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SEASONAL CLIMATE OUTLOOK FOR SOUTH ASIA

(June to September 2025)

Highlights

- Over 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 during first half of the monsoon season and weak negative IOD conditions are likely to develop during later part of the monsoon season.

- The probability forecast for precipitation for JJA season indicates that enhanced probability of above normal precipitation is likely over most parts of South Asia except over extreme north where below normal precipitation is likely. The same for JAS season indicate that enhanced probability of above normal precipitation is likely over most parts of South Asia except over extreme north and northeast and southeast of South Asia.

- 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 and August, the country averaged monthly precipitation is likely to be normal to above normal for all countries. In September, it is likely to be normal to above normal for all countries except Maldives where it is likely to be below normal.

- Temperature probability forecast for JJA and JAS seasons indicate that enhanced probability of above normal temperatures is likely over most parts of South Asia except over Indian land mass where enhanced probability of below normal temperature is likely.

- The country averaged monthly temperatures during June is likely to be above normal for all the south Asian countries except India and Nepal where it is likely to be below normal. In July, it is likely to be normal to above normal for all the south Asian countries except India where it is likely to be below normal. In August and September, it is likely to be above normal for all the South Asian Countries.

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1.   Important Global Climate Factors

1.1   *Sea Surface Temperatures over the Pacific Ocean*

In May 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. Cooler than normal SSTs were seen over the eastern extratropical region. Compared to April 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). However, warmer SSTs are developed near western extra tropical region. 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.

1.2   *Sea Surface Temperatures over Indian Ocean*

In May 2025, equatorial SSTs were above average across the western Indian Ocean and the eastern Indian Ocean (Fig. 1a). Above average SSTs were observed in the northern Bay of Bengal. Below normal SSTs were observed over northern west Arabian Sea. Compared to April 2025, cool SSTs were observed across the northern parts of north Arabian Sea (Fig. 1b) and warm SSTs were observed over northern parts of Bay of Bengal. 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 during first half of the monsoon season and weak negative IOD conditions are likely to develop during later part of the monsoon season.
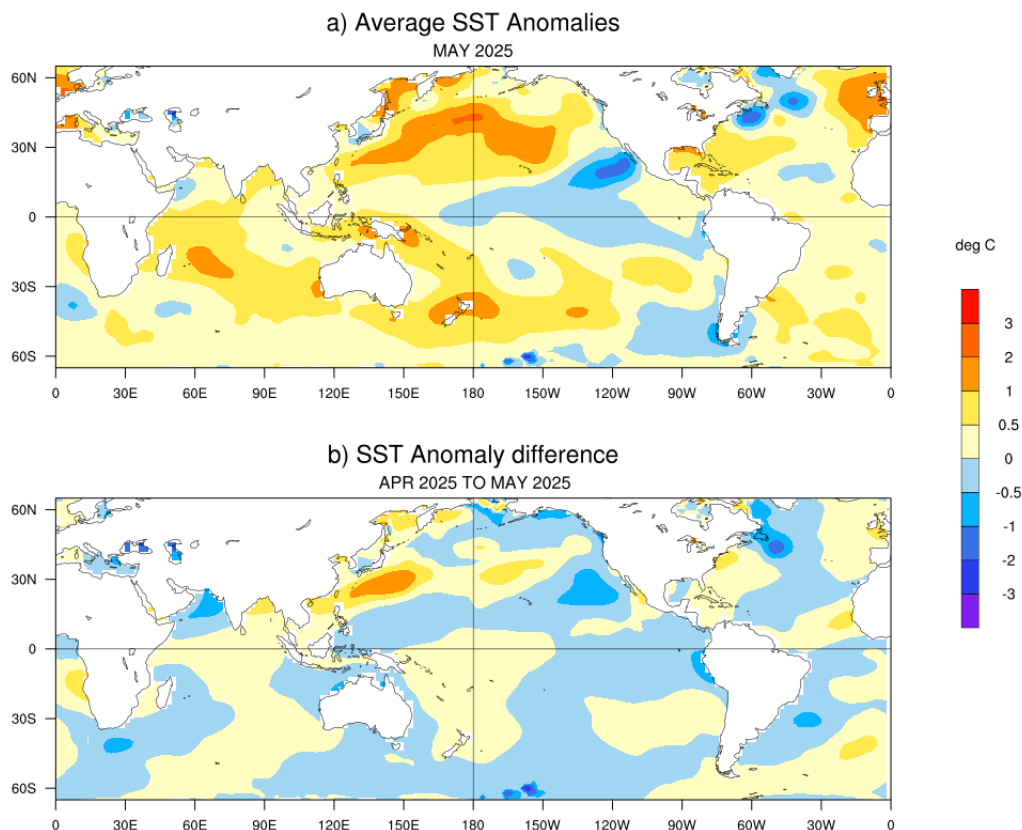

