



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

Dated: 11 Dec, 2020

Subject: Monthly Weather Review for the month of Nov, 2020 and Weather Outlook for the month of Dec 2020

1. Status of northeast monsoon rainfall over southeast Peninsular India during 1 Oct till 30 Nov 2020

The south Peninsula consisting of five subdivisions (Tamil Nadu, Coastal Andhra Pradesh, Rayalaseema, Kerala and south interior Karnataka) receives about 30% of its annual rainfall during the NE monsoon season (October to December). Tamil Nadu in particular receives about 48% of its annual rainfall during this season. Fig 1 shows cumulative Northeast monsoon Rainfall(NEMR) over these five subdivisions as a whole. It shows NEMR during Oct-Nov 2020 is normal with actual rainfall being +2% above the long period average

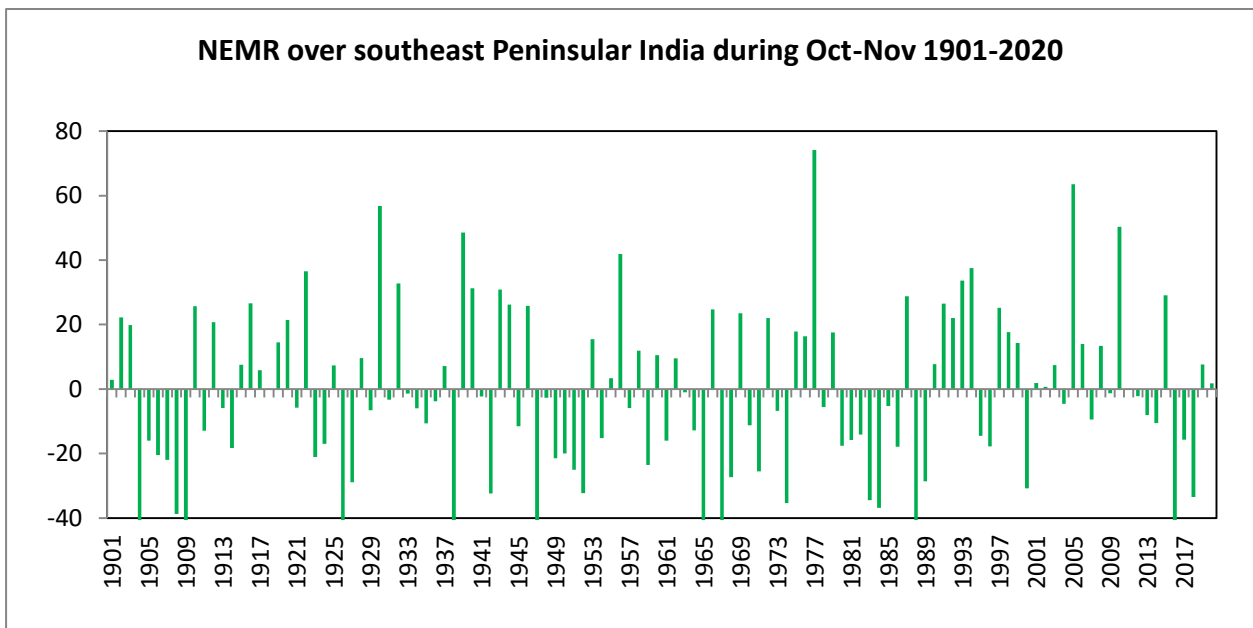


Fig 1: Time series of percentage departure from normal NEMR over Southeast Peninsular India (Tamil Nadu, Coastal Andhra Pradesh, Rayalaseema, Kerala and south interior Karnataka) during 1901-2020 for the period of Oct-Nov

In the year 2020, the progress of NEMR over Tamil Nadu has been highly variable as it was subdued till 11 Nov with weekly departures from normal for week ending on 4 Nov and 11 Nov from normal were -79% and -49% with season's cumulative rainfall departure from normal till 11 Nov as -46%. It may be noted that during the period of 1 Oct till 15 Nov 2020 known as most vulnerable period for cyclone formation over NIO, has got only one depression (12-16 Oct 2020) formed over Bay of Bengal. Thereafter, till mid- Nov 2020, no low pressure system formed over NIO and crossed Tamil Nadu coast resulting deficient rainfall to continue over the state. However, rainfall over Tamil Nadu and Puducherry and adjoining southeast Peninsula have been significantly enhanced during the 2nd fortnight due to formation and movement **Very Severe Cyclonic Storm 'NIVAR' in Bay of Bengal (21st to 27th November) and its movement across** north Tamil Nadu. For the period 1 Oct till 2 Dec 2020, the cumulative rainfall in terms of departure from normal over Tamilnadu has improved to -16% while it was -46% till week ending on 11 Nov 2020.

2. Monthly Rainfall Scenario over the country (01 to 30 Nov, 2020)

Rainfall over the country as a whole for the month of November 2020 shows that it has recorded 29.2mm which is 4% lower than its Long Period Average (LPA) of 30.4mm with south Peninsula having 13% above normal. Details are given below:

Rainfall over India during November 2020

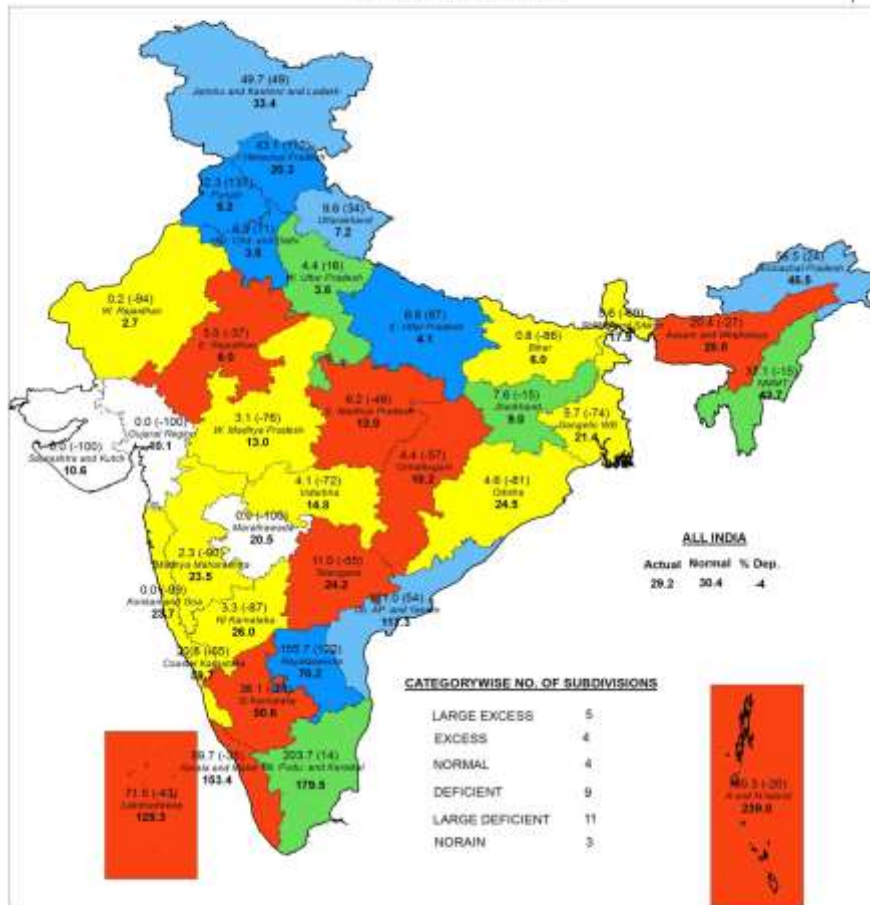
Regions	Actual Rainfall (mm)	Normal Rainfall (mm)	% Departure from LPA
Country as a whole	29.2	30.4	-4%
Northwest India	16.9	11.9	42%
Central India	3.0	15.8	-81%
South Peninsula	100.7	89.2	13%
East & northeast India	20.3	24.6	-18%

During this month, 5 sub-divisions received large excess, 4 excess, 4 normal while remaining are deficient or large deficient except Gujarat state and Marathwada not having any rainfall. The rainfall has been mainly confined to southeastern parts of Peninsular India and northern plains and Western Himalayan Region. The central and western India received subdued rainfall during the month (**Refer Fig 2**).



SUBDIVISION RAINFALL MAP

Period : 01-11-2020 To 30-11-2020



Legend

Large Excess [80% or more] Excess [50% to 80%] Normal [-10% to 10%] Deficient [-40% to -20%] Large Deficient [-90% to -40%] No Rain [-100%] No Data

NOTES :

- a) Rainfall figures are based on operation data.
- b) Small figures indicate actual rainfall (mm), while bold figures indicate Normal rainfall (mm).
- c) Percentage Departures of rainfall are shown in brackets.

