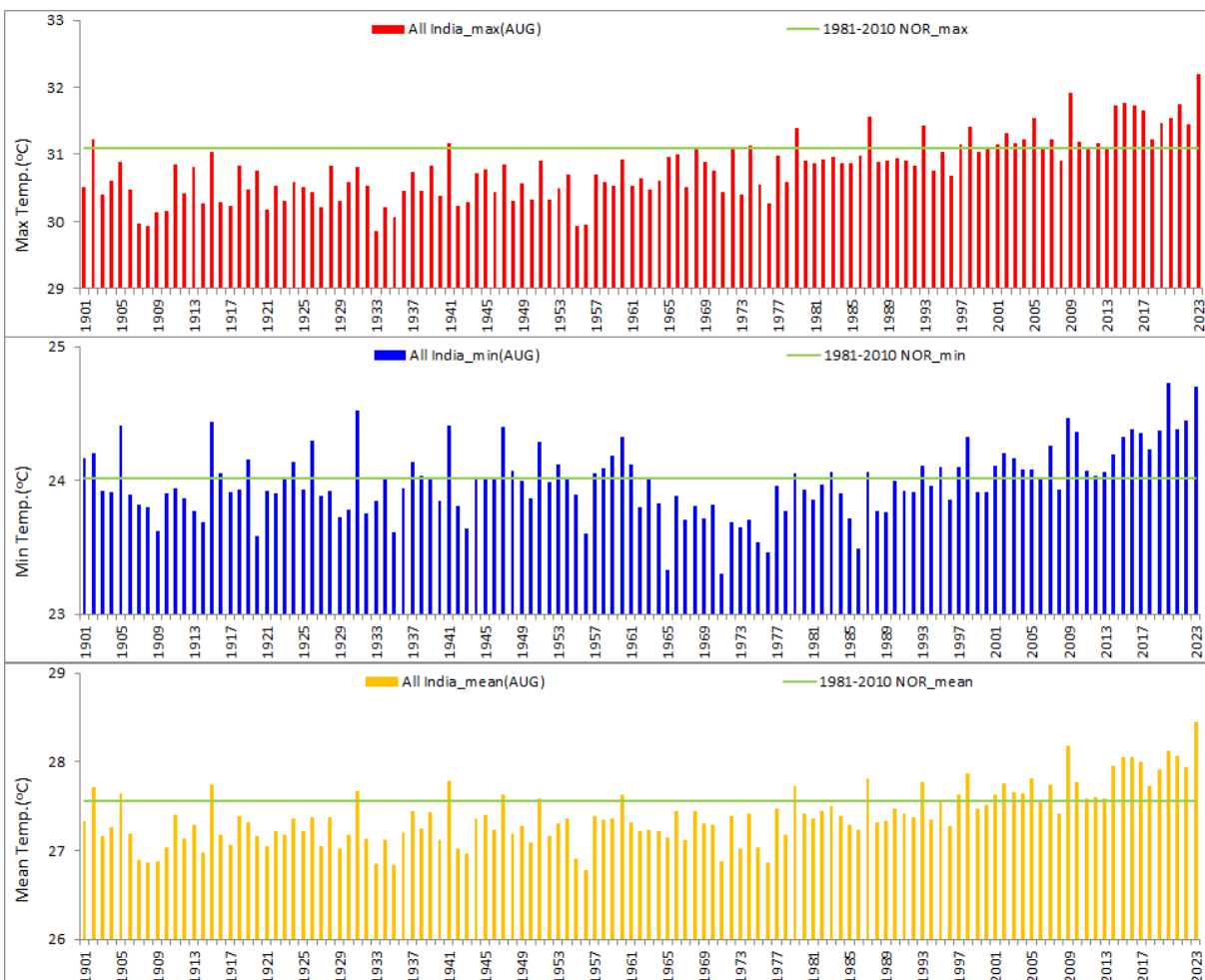


Fig 9: Time series of monthly average maximum, average minimum and mean temperature over the country as a whole for the month of August 1901-2023.

