Earth System Science Organization (ESSO)
Ministry of Earth Sciences (MoES)
India Meteorological Department
WMO Regional Climate Centre
Pune, India
SEASONAL CLIMATE OUTLOOK FOR SOUTH ASIA
(March to June 2025)

Highlights

- Over the equatorial Pacific Ocean, sea surface temperatures (SSTs) are above average in the eastern and far western Pacific Ocean. Below-average SSTs were evident in the central Pacific Ocean. The El Niño-Southern Oscillation (ENSO) is transitioning from weak La Niña conditions to an ENSO-neutral state. The neutral ENSO conditions are expected to persist in the coming month, with a transition to ENSO-neutral likely occurring between March and May 2025.
- Below-average sea surface temperatures (SSTs) are currently seen in some parts of the western Indian Ocean. Currently, neutral Indian Ocean Dipole (IOD) conditions are observed over the Indian Ocean. The latest MMCFS forecast indicates that the neutral IOD conditions are likely to continue for the next several months.
- The probability forecast for precipitation for MAM season indicates that enhanced probability of below normal precipitation is likely over most parts of south Asia except northeast, southeast and southern peninsular India where enhanced probability of above normal precipitation is likely. The same for AMJ season indicate that enhanced probability of below normal precipitation is likely in northwest, north and extreme southern tip of South Asia. The north along the Himalayan plains, central, east, northeast, southeast and most parts of Indian Peninsular region are likely to experience enhanced probability of above normal precipitation.
- In March, the country averaged monthly precipitation is likely to be normal to below normal for all countries. In April, the country averaged monthly precipitation is likely to be below normal to normal for Afghanistan, Bangladesh, Bhutan, India, Mizoram, Nepal and Pakistan and above normal for Maldives and Sri Lanka. where it is likely to be above normal. In May, it is likely to be normal to above normal for all countries except Pakistan where it is likely to be below normal. In June, the country averaged monthly precipitation is likely to be normal to above normal for all the South Asian countries except Afghanistan and Pakistan where it is likely to be below normal.
- Temperature probability forecast for MAM seasons indicate that enhanced probability of above normal temperatures is likely over most parts of South Asia except southeast where enhanced probability of below normal temperature is likely. The same for AMJ seasons indicate that enhanced probability of above normal temperatures is likely over most parts of South Asia except northeast, southeast and peninsular region where enhanced probability of below normal temperature is likely.
- The country averaged monthly temperatures during March is likely to be below normal for Afghanistan and normal to above normal for all the other countries. In April and May, it is likely to be normal to above normal for all the south Asian countries. In June, the country averaged monthly temperatures are likely to be above normal for all the countries except Bangladesh where it is likely to be below normal.

1. Important Global Climate Factors

1.1 Sea Surface Temperatures over the Pacific Ocean

In February 2025, sea surface temperatures (SSTs) were above average in the eastern and far western Pacific Ocean. Below-average SSTs were evident in the central Pacific Ocean (Fig.1a). Warmer than average SSTs were observed over the extra-tropical Pacific region, while cooler than average SSTs were observed in parts of the southern extra-tropical Pacific region. Compared to January 2025, negative SST anomalies were present over the western equatorial Pacific Ocean, and around the Maritime Continent. Positive SST anomalies were observed over the central and east-central equatorial Pacific Ocean. Cool SST anomalies were observed over some parts of the South Pacific Ocean (Fig.1b). Over the equatorial Pacific Ocean, sea surface temperatures (SSTs) are above average in the eastern and far western Pacific Ocean. Below-average SSTs were evident in the central Pacific Ocean. The El Niño-Southern Oscillation (ENSO) is transitioning from weak La Niña conditions to an ENSO-neutral state. The neutral ENSO conditions are expected to persist in the coming month, with a transition to ENSO-neutral likely occurring between March and May 2025. (Fig.2)

1.2 Sea Surface Temperatures over Indian Ocean

In February 2025, equatorial SSTs were in the neutral range across most of the central Indian Ocean (Fig. 1a). Above average SSTs were observed in the Northern Arabian Sea and north Bay of Bengal. Cooler than average SSTs were observed over parts of western Indian Ocean. Compared to January 2025, cool SSTs were observed across the Eastern Indian Ocean, some parts of western Indian Ocean and Bay of Bengal (Fig. 1b). Warm SSTs were observed over most parts of Arabian Sea. • Below-average sea surface temperatures (SSTs) are currently seen in some parts of the western Indian Ocean. Currently, neutral Indian Ocean Dipole (IOD) conditions are observed over the Indian Ocean. The latest MMCFS forecast indicates that the neutral IOD conditions are likely to continue for the next several months (Fig.3).