Fig.1: (a) Sea surface temperature (SST) anomalies (^{0}C) during May 2025 and (b) changes in the SST anomalies (^{0}C) from April to May 2025. SSTs are based on the ERSSTv5, from NOAA, and anomalies are computed with respect to 30-year (1991-2020) long term mean.
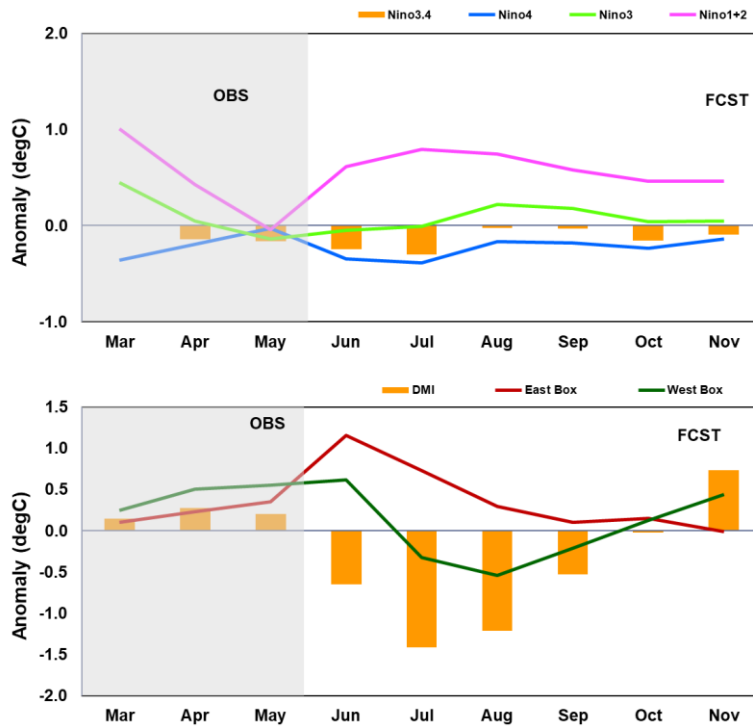
Fig.2: Time series of monthly area-averaged SST anomalies (°C) in the 4 Niño regions. ERSSTv5 observed anomaly for the last 3 months and MMCFS model PDF corrected anomaly forecast for the next 6 months.