Fig. 2. Meteorological subdivision-wise Monthly rainfall during Nov, 2020

3. Frequency of Heavy Rainfall events

- **Tamil Nadu, Puducherry & Karaikkal:** The extremely heavy falls at isolated places occurred on three days; Very heavy rainfall at isolated places on six days; Heavy rainfall at isolated places on 7 days
- **Coastal Andhra Pradesh & Yanam:** The extremely heavy falls at isolated places occurred on two days ; and Heavy rainfall at isolated places on 8 days
- **Royalaseema:** The extremely heavy falls at isolated places occurred on two days; Very heavy rainfall at isolated places on one days
- **Kerala & Mahe:** Very heavy rainfall at isolated places on 1 days; Heavy rainfall at isolated places on 4 days.
- The occurrences of heavy rainfall events are shown in **Fig. 3.**

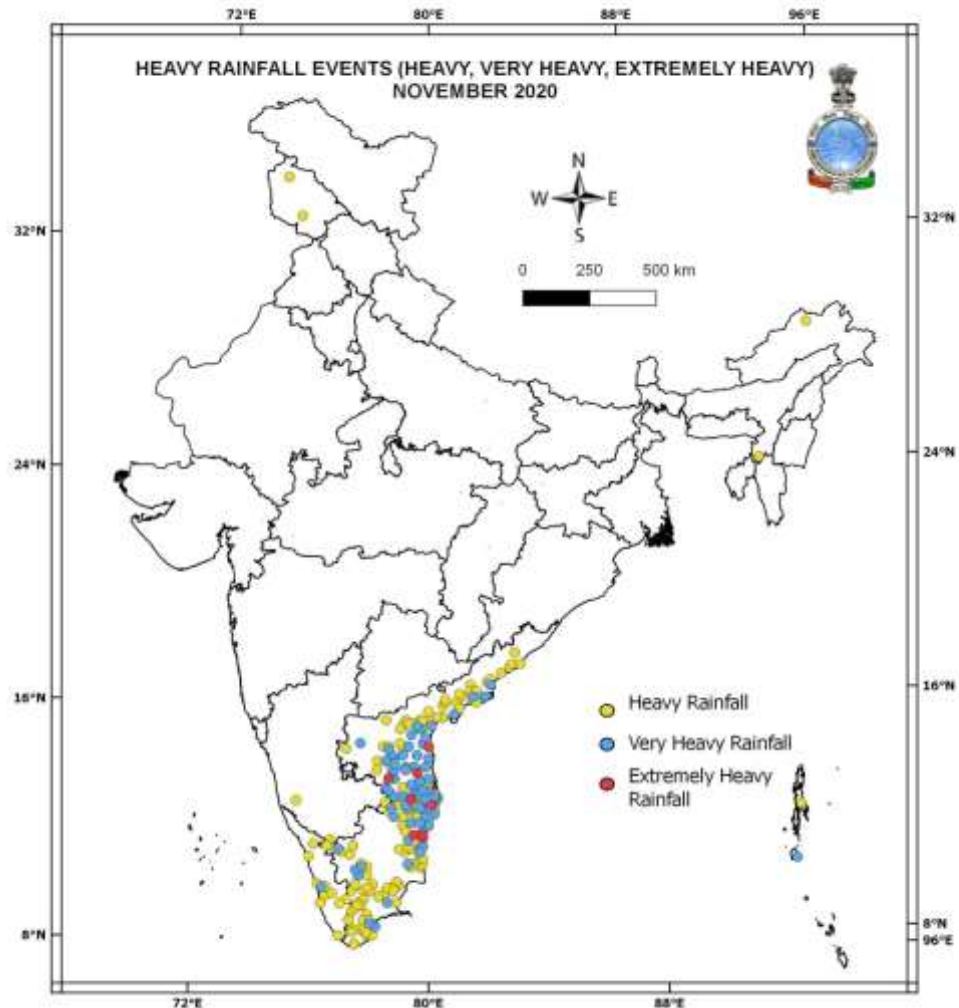


Fig. 3. Locations reported Heavy rainfall events during Nov, 2020

• **Heavy / Very Heavy Rainfall Warning Skill:**

No. of Heavy/Very Heavy Rainfall Events (>64.4 mm) and Warning Skill (correctness in %) of spatial distribution in issued warnings during the month is given below:

warning issued for	No. of Heavy/Very Heavy Rainfall Events (>64.4 mm): 46	
	Percentage correct (in %) for Rainfall >64.4mm	
Day1 / 24 Hours	96%	
Day2 / 48 Hours	96%	
Day3 / 72 Hours	96%	

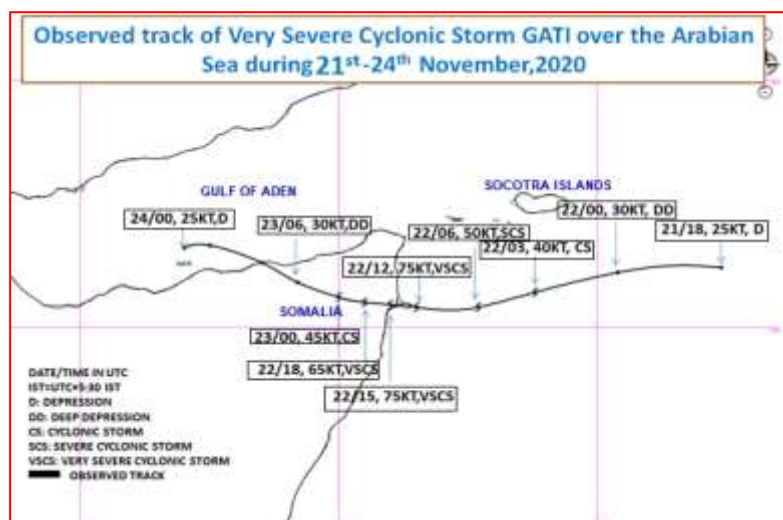
4. Cyclogenesis over North Indian Ocean

Among all the months, both Oct and Nov are the most vulnerable months for Cyclonic disturbances (Depressions +Cyclones) over the north India Ocean(NIO). The average frequencies Cyclonic disturbances as depressions and cyclones are 2.0 and 1.8 during October and 1.8 and 1.2 during November respectively based on data of 1961-2019. However, in Oct 2020, a total of 3 Depressions formed over NIO with no Cyclones while in Nov 2020, 3 cyclones formed over NIO (1

over the Arabian Sea and 2 over the Bay of Bengal). Out of the **three (Nivar, Gati, Burevi)**, two (Nivar & Gati) intensified into very severe cyclonic storms. **Further, out of the three, two crossed Tamilnadu coast (Nivar & Burevi) & Gati crossed Somalia coast.**

a. Very Severe Cyclonic Storm “GATI” over the Arabian Sea (21st – 24th November 2020):

- A low pressure area formed over central parts of south Arabian Sea (AS) in the morning (0300 UTC) 19th November.
- It lay as a well marked low pressure area over southwest AS & neighbourhood in the early morning (0000 UTC) 21st.
- It concentrated into a depression over the same region in the midnight (1800 UTC) of 21st.
- Moving west-southwestwards, it explosively intensified into a deep depression in the early morning (0000 UTC) of 22nd and further into the cyclonic storm “**GATI**” in the same morning (0300 UTC), into a severe cyclonic storm in the noon (0600 UTC) and into very severe cyclonic storm in the afternoon (0900 UTC) over southwest AS. It reached it’s peak intensity of 75 knots in the same evening (1200 UTC) over the southwest AS.
- Continuing to move westwards, it crossed Somalia coast near latitude 10.45°N and longitude 51.10°E between 1400 and 1500 UTC of 22nd as a very severe cyclonic storm with estimated wind speed of 130-140 kmph gusting to 155 kmph.
- Continuing to move nearly westwards, it weakened into a severe cyclonic storm in the early morning (2100 UTC of 22nd) of 23rd, into a cyclonic storm in the early morning (0000 UTC) and into a deep depression in the same noon (0600 UTC) over north Somalia.
- Thereafter, it moved west-northwestwards and emerged into Gulf of Aden in the evening (1200 UTC) of 23rd.
- Continuing to move west-northwestwards, it weakened into a depression in the early morning (0000 UTC) of 24th over Gulf of Aden and adjoining north Somalia and into a well marked low pressure area in the noon (0600 UTC) of 24th over the same region.
- As per media reports, intense rainfall activity occurred over north Somalia, more than 20 cm rainfall in just a few days against about 10 cm of annual rainfall.
- The observed track of the system during 21st to 24th November is as follows:



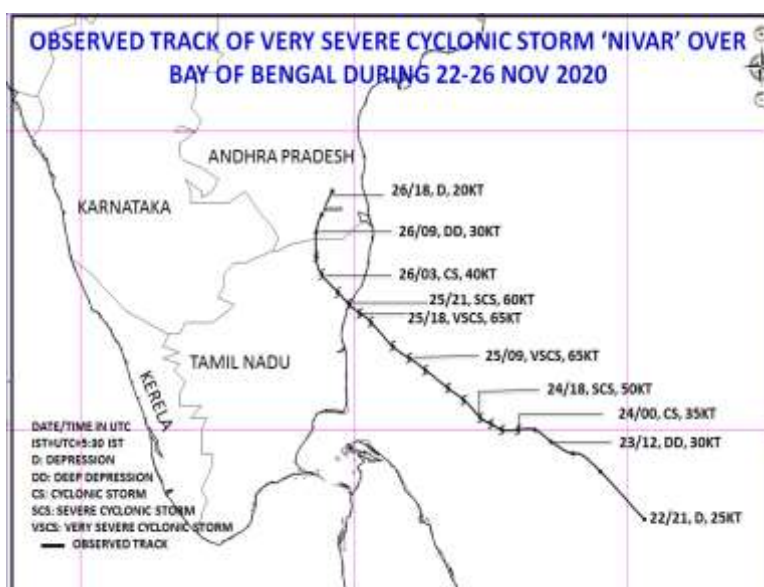
- **Forecast performance:** IMD monitored and predicted its genesis on 19th and movement towards Somalia coast on the first objective track forecast issued on 0000 UTC of 22nd November. IMD predicted it to cross Somalia coast as a Severe Cyclonic Storm.
- **The salient features of GATI are as follows:**

i) It rapidly intensified from depression to VSCS within 18 hours (25 knots to 75 knots)

