



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

Dated: 03 April, 2021

Subject: Monthly Weather Review for the month of March 2021 and Weather Outlook for the month of April 2021

1. Salient features of month of March 2021

(a) Western Disturbances(WD):

The Western Disturbance(WD) activity in the month of March 2021 was higher than normal as a total of seven WDs moved across Western Himalayan Region against the normal of four WDs. Out of seven WDs, three WDs (1st WD during 6-9 March; 2nd WD during 11-14 March and 3rd WD during 21-23 March) were very active and had moved as a cyclonic circulation at middle level or as a long amplitude north-south trough in middle and upper tropospheric westerly winds, extending south-wards, upto, 17°-20°N, with its southern end dipping to north Arabian sea and thus favoring moisture incursion to north India during respective periods. Other four WDs moved across extreme northern parts of the country to the north of 28°N. All three active WDs caused scattered to fairly widespread rainfall/snowfall/thunderstorm activity over Western Himalayan Region during the period and movement of these systems to eastward and formation of its induced cyclonic circulation over northwest Rajasthan in association with these WDs, caused isolated to scattered rainfall/thunderstorm activity over adjoining plains of Northwest India during the same period. Isolated hailstorm activity was also reported over these regions. These WDs have also caused isolated to scattered rainfall/thunderstorm activity over northern parts of Central India where isolated hailstorm activity was also reported due to the passage of these long amplitude trough in westerly winds at mid and upper tropospheric levels.

(b) Season's first Heat wave to severe heat wave spell observed during 29-31 March 2021:

The heat wave conditions at most places with Severe Heat wave conditions at isolated places occurred over West Rajasthan during 29-31 March, Heat wave conditions at a few places over east Rajasthan during 30-31 March, over Odisha and adjoining parts of Gangetic west Bengal, Coastal Andhra Pradesh, Tamil Nadu on 31 March. The highest maximum temperature of 44.6°C had been recorded at Baripada (Odisha) on 30th March 2021.

(c) Formation of Season's 1st low pressure area over Bay of Bengal on 29 March 2021

A cyclonic circulation extending upto mid tropospheric levels lay over Southeast Bay of Bengal & adjoining South Andaman Sea on 29th March 2021 and it persisted over the same area on 30th ; Under its influence, a Low Pressure Area formed over Southeast Bay of Bengal & adjoining South Andaman Sea in the early morning hours of 31st which lay over South Andaman Sea and adjoining Southeast Bay of Bengal by the evening of the same day. This system has caused scattered to fairly widespread rainfall/thunderstorm activity over Andaman & Nicobar Islands during 29-31 March. Latter, it became a depression and moved north northeastwards towards Myanmar coast during 2-3 April and weakened into a low pressure area on 4th April.

(d) Northeastern parts of India experienced notable wet spell associated with thunderstorm activities during last week of the month

Northeastern parts of India had no major thunderstorm activities till 27 March. However, towards end of March 2021, under the influence of strong lower level south-westerly winds from the Bay of Bengal and other favourable meteorological conditions, scattered to widespread rainfall occurred over northeastern states during 29 March to 1 April, 2021. Isolated heavy rainfall also occurred over the region on 31 March 2021.

(e) Season's 1st dust raising Strong Surface Winds (speed reaching 30-40 kmph):

Dust raising Strong Surface Winds prevailed during 30-31 March 2021 over parts of Punjab, Rajasthan, Haryana, Chandigarh & Delhi, Uttar Pradesh, Madhya Pradesh and Strong Surface Winds (speed reaching 30-40 kmph) prevailed over Jharkhand & Gangetic West Bengal.

(f) Sub-dued rainfall activities in the month:

Rainfall over the country as a whole for the month of March 2021 was 16.7 mm, which is 45% less than its Long Period Average (LPA) of 30.4 mm and hence rainfall was deficient. **Week by week rainfall data in March 2021 shows that consecutively past four weeks in the season, India received deficient rainfall over the country as whole (refer Fig 1).**

During this month spatial pattern of rainfall(refer Fig 2) shows that 3 sub-divisions received large excess, 2 sub-divisions excess, 5 sub-divisions normal and remaining 23 sub-divisions deficient or large deficient rainfall and 3 sub-divisions received no rainfall.

