

Climate Summary for the month of October 2021

1. Monthly Rainfall Scenario (01 to 31 October 2021)

Rainfall over the country as a whole for the month of October 2021 shows that it has recorded 100.7 mm, which is 33% more than its Long Period Average (LPA) of 76 mm. Rainfall over northwest India (67.0mm) during the month of October was sixth highest since 1901 after the years 1956 (150mm), 1955 (147.7mm), 1917(101.6mm), 1985 (93.9mm) and 1903(72.7mm). The monthly rainfall for October 2021 is given in the table below:

Regions	Actual Rainfall (mm)	Normal Rainfall (mm)	% Departure from LPA
Country as a whole	100.7	76.0	32.5
Northwest India	67.0	23.0	191.2
Central India	59.6	53.5	11.4
South Peninsula	185.0	154.5	19.7
East & northeast India	148.6	129.1	15.1
Northeast Monsoon Region (South Peninsula)	228.3	176.4	29.4

The date of withdrawal of southwest monsoon 2021 from the entire country is the 7th most delayed monsoon withdrawal (on or after 25th October) during 1975-2021. During recent years of 2010-2021, for five years, viz. 2017, 2010, 2016, 2020 and 2021, happened late withdrawal (25th Oct or latter). The southwest monsoon withdrawal map is given in Figure 1.

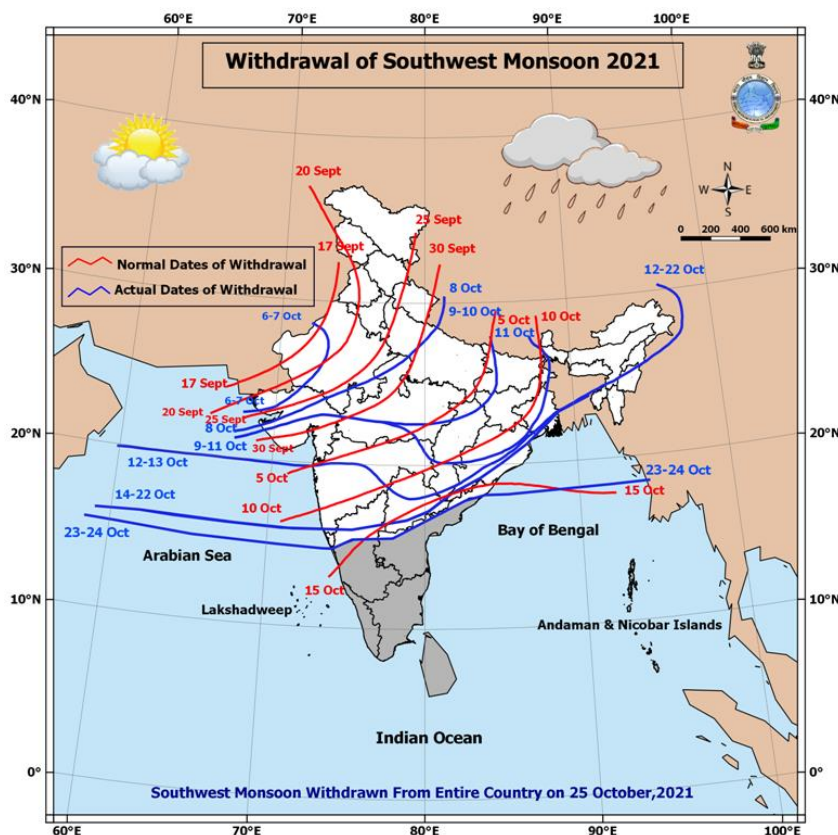


Fig.1: Withdrawal of Southwest Monsoon 2021

During this month, 15 sub-divisions received large excess, 7 excess, 8 normal, and 6 deficient rainfall. During the month of October above normal rainfall received over many parts of the country due to the formation of more number of Low Pressure Systems and active Western Disturbance over north India. The rainfall received for October 2021 over Kerala was highest (94.4% departure from LPA) since 1901. Uttarakhand also receive fifth highest (475.7% departure from LPA) since 1901 after the year 1956 (959.2%), 1955 (693.2%), 1910 (649.6%) and 1985 (524.9%) during October.

The time series of October rainfall (percentage departure from normal for the period 1961-2010) over south peninsular India, Kerala and Uttarakhand for the month of October (1901 to 2021) are given in Fig.2.