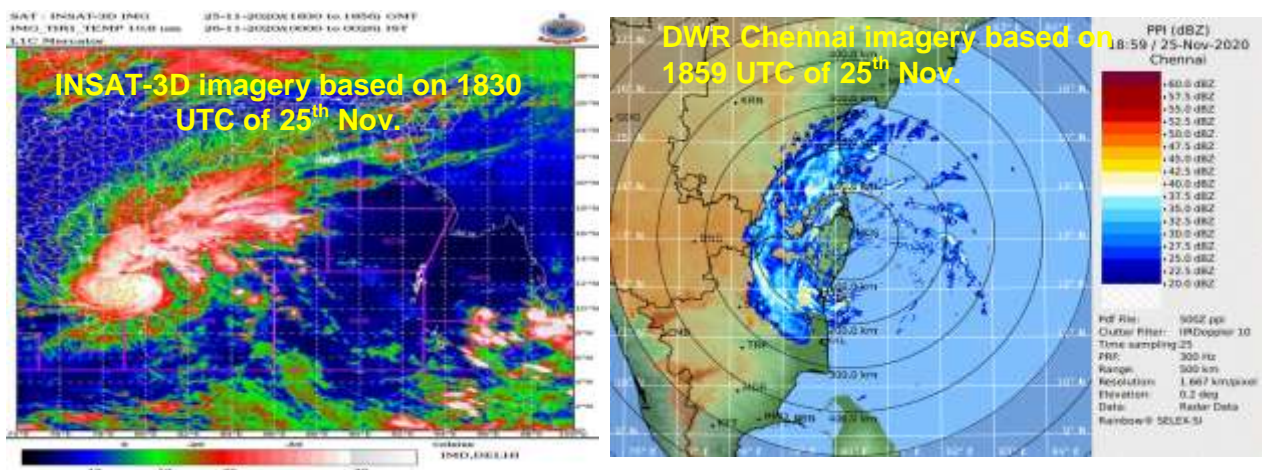
i) It moved rapidly with a speed of about 40-45 kmph and crossed Somalia coast

b. Very Severe Cyclonic Storm 'NIVAR' in Bay of Bengal (21st to 27th November):

- A Low Pressure Area (LPA) formed over Equatorial Indian Ocean (EIO) and adjoining central parts of south Bay of Bengal (BoB) on 21st November.
- It lay as a Well Marked Low Pressure Area (WML) over southwest & adjoining southeast Bay of Bengal on 22nd November.
- It concentrated into a depression over the same region in the early hours (0230 hrs IST / 2100 UTC of 22nd) of 23rd November.
- Moving west-northwestwards, it intensified into a deep depression in the evening of 23rd and further into the cyclonic storm “NIVAR” in the early morning (0530 hrs IST / 0000 UTC) of 24th over southwest BoB.
- Continuing to move west-northwestwards, it further intensified into a severe cyclonic storm in the midnight (2330 hrs IST / 1800 UTC) of 24th and into a very severe cyclonic storm in the afternoon (1430 hrs IST / 0900 UTC) of 25th.
- Moving further northwestwards, it crossed Tamilnadu & Puducherry coasts near Puducherry (near lat. 12.1°N and long. 79.9°E) during 2330 IST of 25th to 0230 IST of 26th as a very severe cyclonic storm with estimated wind speed of 120 kmph gusting to 135 kmph.
- Continuing to move northwestwards, it weakened into a severe cyclonic storm in the early morning hours (0230 hrs IST) of 26th.
- Thereafter, it moved north-northwestwards and weakened into a cyclonic storm in the morning (0830 hrs IST / 0300 UTC) of 26th November, 2020 over north coastal Tamilnadu.
- Thereafter, it started recurving north-northeastwards and weakened into a deep depression in the afternoon (1430 hrs IST) of 26th over south Rayalaseema, into a depression in the same midnight (2330 hrs IST) over south coastal Andhra Pradesh.
- Thereafter, it weakened into a well marked low pressure area over south coastal Andhra Pradesh and adjoining westcentral BoB in the early morning (0000 UTC) of 27th November.
- Under the influence of this system, intense rainfall activity occurred over north Tamil Nadu & Puducherry, Rayalseema and south coastal Andhra Pradesh. Heavy to very heavy rainfall occurred at a few places and isolated extremely heavy rainfall (≥ 20 cm) occurred over north Tamilnadu, Puducherry on 24th, 25th & 26th and over Rayalaseema & south coastal AP on 25th and 26th.
- The observed track of the system during 22nd to 27th November is as follows:



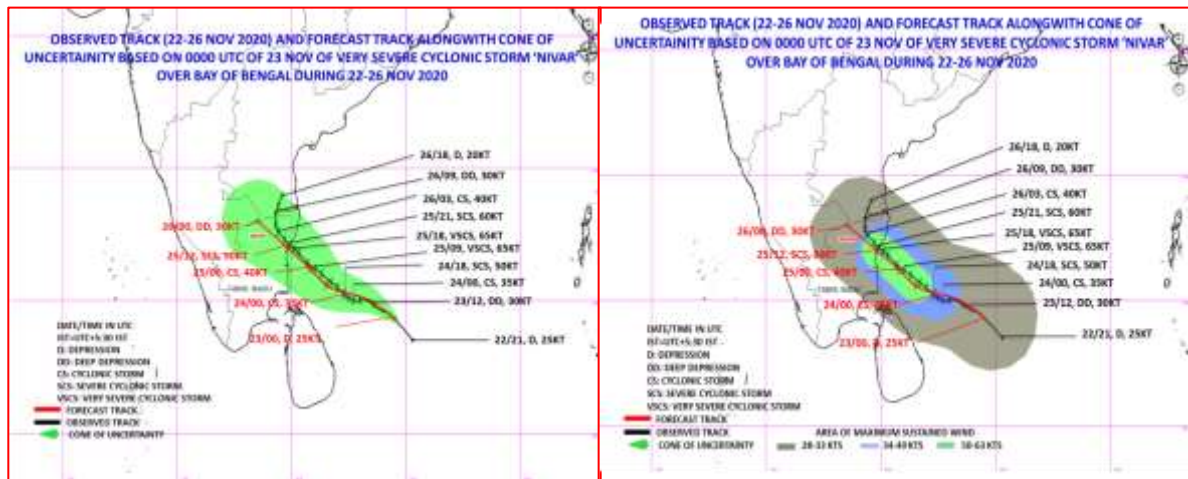
i. Monitoring of "NIVAR": India Meteorological Department (IMD) maintained round the clock watch over the north Indian Ocean and the cyclone was monitored since 5th November, about 16 days prior to the formation of low pressure area over equatorial Indian Ocean and adjoining central parts of south BoB on 21st November and 18 days prior to the formation of depression over central parts of south BoB on 23rd. The cyclone was monitored with the help of available satellite observations from INSAT 3D and 3DR, SCAT SAT, polar orbiting satellites and available ships & buoy observations in the region. The system was also monitored by Doppler Weather RADARs (DWR) Chennai, Karaikal and Sriharikota. Various numerical weather prediction models run by Ministry of Earth Sciences (MoES) institutions (IMD, IITM, NCMRWF, INCOIS), global models and dynamical-statistical models were utilized to predict the genesis, track, landfall and intensity of the cyclone. A digitized forecasting system of IMD was utilized for analysis and comparison of various models' guidance, decision making process and warning products generation. Typical satellite and radar imageries are as follows:



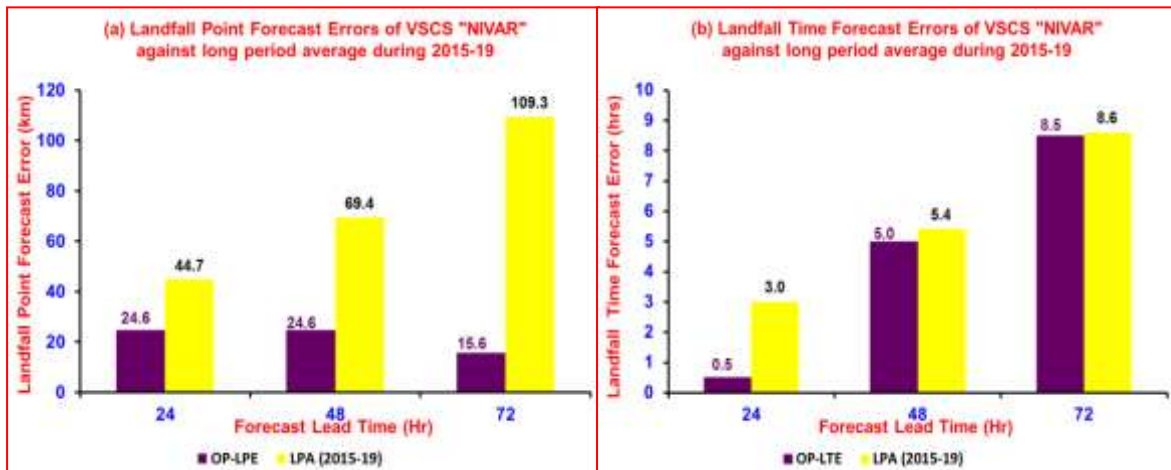
ii. Forecast Performance:
Genesis, track, landfall and intensity forecast:

- The extended range outlook issued on 12th November, indicated that a low pressure area would form over BoB during first half of week (20-26 November) and depression would form over south Bay of Bengal later half of the week. Actually, low pressure area formed over EIO and adjoining central parts of south BoB on 21st November and depression formed over central parts south BoB in on 23rd November. Thus, the genesis of "NIVAR" was predicted by IMD about 12 days in advance.
- The daily national bulletin issued at 1210 hrs IST of 20th November indicated that a low pressure area would form over central parts of south Bay of Bengal around 23rd November, 2020. It was also indicated that it would concentrate into a depression over southwest Bay of Bengal and move west-northwestwards towards Tamilnadu coast by 25th. Actually, the system moved northwestwards towards Tamilnadu coast and crossed the coast in the late night of 25th. Thus, track of "NIVAR" was predicted correctly by IMD about 5 days in advance.
- The first special bulletin and press release issued at 1500 hrs IST of 21st November indicated that a depression would form over southwest BoB around 23rd. It was also indicated that, it would intensify further and move west-northwestwards towards Sri Lanka-south Tamil Nadu coast and reach near Tamil Nadu & Puducherry coast on 25th November, 2020 (about 4 days and 8 hours prior to landfall near Puducherry).
- In the bulletin issued at 1130 hrs IST of 22nd November. It was indicated that the cyclone would cross Tamilnadu and Puducherry coasts between Karaikal and Mammalapuram during 25th afternoon (3 days and 12 hours prior to landfall). **For the first time IMD indicated landfall area of the cyclone, when the system was in the stage of low pressure area.**

- First information that the system would cross Tamilnadu coast close to Puducherry in the evening of 25th with a wind speed of 100-110 kmph gusting to 120 kmph was released in the bulletin issued at 0830 hrs IST of 23rd (about 2 days and 18 hours prior to landfall). The cyclone crossed coast near Puducherry during midnight of 25th to early hours of 26th November with a wind speed of about 120 kmph.
- Since 20th November, regular warnings about the heavy rainfall and strong winds were issued for the states of Tamilnadu, Puducherry and Andhra Pradesh.
- The observed and forecast track based on 0530 hrs IST of 23rd about 72 hrs prior to landfall demonstrating accuracy in track, landfall and intensity prediction is presented in Fig. given below. The black and red lines indicate the observed (actual) track and forecast track respectively. The closeness of these two lines indicate very accurate forecast of track (movement) and landfall point of cyclone, NIVAR.