Figure10 shows time series of monthly average maximum, average minimum and mean temperature over the South Peninsular India for the month of August 1901-2023. Over South Peninsular India during August, the average maximum temperature was highest at 32.66°C since 1901 against earlier record of 32.17°C in 2016. The average minimum temperature was highest at 25.26 °C since 1901 against earlier record of 25.17°C in 2016. The mean temperature was highest at 28.96°C since 1901 against the earlier record of 28.67°C in 2016.

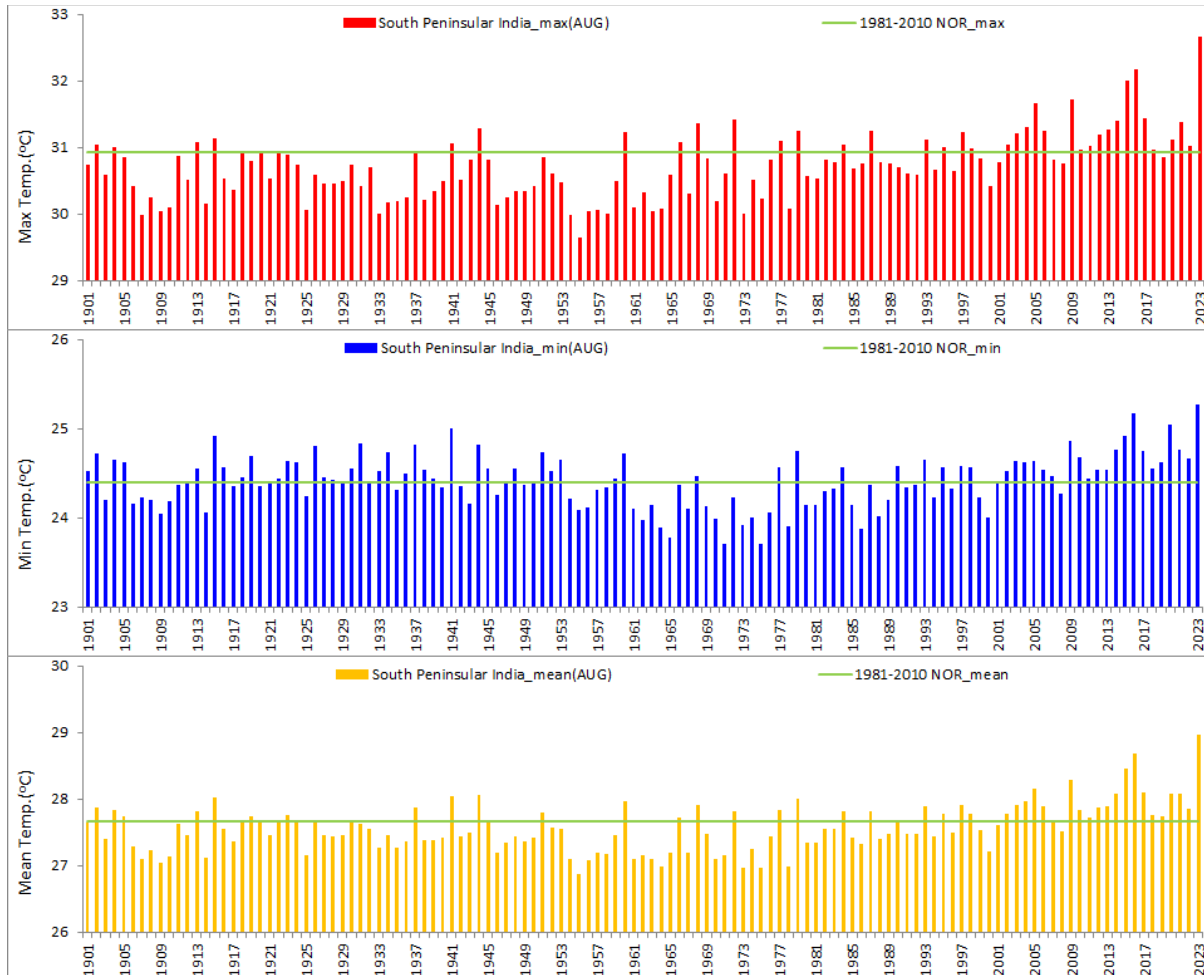


Fig 10: Time series of monthly average maximum, average minimum and mean temperature over South Peninsular India for the month of August 1901-2023.