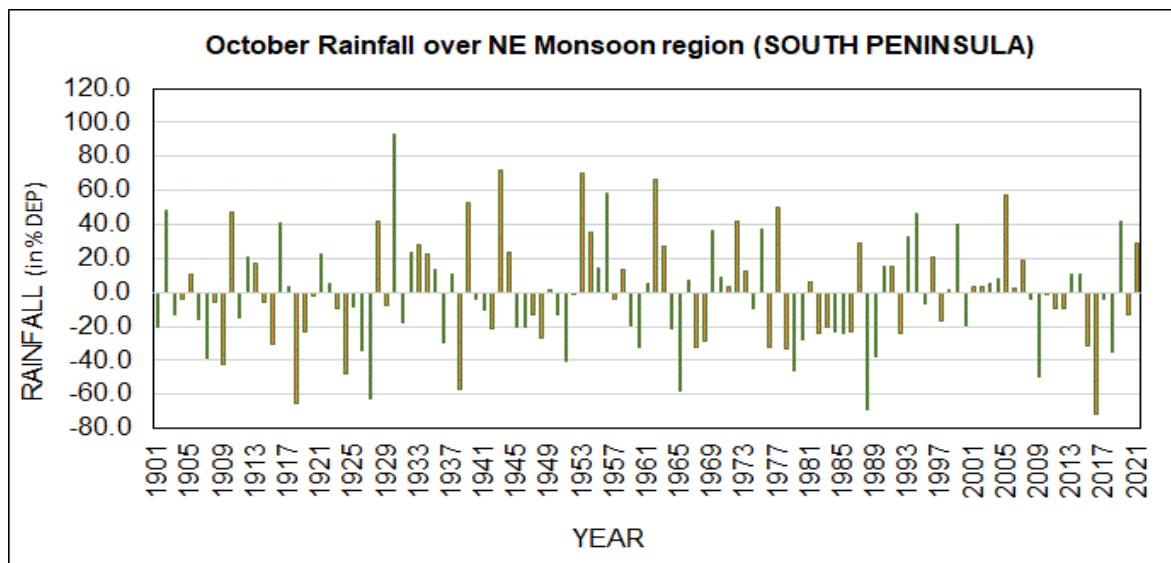


Fig 2(a): The October month rainfall (percentage departure) over south peninsular India during 1901 to 2021.

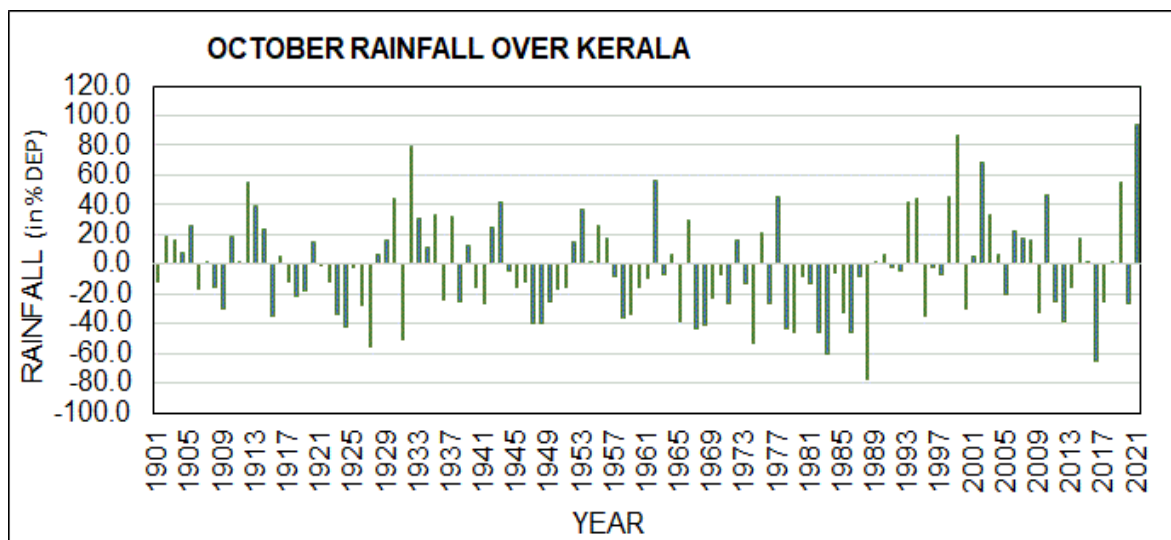


Fig 2(b): The rainfall (percentage departure) received over October 2021 over Kerala during 1901 to 2021.

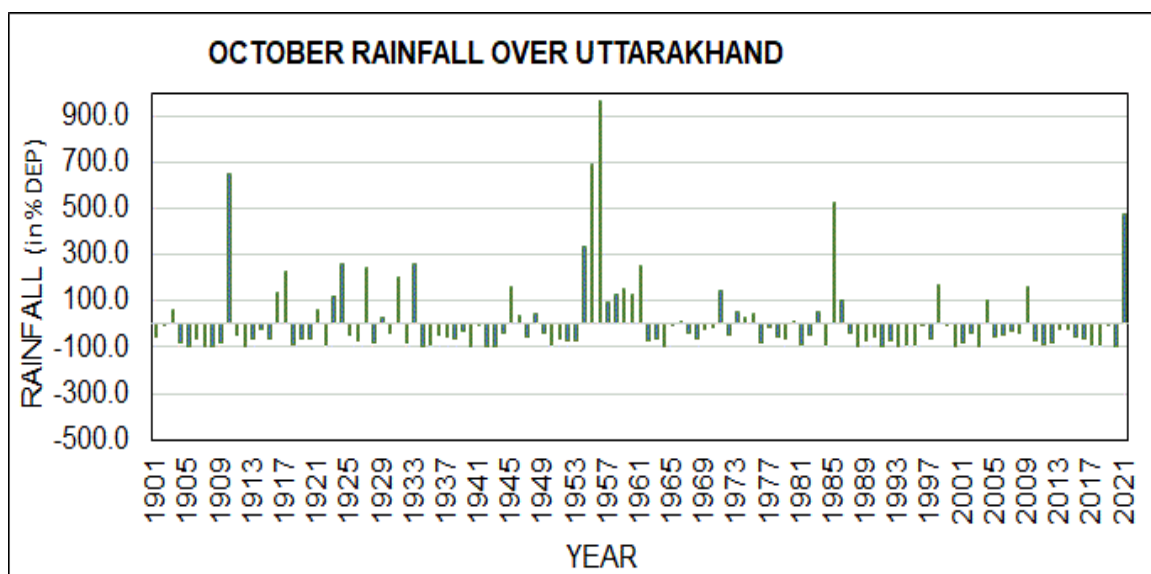


Fig 2(c): The rainfall (percentage departure) received over October 2021 over Uttarakhand during 1901 to 2021.