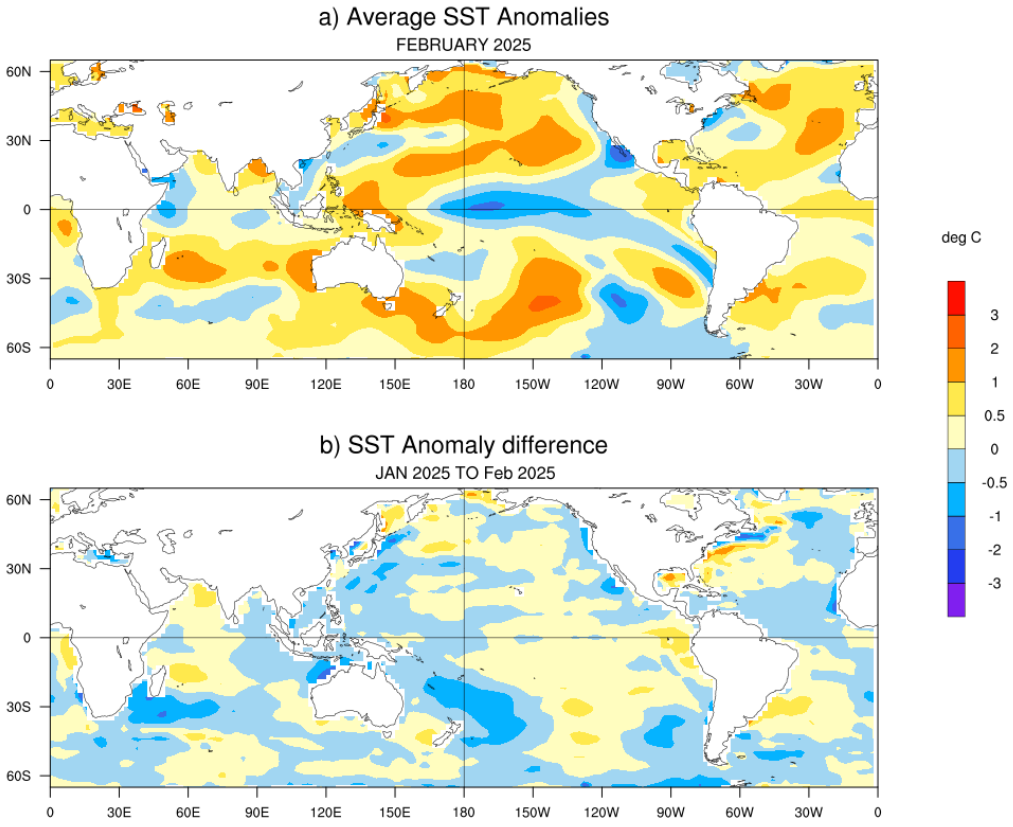

Fig.1: (a) Sea surface temperature (SST) anomalies (^{0}C) during February 2025 and (b) changes in the SST anomalies (^{0}C) from January to February 2025. SSTs are based on the COBE-SST 2, from NOAA, and anomalies are computed with respect to 30-year (1991-2020) long term mean.