Figure11 shows time series of monthly average minimum and mean temperature over the Central India for the month of August 1901-2023. Over Central India during August, the average minimum temperature was 3rd highest (24.58°C with an anomaly of 0.40°C) after 2009(24.75°C) and 1998(24.65°C) since 1901. The mean temperature was the 4th highest (27.82°C with an anomaly of 0.62°C) after 2009(27.94°C), 2015(27.90°C) and 2021(27.88°C) since 1901.

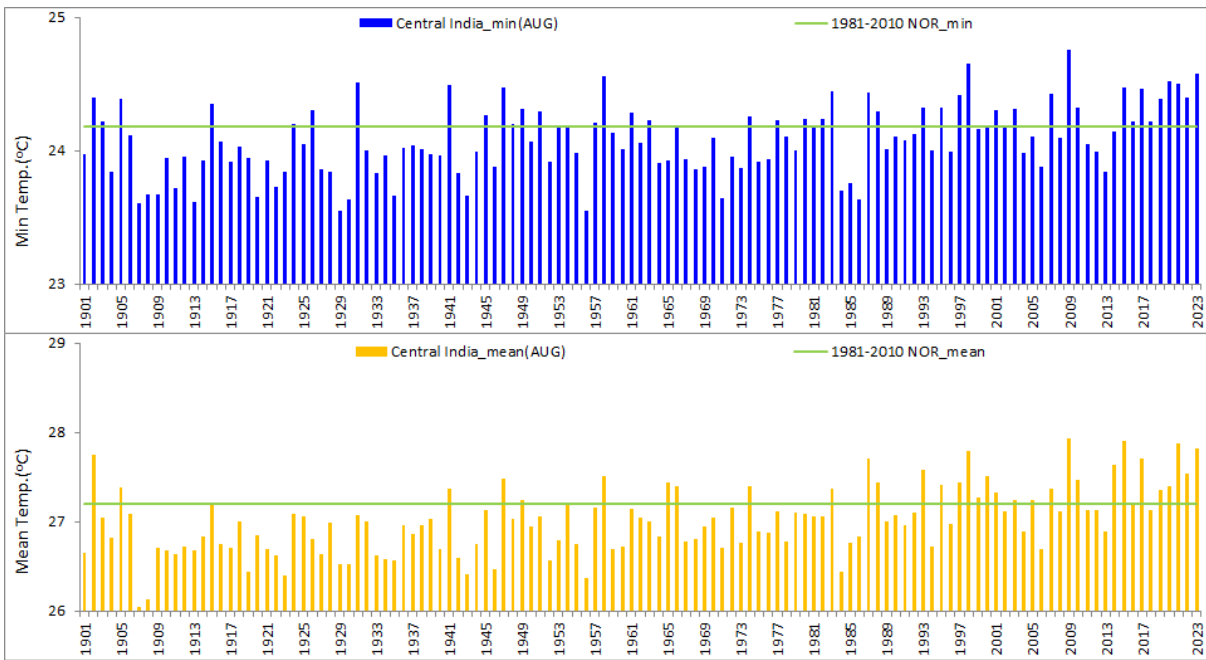


Fig 11: Time series of monthly average minimum temperature and mean temperature over Central India for the month of August 1901-2023.

Figure 12 shows time series of monthly average minimum and mean temperature over the Northwest India for the month of August 1901-2023. Over Northwest India during August, the average minimum temperature was the 4th highest (23.61°C with an anomaly of 0.70°C) after 2020(24.05°C), 1947(24.00°C), 1905(23.86°C) since 1901. The mean temperature was also the 4th highest (28.04°C with an anomaly of 0.697°C) after 2020(28.24°C), 2009(28.16°C) and 1987(28.05°C) since 1901.

