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INDIA METEOROLOGICAL DEPARTMENT
Climate Research and Services (CRS)

Climate Summary for the month of May 2023

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

During May 2023, country as a whole received 67.5 mm rainfall which is 10% more than its Long Period Average (LPA) of 61.4 mm based on data of 1971-2020. Rainfall over homogeneous region of Northwest India (67.3 mm) was 3rd highest since 1901 after the years 1987 (95 mm) and 2021 (68.2 mm). Among the four homogeneous region, East & northeast India received 111.3 mm of rainfall, which is 3rd lowest since 1901. Prior lowest rainfall years were 1907 (108.1 mm) and 2012 (109.6 mm).

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

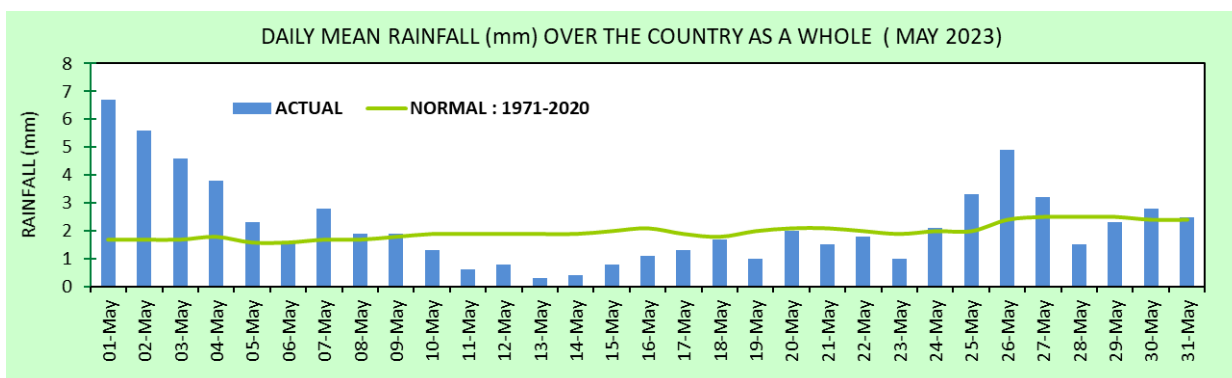


Fig.1 (a): Daily variation of rainfall over the country as a whole during May 2023.

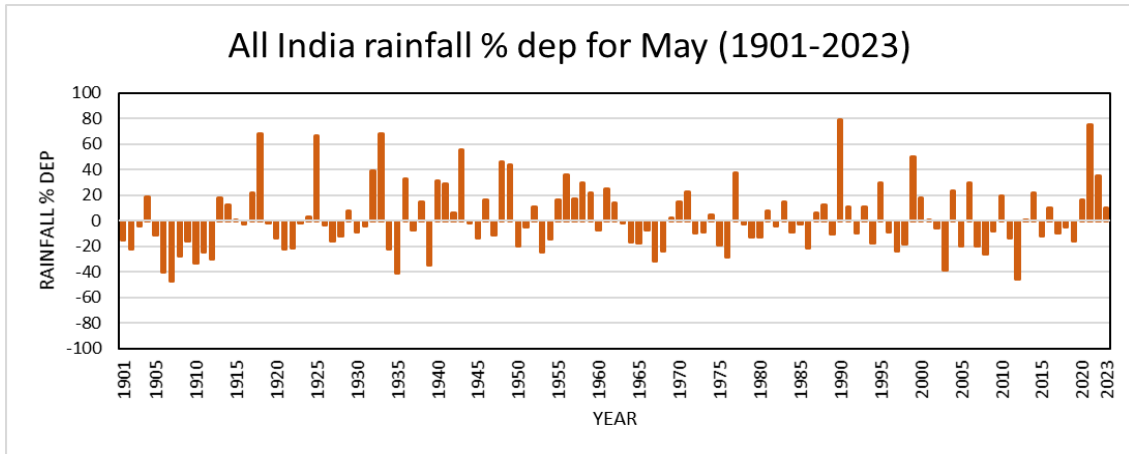


Fig 1(b). All India monthly rainfall percentage departure from normal based on 1971-2020 during May from 1901-2023.

The time series of area-weighted rainfall since 1901 for Northwest India and East & northeast India are given in Fig. 2(a) and (b) respectively.

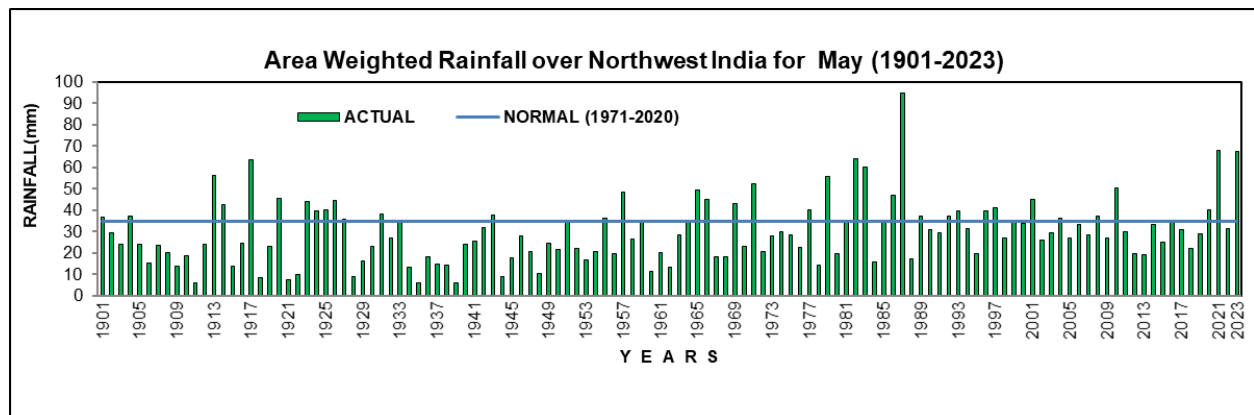


Fig.2 (a): Time series of area weighted rainfall over Northwest India for May (1901 - 2023)