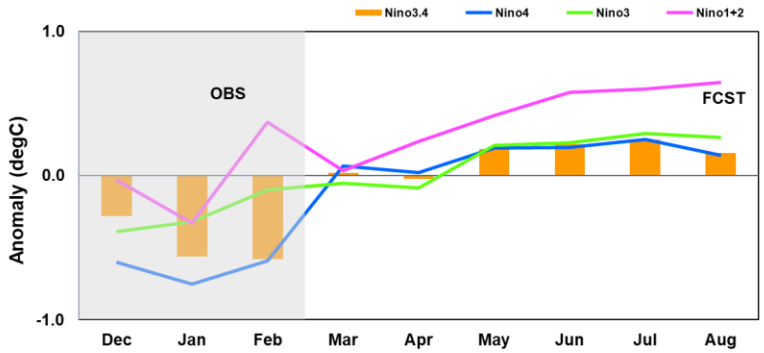

Fig.2: Time series of monthly area-averaged SST anomalies (°C) in the 4 Niño regions. ERSSTv5 observed anomaly for the last 3 months and MMCFS model PDF corrected anomaly forecast for the next 6 months.

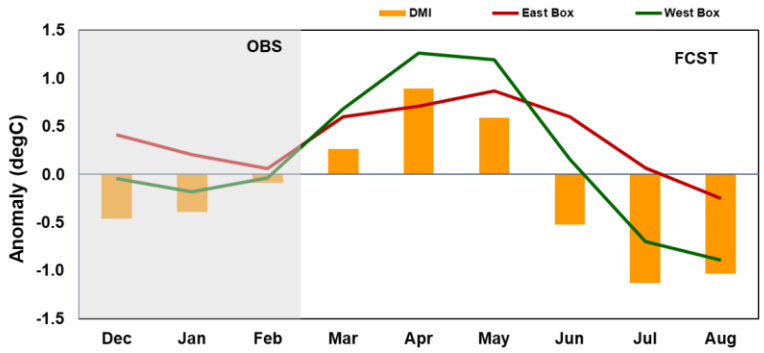

Fig.3: The time series of the monthly area-averaged SST anomaly Indices (°C) over west equatorial Indian Ocean (WEI) & east equatorial Indian Ocean (EEI) along with Dipole Mode Index (DMI=WEI-EEI) representing Indian Ocean Dipole (IOD). ERSSTv5 observed anomaly for the last 3 months and MMCFS model PDF corrected anomaly forecast for the next 6 months.

1.3 Convection (OLR Anomaly) Pattern over the Asia Pacific Region

The Outgoing Longwave Radiation (OLR) anomaly during February 2025 is shown in (Fig.4). Negative OLR anomalies (enhanced convection, blue shading) were observed over most parts of south east Indian Ocean, south China Sea, western, south western and eastern tropical Pacific Ocean. Negative OLR anomalies were also observed over some parts of Pakistan, Afghanistan and maritime continent. Positive OLR anomalies (suppressed convection, orange/red shading) were observed over some parts of south west Bay of Bengal, central and west Indian Ocean, central and west central Tropical Pacific Ocean. Positive OLR anomalies were also observed over some parts of southern peninsular India, Africa, Australia and north America.