The observed actual rainfall, climatology normal rainfall for the period 1961 to 2010 and its departures from normal for October 2021 is given in Figure 3.

RAINFALL OVER THE COUNTRY FOR OCTOBER 2021

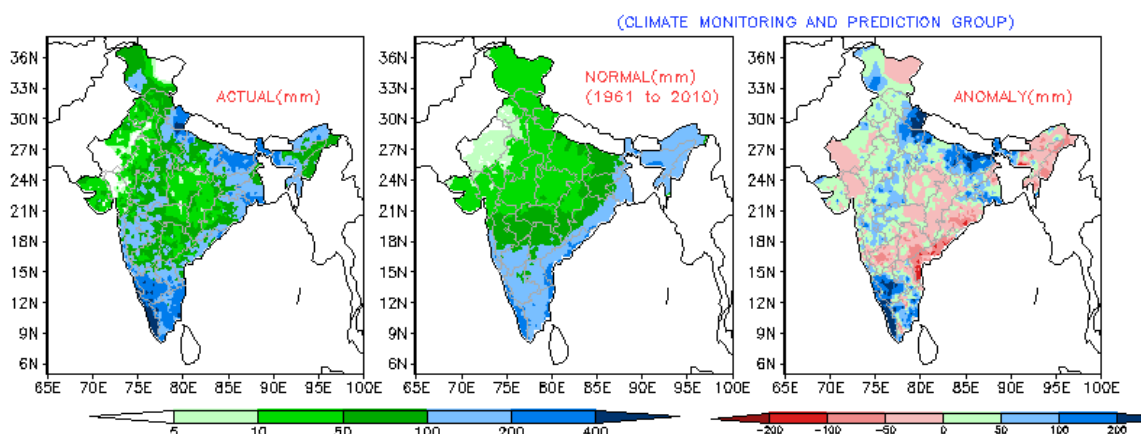


Fig 3: Observed spatial Rainfall pattern for the month of October 2021 over India and their departure from normal (1961 to 2010 period).

Frequency of Heavy Rainfall events

The October 2021 witnessed heavy, very heavy and extremely heavy rainfall events over many stations of south peninsular India and north India. The location of occurrences of rainfall extremely heavy, very heavy events and heavy rainfall events is shown in the Figure 4. There were 36 stations reporting extremely heavy rainfall (>204.5mm), 160 stations reporting very heavy rainfall (115.6 to 204.4mm), 788 stations reporting heavy rainfall (64.5 to 115.5mm of rainfall),