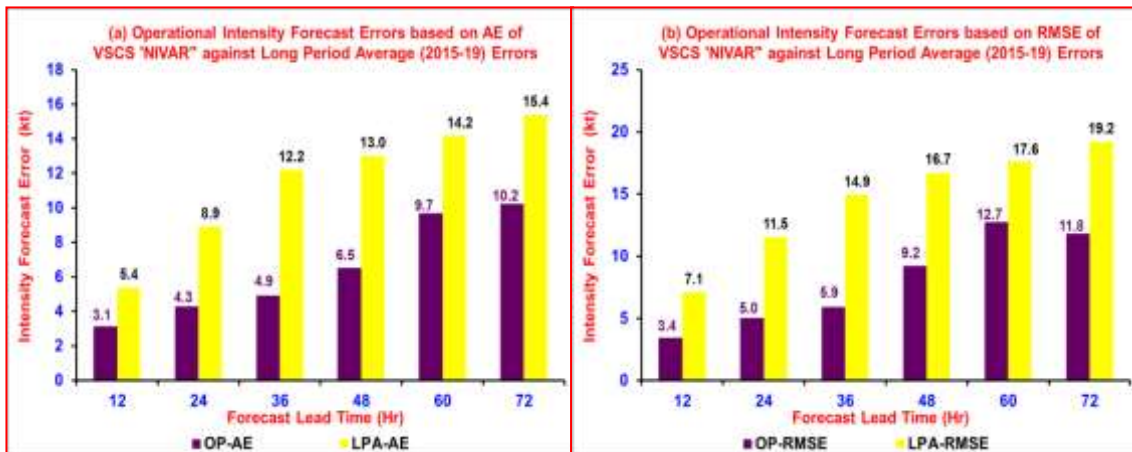
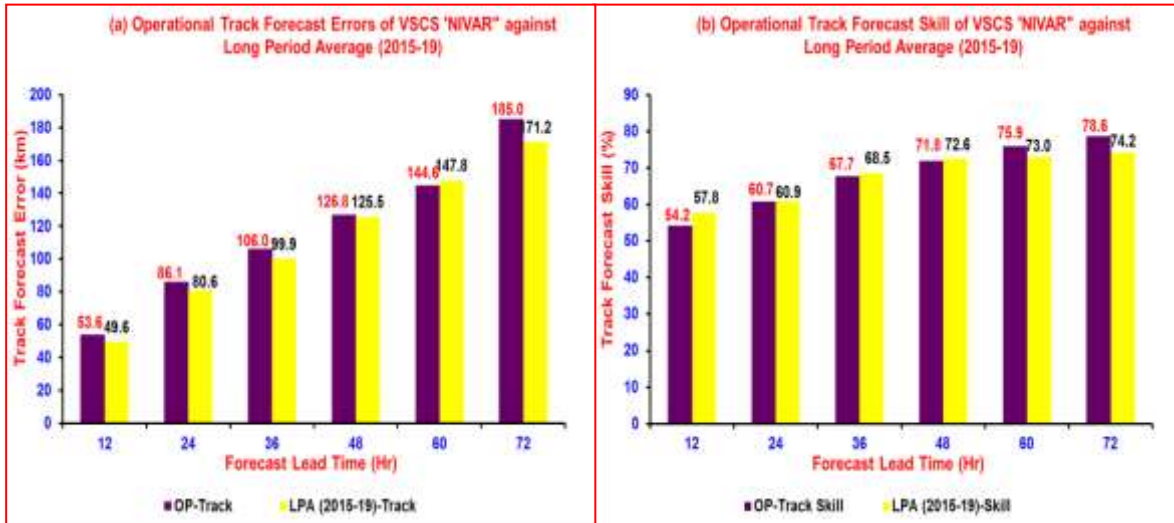
iii. Landfall forecast error: The landfall point and time Forecast errors compared to long period average (LPA) errors during 2015-19 is as under:



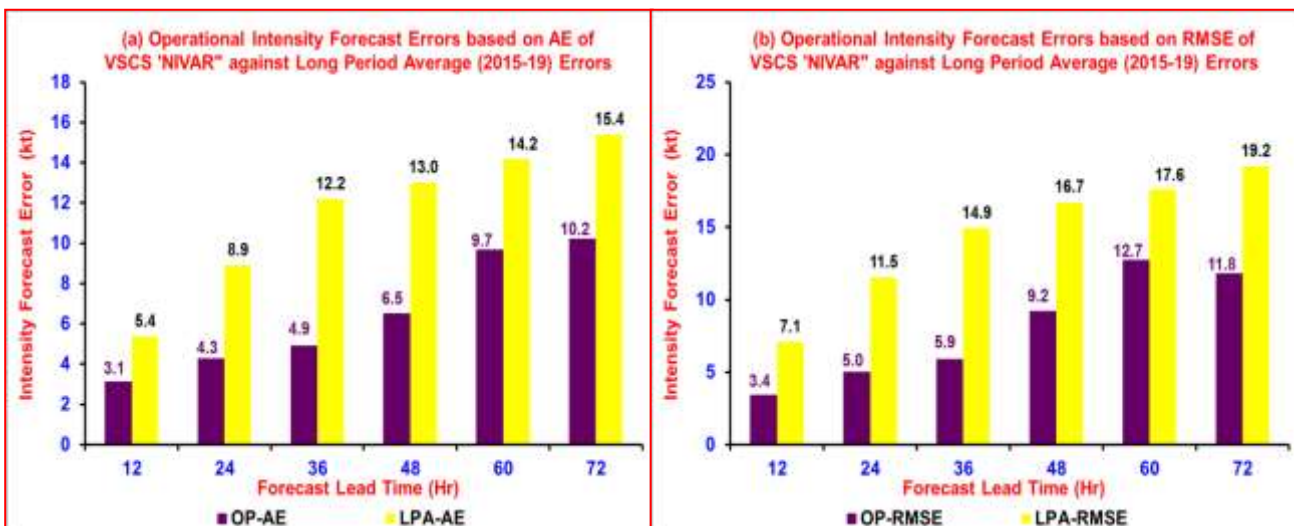
The landfall point forecast errors for 24, 48 and 72 hrs lead period were 25, 25 and 16 km respectively against the LPA errors (2015-19) of 44.7, 69.4 and 109.3 km during 2015-19 respectively. The landfall time forecast errors for 24, 48 and 72 hrs lead period were 0.5, 5.0, and 8.5 hours respectively against the LPA errors (2015-19) of 3.0, 5.4 and 8.6 hours during 2015-19 respectively. **For all lead periods, the landfall point errors were exceptionally less than the LPA errors during 2015-19.**

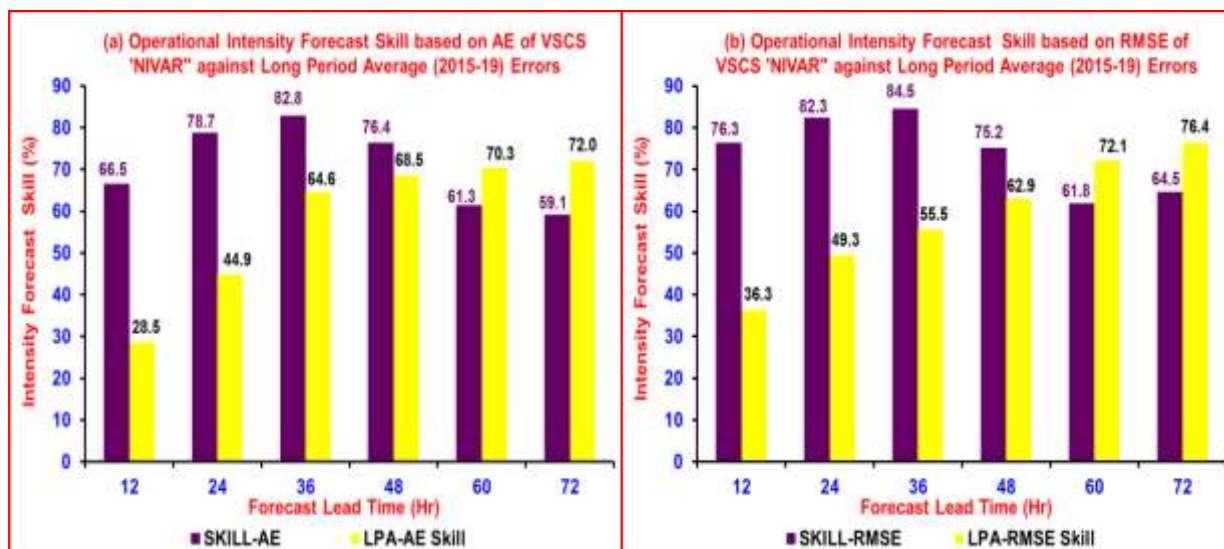
iv. Track forecast error and skill: The track forecast errors (Forecast position – Actual position of Cyclone centre) and skill as compared to Climatological and Persistence forecast are presented in Fig. 5 (a-b). The track forecast errors for 24, 48 and 72 hrs lead period were 86.1,

126.8, and 185.0 km respectively against the LPA errors (2015-19) of 80.6, 125.5, and 171.2 km respectively (Fig.5a). The track forecast skill was about 61%, 72%, and 79% against the LPA skill of 61%, 73%, and 74% for 24, 48 and 72 hrs lead period respectively (Fig.5b).



v. Intensity forecast error and skill: The intensity forecast errors (Forecast wind – Actual wind) and skill based on absolute errors and root mean square errors are presented in Figures given below respectively.