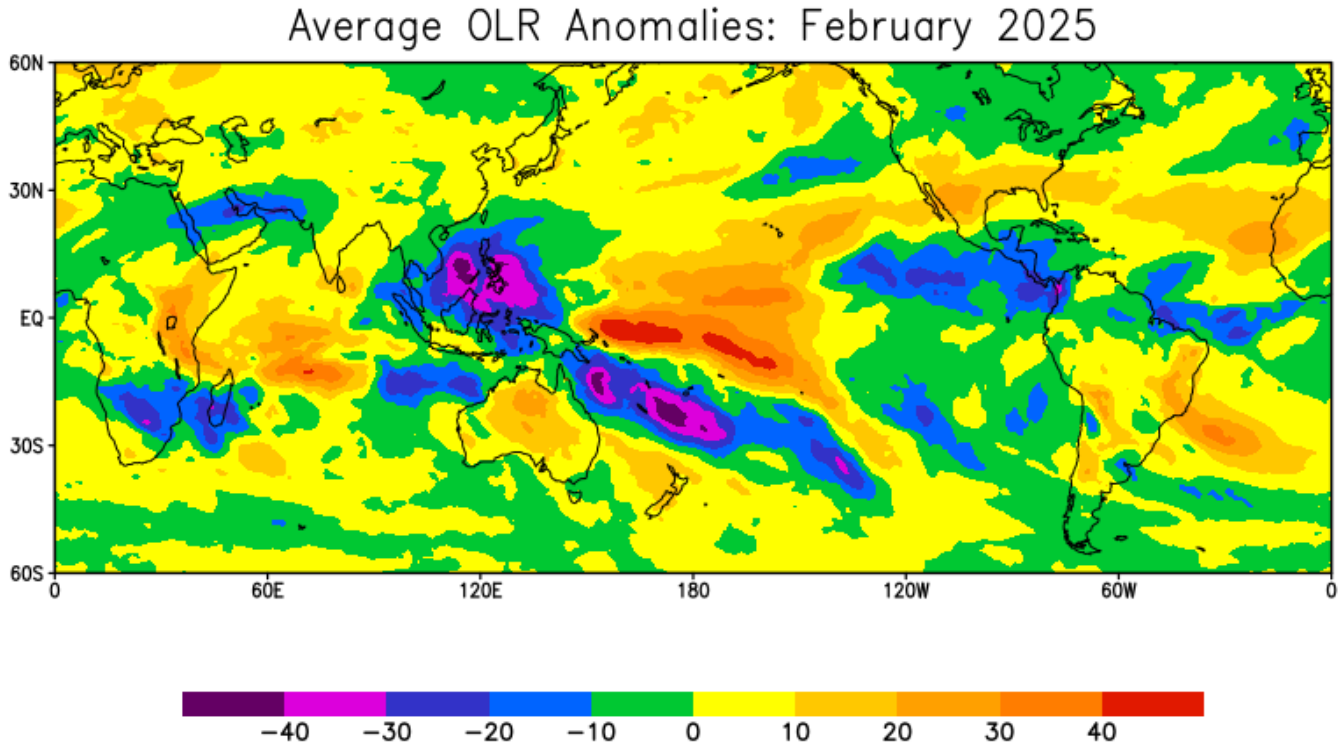

Fig.4: Outgoing Long Wave Radiation (OLR) Anomaly (W/m^2) for February 2025 (Data source: NCEP-NOAA)

1.4 Snow Cover Area over the Northern Hemisphere (NH)

During February 2025, the NH snow cover area (45.48 million Sq. km) was less than the 1991-2020 normal by 0.22 million Sq. km (Fig. 5). Eurasian Snow cover area (28.42 million Sq. km) was 0.1 million Sq. km less than the 1991-2020 normal. North America snow cover area of 17.06 million sq. km was less by 0.13 million Sq. Km with respect to 1991-2020 normal.