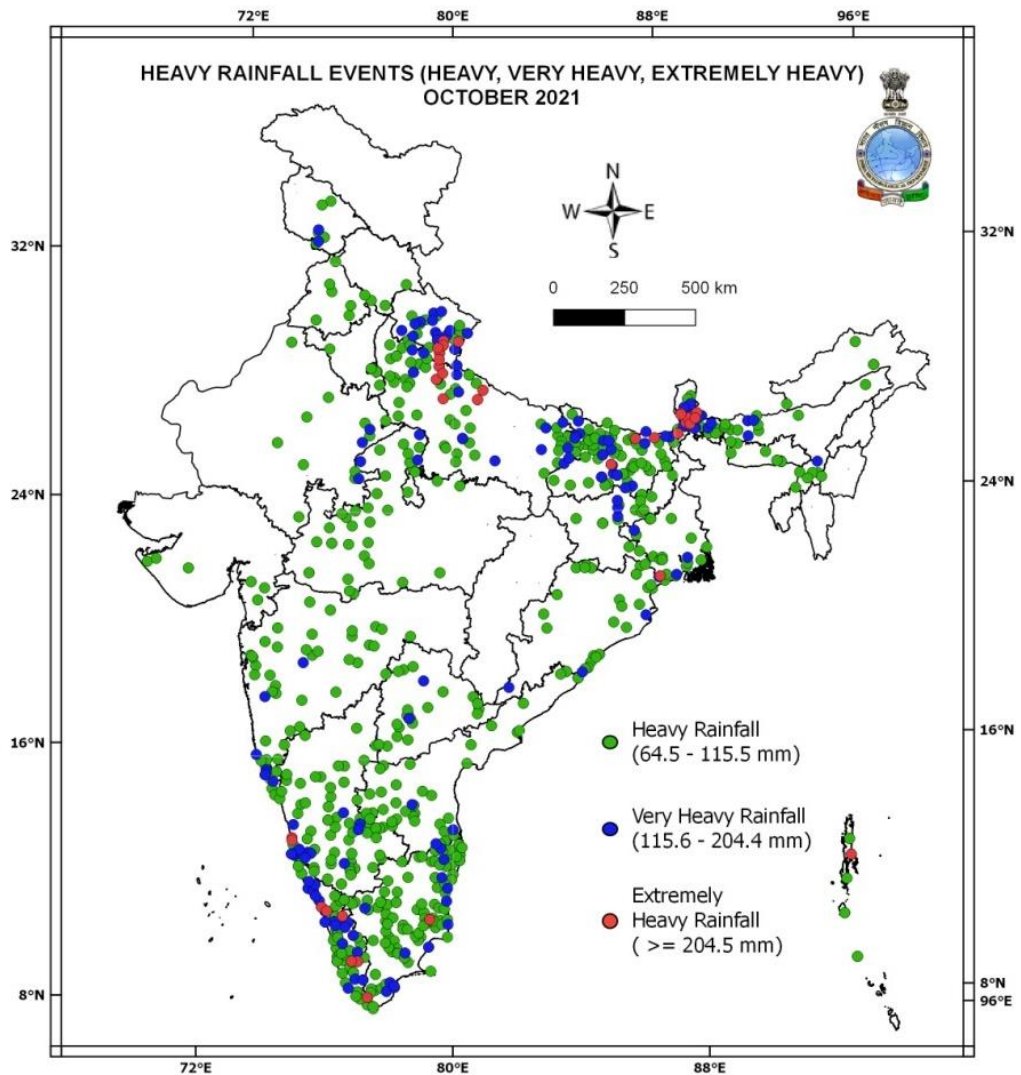


Fig 4: The location of occurrences of extremely heavy, very heavy events and extremely heavy rainfall events in the month of October 2021.

The table below shows stations received 24-hour record rainfall and its previous record in October 2021.

STATION	24 HOUR RECORD RAINFALL IN OCTOBER 2021(mm)*	DATE	PREVIOUS RAINFALL RECORD(mm)	DD-MM-YYYY
FORBESGANJ	257.4	20	176.8	18-10-1985
PALAM	56.1	18	52	3-10-2004
CAR NICOBAR	103	8	98.4	15-10-2017
PAHALGAM	67.8	24	67.2	28-10-1982
JAMMU AERO	122	24	63.8	20-10-2006
UDHAMPUR(IAF)	139.6	24	64.2	13-10-2013
MANGALURU AP OBSY	192.3	13	161.6	9-10-1993
KARIPUR AP.	254.9	12	167.6	25-10-2008
WASHIM	54.2	17	29.3	3-10-2008
KANNOD-ARG	52	18	39.4	8-10-1975
GANGTOK	129.7	20	129.5	12-10-2001
SUKINDA	41	18	33.2	10-10-1974

BHATINDA	78	5	31.2	4-10-1978
JALANDHAR	32.6	24	0.2	2-10-1978
BHILWARA	53	18	47.6	1-10-1970
BUNDI	48	18	39	14-10-2014
SRIGANGANAGAR TEHSIL SR	42	24	33	4-10-1996
ERODE	96	1	75	29-10-2006
MAHABALIPURAM	60.4	6	23.2	24-10-1978
ARAKONAM	94.4	6	36	12-10-1998
AZAMGARH	200	2	81	11-10-1958
BAREILLY PBO	178	19	92.6	2-10-1998
BULANDSHAHR	105	18	62.8	18-10-1971
GORAKHPUR	192.9	2	160	11-10-1956
KANPUR OBSY	127.6	19	109.2	7-10-1927
RAMPUR	98.3	19	47.5	15-10-2014
CHANDIGARH	29.7	25	18.6	11-10-2018
CHAMOLI	101.2	19	61	16-10-1985
JOSHIMATH	185.6	19	108	18-10-1998
ROORKEE	40	17	21	11-10-2013
MUKTESHWAR	340.8	19	182.4	2-10-1910
NAINITAL	401	19	300.7	9-10-1956
PAURI	112	19	26	1-10-2019
DHARCHULA	196	19	84	6-10-2009

*Based on real time available data

Chief synoptic features during October 2021

During October, total five low-pressure systems formed (4 over North Indian Ocean and one over land). Out of this, two systems developed over Arabian Sea (1 severe cyclonic storm- “SHAHEEN” and 1 low-pressure area) and two low-pressure areas over Bay of Bengal. The tracks of low-pressure systems and tropical cyclone formed during October 2021 are given in Fig.5.