The monthly rainfall for March 2021 is given in the table below:

Regions	Actual Rainfall (mm)	Normal Rainfall (mm)	% Departure from LPA
Country as a whole	16.7	30.4	-45.2
Northwest India	27	47.5	-43.1
Central India	5.2	8.4	-38.4
South Peninsula	6.3	14.4	-56.2
East & northeast India	33.8	63.5	-46.8

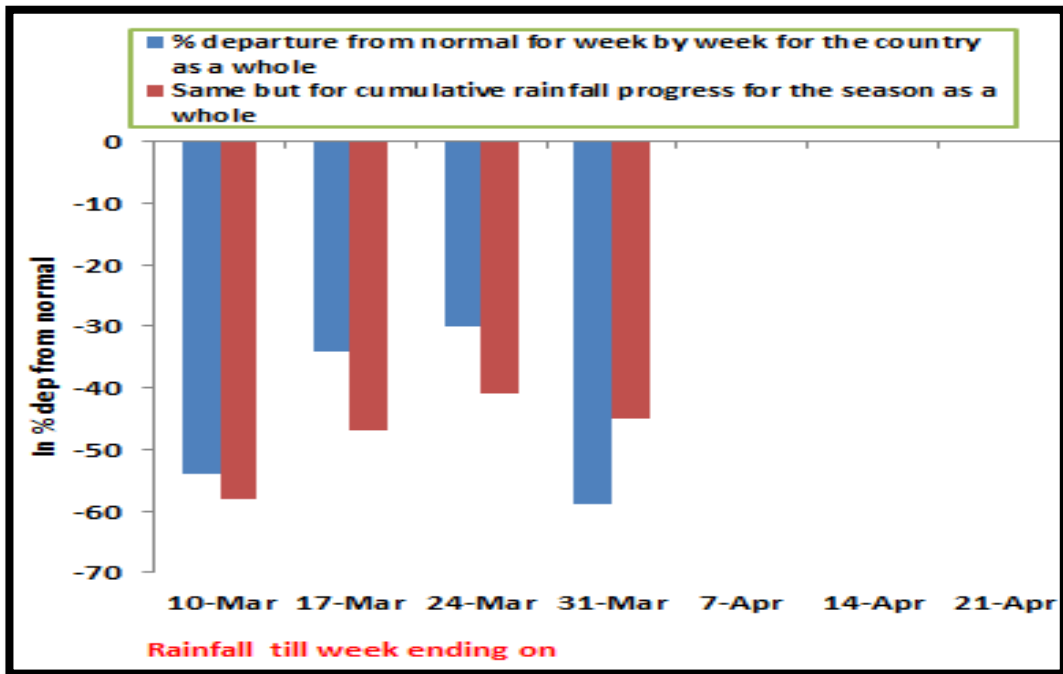


Fig 1: Rainfall progress during pre-monsoon season 2021

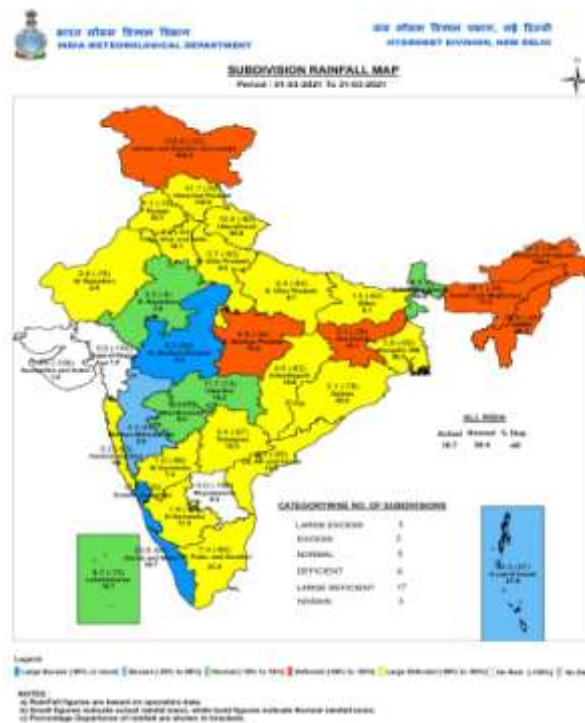


Fig. 2. Meteorological subdivision-wise rainfall during March 2021

(g) Frequency of Heavy Rainfall events

The month of March 2021 witnessed very heavy rainfall event Kothagiri in Tamilnadu and heavy rainfall events over few stations in the South Peninsular India. The location of occurrences of heavy rainfall events are shown in the Figure 3. Kothagiri in Tamilnadu reported 120 mm of rainfall on 11th March 2021. The list of heavy rainfall reported stations are given below;

Date of Heavy rains in March 2021	Station Name	Met. Sub Division	Rainfall(mm)
2	TUTING	Arunachal Pradesh	80.4
6	CHERRAPUNJI	Assam & Meghalaya	79.2
10	KOKRAJHAR	Assam & Meghalaya	68.2
10	MYLAUDY	Tamil Nadu, Puducherry and Karikal	72.2
11	DEVAKOTTAI	Tamil Nadu, Puducherry and Karikal	68
11	ANDIPATTI	Tamil Nadu, Puducherry and Karikal	87.2
11	SIVAGIRI	Tamil Nadu, Puducherry and Karikal	91
11	THENKASI	Tamil Nadu, Puducherry and Karikal	74
11	THRITLA	Kerala & Mahe	67
12	KUPWARA	Jammu & Kashmir and Ladakh	66
24	GOVINDPURA	Jammu & Kashmir and Ladakh	65

