



भारत सरकार

**Government of India**

पृथ्वी विज्ञान मंत्रालय (एम. ओ. ई. एस.)

**Ministry of Earth Sciences (MoES)**

भारत मौसम विज्ञान विभाग

**INDIA METEOROLOGICAL DEPARTMENT**

**Climate Research and Services (CRS)**

### **Climate Summary for the month of December 2022**

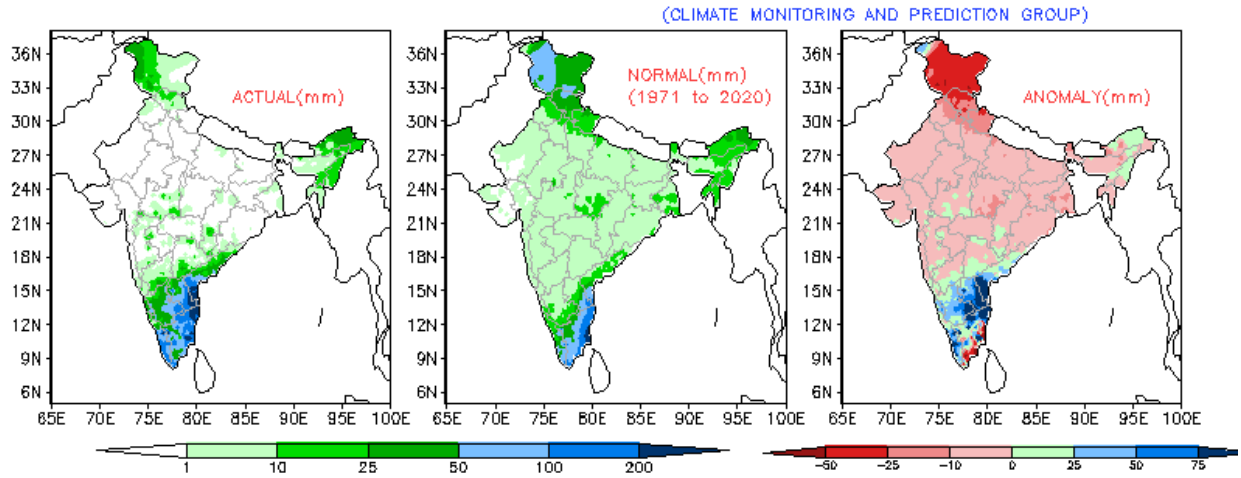
#### **1. Monthly Rainfall Scenario (01 to 31 December, 2022)**

Rainfall over the country as a whole for the month of December 2022 was 13.6 mm, which was 14% less than its Long Period Average (LPA) of 15.9 mm. Rainfall over homogeneous region of south peninsular India ( 57.3 mm) was second highest since 2001 after the year 2010 ( 58.5 mm). The monthly rainfall for December 2022 is given in the table below:

<b>Regions</b>	<b>Actual Rainfall (mm)</b>	<b>Normal Rainfall (mm)</b>	<b>% Departure from LPA</b>
<b>Country as a whole</b>	<b>13.6</b>	<b>15.9</b>	<b>-14.0</b>
<b>Northwest India</b>	<b>3.3</b>	<b>18.9</b>	<b>-83.0</b>
<b>Central India</b>	<b>1.2</b>	<b>5.1</b>	<b>-77.0</b>
<b>South Peninsula</b>	<b>57.3</b>	<b>32.0</b>	<b>79.0</b>
<b>East &amp; northeast India</b>	<b>6.1</b>	<b>13.1</b>	<b>-53.0</b>

During this month, 6 sub-divisions received large excess, 2 excess, 3 normal, 4 deficient and 18 received large deficient rainfall and 3 subdivisions did not receive any rain.

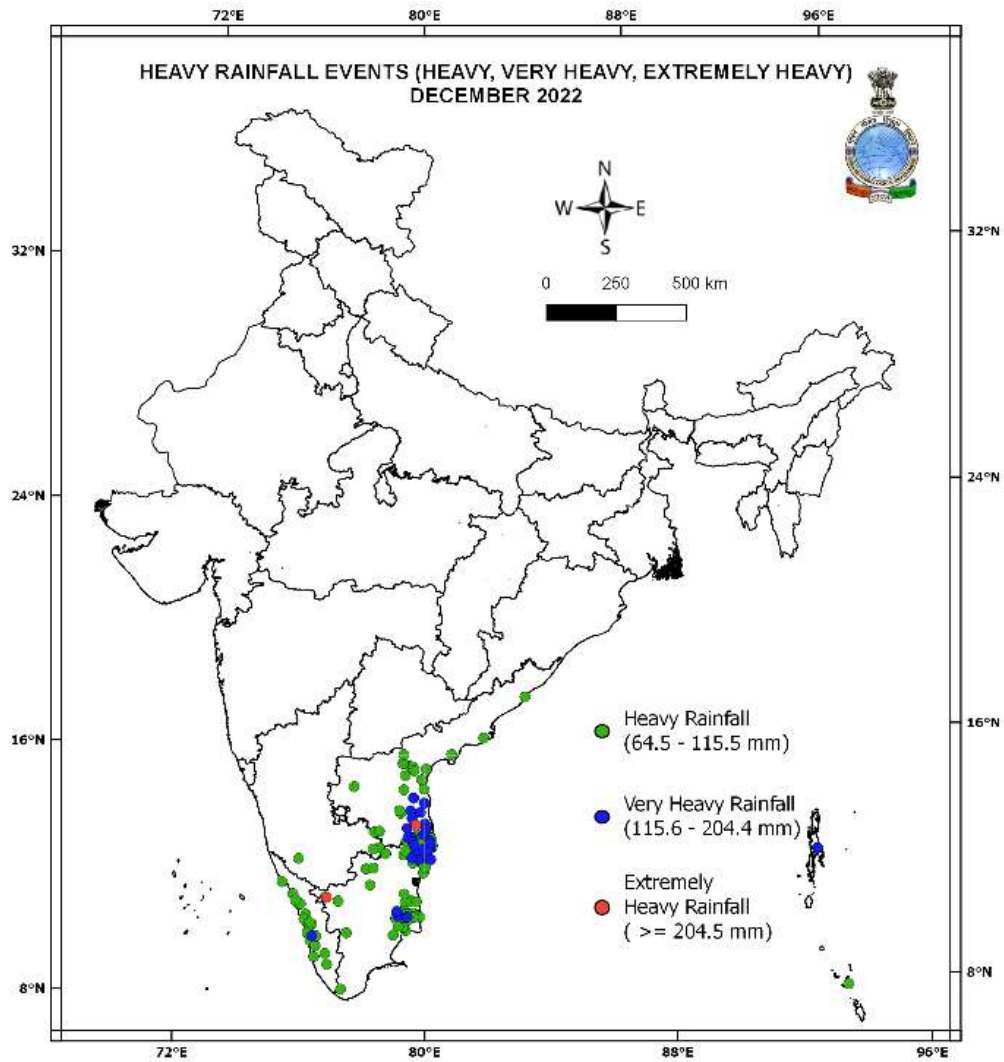
The observed spatial rainfall, normal rainfall for the period 1971 to 2020 and its departures from normal for the month of December 2022 is given in Figure 1.