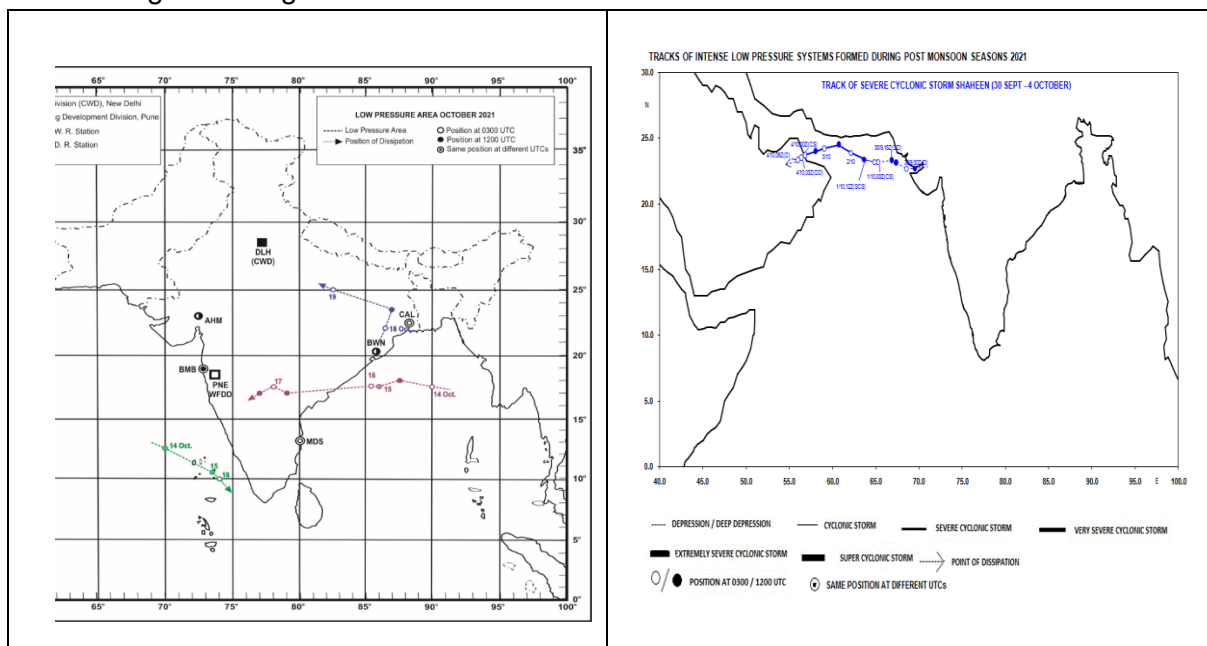


Figure. 5. Tracks of Low-Pressure Systems and Tropical cyclone (Shaheen) formed during October 2021.

2. Characteristics of Temperatures for the month of October 2021

The observed average maximum, average minimum and mean temperature for the country as a whole during October 2021 are 31.42°C, 22.16°C and 26.79°C respectively, against the normal of 31.16°C, 20.88°C and 26.02°C based on period 1981-2010. Thus, the average minimum and mean temperature for the country as a whole are above normal by 1.28°C and 0.77°C respectively except average maximum temperature which is near normal by 0.26°C. 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 2021-normal temperature based on data of 1981-2010). Figure 6 shows time series of monthly average minimum and mean temperature over all India for the month of October during 1901-2021. The average minimum temperature over all India is second highest (22.16°C) and mean temperature is fifth highest (26.79°C) since 1901.

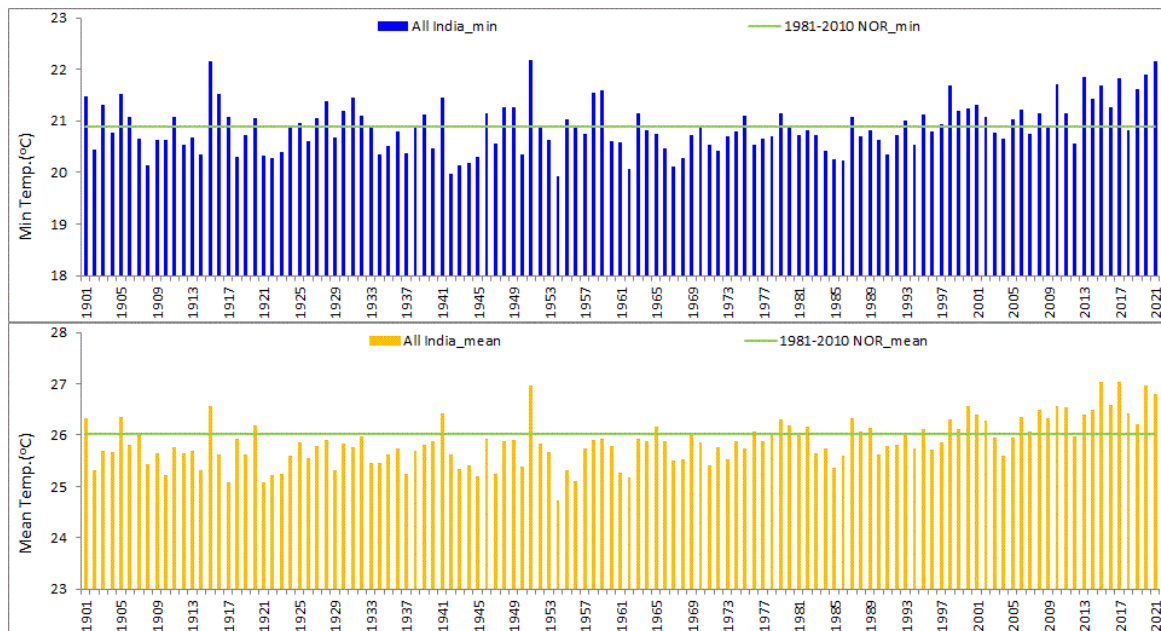


Fig 6: Time series of monthly average minimum and mean temperature over all India for the month of October during 1901-2021.

Figure 7 shows time series of monthly average maximum, average minimum and mean temperature over East & Northeast India for the month of October during 1901-2021. The average maximum temperature over East & Northeast India during October 2021 is second highest (32.11°C), average minimum temperature is third highest (22.74°C) and mean temperature is second highest (27.42°C) since 1901.