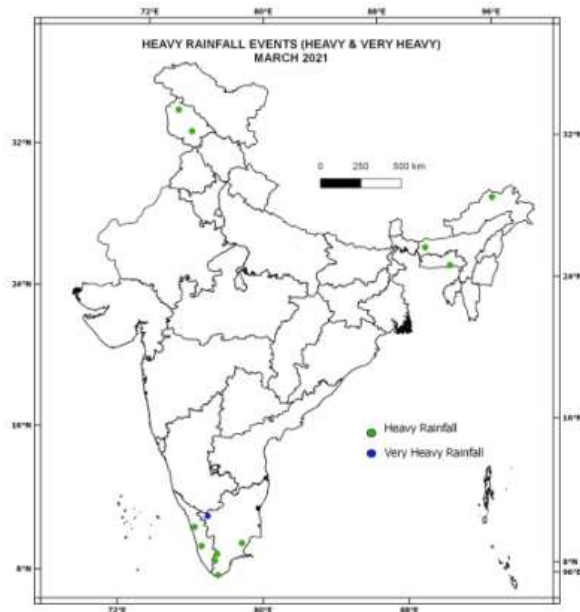


Fig 3: The location of occurrence of heavy rainfall events in the month of March 2021.

(h) Characteristics of Monthly Temperatures pattern over the country during March 2021.

Spatial Pattern in the month (refer Fig 4):

The observed spatial temperature pattern of monthly average maximum, average minimum and mean temperature over India and their departures from normal (1981 to 2010 periods) for the month of March 2021 is given in Fig. 4. It shows, monthly average maximum, average minimum and mean temperature were higher than normal over northwestern, central and eastern and northeastern parts of the country with parts of peninsular India had below normal temperatures. .

TEMPERATURE FOR THE MONTH MAR 2021 & ITS ANOMALY

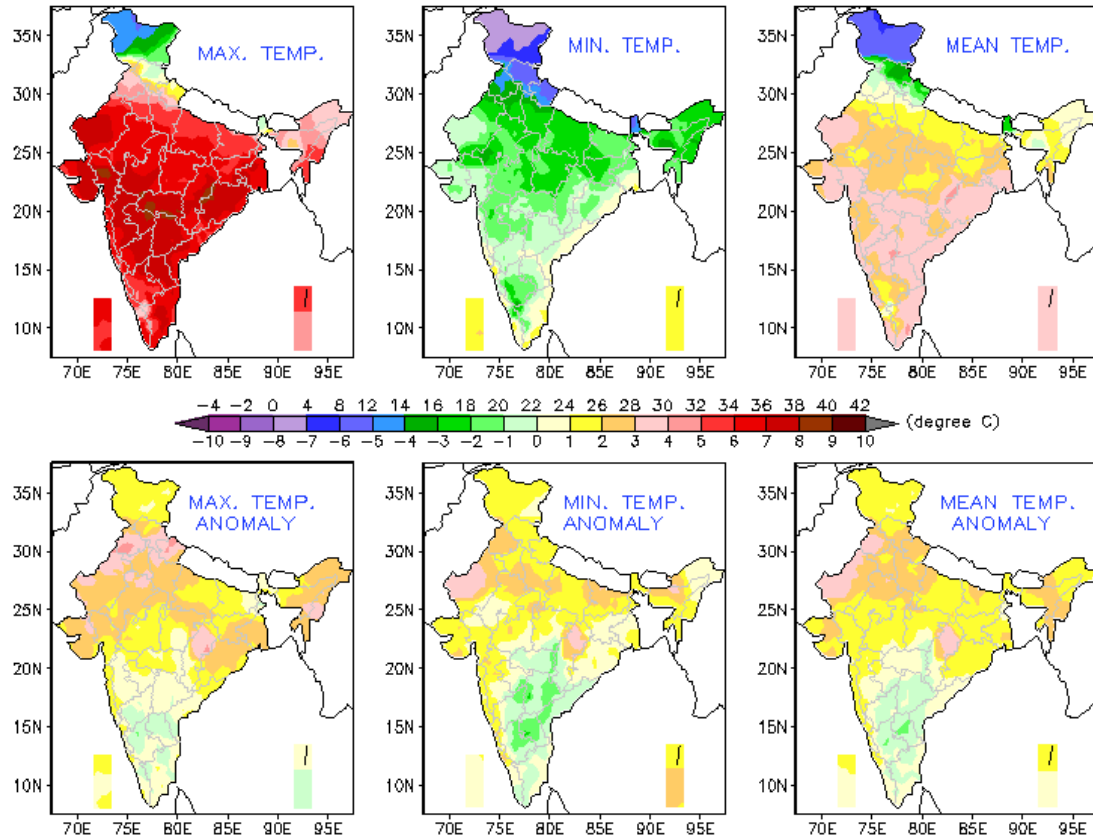


Fig 4: Observed spatial temperature pattern of monthly average maximum, average minimum, and mean temperature over India (top three from left to right) and their departure from normal (1981 to 2010 period) for March 2021(lower three from left to right).