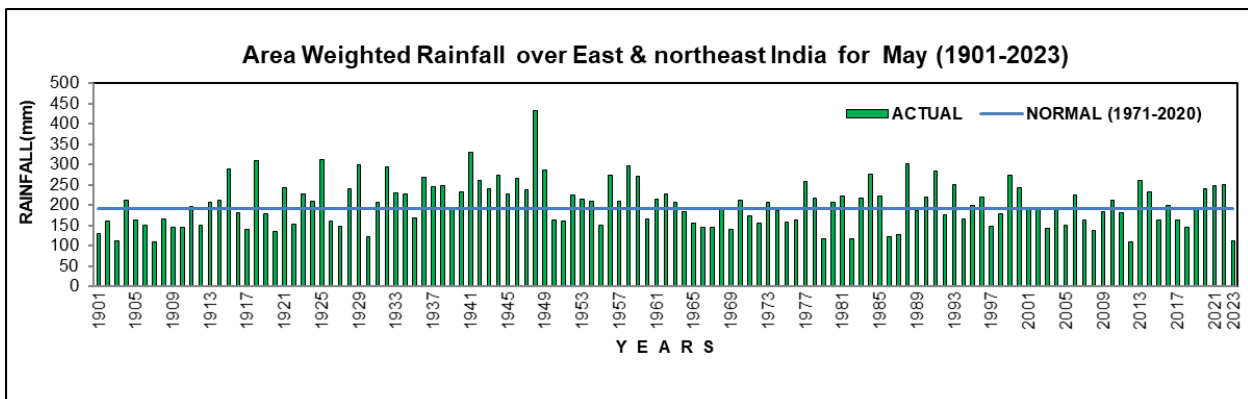


Fig.2 (b): Time series of area weighted rainfall over East & Northeast India for May (1901 - 2023)

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

Regions	Actual Rainfall (mm)	Normal Rainfall (mm)	% Departure from LPA
Country as a whole	67.5	61.4	10.0
Northwest India	67.3	34.6	94.0
Central India	31.2	19.0	64.0
South Peninsula	94.6	71.8	32.0
East & northeast India	111.3	189.9	-41.0

During this month, 17 sub divisions received large excess, 3 excess, 4 normal, 9 deficient and 3 received large deficient rainfall. The rainfall distribution expressed in percentage departure is given in Fig.3.

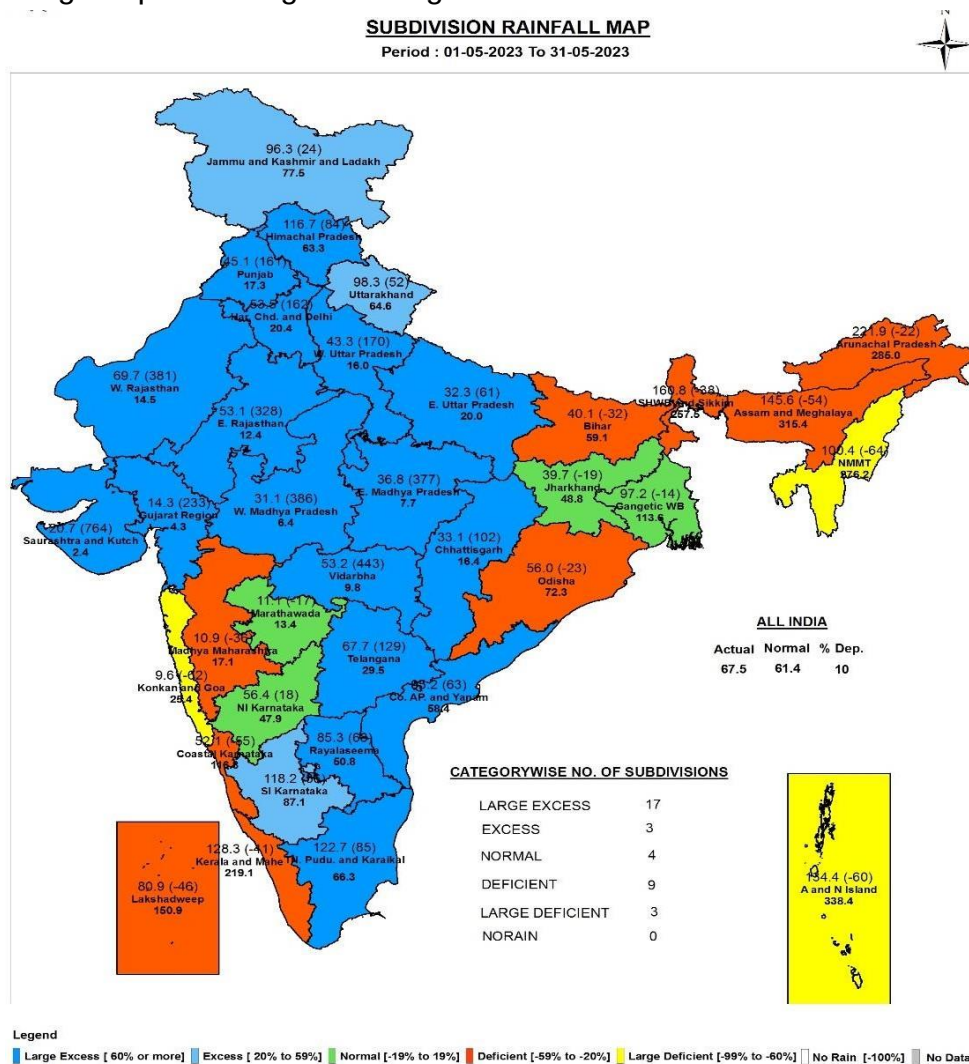


Fig 3: Subdivision-wise rainfall distribution for May 2023.