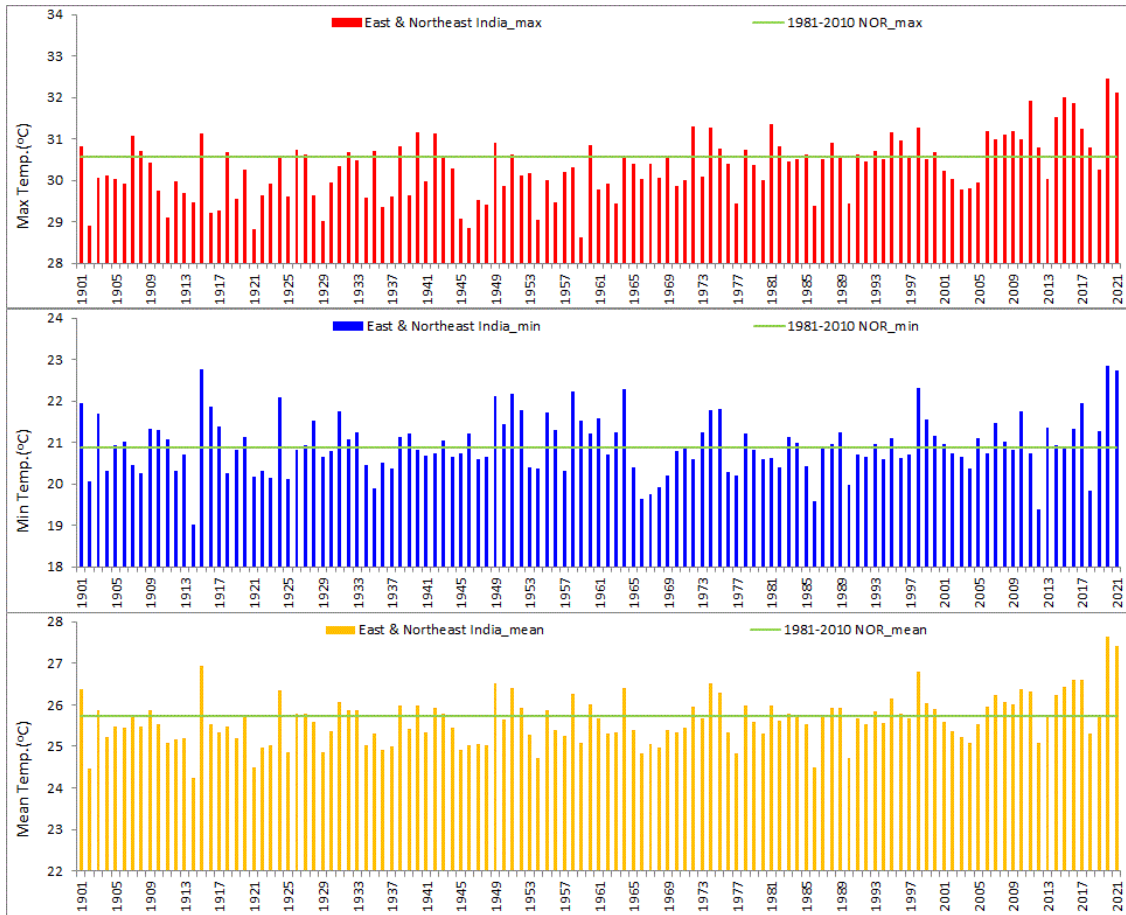


Fig 7: Time series of monthly average maximum, average minimum and mean temperature over East & northeast India for the month of October during 1901-2021.

Figure 8 shows time series of average minimum temperature over South Peninsular India for the month of October during 1901-2021. The average minimum temperature over South Peninsular India during October 2021 is highest (24.46°C) since 1901.

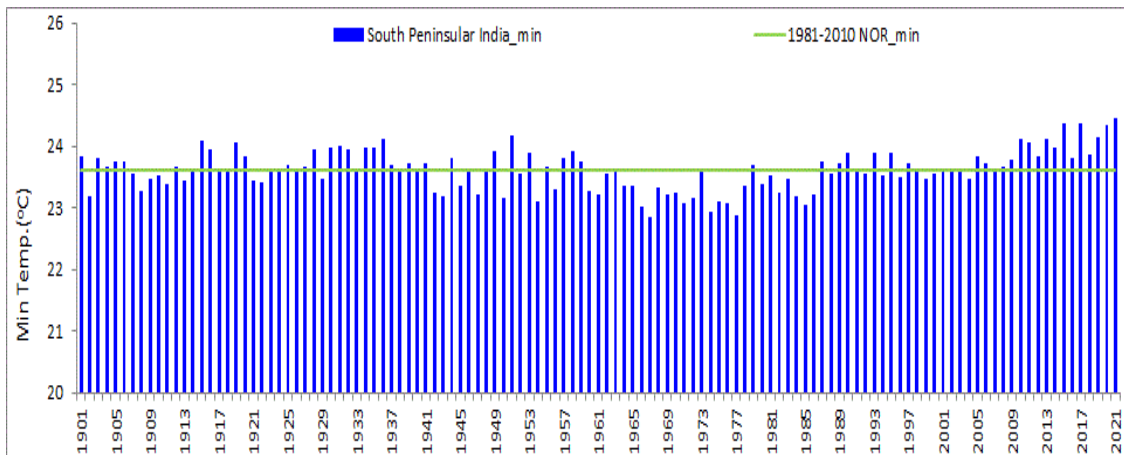


Fig 8: Time series of monthly average minimum temperature over South Peninsular India for the month of October during 1901-2021.

