Earth System Science Organization (ESSO)
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SEASONAL CLIMATE OUTLOOK FOR SOUTH ASIA

(May to August 2025)

Highlights

- Currently, neutral El Nino-Southern Oscillation (ENSO) conditions are prevailing over the equatorial Pacific region. The latest Monsoon Mission Climate Forecast System (MMCFS) as well as other climate model forecasts indicate that the neutral ENSO conditions are likely to continue during the monsoon season.

- At present, neutral Indian Ocean Dipole (IOD) conditions are observed over the Indian Ocean. The latest MMCFS forecast as well as other climate model forecasts indicates that the neutral IOD conditions are likely to continue for the next several months.

- The probability forecast for precipitation for MJJ and JJA seasons indicates that enhanced probability of above normal precipitation is likely over most parts of north along the plains of Himalayas, most parts of southern Peninsula of India, south central, east, northeast, southeast of South Asia and enhanced probability of below normal precipitation is likely over north west, extreme north, north central and northeast part of South Asia.

- In May, the country averaged monthly precipitation is likely to be normal to above normal for all countries except Afghanistan and 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 countries except Afghanistan where it is likely to be below normal. In July, it is likely to be normal to above normal for all countries except Afghanistan, Bangladesh and Maldives where it is likely to be below normal. In August, the country averaged monthly precipitation is likely to be normal to above normal for all the South Asian countries.

- Temperature probability forecast for MJJ and JJA seasons indicate that enhanced probability of above normal temperatures is likely over most parts of South Asia except over extreme north, south peninsular region and southeast of South Asia where enhanced probability of below normal temperature is likely.

- The country averaged monthly temperatures during May and June is likely to be above normal for all the south Asian countries except Bangladesh and Myanmar where it is likely to be below normal. In July and August, it is likely to be normal to above normal for all the south Asian countries.

1. Important Global Climate Factors

1.1 Sea Surface Temperatures over the Pacific Ocean

In April 2025, sea surface temperatures (SSTs) were near average across most of the equatorial Pacific Ocean (Fig. 1a). Warmer-than-average SSTs were observed in the northern and southern extra-tropical regions of the Pacific. Compared to March 2025, negative SST anomalies developed over the eastern, east-central, and far western Pacific Ocean. Additionally, cool SST anomalies were present in parts of both the South and North Pacific Ocean (Fig. 1a). Currently, neutral El Nino-Southern Oscillation (ENSO) conditions are prevailing over the equatorial Pacific region. The latest Monsoon Mission Climate Forecast System (MMCFS) as well as other climate model forecasts indicate that the neutral ENSO conditions are likely to continue during the monsoon season (Fig.2).

1.2 Sea Surface Temperatures over Indian Ocean

In April 2025, equatorial SSTs were in the neutral range across the Indian Ocean (Fig. 1a). Above average SSTs were observed in the northern Arabian Sea. Compared to March 2025, cool SSTs were observed across the northern parts of north Bay of Bengal (Fig. 1b). Warm SSTs were observed over most parts of Arabian Sea. At present, neutral Indian Ocean Dipole (IOD) conditions are observed over the Indian Ocean. The latest MMCFS forecast as well as other climate model forecasts indicates that the neutral IOD conditions are likely to continue for the next several months. (Fig.3).