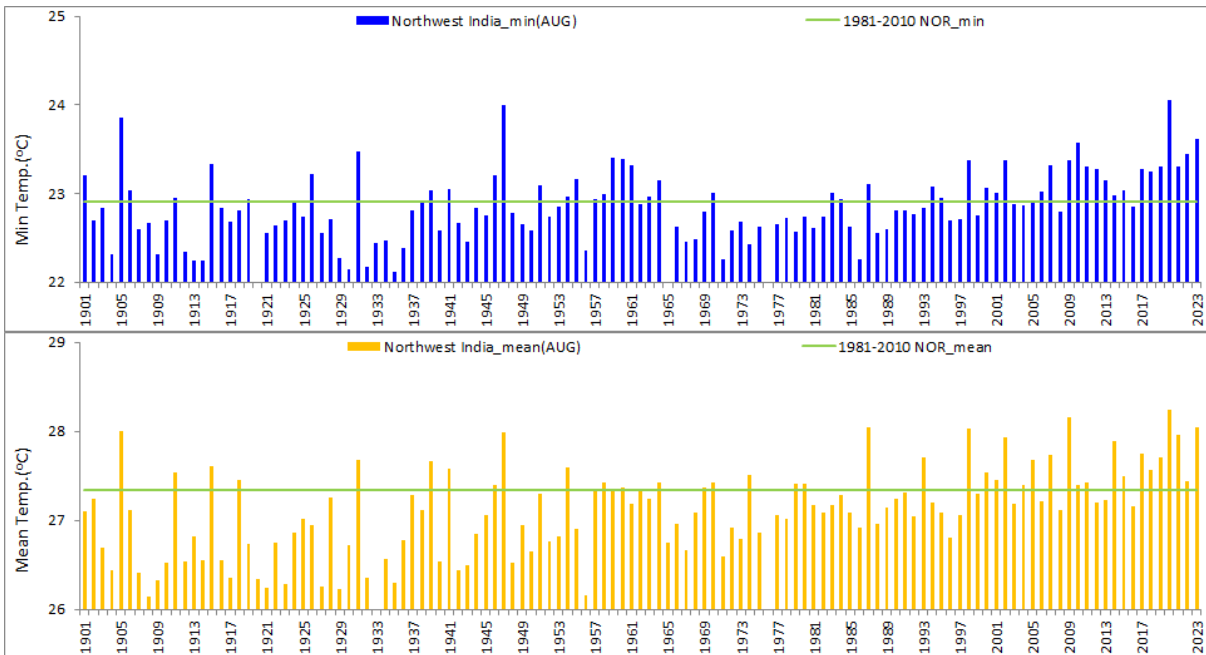


Fig 12: Time series of monthly average minimum temperature and mean temperature over Northwest India for the month of August 1901-2023.

Figure 13 shows time series of monthly mean temperature over the East & Northeast India for the month of August 1901-2023. Over East & Northeast India during August, the mean temperature was the 5th highest (28.74 °C with an anomaly of 0.62 °C) after 2022(29.43 °C), 2019(29.40 °C), 2016(29.09 °C) and 2020(29.08 °C)

since 1901.