The Temperatures during October 2021 for all India and homogeneous regions with its rank since 1901 are given below;

OCT 2021		Max Temp (°C)	Min Temp (°C)	Mean Temp (°C)
ALL INDIA	ACTUAL	31.42	22.16	26.79
	NORMAL	31.16	20.88	26.02
	ANOMALY	0.26	1.28	0.77
	TOP RANK	25	2	5
NORTHWEST INDIA	ACTUAL	29.82	17.91	23.87
	NORMAL	30.33	16.06	23.19
	ANOMALY	-0.51	1.85	0.67
	TOP RANK	76	6	18
EAST & NORTHEAST INDIA	ACTUAL	32.11	22.74	27.42
	NORMAL	30.58	20.87	25.72
	ANOMALY	1.53	1.87	1.70
	TOP RANK	2	3	2
CENTRAL INDIA	ACTUAL	32.63	22.37	27.50
	NORMAL	32.69	21.47	27.08
	ANOMALY	-0.06	0.90	0.42
	TOP RANK	45	8	18
SOUTH PENNINSULAR INDIA	ACTUAL	31.36	24.46	27.91
	NORMAL	31.02	23.60	27.31
	ANOMALY	0.35	0.87	0.61
	TOP RANK	18	1	6

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

All India (Oct 2021)					East & Northeast India (Oct 2021)					South Peninsular India (Oct 2021)				
Year	TMin	Normal	Anomaly	Rank	Year	Tmin	Normal	Anomaly	Rank	Year	TMin	Normal	Anomaly	Rank
1951	22.186	20.88	1.30	1	2020	22.836	20.87	1.96	1	2021	24.46	23.60	0.87	1
2021	22.165	20.88	1.28	2	1915	22.751	20.87	1.88	2	2015	24.38	23.60	0.78	2
1915	22.151	20.88	1.27	3	2021	22.743	20.87	1.87	3	2017	24.36	23.60	0.76	3
2020	21.889	20.88	1.00	4	1998	22.324	20.87	1.45	4	2020	24.33	23.60	0.73	4
2013	21.850	20.88	0.97	5	1964	22.275	20.87	1.40	5	1951	24.16	23.60	0.56	5

All India (Oct 2021)					East & Northeast India (Oct 2021)				
Year	TMean	Normal	Anomaly	Rank	Year	TMean	Normal	Anomaly	Rank
2017	27.044	26.02	1.02	1	2020	27.65	25.72	1.92	1
2015	27.027	26.02	1.00	2	2021	27.42	25.72	1.70	2
2020	26.960	26.02	0.94	3	1915	26.94	25.72	1.21	3
1951	26.954	26.02	0.93	4	1998	26.80	25.72	1.07	4
2021	26.793	26.02	0.77	5	2017	26.60	25.72	0.87	5

East & Northeast India (Oct 2021)				
Year	TMax	Normal	Anomaly	Rank
2020	32.459	30.58	1.88	1
2021	32.105	30.58	1.53	2
2015	32.009	30.58	1.43	3
2011	31.916	30.58	1.34	4
2016	31.862	30.58	1.29	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 October 2021 is given in Figure 9.

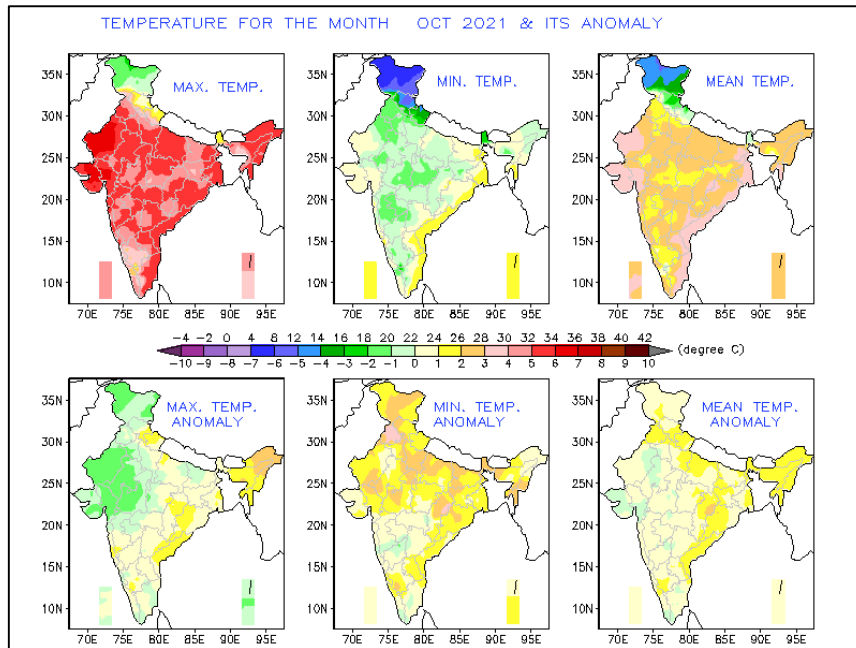


Fig 9: Observed spatial temperature pattern of monthly average maximum, average minimum, and mean temperature over India (top three from left to right) and their departure from normal (1981 to 2010 period) for October 2021 (lower three from left to right).

3. Significant Weather Events for the month of October 2021:

The figure 10 shows significant weather events during the month. (based on real time media reports.).