The absolute error (AE) of intensity (wind) forecast for 24, 48 and 72 hrs lead period were 4.3, 6.5 and 10.2 knots against the LPA errors of 8.9, 13.0, and 15.4 knots during 2015-19 respectively (Fig. 6a). The root mean square error (RMSE) of intensity (wind) forecast for 24, 48 and 72 hrs lead period were 5.0, 9.2 and 11.8 knots against the LPA errors of 11.5, 16.7, and 19.2 knots respectively .

The skill (%) in intensity forecast as compared to persistence forecast based on AE for 24, 48 and 72 hrs lead period was 79%, 76% and 59% against the LPA of 45%, 69% and 72% respectively (Fig. 7a). The skill (%) in intensity forecast based on RMSE for 24, 48 and 72 hrs lead period was 82%, 75% and 65% against the LPA of 49%, 63% and 76% respectively.

vi. Warning & advisories issued by IMD:

- **First Press Release and Special Bulletin** for east coast states were issued at 1500 hrs IST of 21st November (4 days 10 hrs prior to landfall)
- **Pre cyclone watch for Tamilnadu and Puducherry coasts** was issued at 1300 hrs IST of 22nd November when the system lay as a well marked low pressure over central parts of south BoB (about 3 days and 16 hours prior to landfall of NIVAR).
- **Cyclone Alert for Tamilnadu and Puducherry coasts** was issued at 0550 hrs IST of 23rd at depression stage (about 70 hours prior to landfall)
- **Cyclone Warning for Tamil Nadu & Puducherry coasts** was issued at 0900 hrs IST of 24th (about 40 hours prior to landfall)
- **Post Landfall Outlook for interior districts of TN & Puducherry** was issued at 1345 hrs IST of 25th (about 10 hours prior to landfall)
- A total of 38 bulletins to national level disaster managers & chief secretaries of Tamilnadu, Puducherry, Andhra Pradesh, Telangana, Andaman & Nicobar Islands, West Bengal, Odisha, Kerala and Lakshadweep. In addition, 7 Nos. of press release, 6 bulletins from Director General of Meteorology to senior Government Officers, 13 bulletins for civil aviation, regular media briefings and joint press conference addressed by DGM IMD and DG NDRF on 24th. The 3 hourly advisories were uploaded on all websites of IMD namely www.mausam.imd.gov.in and www.rscmcnewdelhi.imd.gov.in. Warnings were also uploaded on all social networking sites including Facebook, Twitter, Whatsapp etc. frequently and SMS were also sent to registered users on RSMC website, national level disaster managers and chief secretaries of concerned states. Hourly bulletins were also issued 12 hours prior to landfall.
- **The cyclone warning track and wind graphics were provided in IMD and RSMC, New Delhi website through interactive web-GIS map.**

5. Characteristics of Temperatures of Nov 2020

Fig 4 shows observed spatial temperature pattern of monthly average maximum, average minimum and average temperature over India and their departure from normal for Nov 2020. Fig 5

shows time series of all India monthly average maximum, average minimum and mean temperature during 1971-2020. The actual observed average maximum, average minimum and average temperature for the country as a whole during Nov 2020 are 29.2° C, 17.7° C and 23.5 ° C respectively which is same as normal. Fig 6 shows time series of Northwest India monthly average maximum, average minimum and mean temperature during 1971-2020. The average maximum, average minimum and mean temperature over Northwest India as a whole during Nov 2020 was 24.4 ° C, 10.3 ° C and 17.4 ° C respectively, which were lower than their normal of normal are 25.7 ° C, 11.2 ° C and 18.4 ° C respectively. Fig 6 shows that the month of Nov 2020 is the 3rd coldest month for Northwest India in terms of monthly mean temperature since 1971, with 1975 as the ever coldest Nov followed by 1981 with their mean temp as 16.42 ° and 17.23 ° respectively. The national capital region and adjoining areas of Haryana, Punjab, Uttar Pradesh & Rajasthan recorded lower temperature during Nov. 2020. **Temperatures recorded over New Delhi(Safderjung) for the month of Nov 2020 and comparison with data since 1951 shows that it recorded lowest monthly mean minimum temperature(MMT) during Nov. 2020 (10.2 ° C) in last 72-years after Nov 1949 (10.2 ° C).**

TEMPERATURE FOR THE MONTH NOV 2020 & ITS ANOMALY

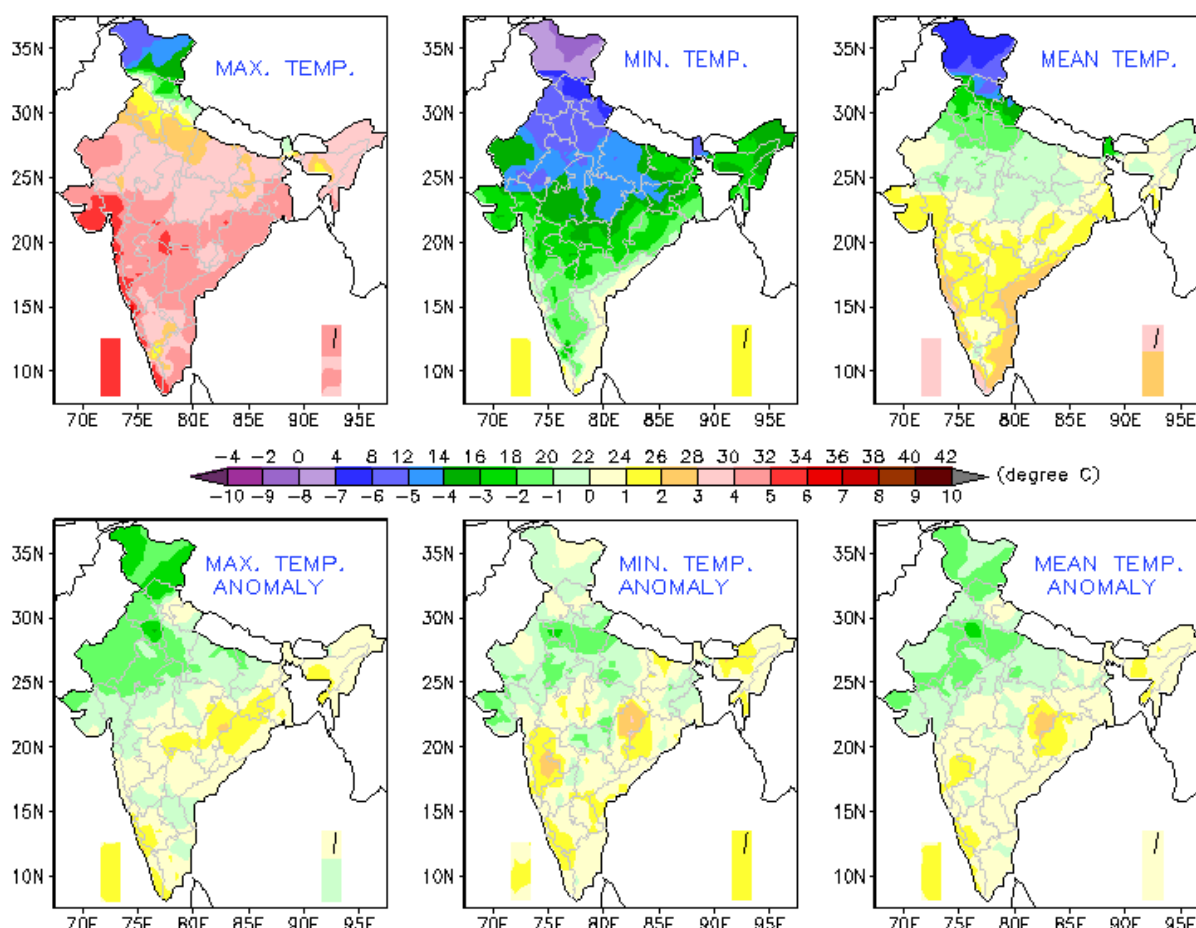


Fig 4: observed **spatial temperature pattern of monthly average minimum, average maximum and mean temperature over India**(top three from left to right) and their departure from normal for Nov 2020(lower three from left to right).