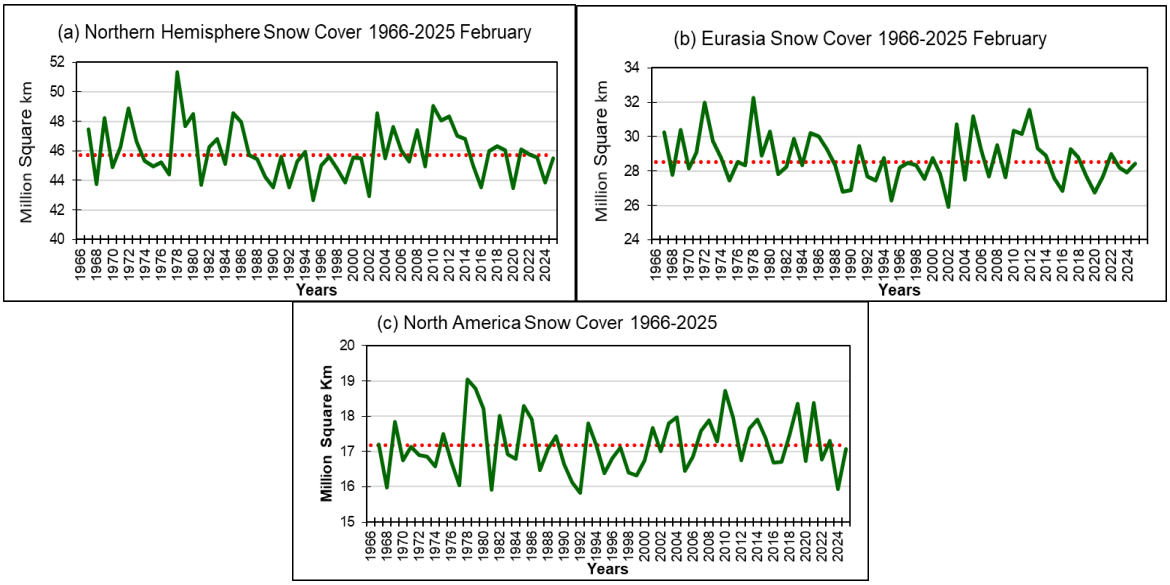

Fig.5. Snow cover area (million Sq. km) for the month of February during the period 1966-2025 (green solid lines) and normal value (1991-2020) (red dotted line) for (a) Northern Hemisphere (b) Eurasia and (c) North America. (Data Source: Rutgers University Snow Lab).

1.5. Madden Julian Oscillation (MJO)

During the first fortnight of February 2025, MJO moved eastwards from phase 5 (Maritime Continent) to phase 7 (Western Pacific) with enhanced strength. In the third week it remained to phase 7 (Western Pacific) with reduced strength. It then moved eastwards to phase 8 (Western H. and Africa) in the fourth week with reduced strength. The MJO phase diagram illustrates the progression of the MJO through different phases, which generally coincide with locations along the equator around the globe.

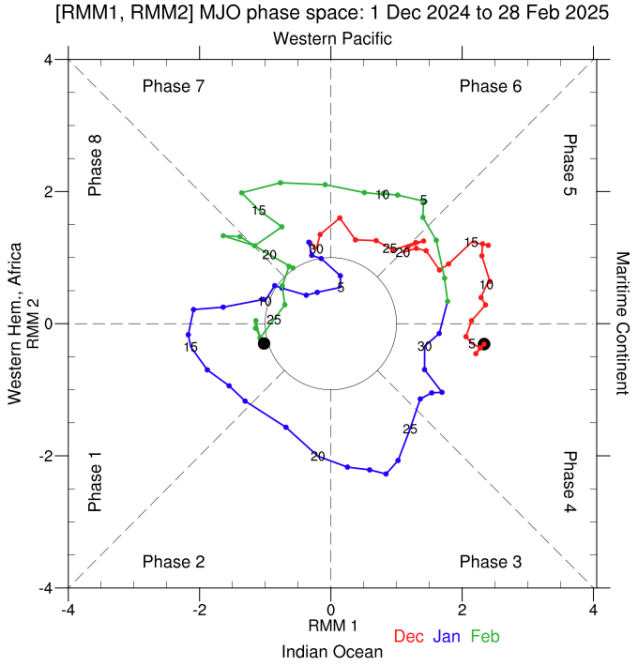

Fig.6. RMM phase diagram for Madden Julian Oscillation (MJO) for the period December 2024 to February 2025. (Data Source: http://www.bom.gov.au/climate/mjo/).

2. Seasonal Outlook for South Asia

The seasonal outlook was prepared based on the forecast from Monsoon Mission Coupled Forecasting System (MMCFS). The model is a fully coupled ocean-atmosphere-land model. The atmospheric component of CFSv2 is Global Forecast System (GFS) with spectral resolution of T382 (approximately 38 km) and 64 hybrid vertical levels and the ocean component is Geophysical Fluid Dynamics Laboratory (GFDL) Flexible Modelling System (FMS) Modular Ocean Model version.

2.1. Precipitation Probability Forecast:

The probability forecasts for precipitation for the seasons March to May 2025 (MAM) and April to June 2025 (AMJ) are given in the Figures 7a and 7b respectively. The forecast is prepared based on the February initial conditions. The probability forecast for precipitation for MAM season indicates that enhanced probability of below normal precipitation is likely over most parts of south Asia except northeast, southeast and southern peninsular India where enhanced probability of above normal precipitation is likely. The same for AMJ season indicate that enhanced probability of below normal precipitation is likely in northwest, north and extreme southern tip of South Asia. The north along the Himalayan plains, central, east, northeast, southeast and most parts of Indian Peninsular region are likely to experience enhanced probability of above normal precipitation.