Characteristics of all India and four Homogenous region temperature and comparison with its historical time series:

Following table shows the status of all India average monthly maximum, monthly minimum and mean temperature for the month of March 2021 and also for respective homogenous region (https://www.imdpune.gov.in/Seasons/Pre_Monsoon/premonsoon.html). The observed monthly average maximum, minimum and mean temperature for the country as a whole during March 2021 are 32.65°C, 19.95°C and 26.30°C respectively, against the normal of 31.24°C, 18.87°C and 25.06°C based on the climatology period 1981-2010. Thus the average maximum, minimum and mean temperature for the country as a whole were above normal by 1.4°C, 1.08°C and 1.24°C respectively.

The all India average monthly maximum temperature during March 2021 with 32.65degC is the warmest in last 11-years, and 3rd warmest in last 121 years with 2010 and 2004 as the ever warmest and 2nd warmest month with 33.09degC and 32.82degC respectively(Refer Fig 5).

Region	Details of Temperature and Rank of March 2021 from historical data since 1901	Monthly Average Max Temp (°C)	Monthly average Min Temp (°C)	Monthly Mean Temp (°C)
ALL INDIA	ACTUAL	32.65	19.95	26.30
	NORMAL	31.24	18.87	25.06
	ANOMALY	1.40	1.08	1.24
	TOP RANK	3	4	3
	BOT RANK	119	118	119
NORTHWEST INDIA	ACTUAL	29.03	14.58	21.80
	NORMAL	26.82	12.73	19.77
	ANOMALY	2.21	1.86	2.03
	TOP RANK	9	4	6
	BOT RANK	113	118	116
EAST & NORTHEAST INDIA	ACTUAL	31.77	17.64	24.71
	NORMAL	30.21	16.58	23.39
	ANOMALY	1.56	1.06	1.31
	TOP RANK	10	6	4
	BOT RANK	112	116	118
CENTRAL INDIA	ACTUAL	35.13	20.70	27.92
	NORMAL	33.58	19.62	26.60
	ANOMALY	1.55	1.08	1.32
	TOP RANK	4	7	4
	BOT RANK	118	115	118
SOUTH PENINSULAR INDIA	ACTUAL	33.76	23.90	28.83
	NORMAL	33.08	23.34	28.21
	ANOMALY	0.68	0.56	0.62
	TOP RANK	4	8	3
	BOT RANK	118	115	119

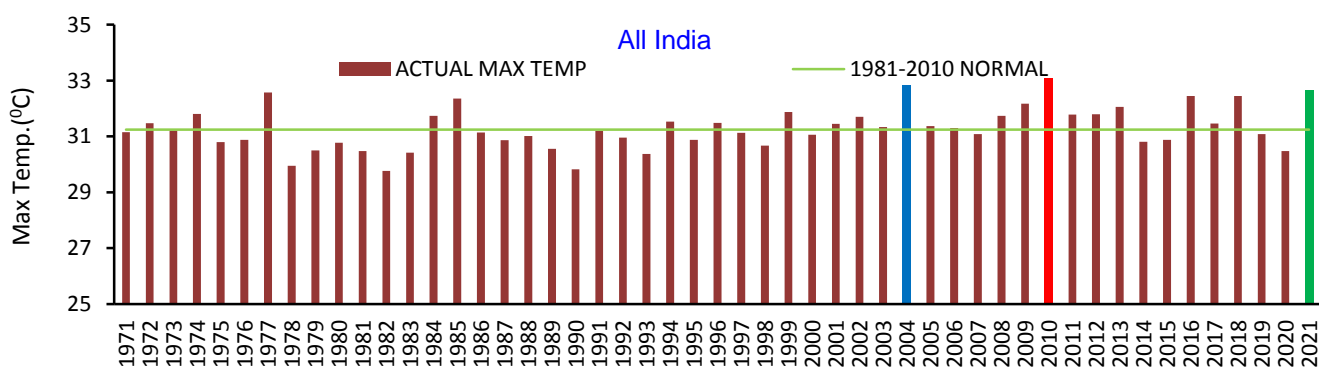


Fig 5: All India average monthly maximum temperature time series for all India 1971-2021