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 May 2025 is shown in (Fig.4). Negative OLR anomalies (enhanced convection, blue shading) were observed over most parts of North Indian Ocean (Bay of Bengal and Arabian Sea), central region of south tropical Pacific Ocean and east tropical Pacific Ocean. Negative OLR anomalies were also observed over most parts of South Asia except northwest of South Asia, over maritime continent and parts of east China. Positive OLR anomalies (suppressed convection, orange/red shading) were observed over western tropical Pacific Ocean. Positive OLR anomalies were also observed over north west parts of South Asia, parts of Africa, south Australia and north and south America.
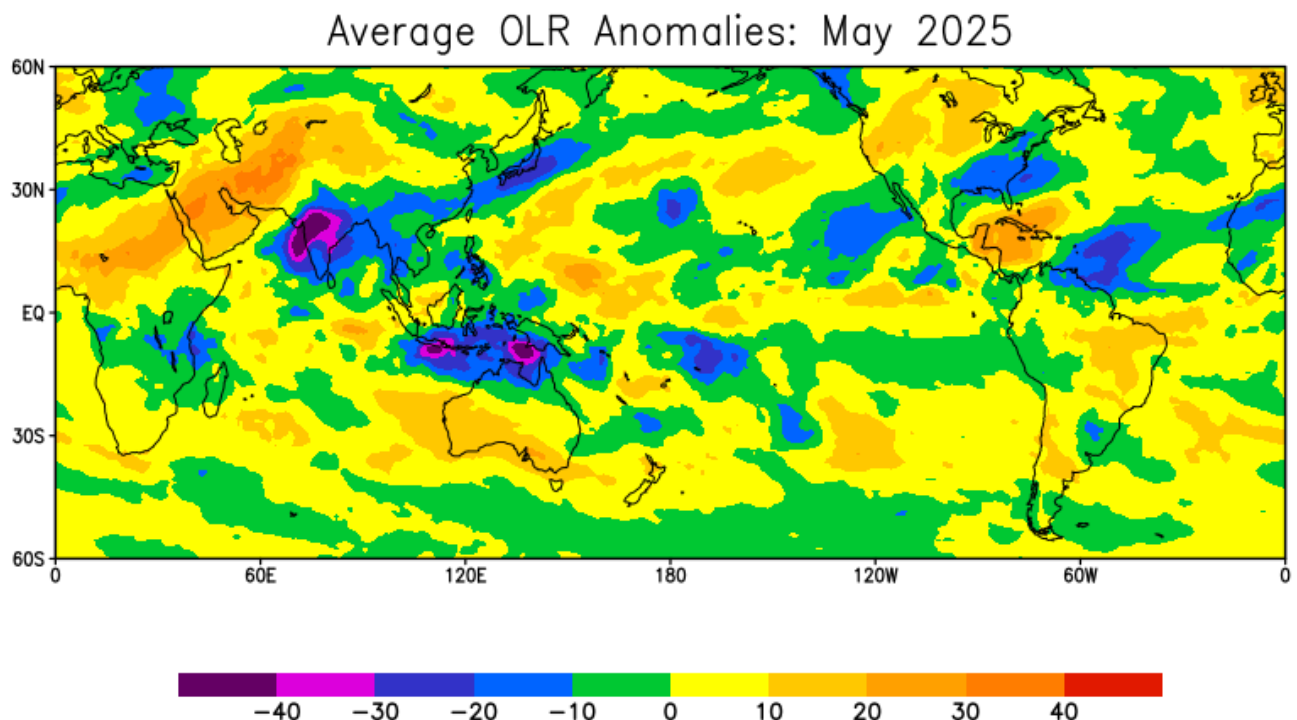

Fig.4: Outgoing Long Wave Radiation (OLR) Anomaly (W/m^2) for May 2025
(Data source: NCEP-NOAA)