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

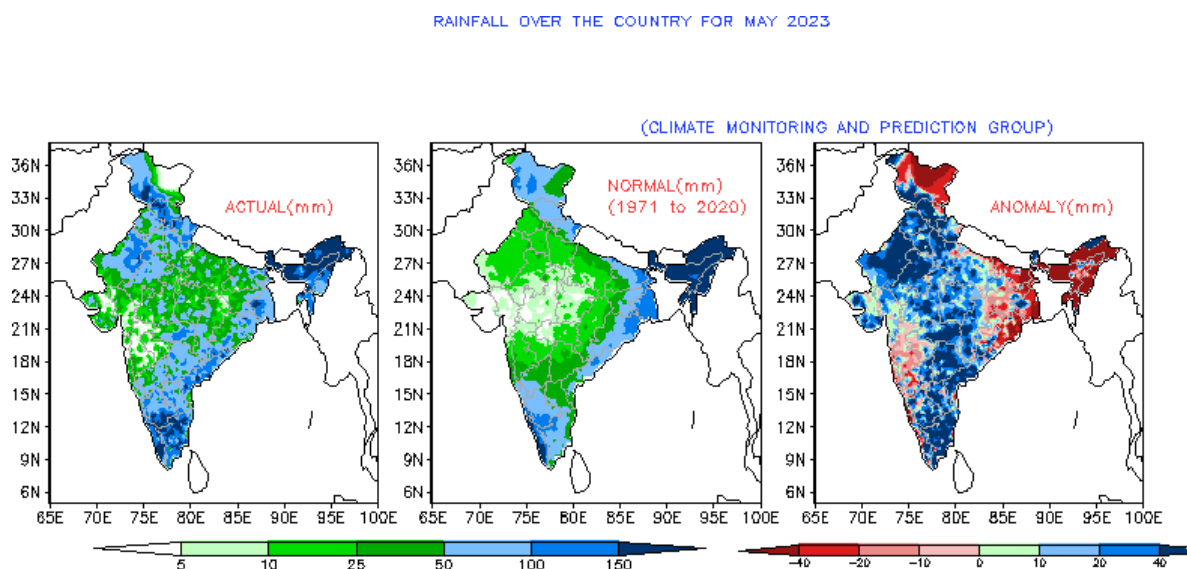
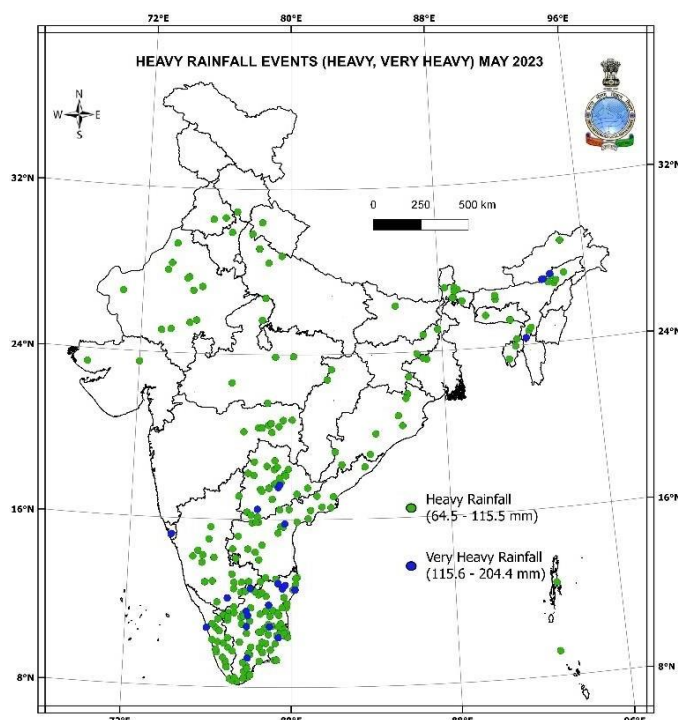


Fig 4: Observed spatial Rainfall pattern for the month of May 2023 over India and their departure from normal based on 1971 to 2020 period.

2. Frequency of Heavy Rainfall events

During May 2023 there were many heavy rainfall events (64.5 to 115.5 mm of rainfall) mainly in Telangana, Tamilnadu, Puducherry & Karaikal, Kerala & Mahe, Odisha, Sub Himalayan West Bengal & Sikkim, Rajasthan, Karnataka and Assam & Meghalaya. Very heavy rainfall (115.6 to 204.4 mm of rainfall) occurred mainly over Tamilnadu, Puducherry, Andhra Pradesh, Telangana, Assam, Meghalaya and Goa. The location of occurrence of heavy and very heavy rainfall events is shown in the Figure 5. Out of total 264 events, 24 were very heavy rainfall (115.6 to 204.4 mm) and 240 were heavy rainfall (64.5 to 115.5 mm of rainfall) events during this month.



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

Fig 5: The location of occurrence of heavy rainfall events in May 2023.

Some stations received record heavy rainfall (24 hour). The table below shows stations which received 24-hour record rainfall and its previous record.

STATION	24 HOUR RECORD RAINFALL IN May 2023(mm)#	DATE	PREVIOUS RAINFALL RECORD(mm)	DATE	STATE
ROORKEE	72.2	4	57.7	30-05-1910	Uttarakhand
ERINPURA/JAWAI DAM	77.0	29	44.2	07-05-2008	Rajasthan
DATIA	76.2	1	23.2	06-05-1981	Madhya Pradesh

based on real time available data

3. Characteristics of Temperatures for the month of May 2023

The average maximum, average minimum and mean temperature for the country as a whole during May 2023 were 35.03 °C, 23.92 °C and 29.47 °C respectively, against the normal of 35.17 °C, 24.32 °C and 29.74 °C based on period 1981-2010. 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 May 2023 is shown in the figure 6(a) and (b). The cooler than normal temperatures occurred over the country as a whole during many days in May 2023 mainly because of active thunderstorm activity and frequent passage of western disturbance over north India and other supporting synoptic scale weather systems over central and Peninsular India.