2. Large scale features

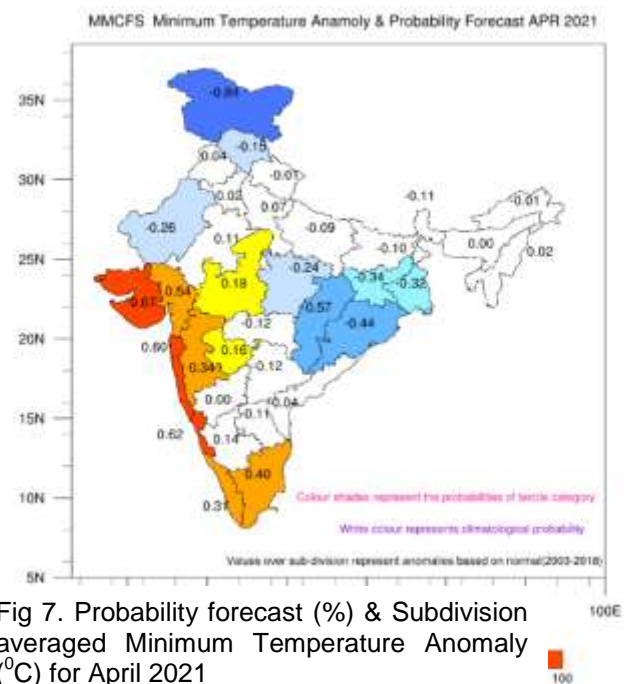
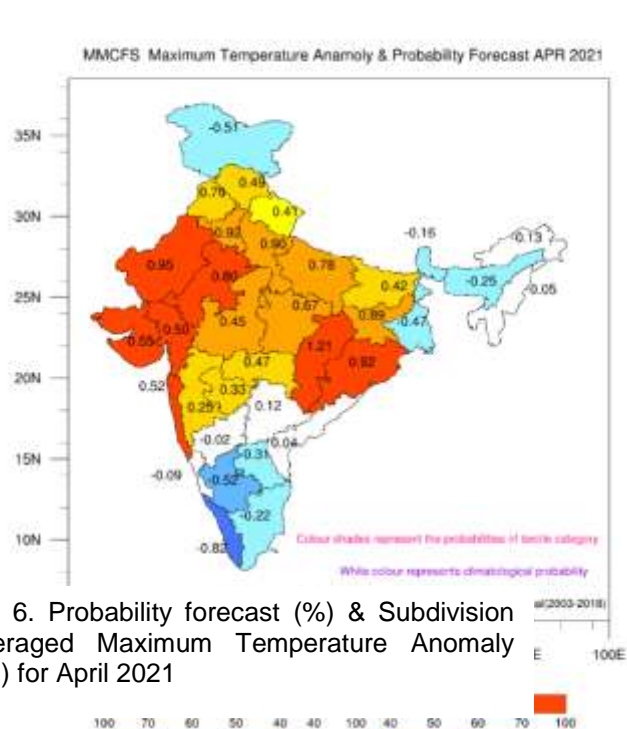
- Currently, moderate La Niña conditions are prevailing over equatorial Pacific and Sea Surface Temperatures (SSTs) are below normal over central & eastern equatorial Pacific Ocean. The latest Monsoon Mission Climate Forecasting System (MMCFS) forecast indicates warming of SSTs over Nino 3.4 region during the coming season and there is a possibility of transition of

La Niña conditions to ENSO neutral conditions during the forthcoming season. However, model skill during this period is supposed to be limited because of the spring barrier.

- At present, neutral Indian Ocean Dipole (IOD) conditions are observed over Indian Ocean and the latest MMCFS forecast indicates neutral IOD conditions are likely to continue up to May, June & July (MJJ) months and negative IOD conditions likely to develop thereafter.
- The Madden Julian Oscillation (MJO) index lies currently in phase 6 with amplitude more than 1. It will continue in same phase till 9th April . Thereafter, it will move to phase 7 with amplitude remaining more than 1 and remain in phase 7 till 18th April 2021. Thus, MJO phase and amplitude will become unfavorable for any cyclogenesis over north Indian Ocean (Bay of Bengal & Arabian Sea).

3. Climate Outlook for April 2021

3.1 Temperature outlook for April 2021



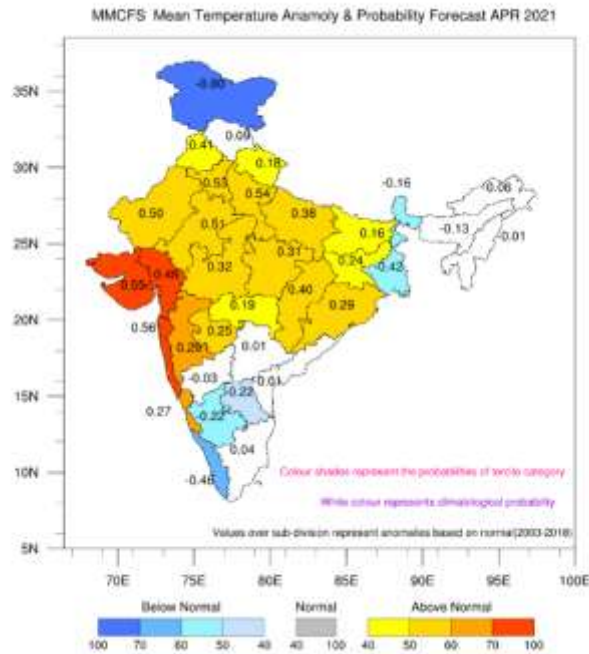


Fig.6, Fig.7 and Fig.8 shows predicted sub-divisional probability and the subdivision averaged maximum, minimum and mean temperature anomalies (departures from the long term normal) respectively for the month of April 2021. The probability forecast for maximum temperature (Fig.6) indicates that above normal maximum temperatures are likely to be over most subdivisions of northwest, north along the plains of Himalayas, east, west and central India and below normal maximum temperatures over most subdivisions of south Peninsular India, northeast India and few subdivisions of extreme north India. Few subdivisions of northeast and north of south peninsular India are likely to experience climatological probability for maximum temperature.