1.4 Snow Cover Area over the Northern Hemisphere (NH)

During May 2025, the NH snow cover area (8.51 million Sq. km) was less than the 1991-2020 normal by 0.52 million Sq. km (Fig. 5). Eurasian Snow cover area (8.75 million Sq. km) was 0.43 million Sq. km less than the 1991-2020 normal. North America snow cover area of 8.51 million sq. km was less by 0.53 million Sq. Km with respect to 1991-2020 normal.
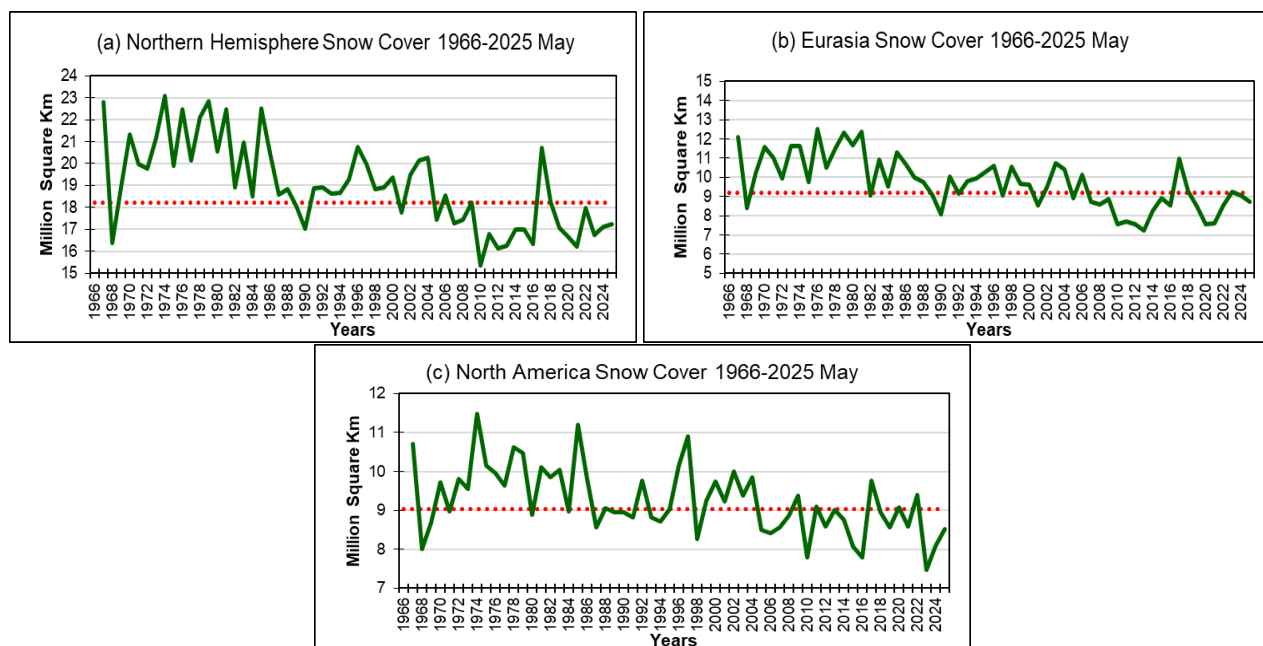

Fig.5. Snow cover area (million Sq. km) for the month of May during the period 1966-2025 (green solid lines) and normal value (1991-2020) (red dotted line) for (a) Northern Hemisphere (b) Eurasia and (c) North America. (Data Source: Rutgers University Snow Lab).

1.5. Madden Julian Oscillation (MJO)

During the first half of the first week of May 2025, MJO index was in Phase 8 with an amplitude > 1. During the second half of first week it remained in Phase 8 with amplitude < 1. In the second week it moved eastwards to phase 6 (Western Pacific) with an amplitude < 1. In the third and fourth week it remained subdued with an amplitude < 1 and finally reached phase 4 (Maritime Continent) at the end of the month. The MJO phase diagram illustrates the progression of the MJO through different phases, which generally coincide with locations along the equator around the globe.
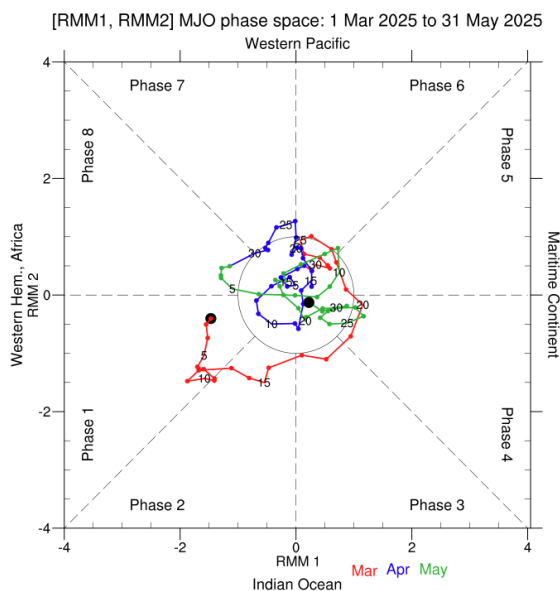

