Earth System Science Organization (ESSO)
Ministry of Earth Sciences (MoES)
India Meteorological Department (IMD)

El Niño Southern Oscillation (ENSO) and Indian Ocean Dipole (IOD) Bulletin

September 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 increased likelihood of La Niña conditions during the upcoming months.

At present, negative 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 negative IOD conditions are likely to develop during SON season and likely to continue for a short period of time.

1. Current Sea Surface Temperature (SST) Conditions over the Pacific and Indian Oceans

In August 2025, sea surface temperatures (SSTs) were near average over central and equatorial Pacific Ocean (Fig. 1a). SSTs were above average over the western parts of equatorial Pacific Ocean. Warmer-than-average SSTs were observed in the northern and southern extra-tropical regions of the Pacific. Compared to July 2025, negative SST anomalies developed over the eastern & central Pacific Ocean while positive SST anomalies seen across the western Pacific Ocean. Additionally, cool SST anomalies were present in some parts of both the South and North Pacific Ocean (Fig. 1a).

In August 2025, warmer than average SSTs were seen over eastern parts of the equatorial Indian Ocean and near average over the western Indian Ocean (Fig. 1a). Cool SSTs were observed in the Arabian Sea and warm SSTs over northern Bay of Bengal. Compared to July 2025, warm SSTs were observed across the Arabian Sea, Bay of Bengal and eastern Indian Ocean (Fig. 1b) while cool SSTs were observed over some parts of the western Indian Ocean.

1.1 El Niño Southern Oscillation (ENSO) conditions over the Pacific Ocean

The monthly time series of Niño3.4 SST anomalies for the last 12 months, from September 2024 to August 2025 is shown in Fig. 2(a). In September 2024, ENSO neutral conditions were observed over the equatorial Pacific Ocean, which persisted until November 2024. Since December, weak La Niña conditions have been observed over the equatorial

Pacific, persisting until January 2025. Thereafter, these conditions began to weaken from February 2025 onwards. Thereafter neutral ENSO conditions were observed till August 2025. Currently, the neutral El Niño–Southern Oscillation (ENSO) conditions are present.

The strong positive subsurface temperature anomalies are observed over the western Pacific Ocean, both near and above the 20°C isotherm depth (Fig. 2b). Negative subsurface temperature anomalies are observed over the central equatorial Pacific Ocean occurring near and below the thermocline depth (Fig.2b).

1.2. Indian Ocean Dipole (IOD) conditions over the Indian Ocean

Figure 2(c) shows the monthly time series of Dipole Mode Index (DMI) for September 2024 to August 2025. Weak negative IOD conditions were observed from October 2024 to January 2025, followed by prevailing neutral IOD conditions over the Indian Ocean till July 2025. The neutral IOD conditions turned into Weak Negative IOD conditions during Auguest 2025. At present, negative IOD conditions are prevailing over the Indian Ocean.

Strong positive subsurface temperature anomalies (Fig. 2d) were observed in the eastern equatorial Indian Ocean, below the 20°C isotherm depth, extending down to the thermocline depth.