The probability forecast for minimum temperature (Fig.7) indicates that above normal minimum temperature are likely to be over most subdivisions of west, adjoining central and few subdivisions of south peninsular India and below normal minimum temperatures over few subdivisions of extreme north, northwest, east and adjoining central India. Rest of the subdivisions are likely to experience climatological probability for minimum temperature.

The probability forecast for mean temperature (Fig.8) indicates above normal mean temperature over most subdivisions of north along the plains of Himalayas, northwest, west and east India. Few subdivisions of east, extreme north and south peninsular India are likely to experience below normal mean temperatures. Rest of the subdivisions are likely to experience climatological probability for mean temperature.

3.2 Rainfall Forecast

Weather systems & associated Precipitation during Week 1 (01 to 07 April, 2021) and Week 2 (08 to 14 April, 2021)

Rainfall for week 1: (01 to 07 April, 2021)

- Under the influence of fresh Western Disturbance, light/moderate fairly widespread to widespread rain/snow very likely over Western Himalayan Region during 4th to 7th April and light isolated rainfall over Punjab and Haryana & Chandigarh on 5th & 6th April, 2021. Thunderstorm with lightning & hail likely at isolated places over Jammu & Kashmir, Ladakh, Gilgit-Baltistan & Muzaffarabad on 4th and over Himachal Pradesh & Uttarakhand on 5th April, 2021.
- Due to trough and/or wind confluence over south Peninsular India, light thundershower is very likely over Kerala & Mahe, Tamilnadu, Puducherry & Karaikal and Coastal Andhra Pradesh during many days of the week 1 (**Fig 9 and Fig 10**).

Rainfall for week 2: (08 to 14 April, 2021)

- **Due to lower level southwesterly winds from the Bay of Bengal to northeastern states and West Bengal, fairly widespread to widespread rainfall with heavy falls at isolated places are likely over this region during 1st half of the week 2. As a result above normal rainfall activity likely over this region.**
- Due to trough over southwest Peninsular India, light thundershower is very likely over Kerala & Mahe, Coastal & south Karnataka during many days of the week 2.
- Due to absence of any active Western Disturbance, rainfall activity is likely to be below normal over northwest India. It is likely to be below normal to normal over remaining parts of the country (**Fig 9 and 10**).

➤ Week 3: (15 to 21 April 2021)

- In Week 3, it is very likely to be normal to above normal rainfall over most parts of India except Kashmir and parts of northeastern states and Maharashtra and adjoining parts of east central and parts of Peninsular India where it is likely to be normal to below normal (refer Fig 9 and 10).

➤ Week 4: 22-28 April, 2021

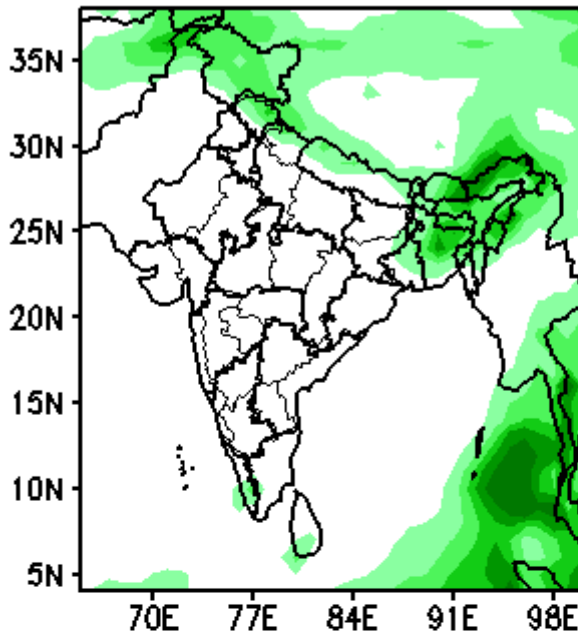
- In Week 4, it is very likely to be normal to above normal rainfall over most parts of India except Kashmir and parts of northeastern states where it is likely to be below normal (refer Fig 9 and 10).