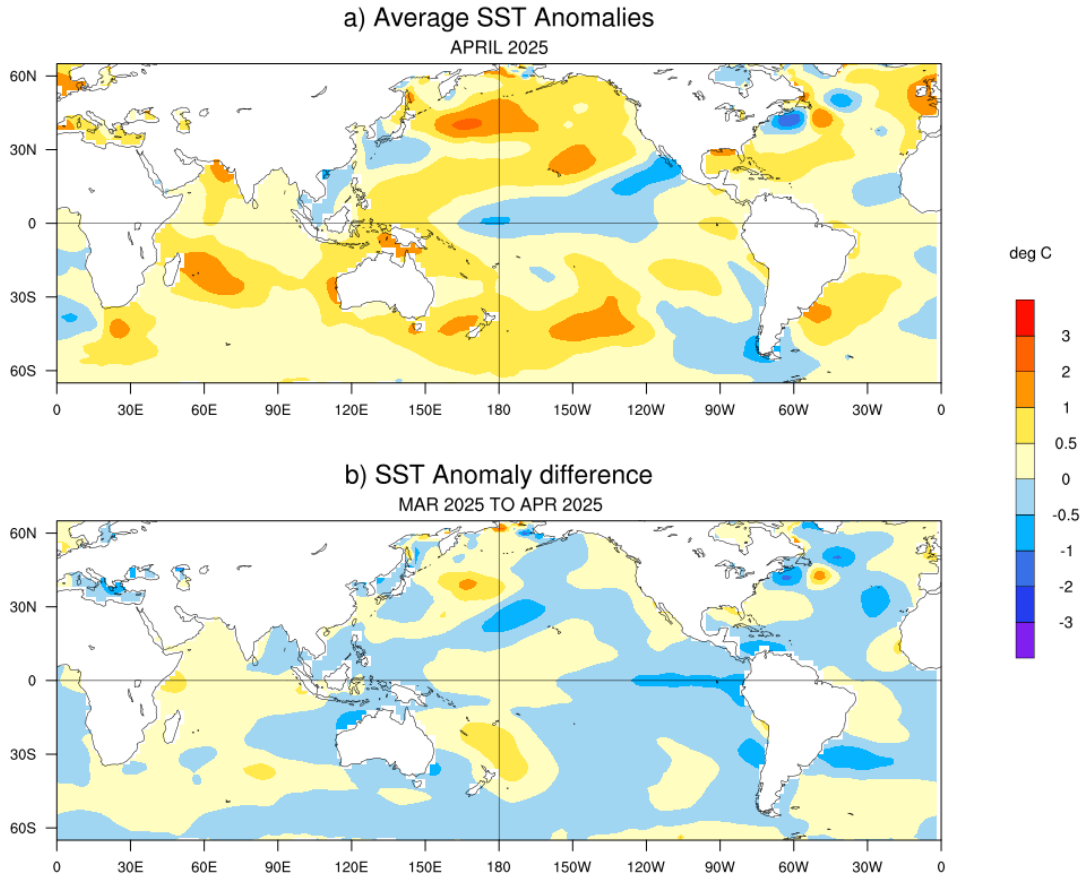

Fig.1: (a) Sea surface temperature (SST) anomalies (^{0}C) during April 2025 and (b) changes in the SST anomalies (^{0}C) from March to April 2025. SSTs are based on the ERSSTv5, from NOAA, and anomalies are computed with respect to 30-year (1991-2020) long term mean.

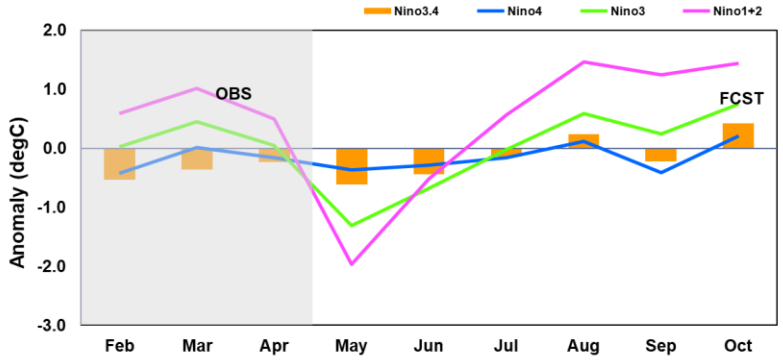

Fig.2: Time series of monthly area-averaged SST anomalies (°C) in the 4 Niño regions. ERSSTv5 observed anomaly for the last 3 months and MMCFS model PDF corrected anomaly forecast for the next 6 months.