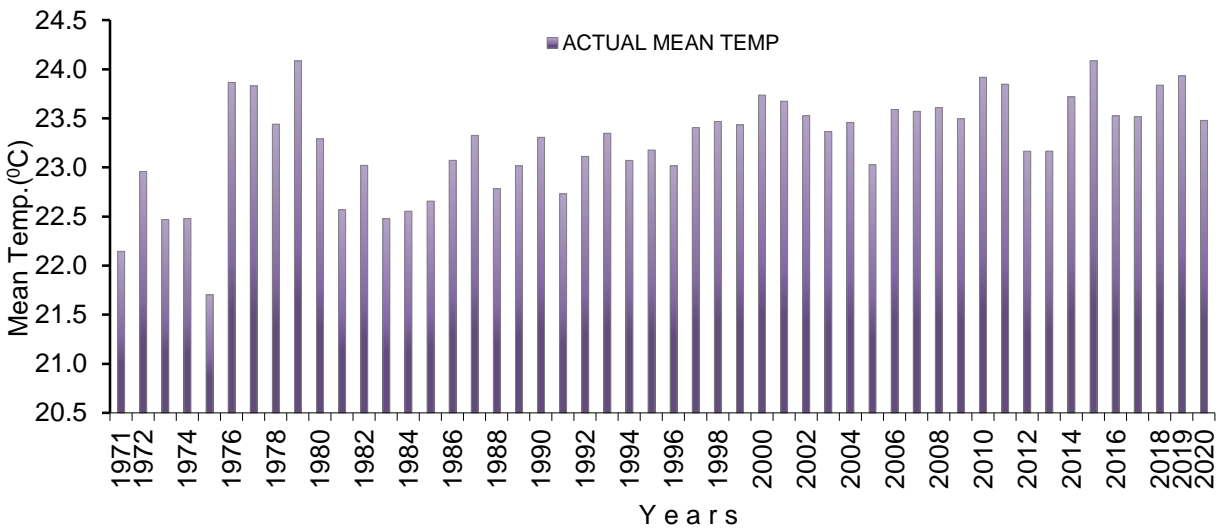
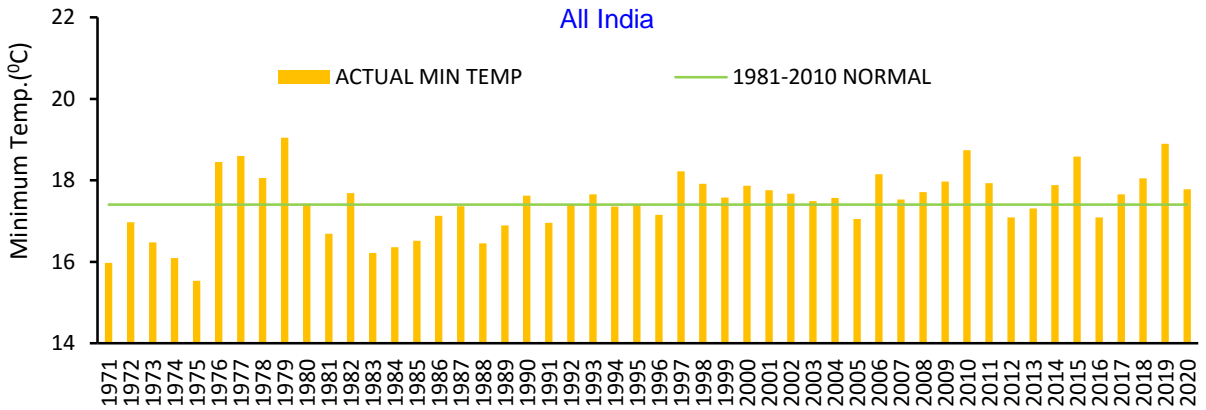
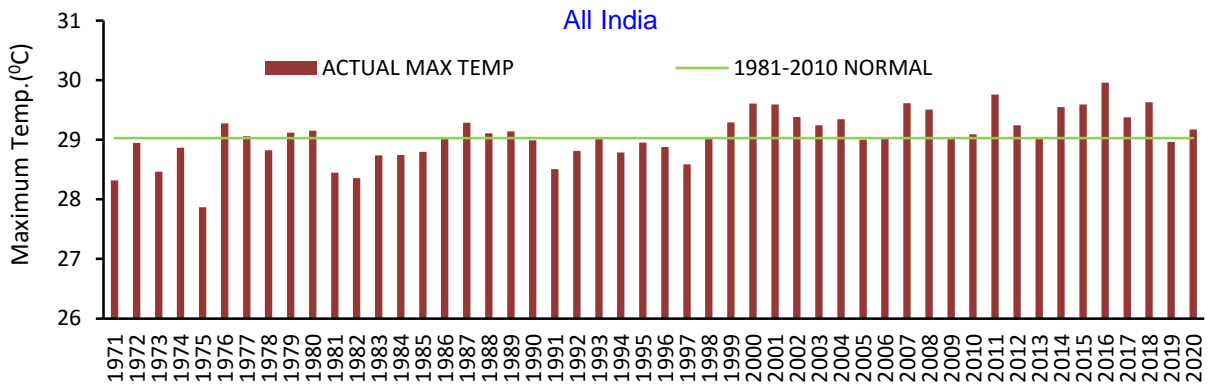


Fig 5: Time series of All India monthly average maximum, average minimum, mean temperature for the month of Nov during 1971-2020

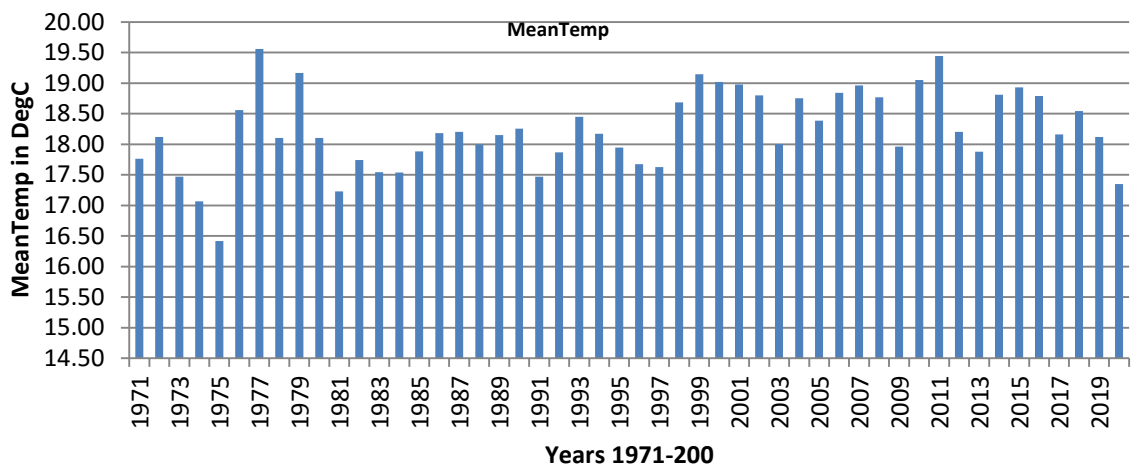
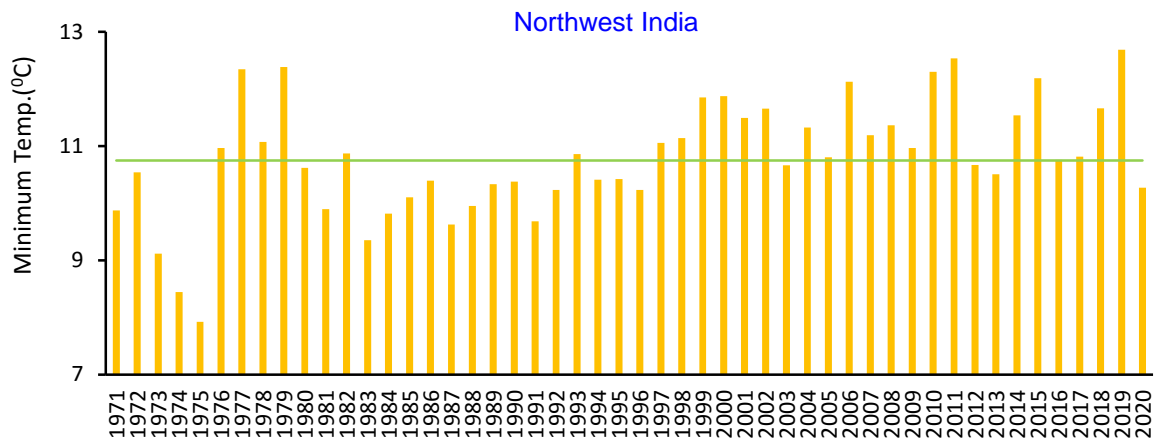
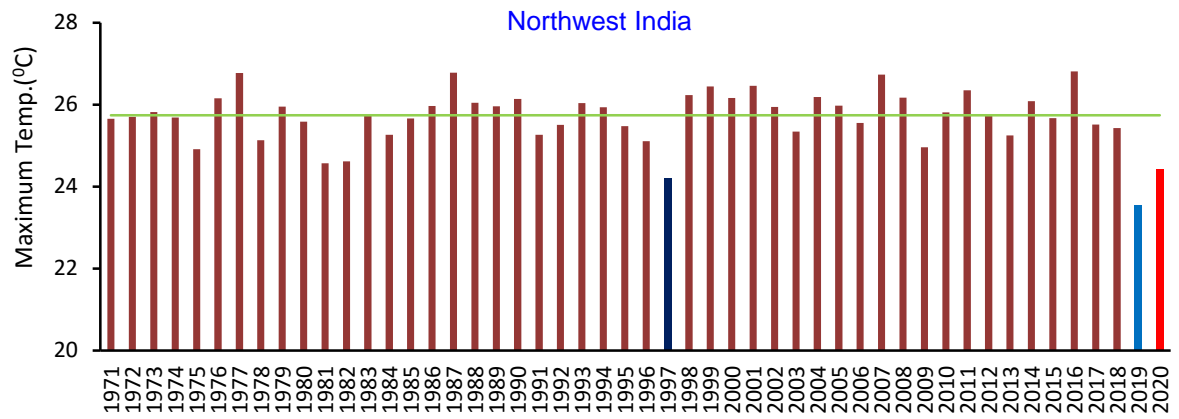


Fig 6: Time series of Northwest India monthly average maximum, average minimum, mean temperature for the month of Nov during 1971-2020

6. Large scale features in Nov 2020

- Currently, moderate La Niña conditions are prevailing over equatorial Pacific and Sea Surface Temperatures (SSTs) are below normal over central and eastern equatorial Pacific Ocean. The latest Monsoon Mission Climate Forecasting System (MMCFS) forecast indicates that colder than normal SST anomaly is most likely to persist over the Nino 3.4 region and La Niña conditions likely to sustain at least early part of the next year.
- 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 during the coming months.
- The Madden Julian Oscillation (MJO) index is in Phase 5 with amplitude close to 1. As per the latest projections, it is likely to continue in same phase during the entire forecast period with amplitude remaining close to 1 till 13th December and becoming less than 1 thereafter.