**Fig 1: Observed spatial Rainfall pattern for the month of December 2022 over India and their departure from normal (1971 to 2020 period).**

## 2. Frequency of Heavy Rainfall events

The December 2022 witnessed very heavy rainfall events associated with Severe Cyclonic storm “Mandous” (6 - 10 December) and Depression formed during 22 – 25 December. Heavy Rainfall mainly observed over Coastal Andhra Pradesh and Tamilnadu, Puducherry & Karaikal. The location of occurrences of heavy, very heavy and extremely heavy rainfall events in a day is shown in the Figure 2. Out of total 117 stations, 3 stations reported extremely heavy rainfall (>204.5 mm), 29 station reported very heavy rainfall (115.6 to 204.4 mm) and 85 stations reported heavy rainfall (64.5 to 115.5 mm of rainfall) during this month.

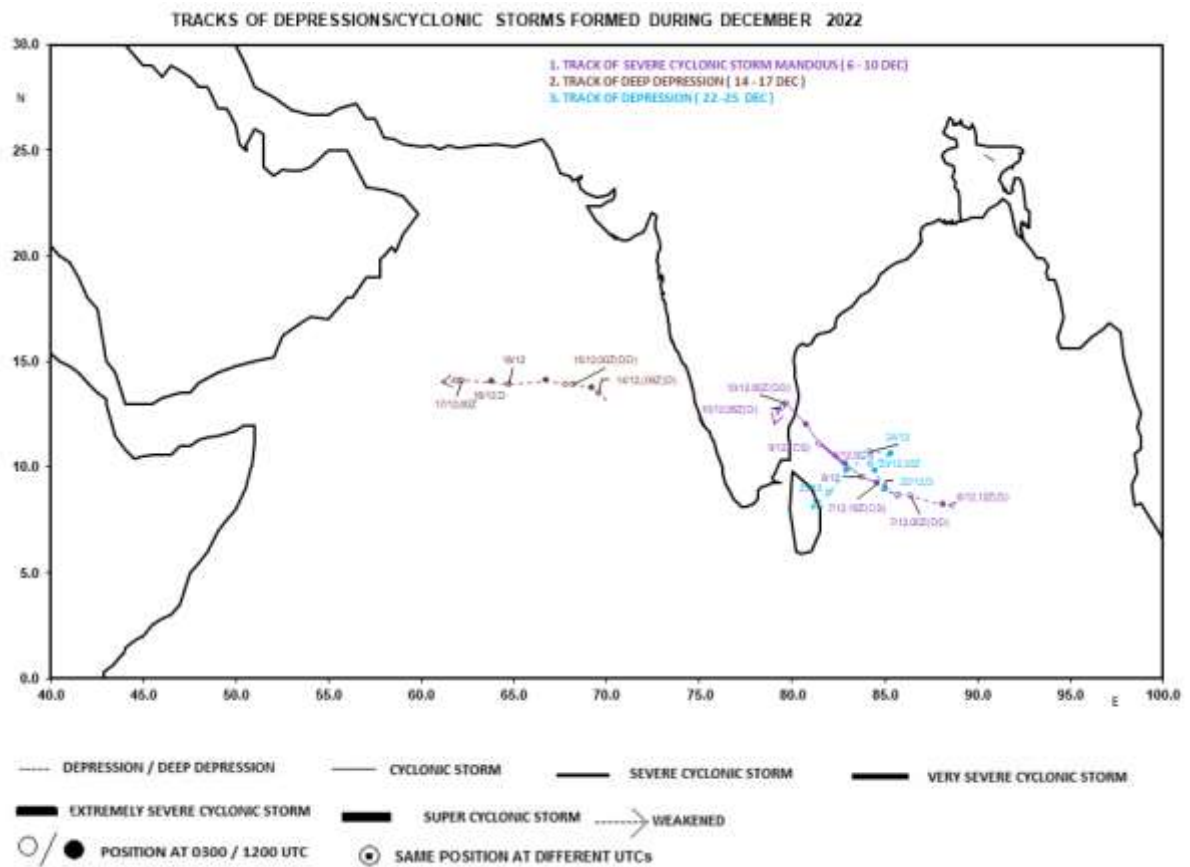


(Only highest category of rainfall event considered for a station)

Fig 2: The location of occurrences of heavy rainfall events in the month December 2022.