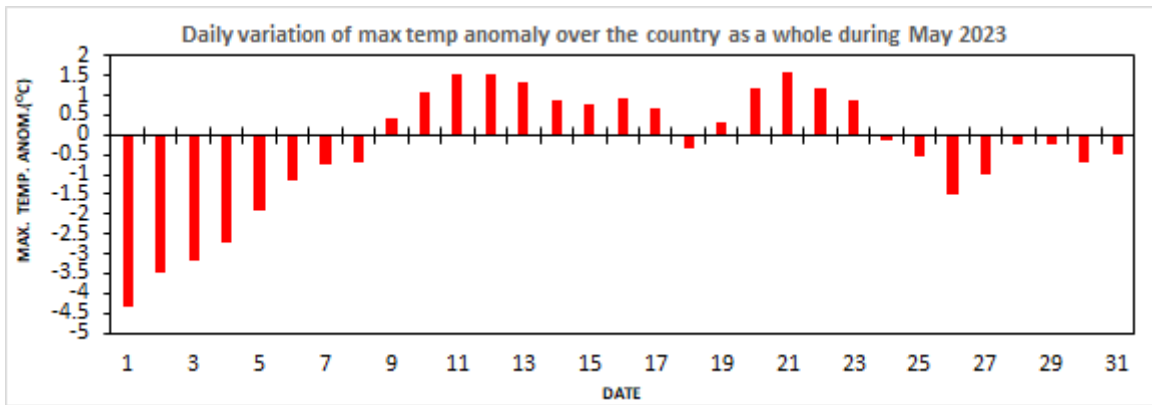


Fig 6(a): Daily variation of maximum temperature anomaly over the country as a whole for May 2023.

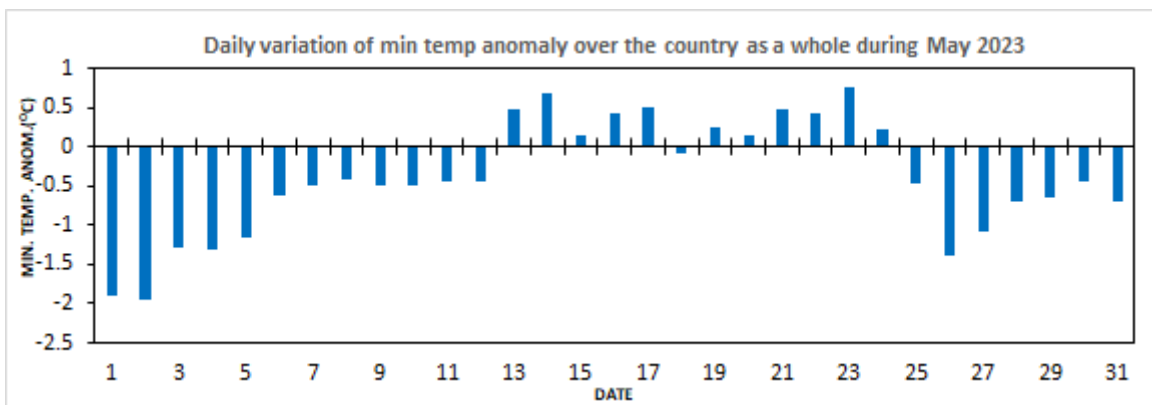


Fig 6(b): Daily variation of minimum temperature anomaly over the country as a whole for May 2023.

Figure 7 shows time series of monthly average maximum, average minimum and mean temperature over the country as a whole for the month of May 1901-2023.



Fig 7: Time series of monthly average maximum, average minimum and mean temperature over the country as a whole for the month of May 1901-2023.

Figure 8 shows time series of monthly average maximum average, average minimum and mean temperature over the Northwest India for the month of May 1901-2023. Over Northwest India during May 2023, the average maximum temperature was the eighth lowest (33.53 °C with an anomaly of -2.06 °C) and the average minimum temperature is the seventh lowest (20.09 °C with an anomaly of -1.37 °C) since 1901. The mean temperature is the eighth lowest (26.81 °C with an anomaly of -1.71 °C) since 1901.