Fig.6. RMM phase diagram for Madden Julian Oscillation (MJO) for the period March to May 2025. (Data Source: http://www.bom.gov.au/climate/mjo/).

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 June to August 2025 (JJA) and July to September 2025 (JAS) are given in the Figures 7a and 7b respectively. The forecast is prepared based on the May initial conditions. The probability forecast for precipitation for JJA season indicates that enhanced probability of above normal precipitation is likely over most parts of South Asia except over extreme north where below normal precipitation is likely. The same for JAS season indicate that enhanced probability of above normal precipitation is likely over most parts of South Asia except over extreme north and northeast and southeast of South Asia.
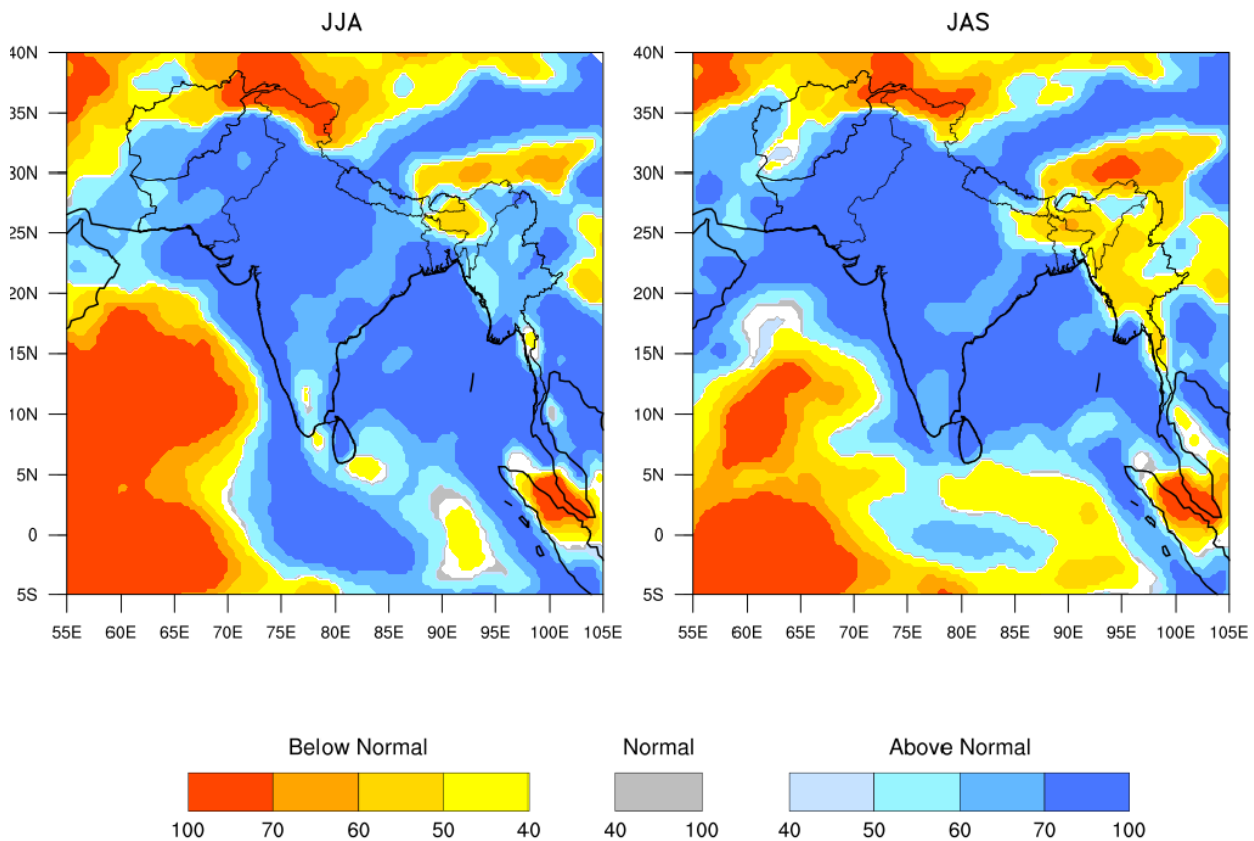