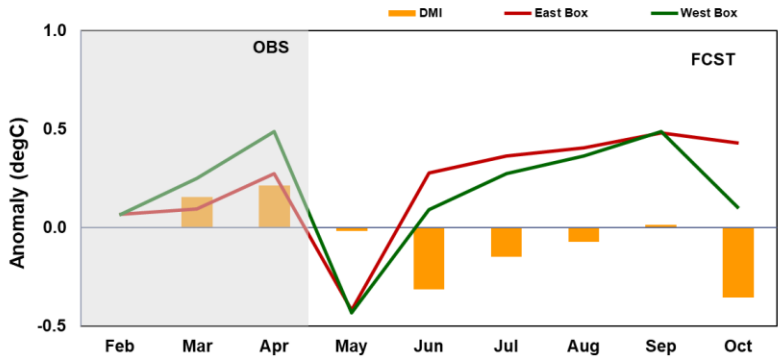

Fig.3: The time series of the monthly area-averaged SST anomaly Indices (°C) over west equatorial Indian Ocean (WEI) & east equatorial Indian Ocean (EEI) along with Dipole Mode Index (DMI=WEI-EEI) representing Indian Ocean Dipole (IOD). ERSSTv5 observed anomaly for the last 3 months and MMCFS model PDF 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 April 2025 is shown in (Fig.4). Negative OLR anomalies (enhanced convection, blue shading) were observed over most parts of Bay of Bengal, west and central south tropical Pacific Ocean and east north tropical ocean. Negative OLR anomalies were also observed over parts of northeast and southeast (Thailand, Vietnam and Cambodia) of South Asia, maritime continent and parts of south Africa. Positive OLR anomalies (suppressed convection, orange/red shading) were observed over north Arabian Sea, South Indian Ocean and central tropical Pacific Ocean. Positive OLR anomalies were also observed over northwest parts of South Asia and some parts of west Australia and north America.

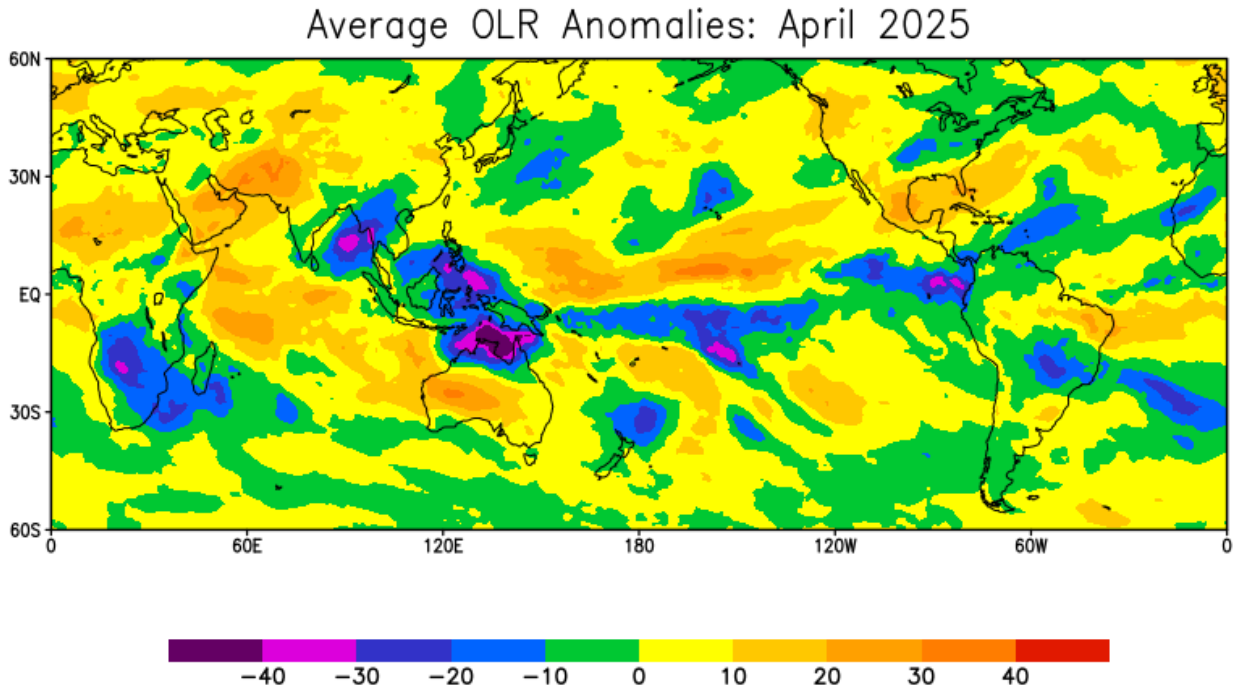

Fig.4: Outgoing Long Wave Radiation (OLR) Anomaly (W/m^2) for April 2025 (Data source: NCEP-NOAA)