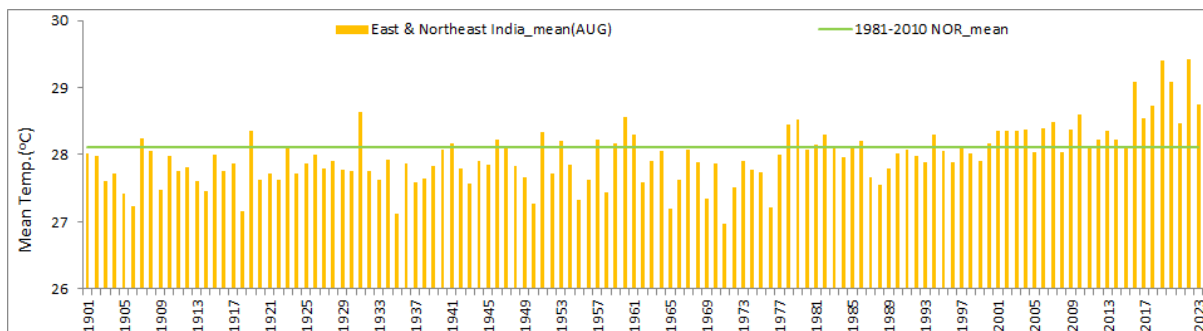


Fig 13: Time series of monthly mean temperature over East & Northeast India for the month of August 1901-2023.

The Temperatures during August 2023 for all India and homogeneous regions with its top ranks since 1901 are given below;

AUG 2023		Max Temp (°C)	Min Temp (°C)	Mean Temp (°C)
ALL INDIA	ACTUAL	32.19	24.70	28.45
	NORMAL	31.09	24.01	27.55
	ANOMALY	1.10	0.69	0.90
	Rank since 1901	1	2	1
NORTHWEST INDIA	ACTUAL	32.48	23.61	28.04
	NORMAL	31.78	22.91	27.35
	ANOMALY	0.70	0.70	0.70
	Rank since 1901	9	4	4
EAST & NORTHEAST INDIA	ACTUAL	32.33	25.15	28.74
	NORMAL	31.76	24.48	28.12
	ANOMALY	0.57	0.67	0.62
	Rank since 1901	9	6	5
CENTRAL INDIA	ACTUAL	31.05	24.58	27.82
	NORMAL	30.21	24.18	27.19
	ANOMALY	0.84	0.40	0.62
	Rank since 1901	6	3	4
SOUTH PENNINSULAR INDIA	ACTUAL	32.66	25.26	28.96
	NORMAL	30.92	24.40	27.66
	ANOMALY	1.73	0.864	1.30
	Rank since 1901	1	1	1

Note : Values are rounded off to nearest two decimal

The five highest temperature records with corresponding ranks since 1901 along with year of occurrence for All India, South Peninsular India (TMax, TMin, TMean), Central India (TMin, TMean) and East & Northeast India (TMean) are given in the table below;

All India (August 2023)					South Peninsular India (August 2023)					Central India (August 2023)				
Year	TMax	Normal	Anomaly	Rank	Year	TMax	Normal	Anomaly	Rank	Year	TMin	Normal	Anomaly	Rank
2023	32.19	31.09	1.10	1	2023	32.66	30.92	1.73	1	2009	24.75	24.18	0.57	1
2009	31.92		0.82	2	2016	32.17		1.25	2	1998	24.65		0.47	2
2015	31.77		0.68	3	2015	32.01		1.09	3	2023	24.58		0.40	3
2021	31.75		0.66	4	2009	31.72		0.80	4	1958	24.56		0.38	4
2014	31.73		0.64	5	2005	31.66		0.73	5	2020	24.52		0.34	5

All India (August 2023)					South Peninsular India (August 2023)					Central India (August 2023)				
Year	TMin	Normal	Anomaly	Rank	Year	TMin	Normal	Anomaly	Rank	Year	TMean	Normal	Anomaly	Rank
2020	24.73	24.01	0.72	1	2023	25.26	24.40	0.86	1	2009	27.94	27.19	0.74	1
2023	24.70		0.69	2	2016	25.17		0.77	2	2015	27.90		0.71	2
1931	24.52		0.51	3	2020	25.04		0.64	3	2021	27.88		0.68	3
2009	24.46		0.45	4	1941	25.00		0.60	4	2023	27.82		0.62	4
2022	24.45		0.44	5	1915	24.92		0.52	5	1998	27.79		0.59	5