Fig.7: Seasonal probability (%) forecasts of precipitation for (a) JJA 2025 (left) and (b) JAS 2025 (right) based on initial conditions of May 2025. The white colour indicates climatological probability.

2.2.   Temperature Probability Forecast:

The probability forecasts for temperature for the season June to August 2025 (JJA) and July to September 2025 (JAS) are given in the Figures 8a and 8b respectively. The forecast is prepared based on the May initial conditions. Temperature probability forecast for JJA and JAS seasons indicate that enhanced probability of above normal temperatures is likely over most parts of South Asia except over Indian land mass where enhanced probability of below normal temperature is likely.

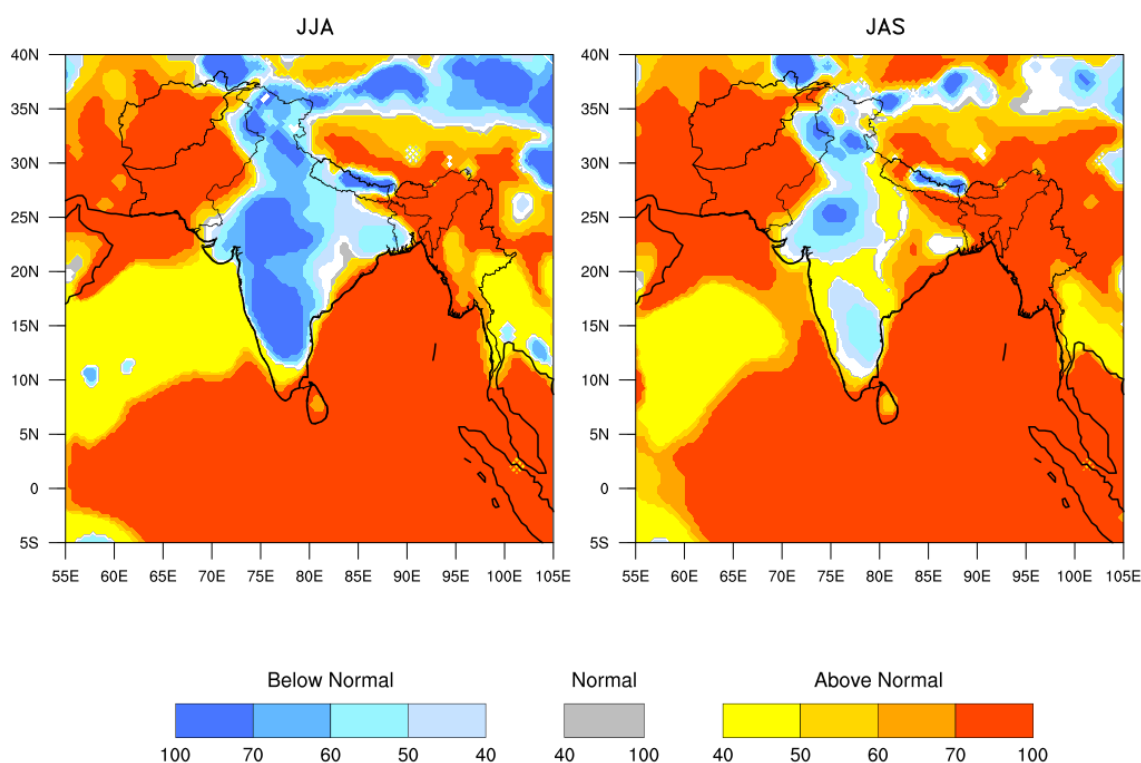**MMCFS Temperature% Probability Forecast : May Ic 2025**