### 3. Chief synoptic features during December 2022

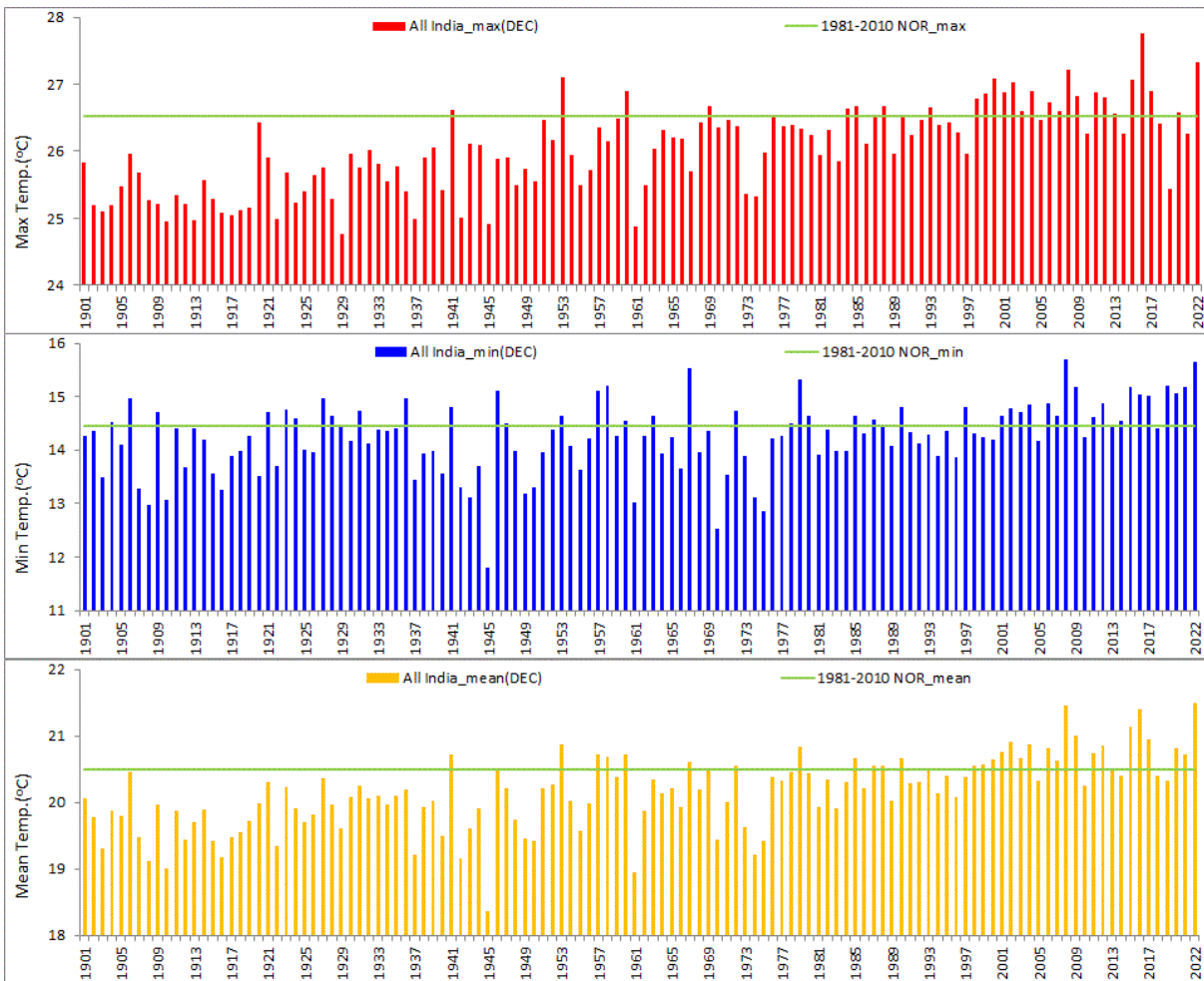
During the month, one severe cyclonic storm, “Mandous” formed over Bay of Bengal during the period 6 - 10 December. Besides this severe cyclonic storm, one deep depression formed over Arabian Sea during 14 -17 December and a depression formed over Bay of Bengal during 22 – 25 December. Tracks of these systems are shown in figure 3. During December month there were seven Western Disturbances (WDs) which cause some rainfall activity over the north Indian region. Out of these, 1 WD (28-30 Dec) caused rain or snowfall over Western Himalayan Region and rainfall over adjoining plains areas. Other 6 WDs were feeble (2-4, 6-8, 11-15(Interacted with SCS “Mandous” and its remnant) ,17-21 and 22-24 Dec) with location north of 28-30°N and did not affect the region.