1.4 Snow Cover Area over the Northern Hemisphere (NH)

During April 2025, the NH snow cover area (27.81 million Sq. km) was less than the 1991-2020 normal by 2.12 million Sq. km (Fig. 5). Eurasian Snow cover area (14.93 million Sq. km) was 1.82 million Sq. km less than the 1991-2020 normal. North America snow cover area of 12.87 million sq. km was less by 0.29 million Sq. Km with respect to 1991-2020 normal.

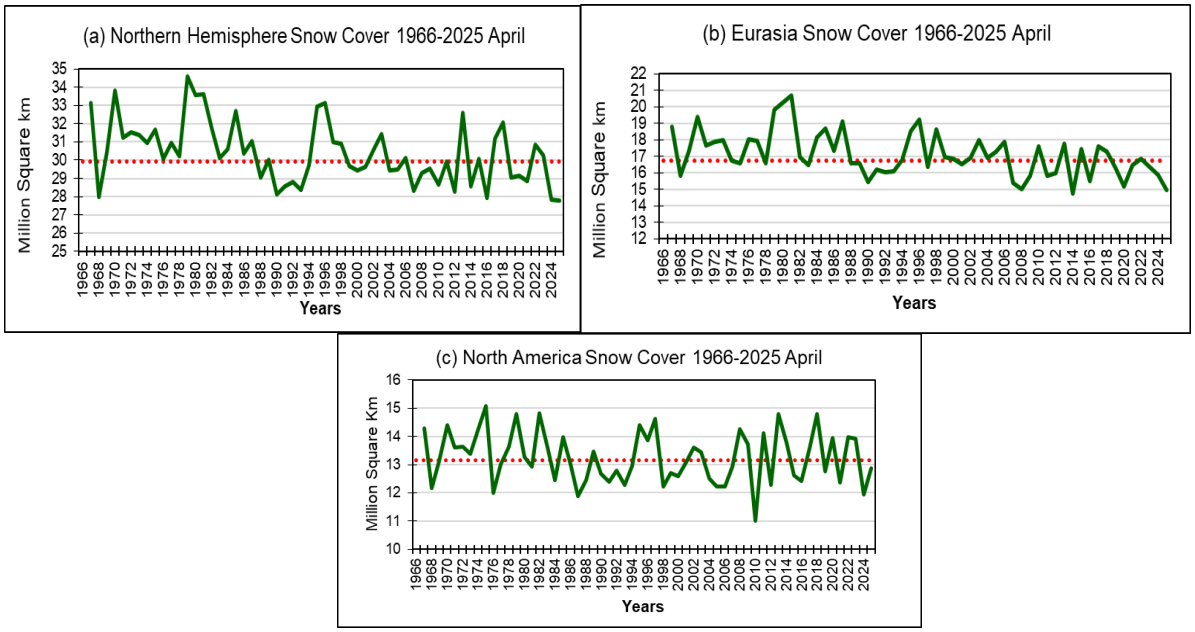

Fig.5. Snow cover area (million Sq. km) for the month of April during the period 1966-2025 (green solid lines) and normal value (1991-2020) (red dotted line) for (a) Northern Hemisphere (b) Eurasia and (c) North America. (Data Source: Rutgers University Snow Lab).

1.5. Madden Julian Oscillation (MJO)

During the first week of April 2025, MJO moved eastwards from phase 6 (Western Pacific) to phase 8 (Western Hem. And Africa) with reduced strength. In the second and third week it moved eastward from phase 8 to phase 6 (Western Pacific) with reduced strength. It then moved eastwards to phase 8 in the fourth week with enhanced 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.