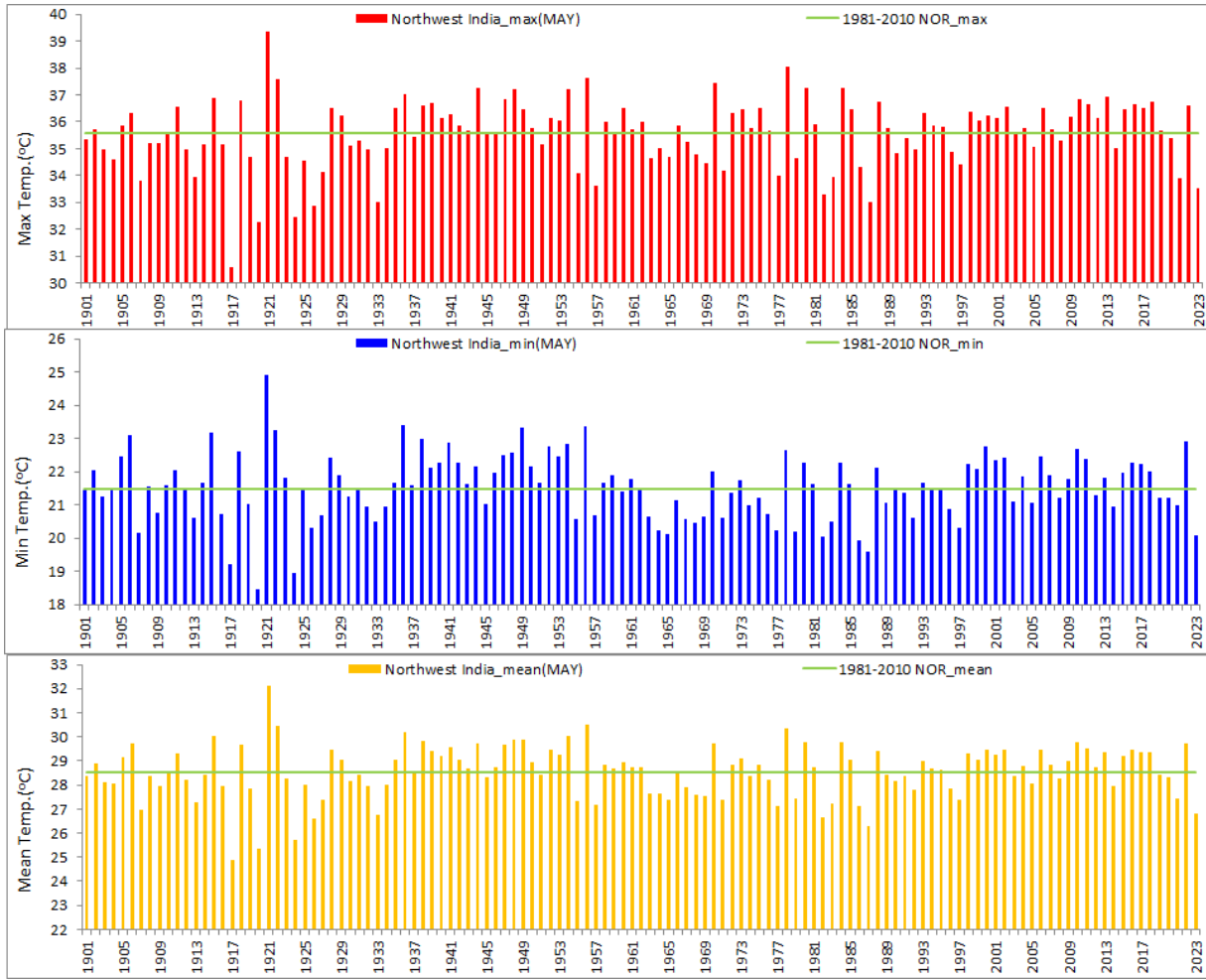


Fig 8: Time series of monthly average maximum, average minimum and mean temperature over Northwest India for the month of May 1901-2023.

Figure 9 shows time series of monthly average minimum temperature over Central India for the month of May 1901-2023. Over Central India during May 2023, the average minimum temperature was the sixth lowest (25.20 °C with an anomaly of - 0.74 °C) after the years 1917(23.51 °C), 1907(24.84 °C), 1920(24.96 °C), 1968(25.06 °C), 1987(25.15 °C) since 1901.

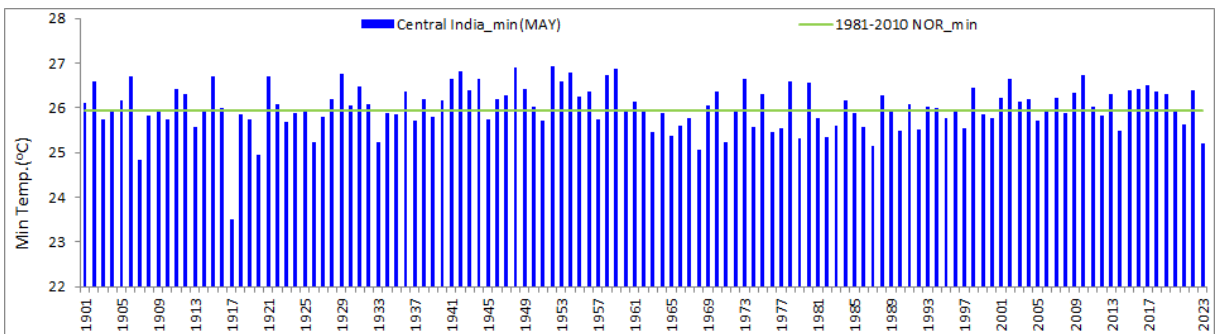


Fig 9: Time series of monthly average minimum temperature over Central India for the month of May 1901-2023

Figure 10 shows time series of monthly average maximum over East & Northeast India for the month of May 1901-2023. Over East & Northeast India during

May 2023, the average maximum temperature was the eighth highest (34.33 °C with an anomaly of 1.30 °C) since 1901.

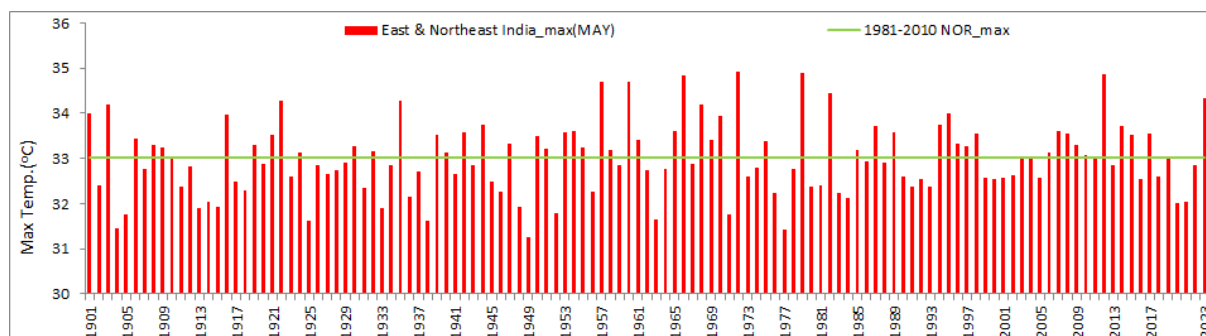


Fig 10: Time series of monthly average maximum temperature over East & Northeast India for the month of May 1901-2023.