**Fig 3: Tracks of low-pressure systems formed during December 2022.**

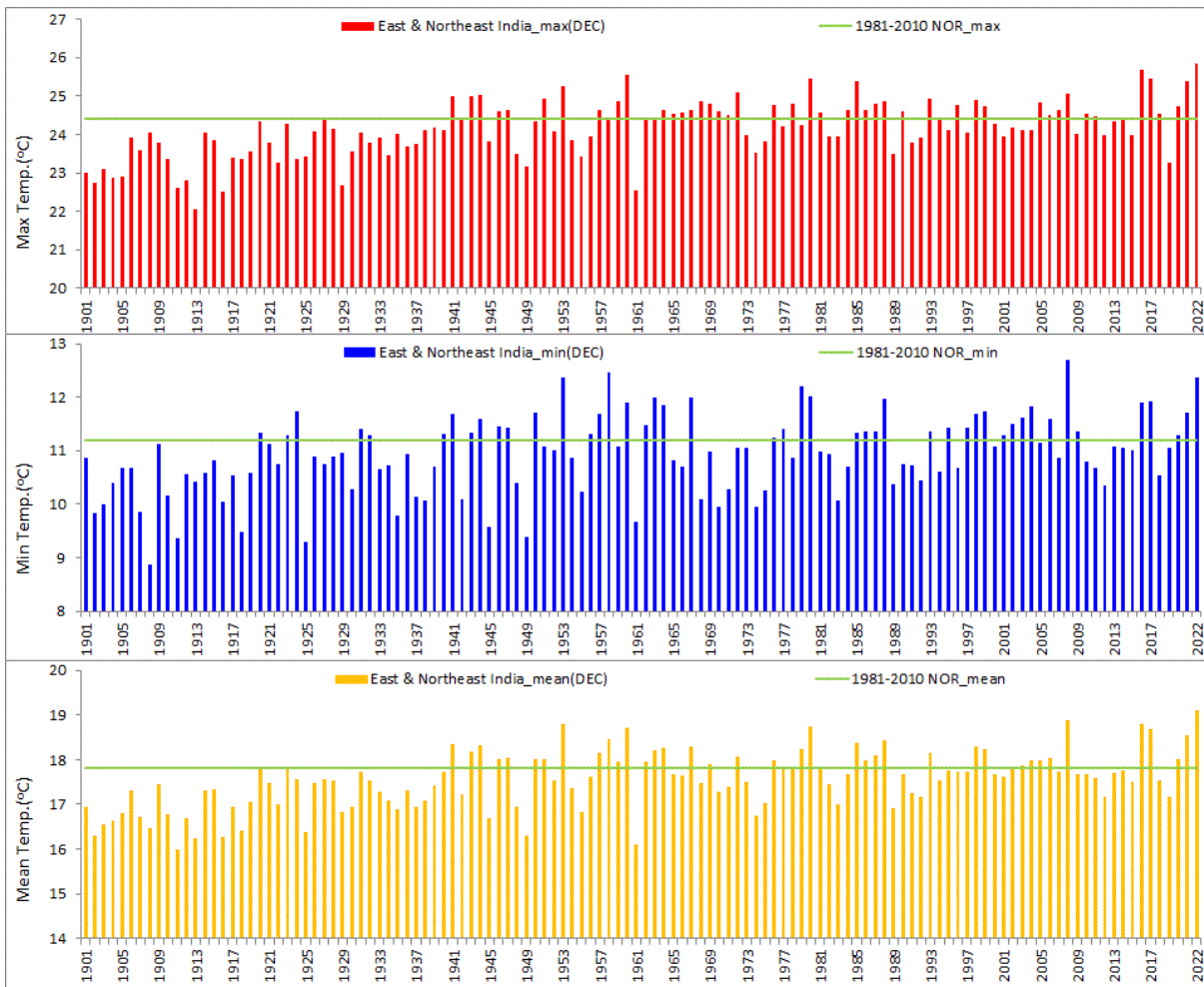
#### **4. Characteristics of Temperatures for the month of December 2022**

The average maximum, average minimum and mean temperature for the country as a whole during December 2022 are 27.32 °C, 15.65 °C and 21.49 °C respectively, against the normal of 26.53 °C, 14.44 °C and 20.49 °C based on period 1981-2010. Thus, the average maximum temperature, average minimum temperature and mean temperature are above normal by 0.79 °C, 1.21 °C and 1.00 °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 2022 - normal temperature based on data of 1981-2010). Figure 4 shows time series of monthly average maximum, average minimum and mean temperature over all India for the month of December 1901-2022. All India wise, during December, the average maximum temperature is the second highest (27.32 °C with anomaly 0.79 °C) after the year 2016(27.75 °C) while the average minimum temperature is also the second highest (15.65 °C with anomaly 1.21 °C) after the year 2008(15.69 °C) since 1901. All India wise, during December, the mean temperature is ever highest at 21.49 °C since 1901 and it has broken the earlier ever-highest record of 21.46 °C that was in 2008 for the month of December for the same period.