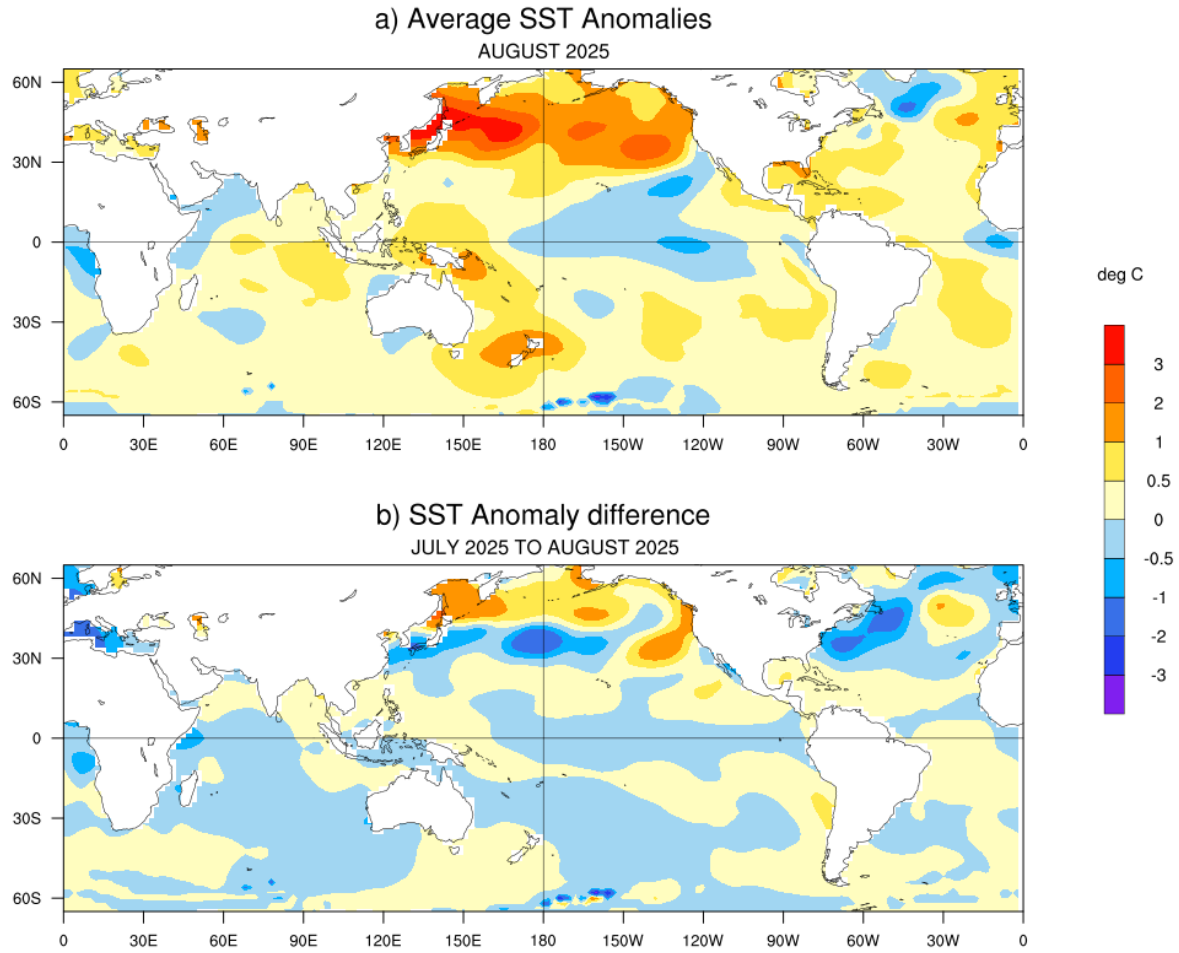

Fig.1: (a) Sea surface temperature (SST) anomalies (degC) during August 2025 and (b) changes in the SST anomalies (degC) from July 2025 to August 2025. SSTs are based on the ERSSTv5 (NCEP-NOAA), and anomalies are computed with respect to 30-year (1991-2020) long term mean.