The Temperatures during May 2023 for all India and homogeneous regions with its top and bottom ranks during 1901 to 2023 are given bellow;

MAY 2023		Max Temp (°C)	Min Temp (°C)	Mean Temp (°C)
ALL INDIA	ACTUAL	35.03	23.92	29.47
	NORMAL	35.17	24.32	29.74
	ANOMALY	-0.14	-0.40	-0.27
	Rank from TOP	63	107	90
	Rank from BOTTOM	61	17	34
NORTHWEST INDIA	ACTUAL	33.53	20.09	26.81
	NORMAL	35.58	21.46	28.52
	ANOMALY	-2.06	-1.37	-1.71
	Rank from TOP	116	117	116
	Rank from BOTTOM	8	7	8
EAST & NORTHEAST INDIA	ACTUAL	34.33	22.61	28.47
	NORMAL	33.03	22.64	27.84
	ANOMALY	1.30	-0.03	0.63
	Rank from TOP	8	73	23
	Rank from BOTTOM	116	51	101
CENTRAL INDIA	ACTUAL	37.00	25.20	31.10
	NORMAL	37.43	25.94	31.68
	ANOMALY	-0.43	-0.74	-0.58
	Rank from TOP	85	118	110
	Rank from BOTTOM	39	6	14
SOUTH PENINSULAR INDIA	ACTUAL	35.03	26.12	30.58
	NORMAL	34.46	25.88	30.17
	ANOMALY	0.58	0.241	0.41
	Rank from TOP	11	40	16
	Rank from BOTTOM	113	84	108

Note: Values are rounded off to nearest two decimal

The ten lowest temperature records with corresponding ranks since 1901 along with year of occurrence for Northwest India (TMax, TMin, TMean), Central India

(TMin) and ten highest temperature records with corresponding ranks since 1901 along with year of occurrence for East & Northeast India (TMax) are given in the table below;

Northwest India (May 2023)					East & Northeast India (May 2023)				
Year	TMax	Normal	Anomaly	Bot Rank	Year	TMax	Normal	Anomaly	Top Rank
1917	30.579	35.58	-5.01	1	1972	34.92	33.03	1.89	1
1920	32.245		-3.34	2	1979	34.90		1.87	2
1924	32.468		-3.12	3	2012	34.88		1.85	3
1926	32.856		-2.73	4	1966	34.83		1.79	4
1987	33.008		-2.58	5	1960	34.70		1.67	5
1933	33.035		-2.55	6	1957	34.70		1.67	6
1982	33.303		-2.28	7	1982	34.43		1.40	7
2023	33.528		-2.06	8	2023	34.33		1.30	8
1957	33.630		-1.95	9	1922	34.29		1.26	9
1907	33.796		-1.79	10	1935	34.27		1.24	10

Northwest India (May 2023)					Central India (May 2023)				
Year	TMin	Normal	Anomaly	Bot Rank	Year	TMin	Normal	Anomaly	Bot Rank
1920	18.448	21.46	-3.02	1	1917	23.51	25.94	-2.43	1
1924	18.956		-2.51	2	1907	24.84		-1.10	2
1917	19.205		-2.26	3	1920	24.96		-0.98	3
1987	19.577		-1.89	4	1968	25.06		-0.87	4
1986	19.918		-1.55	5	1987	25.15		-0.79	5
1982	20.028		-1.44	6	2023	25.2011		-0.73632	6
2023	20.092		-1.37	7	1971	25.2357		-0.70172	7
1965	20.119		-1.34	8	1926	25.2398		-0.69762	8
1907	20.166		-1.30	9	1933	25.2404		-0.69702	9
1979	20.203		-1.26	10	1979	25.3086		-0.62882	10

Northwest India (May 2023)				
Year	TMean	Normal	Anomaly	Bot Rank
1917	24.89	28.52	-3.63	1
1920	25.35		-3.18	2
1924	25.71		-2.81	3
1987	26.29		-2.23	4
1926	26.59		-1.93	5
1982	26.67		-1.86	6
1933	26.76		-1.76	7
2023	26.81		-1.71	8
1907	26.98		-1.54	9
1977	27.10		-1.43	10

Maximum temperature was above normal by 4.4 °C mainly over most parts of North India and East & Northeast India and coastal parts of India. Figure 11 shows the stations with number of days, which were above normal (>4.4 °C) maximum temperatures.

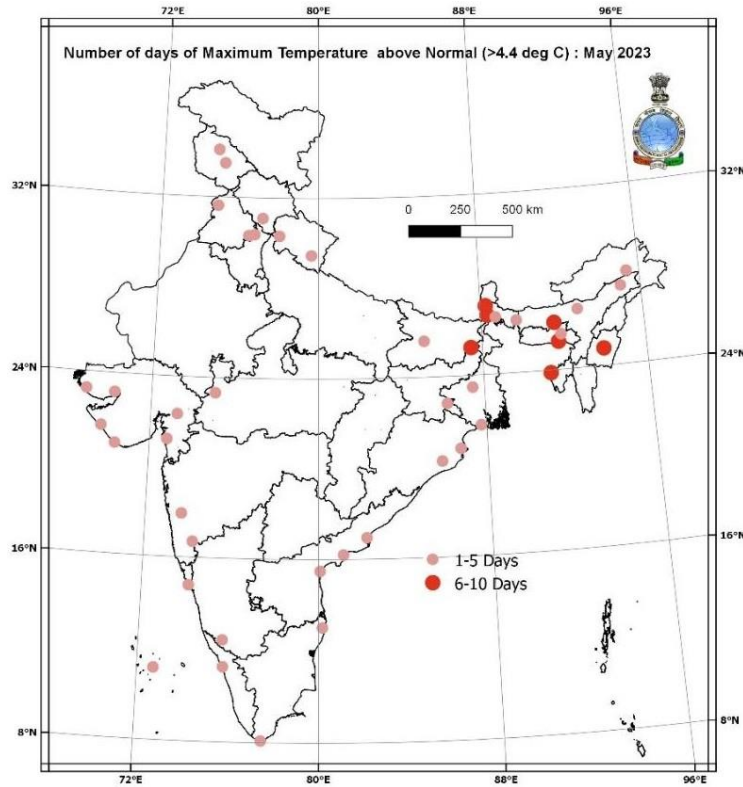


Fig 11: Number of days with maximum temperature above normal (>4.4°C) over the country for May 2023.

The observed spatial distribution of temperature pattern of monthly average maximum, average minimum and mean temperature over India and their departures from normal based on 1981 to 2010 period, for the month of May 2023 is given in Figure 12.