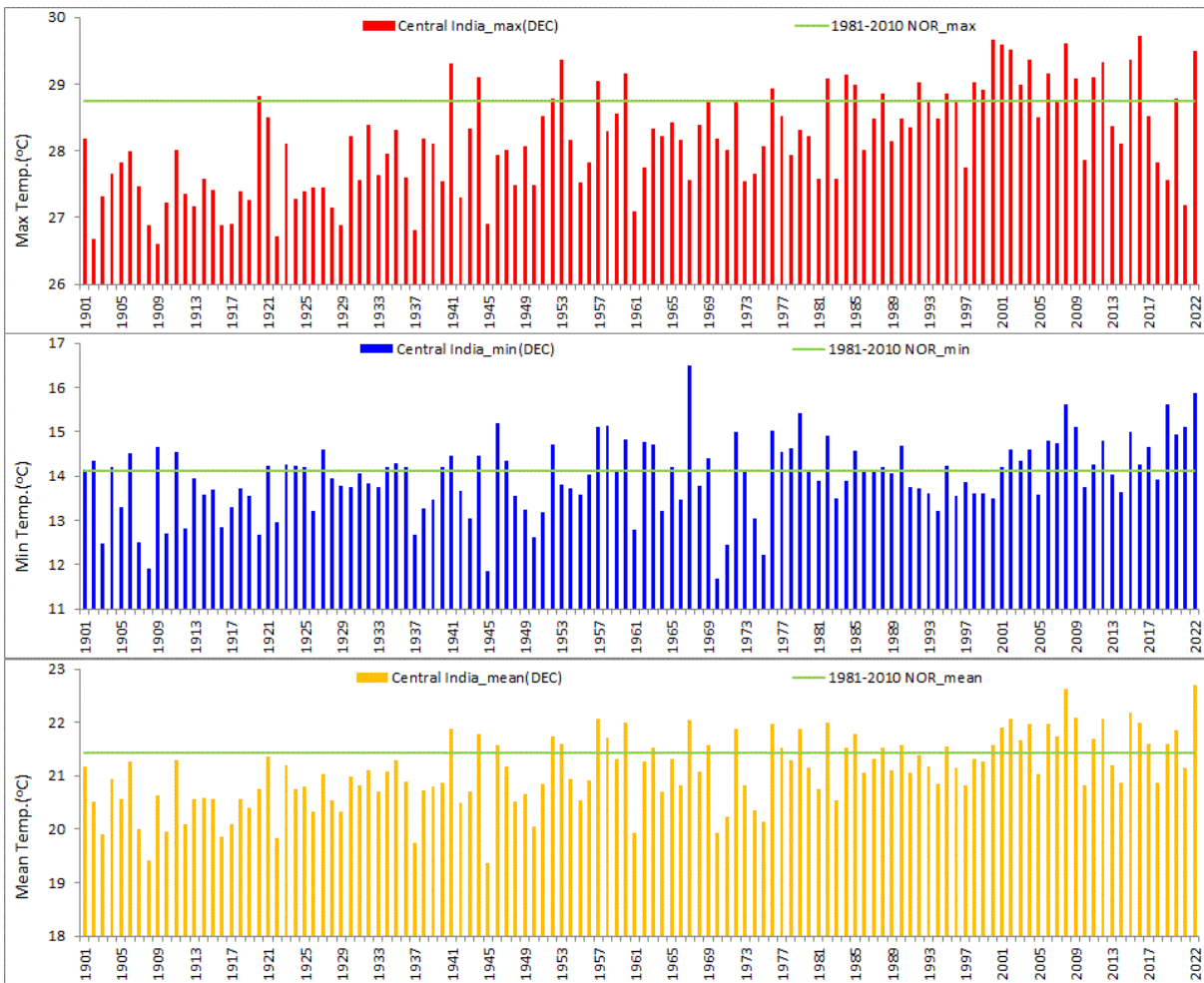
**Fig 4: Time series of monthly average maximum, average minimum and mean temperature over all India for the month of December 1901-2022.**

Figure 5 shows time series of monthly average maximum, average minimum and mean temperature over East & Northeast India for the month of December 1901-2022. Over East & Northeast India during December, the average maximum temperature is ever highest at 25.85 °C since 1901 and it has broken the earlier ever-highest record of 25.69 °C that was in 2016 for the month of December for the same period while the average minimum temperature is the third highest (12.37 °C) after the years 2008(12.70 °C), 1958(12.47 °C) since 1901. The mean temperature is ever highest at 19.11 °C since 1901 and it has broken the earlier ever-highest record of 18.88 °C that was in 2008 for the month of December for the same period.