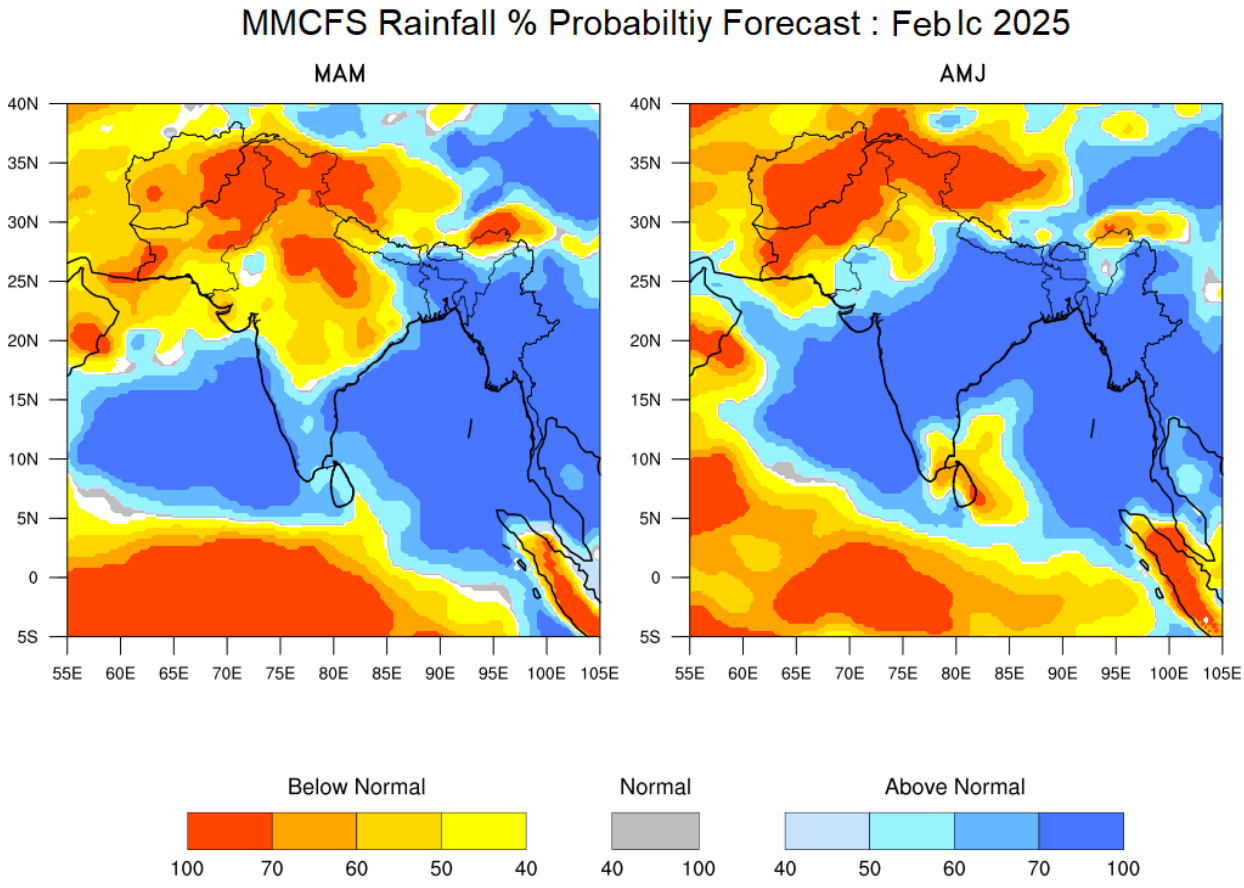

Fig.7: Seasonal probability (%) forecasts of precipitation for (a) MAM 2025 (left) and (b) AMJ 2025 (right) based on initial conditions of February 2025.The white colour indicates climatological probability.

2.2. Temperature Probability Forecast*:*

The probability forecasts for temperature for the season March to May 2025 (MAM) and April to June 2025 (AMJ) are given in the Figures 8a and 8b respectively. The forecast is prepared based on the February initial conditions. Temperature probability forecast for MAM seasons indicate that enhanced probability of above normal temperatures is likely over most parts of South Asia except southeast where enhanced probability of below normal temperature is likely. The same for AMJ seasons indicate that enhanced probability of above normal temperatures is likely over most parts of South Asia except northeast, southeast and peninsular region where enhanced probability of below normal temperature is likely.