During May 2023, there were no heat wave during 1-8 May and then in 24-31 May due to occurrence of thunderstorms and rainfall activities from supporting synoptic systems. Date-wise analysis of met sub-division-based Heat wave condition shows that Heat wave conditions was observed only for 2-3 days over few met sub-divisions of the country in the month of May 2023. It was observed in isolated pockets over West Bengal & Sikkim and Bihar during 9-11 May; Gujarat during 11-12 May; West Rajasthan during 12-13 May; Coastal Andhra Pradesh during 15-17 May; Delhi on 22 and 23 May; south Uttar Pradesh during 21-23 May; West Rajasthan on 21 and 22 May; northeast Madhya Pradesh during 22-24 May. Hence, heat wave conditions in the month of May 2023 were sub-dued over the country.

TEMPERATURE & ITS ANOMOLY FOR THE MONTH MAY 2023

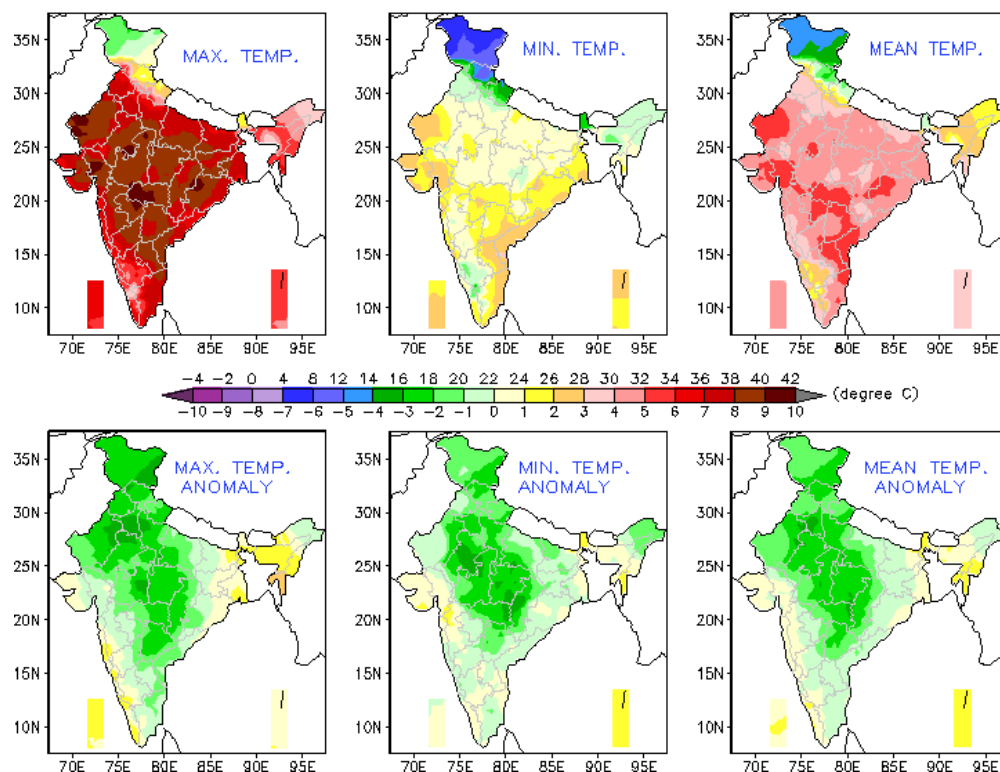


Fig 12: Observed spatial temperature pattern of monthly average maximum, average minimum and mean temperature over India (top three from left to right) and their departure from normal (1981 to 2010 period) for May 2023 (lower three from left to right).

4. Chief Synoptic weather features observed during May 2023.

During May 2023, one extremely severe cyclonic storm “MOCHA” formed over Bay of Bengal during 9 – 15 May. Track of this system is shown in Figure 13.

In addition to this, a total of 8 number of western disturbances (WD) affected the weather over the country during this month (1 – 4 May, 4 – 11 May, 11 – 16 May, 15 – 17 May, 17- 22 May, 23 – 28 May, 27 – 28 May and 29-31 May). These western disturbances were active and helped in triggering large-scale thunderstorms and rainfall activities accompanied with lightning, hail storms squalls and gusty winds in many parts of Northwest India and central India were main reasons for below normal Maximum temperature over the region.