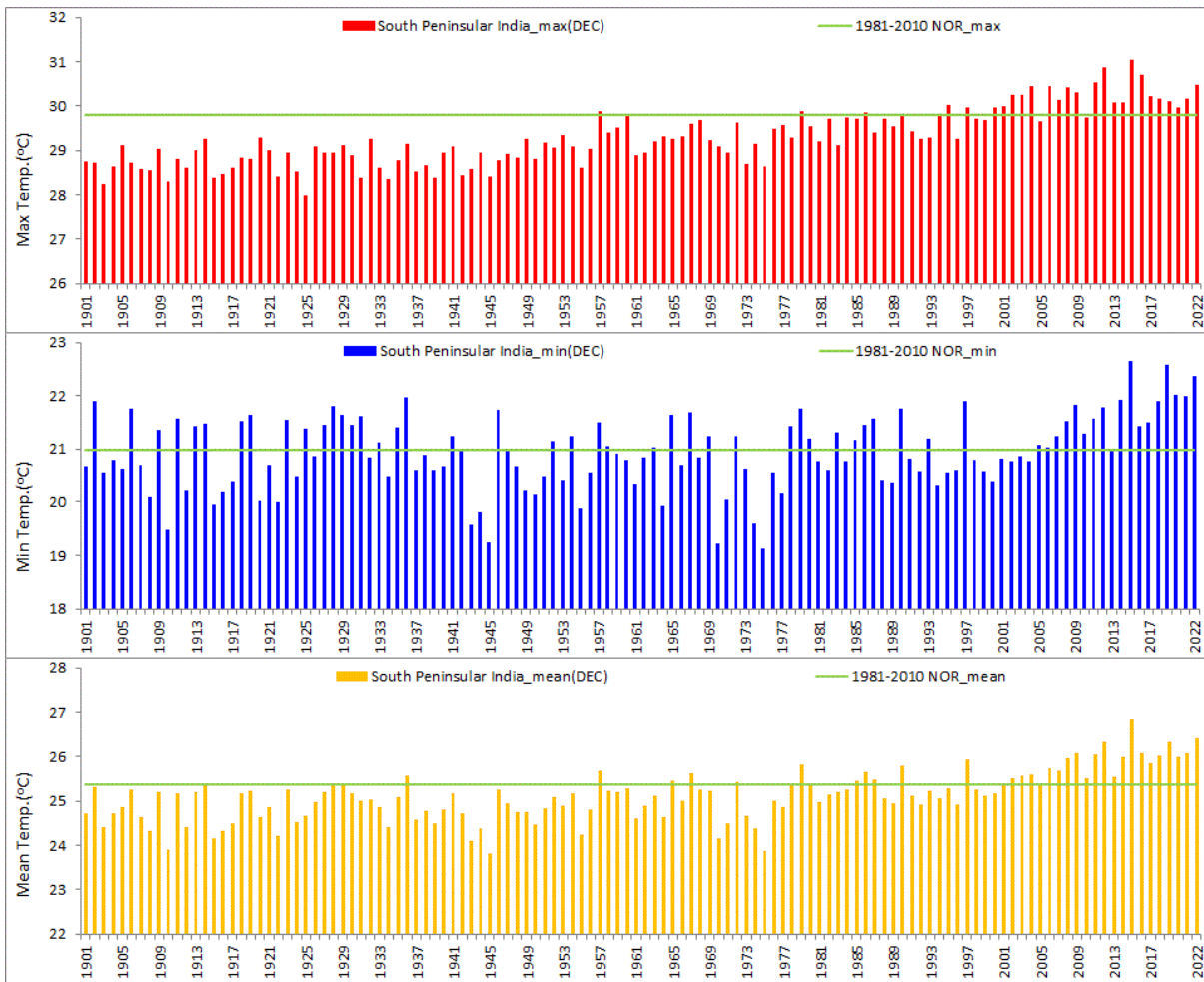
**Fig 5: Time series of monthly average maximum, average minimum and mean temperature over East & Northeast India for the month of December 1901-2022.**

Figure 6 shows time series of monthly average maximum, average minimum and mean temperature over Central India for the month of December 1901-2022. Over Central India during December, the average maximum temperature is the sixth highest (29.49 °C with anomaly 0.75 °C) since 1901 while the average minimum temperature is the second highest (15.88 °C) after the year 1967(16.50 °C) since 1901. The mean temperature is ever highest at 22.69 °C since 1901 and it has broken the earlier ever-highest record of 22.62 °C that was in 2008 for the month of December for the same period.



**Fig 6: Time series of monthly average maximum, average minimum and mean temperature over Central India for the month of December 1901-2022.**

Figure 7 shows time series of monthly average maximum, average minimum and mean temperature over South Peninsular India for the month of December 1901-2022. Over South Peninsular India during December, the average maximum temperature is the fifth highest (30.47 °C with anomaly 0.68 °C) after the years 2015(31.03 °C), 2012(30.87 °C), 2016(30.71 °C), 2011(30.52 °C) since 1901 while the average minimum temperature is the third highest (22.37 °C) after the years 2015(22.66 °C), 2019(22.58 °C) since 1901. The mean temperature is the second highest (26.42 °C with anomaly 1.04 °C) after the year 2015(26.85 °C) since 1901.



**Fig 7: Time series of monthly average maximum, average minimum and mean temperature over South Peninsular India for the month of December 1901-2022.**

The Temperatures during December 2022 for all India and homogeneous regions with its ranks since 1901 are given below;

DEC 2022		Max Temp (°C)	Min Temp (°C)	Mean Temp (°C)
ALL INDIA	ACTUAL	27.32	15.65	21.49
	NORMAL	26.53	14.44	20.49
	ANOMALY	0.79	1.21	1.00
	TOP RANK	2	2	1
NORTHWEST INDIA	ACTUAL	21.23	7.14	14.19
	NORMAL	20.72	6.81	13.77
	ANOMALY	0.51	0.33	0.42
	TOP RANK	20	24	12
EAST & NORTHEAST INDIA	ACTUAL	25.85	12.37	19.11
	NORMAL	24.42	11.19	17.80
	ANOMALY	1.43	1.18	1.31
	TOP RANK	1	3	1
CENTRAL INDIA	ACTUAL	29.49	15.88	22.69
	NORMAL	28.74	14.13	21.44
	ANOMALY	0.75	1.75	1.25
	TOP RANK	6	2	1
SOUTH PENINSULAR INDIA	ACTUAL	30.47	22.37	26.42
	NORMAL	29.79	20.97	25.38
	ANOMALY	0.68	1.40	1.04
	TOP RANK	5	3	2

Note : Values are rounded off to nearest two decimal

The five highest temperature records with corresponding ranks since 1901 along



with year occurrence for all India, East & Northeast India, Central India and South Peninsular India (TMax, TMin, TMean) are given in the table below;

All India (December 2022)					East & Northeast India (December 2022)					Central India (December 2022)				
Year	TMax	Normal	Anomaly	Rank	Year	TMax	Normal	Anomaly	Rank	Year	TMax	Normal	Anomaly	Rank
2016	27.75	26.53	1.220	1	2022	25.85	24.42	1.43	1	2016	29.72	28.74	0.97	1
2022	27.32		0.791	2	2016	25.69		1.27	2	2000	29.66		0.92	2
2008	27.22		0.691	3	1960	25.53		1.11	3	2008	29.62		0.87	3
1953	27.10		0.574	4	1980	25.46		1.04	4	2001	29.59		0.85	4
2000	27.08		0.554	5	2017	25.44		1.02	5	2002	29.52		0.78	5
										2022	29.49		0.75	6