3.3. Cyclogenesis:

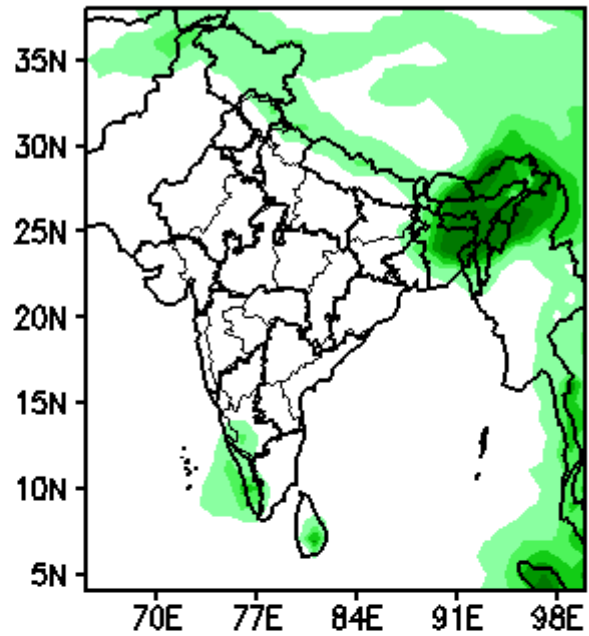
- No cyclogenesis is likely over the north Indian Ocean during next two weeks.

Forecast Rainfall (mm/day)

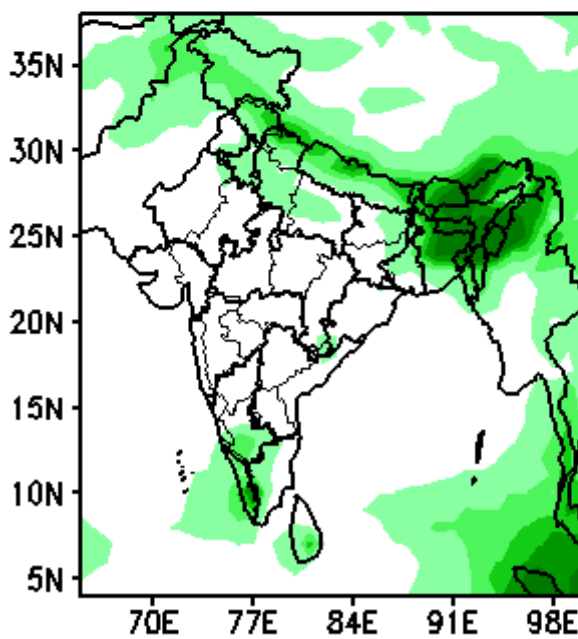
(Week1: 02Apr-08Apr)



(Week2: 09Apr-15Apr)



(Week3: 16Apr-22Apr)



(Week4: 23Apr-29Apr)

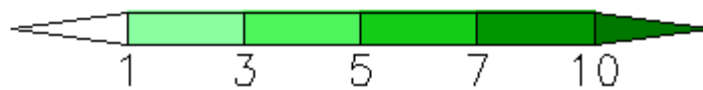
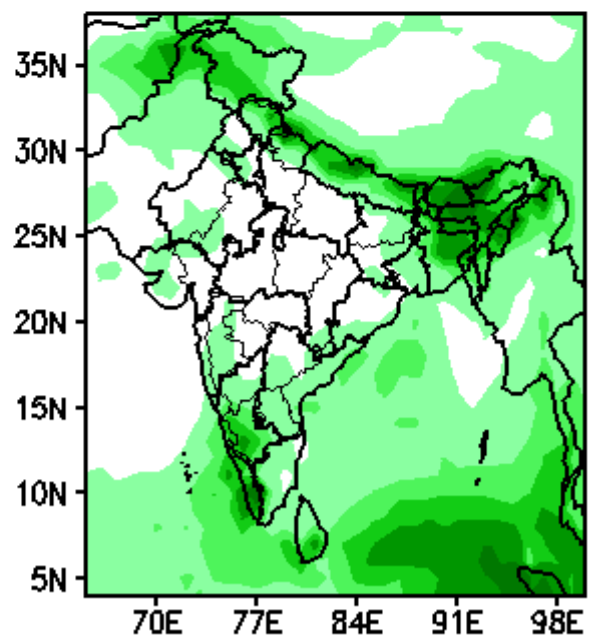
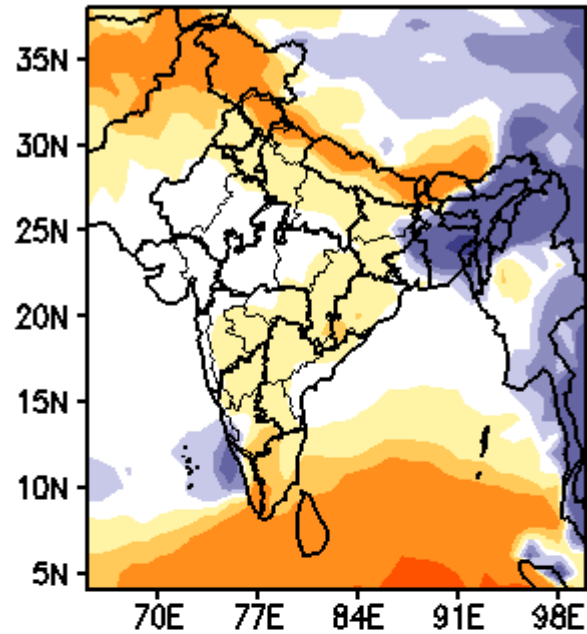
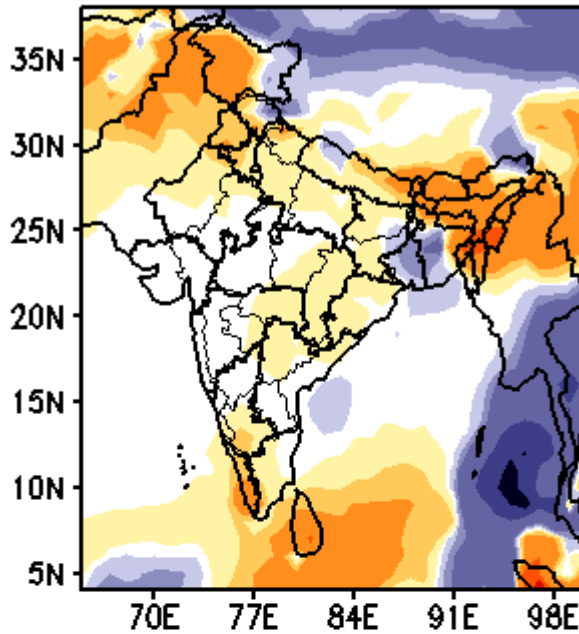