All India (August 2023)					South Peninsular India (August 2023)					East & Northeast India (August 2023)				
Year	TMean	Normal	Anomaly	Rank	Year	TMean	Normal	Anomaly	Rank	Year	TMean	Normal	Anomaly	Rank
2023	28.45	27.55	0.90	1	2023	28.96	27.66	1.30	1	2022	29.43	28.12	1.31	1
2009	28.19		0.64	2	2016	28.67		1.01	2	2019	29.40		1.28	2
2020	28.13		0.58	3	2015	28.46		0.80	3	2016	29.09		0.97	3
2021	28.07		0.52	4	2009	28.29		0.63	4	2020	29.08		0.96	4
2016	28.05		0.50	5	2005	28.15		0.49	5	2023	28.74		0.62	5

Northwest India (August 2023)				
Year	TMin	Normal	Anomaly	Rank
2020	24.05	22.91	1.14	1
1947	24.00		1.09	2
1905	23.86		0.94	3
2023	23.61		0.70	4
2010	23.57		0.66	5

Northwest India (August 2023)				
Year	TMean	Normal	Anomaly	Rank
2020	28.24	27.35	0.90	1
2009	28.16		0.82	2
1987	28.05		0.70	3
2023	28.04		0.70	4
1998	28.02		0.68	5

The observed spatial temperature pattern of monthly average maximum, average minimum and mean temperature over India and their departures from normal (1981 to 2010 period) for the month of July 2023 is given in Figure 14.