All India (December 2022)					East & Northeast India (December 2022)					Central India (December 2022)				
Year	TMin	Normal	Anomaly	Rank	Year	TMin	Normal	Anomaly	Rank	Year	TMin	Normal	Anomaly	Rank
2008	15.69	14.44	1.25	1	2008	12.70	11.19	1.51	1	1967	16.50	14.13	2.37	1
2022	15.65		1.21	2	1958	12.47		1.28	2	2022	15.88		1.75	2
1967	15.53		1.09	3	2022	12.37		1.18	3	2019	15.63		1.50	3
1979	15.32		0.87	4	1953	12.36		1.18	4	2008	15.62		1.49	4
1958	15.22		0.77	5	1979	12.20		1.01	5	1979	15.43		1.296	5

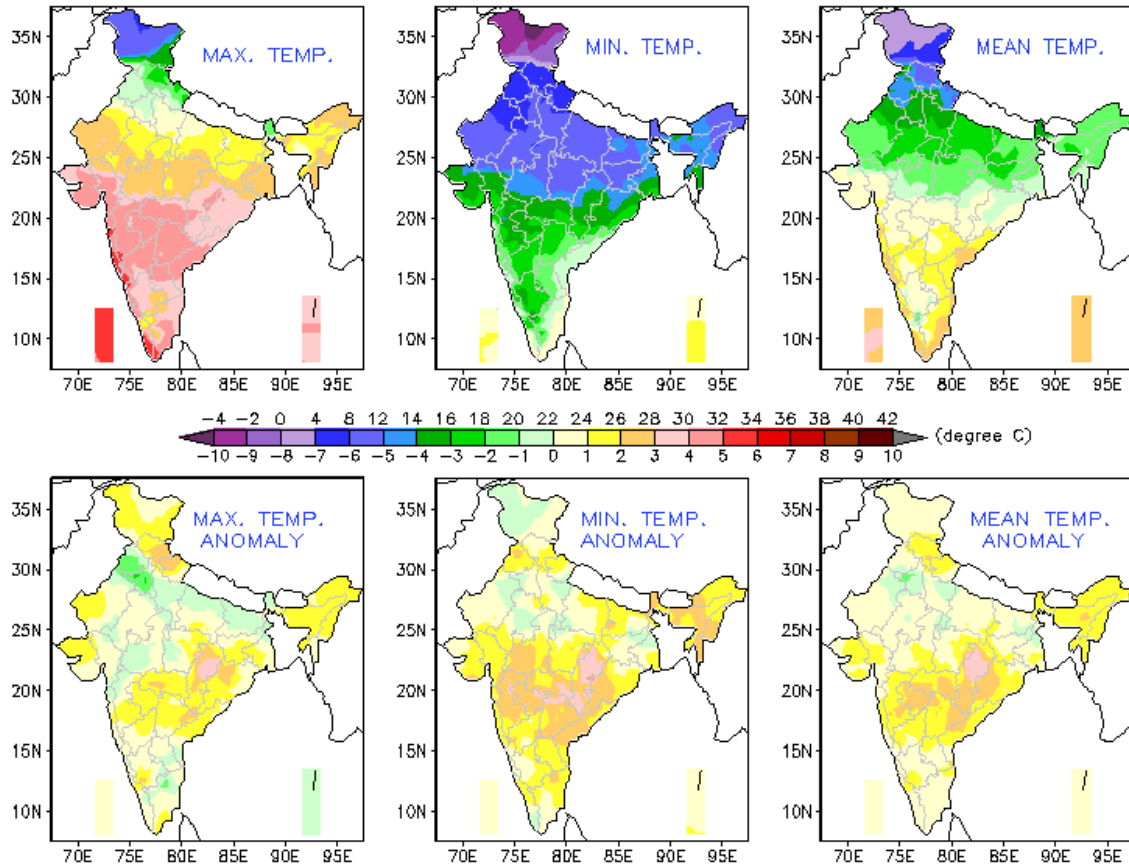
All India (December 2022)					East & Northeast India (December 2022)					Central India (December 2022)				
Year	TMean	Normal	Anomaly	Rank	Year	TMean	Normal	Anomaly	Rank	Year	TMean	Normal	Anomaly	Rank
2022	21.49	20.49	1.00	1	2022	19.11	17.80	1.31	1	2022	22.69	21.44	1.25	1
2008	21.46		0.97	2	2008	18.88		1.07	2	2008	22.62		1.18	2
2016	21.40		0.91	3	1953	18.80		1.00	3	2015	22.18		0.74	3
2015	21.13		0.64	4	2016	18.79		0.99	4	2009	22.10		0.66	4
2009	21.00		0.52	5	1980	18.74		0.93	5	1957	22.07		0.63	5

South Peninsular India (December 2022)					South Peninsular India (December 2022)					South Peninsular India (December 2022)				
Year	Tmax	Normal	Anomaly	Rank	Year	TMin	Normal	Anomaly	Rank	Year	Tmean	Normal	Anomaly	Rank
2015	31.03	29.79	1.24	1	2015	22.66	20.97	1.69	1	2015	26.85	25.38	1.46	1
2012	30.87		1.08	2	2019	22.58		1.61	2	2022	26.42		1.04	2
2016	30.71		0.92	3	2022	22.37		1.40	3	2019	26.34		0.96	3
2011	30.52		0.73	4	2020	22.02		1.04	4	2012	26.33		0.95	4
2022	30.47		0.68	5	2021	22.00		1.03	5	2021	26.08		0.70	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 December 2022 is given in Figure 8.