Fig. 8: Probability (%) forecast for the seasonal mean temperature for (a) JJA 2025 (left) and (b) JAS 2025 (right) based on initial conditions of May 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 June to September 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 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 and August, the country averaged monthly precipitation is likely to be normal to above normal for all countries. In September, it is likely to be normal to above normal for all countries except Maldives where it is likely to be below normal.

The country averaged monthly temperatures during June is likely to be above normal for all the south Asian countries except India and Nepal where it is likely to be below normal. In July, it is likely to be normal to above normal for all the south Asian countries except India where it is likely to be below normal. In August and September, it is likely to be above normal for all the South Asian Countries.
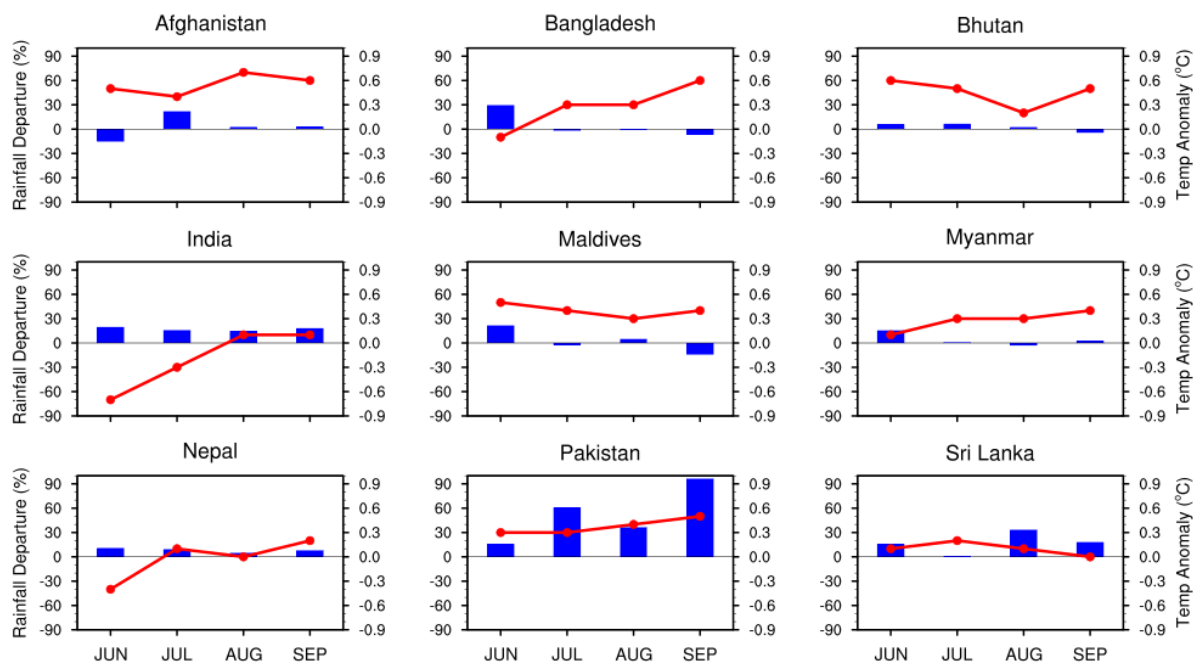
Fig. 9: Monthly country averaged rainfall forecast expressed as percentage departures (%) and Monthly country averaged temperature anomaly (°C) forecast during June to September 2025. Here, the normal range for country averaged monthly precipitation is taken as -10% to +10% (Left Vertical Axis Scale 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).