TEMPERATURE & ITS ANOMALY FOR THE MONTH AUGUST 2023

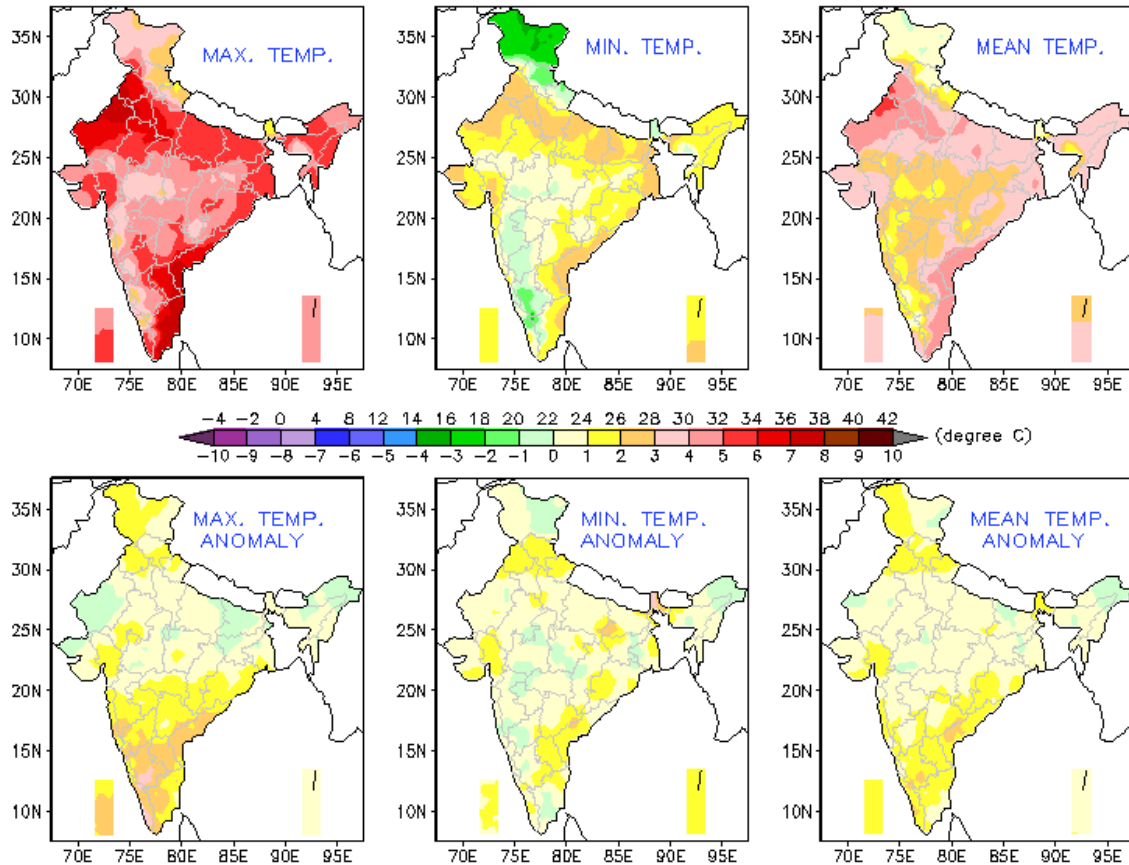


Fig 14: Observed spatial temperature pattern of monthly average maximum, average minimum, and mean temperature over India (top three from left to right) and their departure from normal (1981 to 2010 period) for August 2023 (lower three from left to right).

6. Significant Weather Events for the month August 2023:

During August, total 149 persons reportedly claimed dead, 40 persons injured, 50 persons missing & some livestock perished due to various weather events. The details of casualties given below, which are based on real time media reports. Fig.15 shows significant weather events during August 2023 affecting the population. (Based on real time media reports)

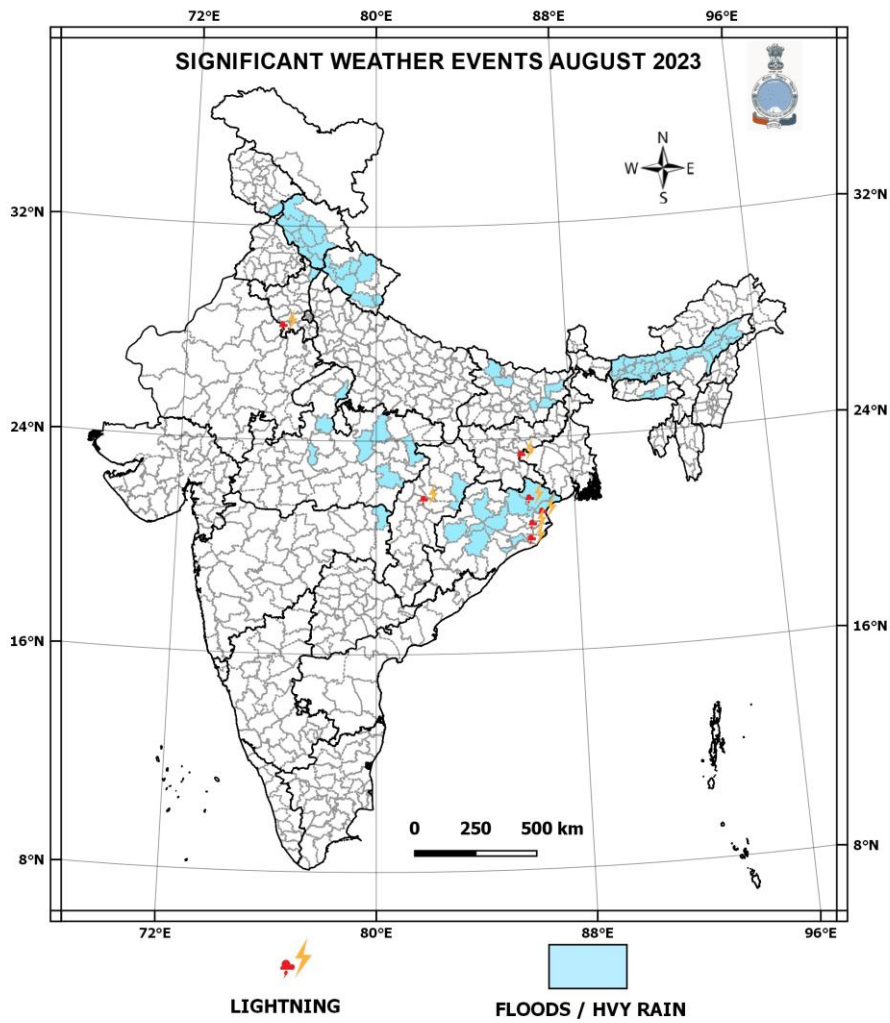


Fig. 15: Significant weather events during August 2023 (Based on real-time media report) which affected population.