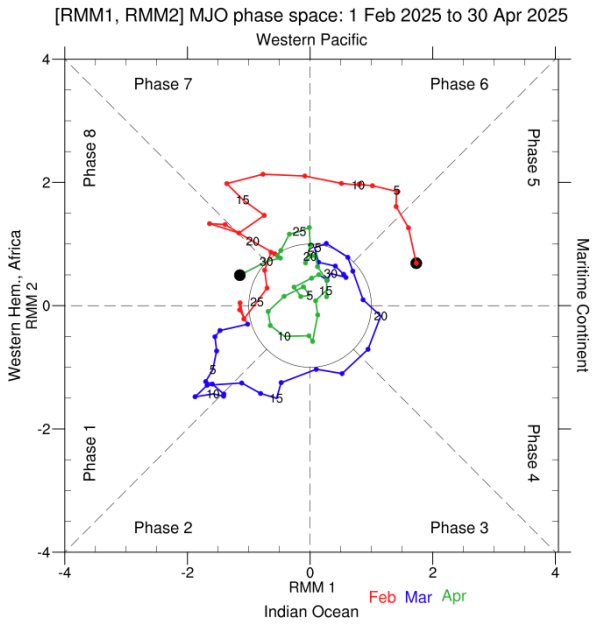

Fig.6. RMM phase diagram for Madden Julian Oscillation (MJO) for the period February to April 2025. (Data Source: http://www.bom.gov.au/climate/mjo/).

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 May to July 2025 (MJJ) and June to August 2025 (JJA) are given in the Figures 7a and 7b respectively. The forecast is prepared based on the April initial conditions. The probability forecast for precipitation for MJJ and JJA seasons indicates that enhanced probability of above normal precipitation is likely over most parts of north along the plains of Himalayas, most parts of southern Peninsula of India, south central, east, northeast, southeast of South Asia and enhanced probability of below normal precipitation is likely over north west, extreme north, north central and northeast part of South Asia.