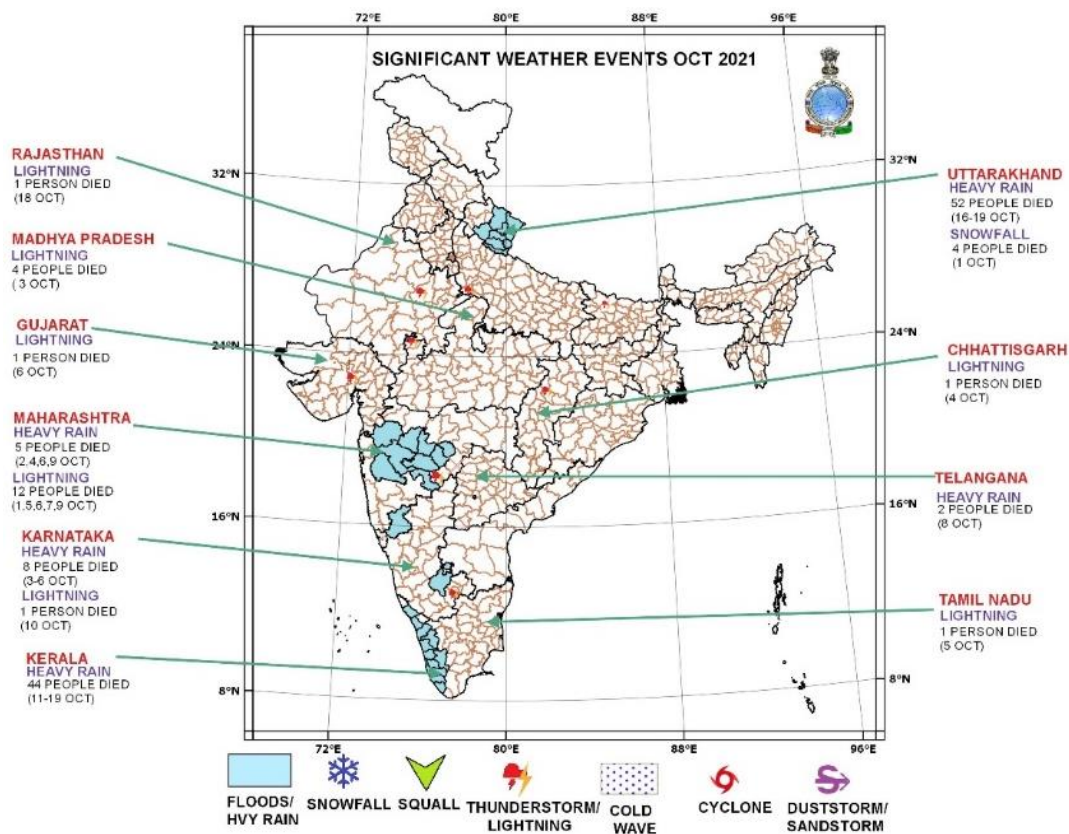


Fig 10: Significant weather events during October 2021 (Based on real-time media report)

From 1st October to 31st October, total 136 persons reportedly claimed dead, 34 persons injured, 13 persons missing & 6 livestock perished. The details of casualties are given below, which are based on real time media reports.

Floods & Heavy Rain: Total 111 persons reportedly claimed dead, 18 persons injured, 11 persons missing & a livestock perished because of heavy rains, floods & landslides during 1st October to 31st October, in addition to this damage to crops, public & private property reported.

The details of the area effected by the events are summarised and given in the table below;

DATE	DEATH	INJURED	MISSING	DISTRICT (STATE) AFFECTED
16 to 19 Oct.	52	17	5	Almora, Bageshwar, Chamoli, Champawat, Nainital, Pauri Garhwal, Pithoragarh, Ranikhet, Udham Singh Nagar (Uttarkhand)
11 to 19 Oct.	44		6	Alappuzha, Idukki, Ernakulam, Kannur, Kottayam, Kollam, Kozhikode, Malappuram, Palakkad, Pathanamthitta, Thrissur, Thiruvananthapuram (Kerala)
3 to 6 Oct.	8	1		Belgaum, Tumkur (Karnataka)
6 & 9 Oct.	5			Ahmednagar, Aurangabad, Osmanabad (Maharashtra)
8 Oct.	2			Hyderabad (Telangana)

Lightning/Thunderstorm: Total 21 persons reportedly claimed dead, 14 injured & 5 livestock perished 1st October to 31st October, because of Lightning/thunderstorm. The details of the area effected by the events are summarized and given in the table below;

DATE	DEATH	INJURED	LIVESTOCK	DISTRICT (STATE) AFFECTED
1, 5, 6, 7, 9 Oct.	12	1	5	Beed, Jalna, Latur, Nanded, Nashik, Parbhani, Pune (Maharashtra)
3 Oct.	4	2		Neemuch (Madhya Pradesh)
4 Oct.	1	9		Bilaspur (Chhattisgarh)
6 Oct.	1	1		Ahmedabad (Gujarat)
5 Oct.	1			Chennai (Tamil Nadu)
10 Oct.	1			Bangalore Urban (Karnataka)
18 Oct.	1	1		Jaipur (Rajasthan)

Snowfall: 4 persons reportedly claimed dead & 2 others missing during 1st October to 31st October, because of snowfall.

DATE	DEATH	MISSING	DISTRICT (STATE) AFFECTED
1 Oct.	4	2	Chamoli (Uttarakhand)