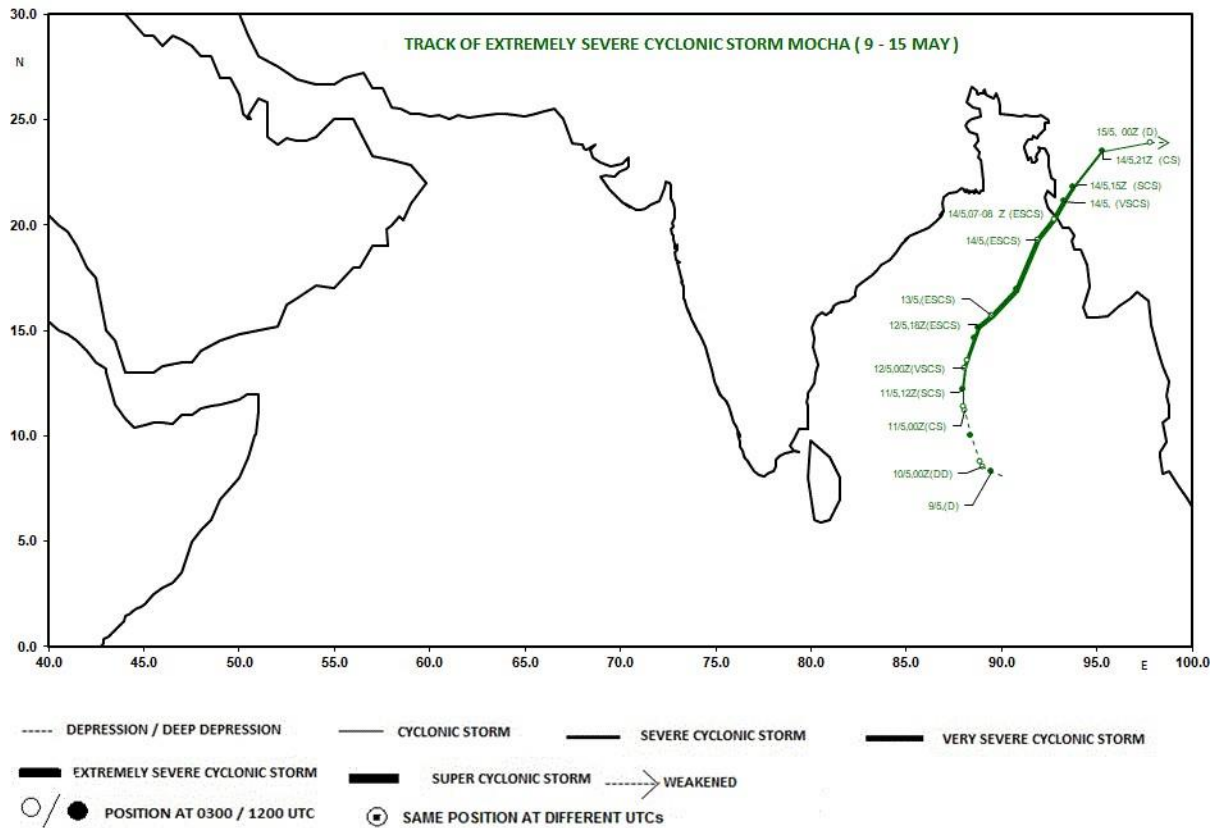


Fig 13: Track of intense low-pressure system formed during May 2023.

5. Significant Weather Events for the month May 2023:

According to media report, during May 2023, 96 persons died, more than 115 persons were injured, more than 10 persons missing and more than 45 livestock perished due to various weather events. The details of casualties given below, which are based on real time media reports (Fig. 14).

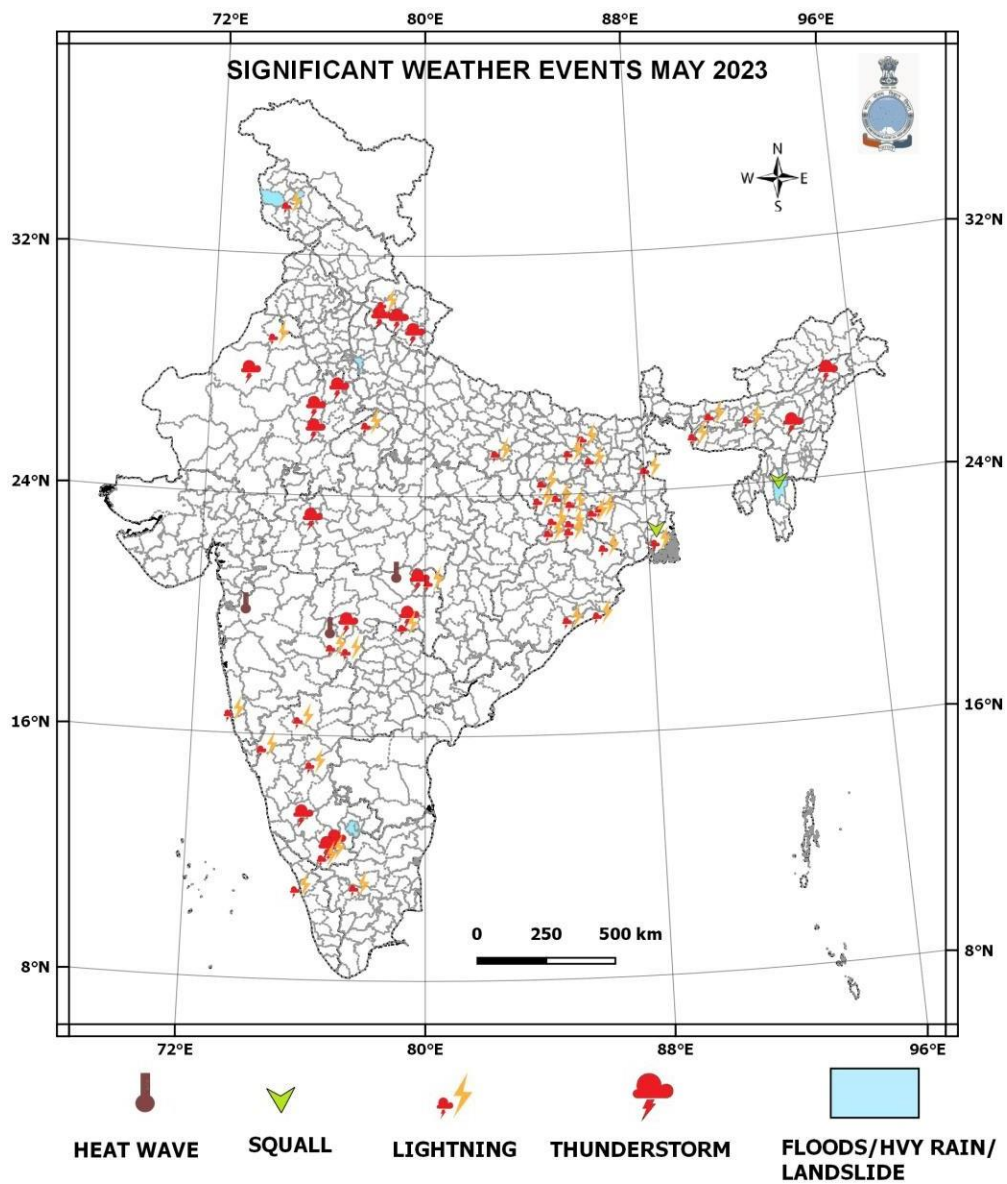


Fig. 14: Significant weather events, which caused death during May 2023 (Based on real-time media report)