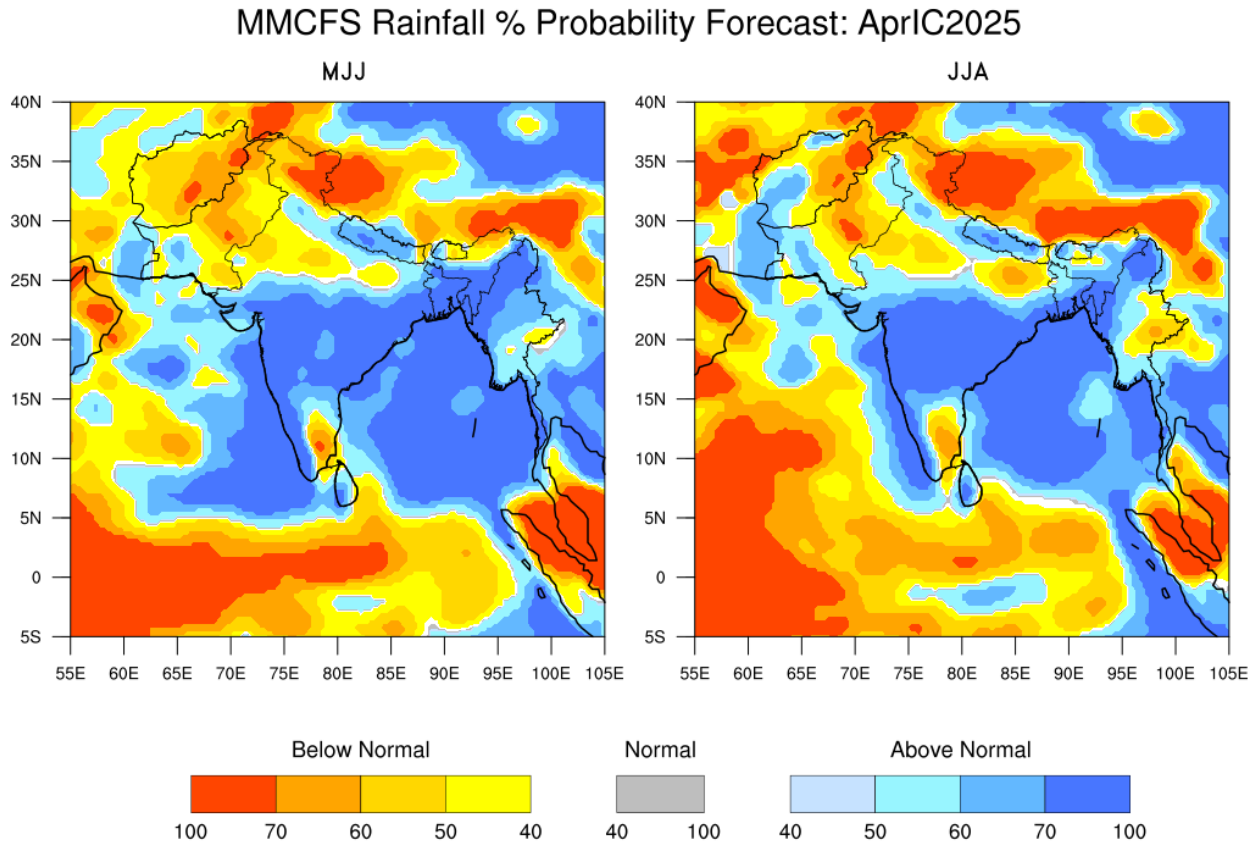

Fig.7: Seasonal probability (%) forecasts of precipitation for (a) MJJ 2025 (left) and (b) JJA 2025 (right) based on initial conditions of April 2025.The white colour indicates climatological probability.