TEMPERATURE & ITS ANOMOLY FOR THE MONTH DEC 2022



**Fig 8: 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 December 2022 (lower three from left to right).**

**5. Significant Weather Events for the month of December 2022:**

During December, total 10 persons reportedly claimed dead due to cyclonic storm and lightning. The details of casualties given below, which are based on real time media reports and other state government agencies.

Fig. 9 shows significant weather events during the month. (Based on real time media reports.)

**Cyclonic Storm:** Total 6 persons reportedly claimed dead during December, because of Severe Cyclonic Storm “MANDOUS”. The details of the area affected by the events are summarized and given in the table below;

DATE	DEATH	DISTRICT (STATE/UT) AFFECTED
6 to 10 Dec.	4	Chennai, Chinglepet, Cuddalore, Kanchipuram, Mayiladurai, Nagapattinam. Thanjavur, Thiruvapur, Tiruvannamalai, Viluppuram & north coastal districts of Tamil Nadu
6 to 10 Dec.	1	Cuddapah (Andhra Pradesh)
6 to 10 Dec.	1	Parts of Puducherry

**Lightning:** Total 4 persons reportedly claimed dead during December, because of Lightning. The details of the area effected by the events are summarized and given in the table below;

DATE	DEATH	DISTRICT (STATE/UT) AFFECTED
13 Dec.	3	Kallakurichi (Tamil nadu)
2 Dec.	1	Thiruvananthapuram (Kerala)

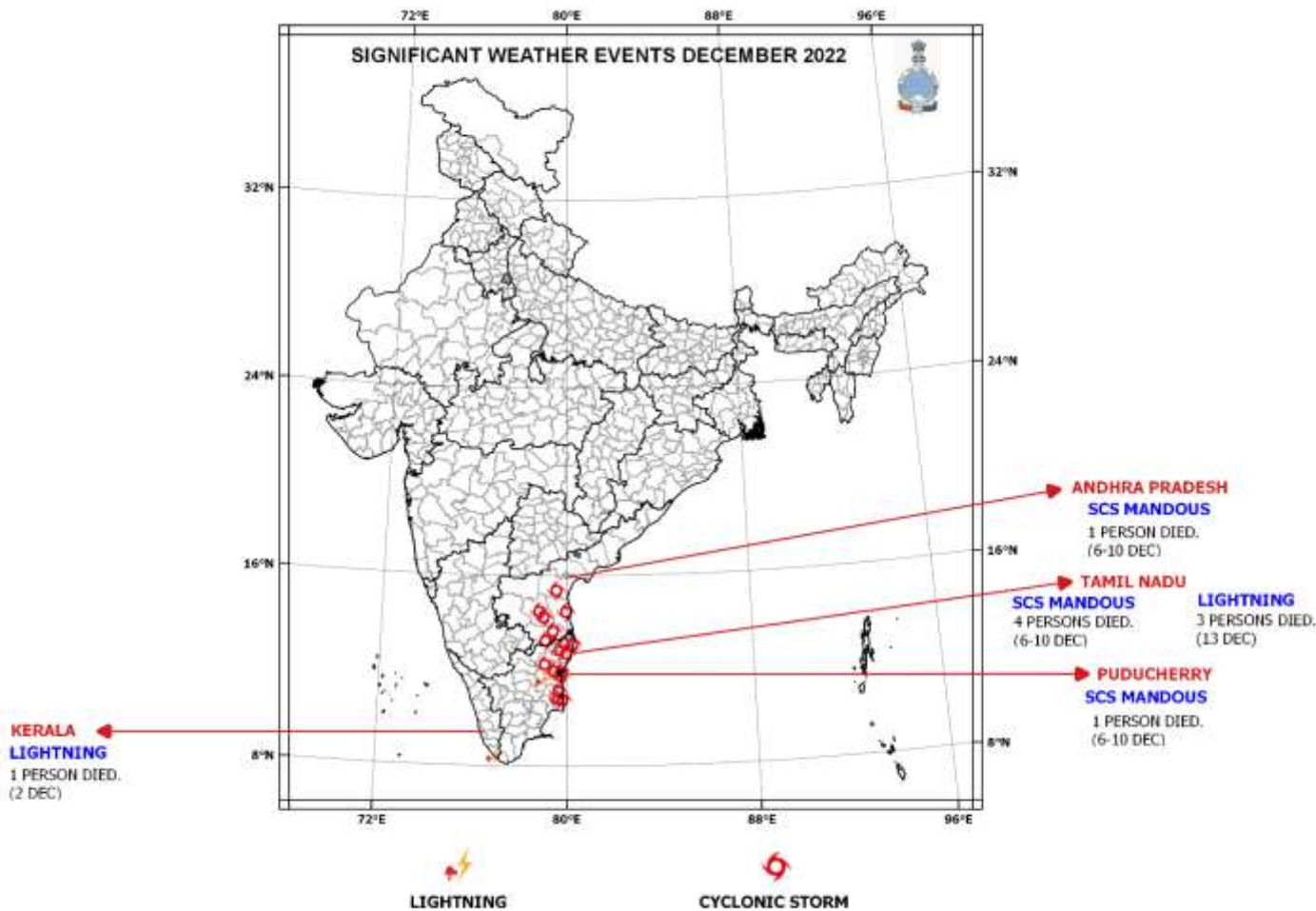


Fig 9: Significant weather events during December 2022 (Based on real-time media report)