Fig 9: Rainfall forecast (Actual) in mm/day over the country for April 2021 (Week 1 to Week 4)

Forecast Rainfall Anomaly (mm/day)

(Week1: 02Apr-08Apr)

(Week2: 09Apr-15Apr)



(Week3: 16Apr-22Apr)

(Week4: 23Apr-29Apr)

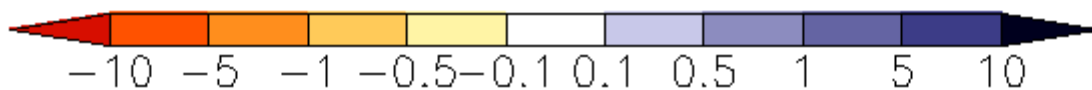
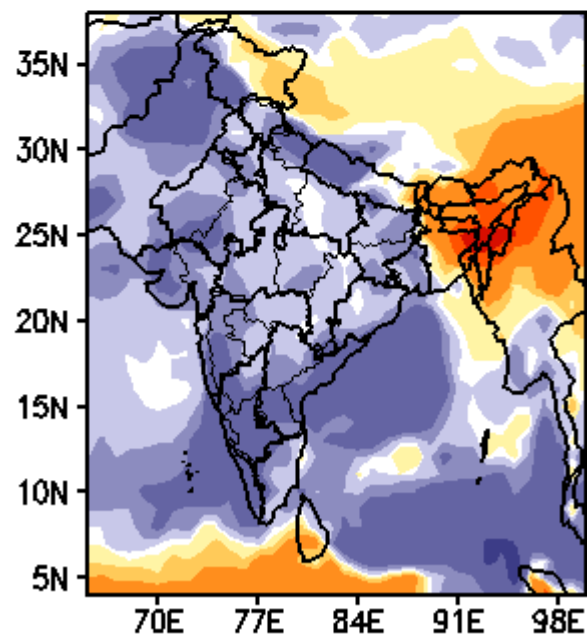
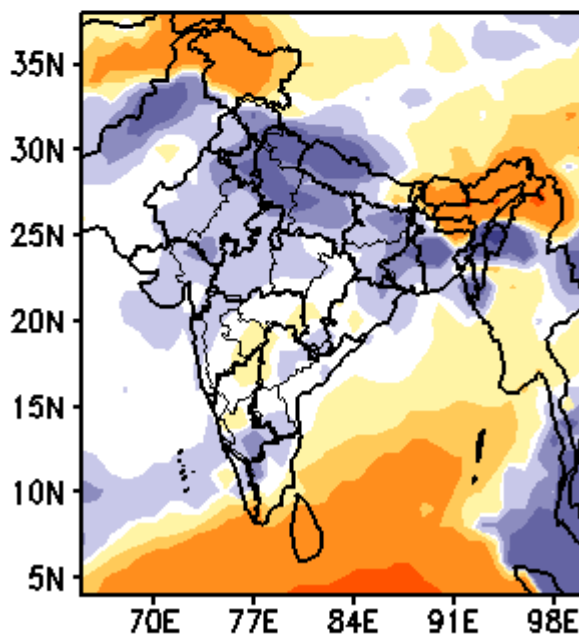


Fig 10: Rainfall forecast (in departure from normal) over the country for April 2021 (Week 1 to Week 4)