7. Weather Outlook for Nov 2020

7.1 Temperature outlook

Fig 7a, 7b and 7c shows predicted sub-divisional probability and the subdivision averaged minimum, maximum and mean temperature anomalies (departures from the long term normal) respectively for December 2020. The probability forecast for minimum temperature (Fig.7a) indicates that below normal minimum temperatures are likely over West Rajasthan, East Rajasthan, Punjab, Himachal Pradesh, Jammu & Kashmir, Haryana Chandigarh & Delhi (HCD), Sub Himalayan West Bengal & Sikkim (SHWB) and Chhattisgarh. Remaining subdivisions of the country is likely to experience above normal minimum temperatures. The probability forecast for maximum temperature (Fig.7b) indicates that most of subdivisions of southern peninsular India except Coastal Andhra Pradesh, some subdivisions of central India (West Madhya Pradesh, Vidharbha, Marathwada and Madhya Maharashtra) and few subdivisions of western India (Gujarat region and Sourashtra & Kutch) are likely to experience below normal Maximum temperature. Remaining subdivisions of the country are likely to experience above normal maximum temperatures. The probability forecast for mean temperature (Fig.7c) indicates that most of subdivisions of India likely to experience above normal mean temperatures. However, below normal mean temperatures are likely to experience over west & east Rajasthan, Jammu & Kashmir and Madhya Maharashtra. Normal mean temperatures are likely to experience over Kerala and South Interior Karnataka.

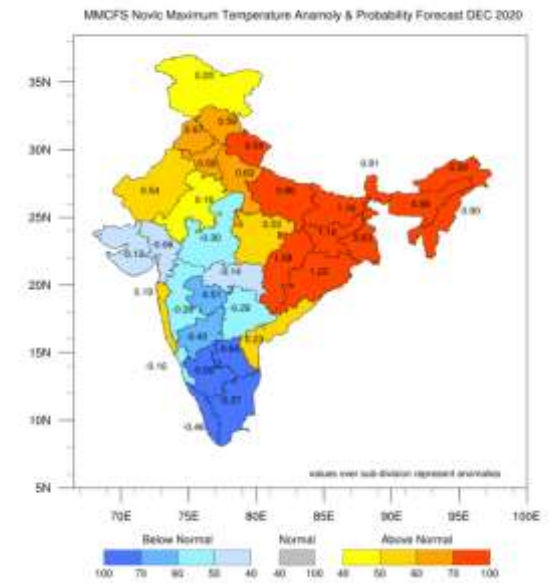
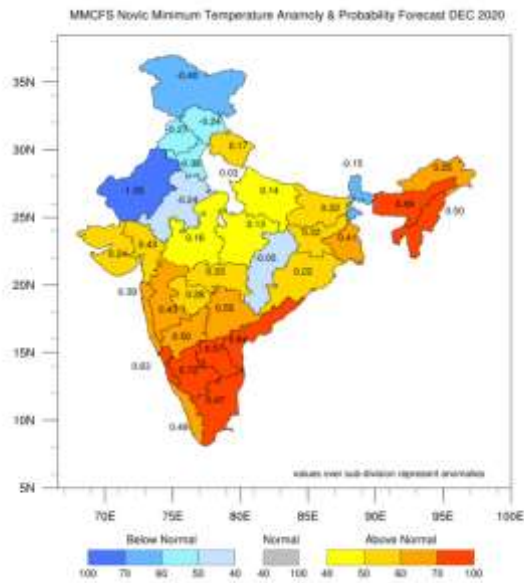


Fig 7a. Probability forecast & Subdivision averaged Minimum Temperature Anomaly forecast for December 2020

Fig 7b. Probability forecast & Subdivision averaged Maximum Temperature Anomaly forecast for December 2020

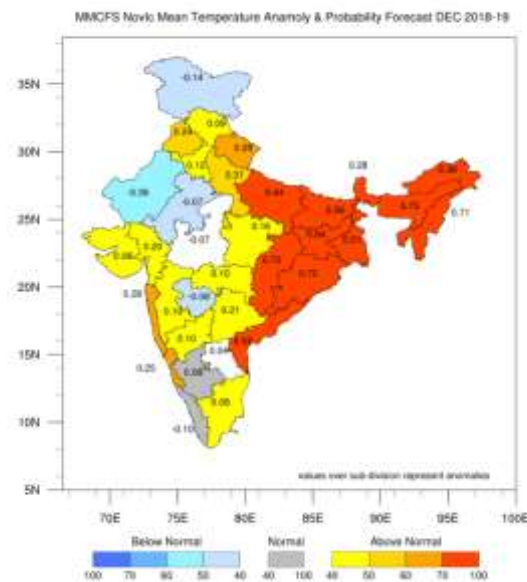


Fig 7c. Probability forecast & Subdivision averaged Mean Temperature Anomaly forecast for December 2020

7.2. Rainfall Forecast

Rainfall for week 1: (10 to 16 December, 2020)

- Low Pressure Area over Southeast Arabian Sea & adjoining Southwest Arabian sea would move westwards and has no influence over Indian region.
- A Western Disturbance as a trough in mid-tropospheric westerlies along Long. 62°E to the north of Lat. 25°E. It would influence northwest India during 11th-12th December with fairly widespread to widespread rain/snowfall over Jammu & Kashmir, Ladakh, Gilgit-Baltistan,

Muzaffarabad and Himachal Pradesh and isolated rain/snowfall over Uttarakhand during same period. Due to high moisture feeding from Arabian Sea to northwest India at lower & mid tropospheric levels, **isolated heavy rain/snow** would also occur over Jammu & Kashmir, Gilgit-Baltistan, Muzaffarabad on 11th December, 2020.

- An induced cyclonic circulation is likely to form over Rajasthan on 11th & 12th and would cause isolated to scattered rainfall over Punjab and Haryana, Chandigarh & Delhi during same period.
- Under the influence of trough & wind confluence over central part of the country, light rain/thundershower would occur over central parts of the country during many days of the week.
- Due to a fresh spell of easterly wave from 15th December, rainfall activity over southeast Peninsular India would increase with **likely heavy rainfall over Tamil Nadu, Puducherry & Karaikkal during 16th to 18th December, 2020.**
- No significant rainfall likely over remaining parts of the country during the week.
- **Cumulatively, above normal rainfall likely over central parts of the country; above normal rain/snow likely over Western Himalayan Region and below normal rainfall activity likely over south peninsula. No rain or near normal precipitation likely over rest part of the country during week 1 (Figs. 8 and 9).**

Rainfall for week 2: (17 to 23 December, 2020)

- **Under the influence of fresh easterly wave, normal to above normal rainfall activity likely over south peninsula. Due to the absence of any active Western Disturbance, below normal rain/snow also likely over Western Himalayan Region. Near normal or no rainfall likely over remaining parts of the country (Figs. 8 and 9).**

Rainfall for week 3: (24 to 30 December, 2020)

- Rainfall is very likely to be above normal over extreme southeast Peninsular India and below normal rainfall over **western Himalayan region. Dry weather over rest parts of the country (Figs. 8 and 9).**

7.3 Cyclogenesis over Indian region including North Indian Ocean: Week 1 and Week 2 Genesis Forecast (Till 24 Dec 2020)

The phase of MJO will support convective activity over the North Bay of Bengal (BoB) during week 1 alone while will support enhancement of convective activity over the Bay of Bengal. Most of the numerical models including IMD GFS, GEFS, NCEP GFS, WRF, NCUM (R), ECMWF and NEPS are indicating that the existing low pressure area over southeast & adjoining southwest Arabian Sea (AS) would move gradually westwards with marginal intensification upto well marked low pressure area. However, IMD WRF is indicating intensification upto depression stage during first half of week-1. IMD Genesis Potential Parameter (GPP) index is indicating no potential zone for