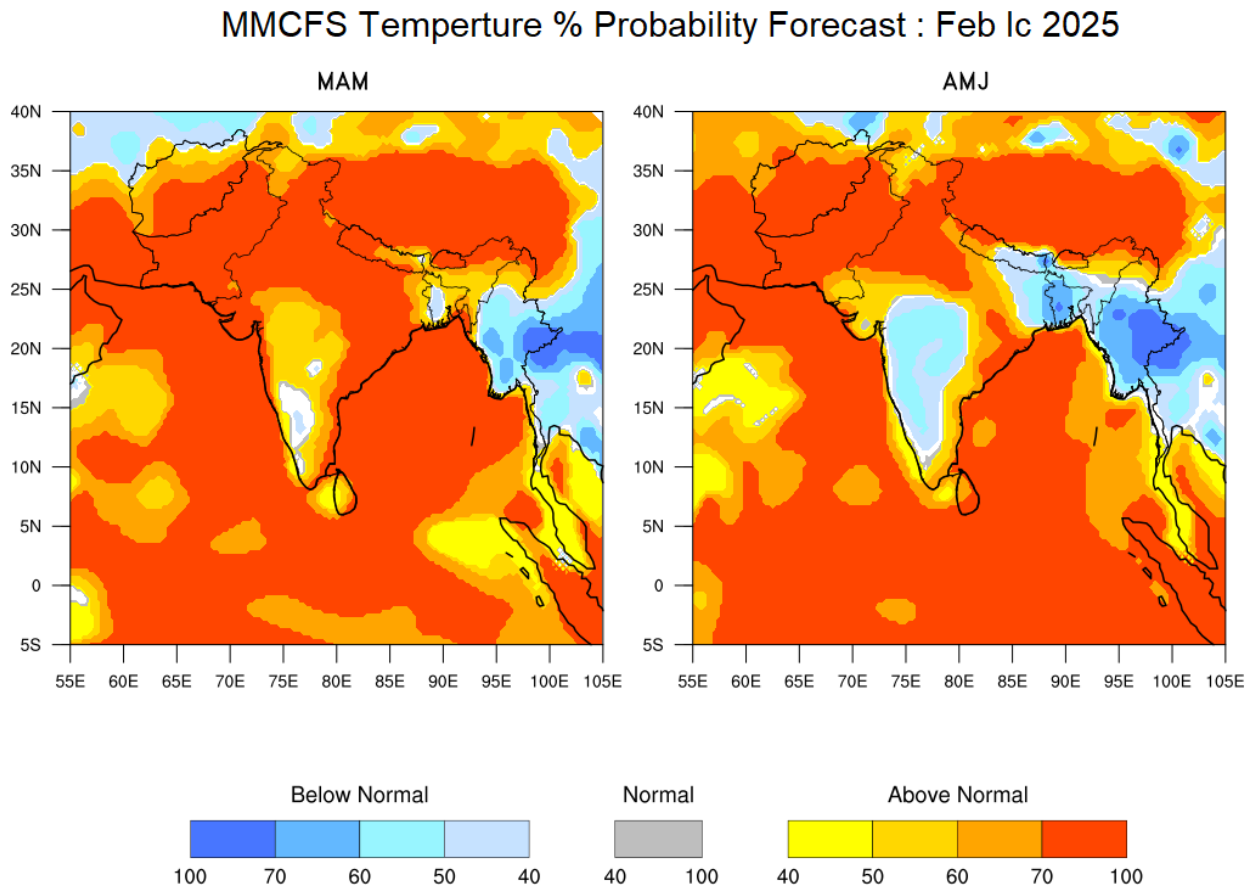

Fig. 8: Probability (%) forecast for the seasonal mean temperature for (a) MAM 2025 (left) and (b) AMJ 2025 (right) based on initial conditions of February 2025. The white colour indicates climatological probability.

3. Forecast Outlook for the Country Averaged Monthly Precipitation and Temperature

The MMCFS model forecast for monthly precipitation and temperature for the next four months (from March to June 2025) averaged over the 9 south Asian countries viz., Afghanistan, Bangladesh, Bhutan, India, Maldives, Myanmar, Nepal, Pakistan and Sri Lanka were shown in the Figures 9. The monthly rainfall anomaly is expressed as percentage departure from Long Period Model Average (LPMA) and monthly temperature anomaly is expressed in degree Celsius.