2.2. Temperature Probability Forecast*:*

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

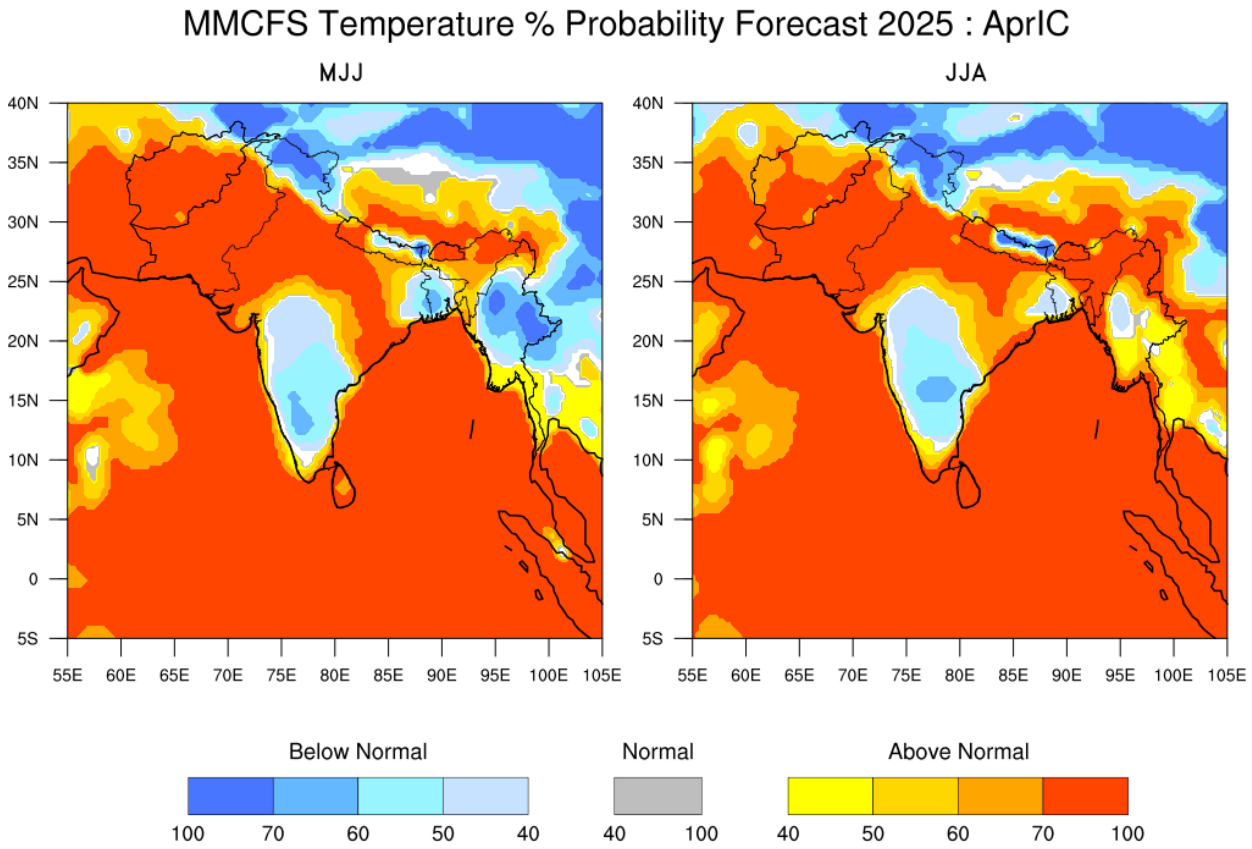

Fig. 8: Probability (%) forecast for the seasonal mean temperature for (a) MJJ 2025 (left) and (b) JJA 2025 (right) based on initial conditions of April 2025. The white colour indicates climatological probability.

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 May to August 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 May, the country averaged monthly precipitation is likely to be normal to above normal for all countries except Afghanistan and 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 countries except Afghanistan where it is likely to be below normal. In July, it is likely to be normal to above normal for all countries except Afghanistan, Bangladesh and Maldives where it is likely to be below normal. In August, the country averaged monthly precipitation is likely to be normal to above normal for all the South Asian countries.

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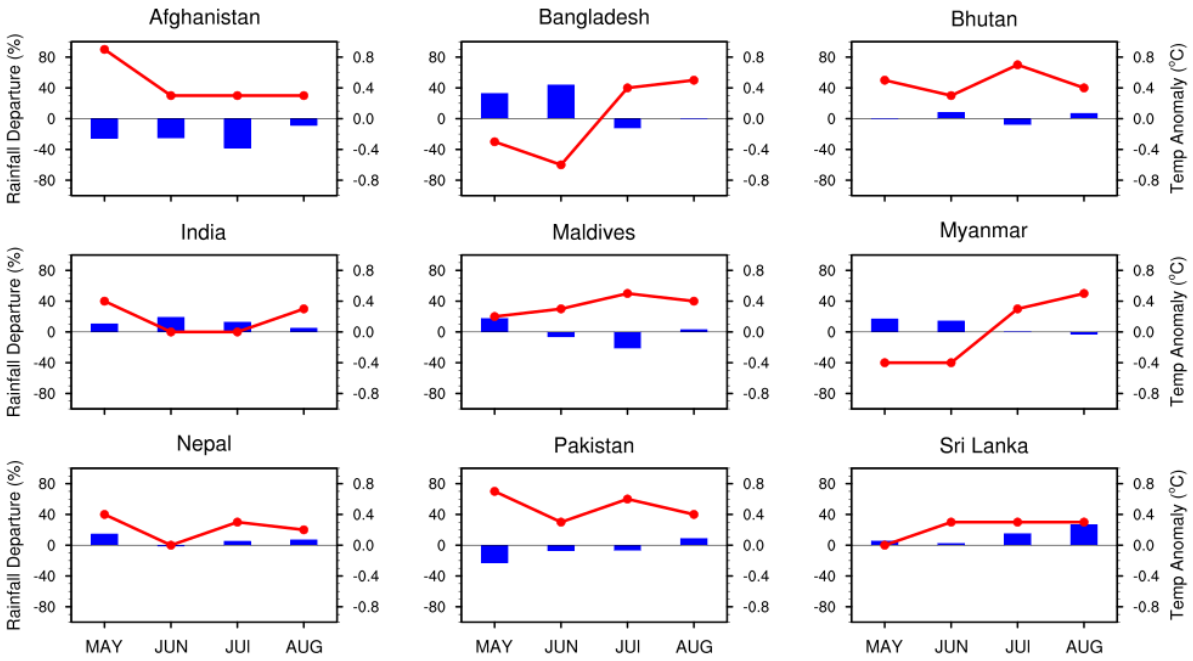

Fig. 9: Monthly country averaged rainfall forecast expressed as percentage departures (%) and Monthly country averaged temperature anomaly (°C) forecast during May to August 2025. Here, the normal range for country averaged monthly precipitation is taken as -10% to +10% (Left Vertical Axis Scale for 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).