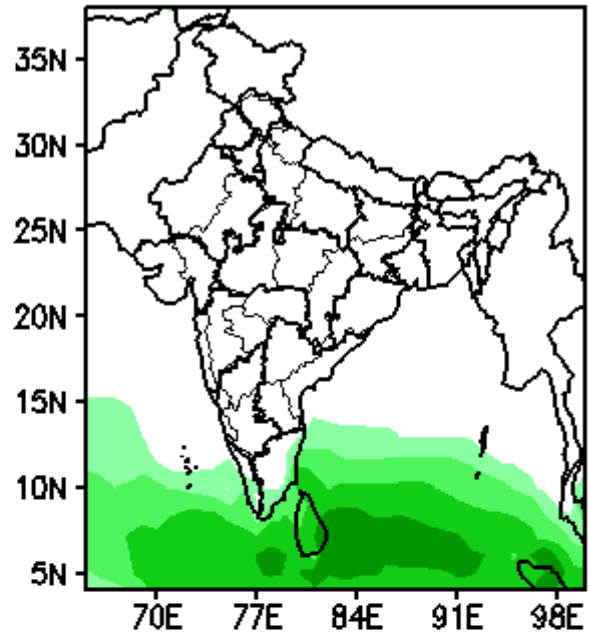
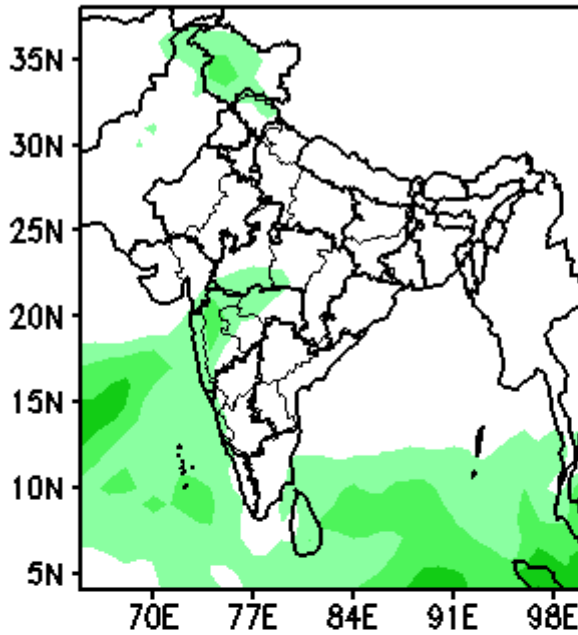
cyclogenesis over AS during next 7 days and a potential zone for cyclogenesis over south Andaman Sea during later part of week 1. Cyclogenesis & evolution probability from MME (CFSv2) model is indicating 10-20 % probability of cyclogenesis over south Bay of Bengal during the forecast period and similar probability over southeast AS extending upto southwest AS during week 1. Considering all the above, it may be concluded that: (1) the existing low pressure area over southeast and adjoining southwest Arabian Sea would move westwards without any significant intensification during first half of week 1 and (2) there is likelihood of development of a low pressure area over south Andaman Sea with westward movement during later part of week 1 with no significant intensification. ([http://www.rsmcnewdelhi.imd.gov.in /images/bulletin/eroc.pdf](http://www.rsmcnewdelhi.imd.gov.in/images/bulletin/eroc.pdf))

Next monthly update will be issued on first week of Jan, 2020

Forecast Rainfall (mm/day)

(Week1: 11Dec-17Dec)

(Week2: 18Dec-24Dec)



(Week3: 25Dec-31Dec)

(Week4: 01Jan-07Jan)

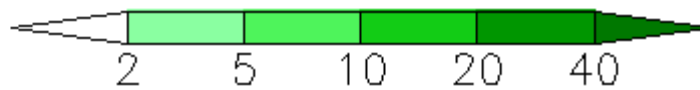
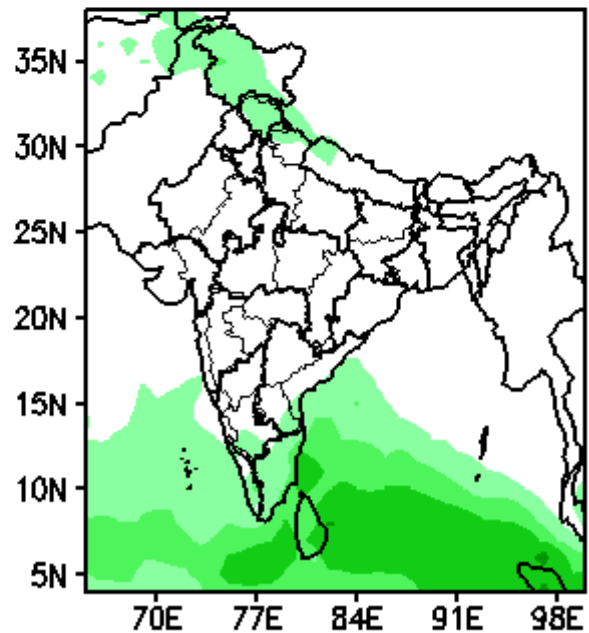
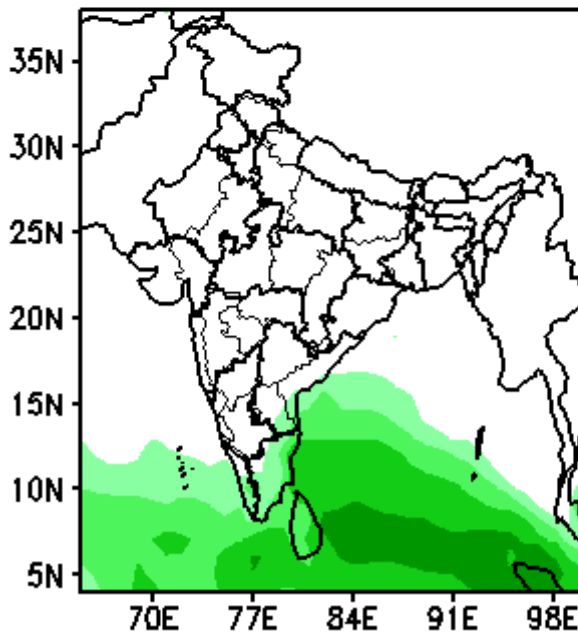
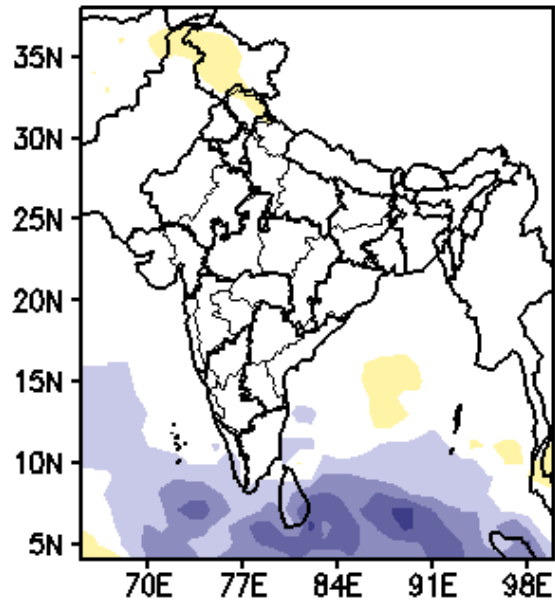
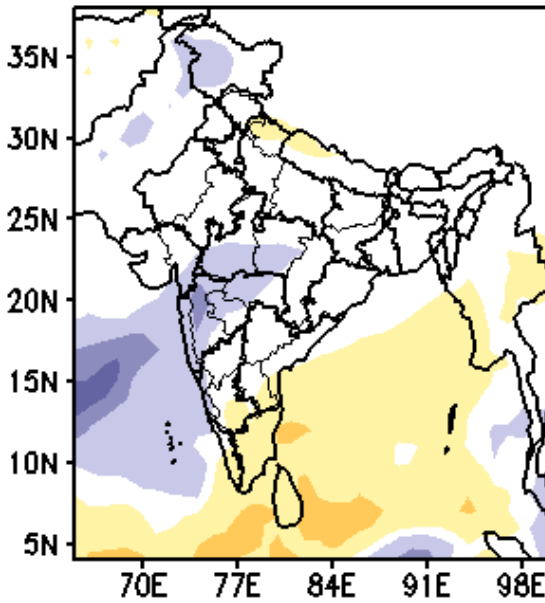


Fig 8: Rainfall forecast(Actual) in mm/day over the country for Dec(Week 1 to Week 4)

Forecast Rainfall Anomaly (mm/day)

(Week1: 11Dec-17Dec)

(Week2: 18Dec-24Dec)



(Week3: 25Dec-31Dec)

(Week4: 01Jan-07Jan)

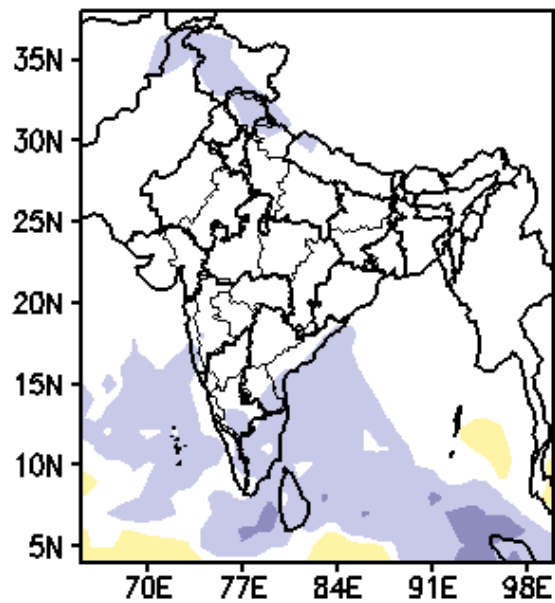
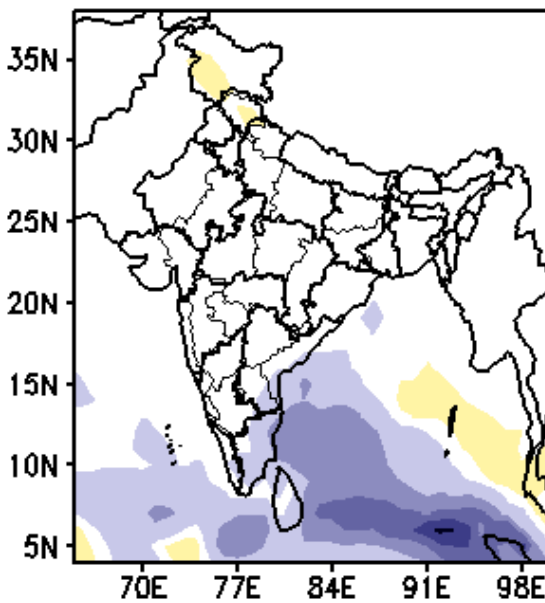


Fig 9: Rainfall forecast(in departure from normal) over the country for Dec(Week 1 to Week 4)