In March, the country averaged monthly precipitation is likely to be normal to below normal for all countries. In April, the country averaged monthly precipitation is likely to be below normal to normal for Afghanistan, Bangladesh, Bhutan, India, Mizoram, Nepal and Pakistan and above normal for Maldives and Sri Lanka. where it is likely to be above normal. In May, it is likely to be normal to above normal for all countries except Pakistan where it is likely to be below normal. In June, the country averaged monthly precipitation is likely to be normal to above normal for all the South Asian countries except Afghanistan and Pakistan where it is likely to be below normal.

The country averaged monthly temperatures during March is likely to be below normal for Afghanistan and normal to above normal for all the other countries. In April and May, it is likely to be normal to above normal for all the south Asian countries. In June, the country averaged monthly temperatures are likely to be above normal for all the countries except Bangladesh where it is likely to be below normal.

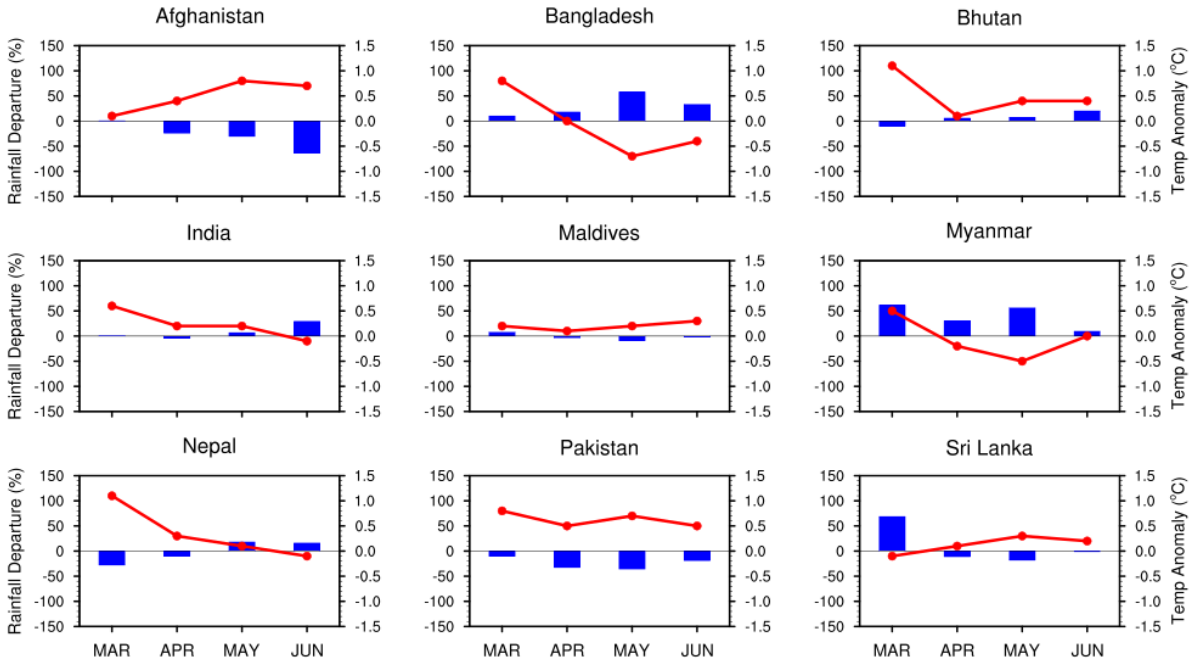

Fig. 9: Monthly country averaged rainfall forecast expressed as percentage departures (%) and Monthly country averaged temperature anomaly (°C) forecast during March to June 2025. Here, the normal range for country averaged monthly precipitation is taken as -10% to +10% (Left Vertical Axis Scale for Precipitation indicated in blue shaded bars) and the normal range for country averaged monthly temperature is taken -0.25°C to +0.25°C (Right Vertical Axis Scale for Temperature indicated in red coloured lines).