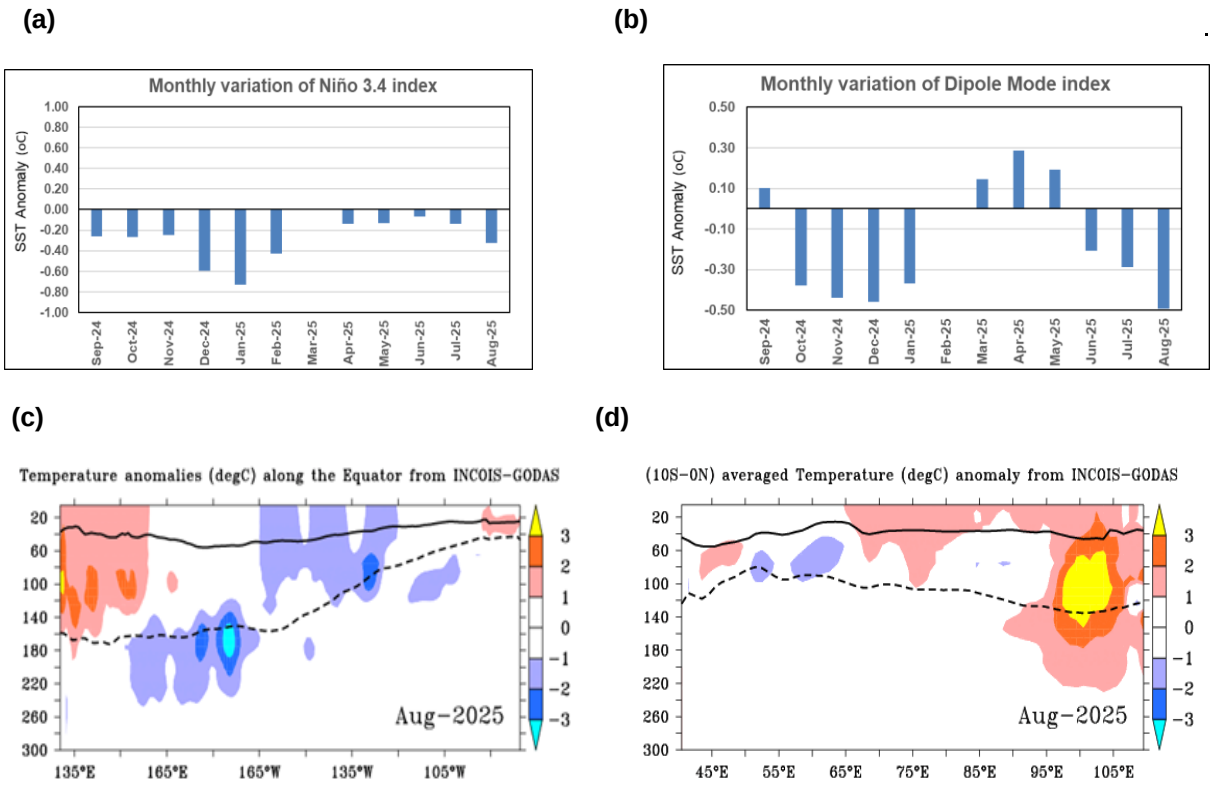

Fig.2: (a) Monthly variation of Niño 3.4 SST index for the last 12 months and (**b**) Depth-longitude section of sub-surface temperature anomalies in the equatorial (5^0S-5^0N) Pacific Ocean for the month of August 2025. (**c**) Same as (**a**) but for the Dipole Mode Index (DMI). (**d**) Same as **(b)** but for the tropical Indian Ocean (10^0S-Eq). The anomalies in (**a**) and (**c**) were computed using the base period of 1991-2020 (Data Source: ERSSTv5) The solid dark line in (b) and (d) is the 20^0C isotherm and the dashed line is thermocline depth (Data Source: INCOIS-GODAS).

2. ENSO and IOD Forecast

The SST forecast was prepared using the high-resolution Monsoon Mission Coupled Forecast System (MMCFS) (AGCM T382L64; ~38 km and OGCM 25 km in the tropics) based on the August 2025 initial conditions. The initial conditions for the model runs were obtained from ESSO-INCOIS and ESSO-NCMRWF analyses. Probability density function (PDF) bias correction was applied to the forecasts of the Niño3.4 index (Fig. 4a) and the DMI (Fig. 4b), based on hindcasts for the period 1999-2008, and anomalies were calculated using the 1991-2020 Climatology.

In August 2025, sea surface temperatures (SSTs) were near average over central and eastern equatorial Pacific Ocean and SSTs were above average over the western parts of equatorial Pacific Ocean. The 3-month season-averaged SST anomaly forecast for the Pacific Ocean (Fig. 3) indicates negative SSTs over the central equatorial Pacific Ocean during most of the forecast period. The latest MMCFS plume and probability forecast (Fig. 4a & 5a) indicates the increased likelihood of La Niña conditions during the upcoming months. However, NDJ onwards highest probability for neutral ENSO conditions is likely. IMD is closely monitoring ENSO conditions. IMD provides monthly updates, reflecting the latest observations and changes in the Pacific Ocean.

The 3-month season-averaged SST anomaly forecast for the Indian Ocean (Fig. 3) suggests that negative SST anomalies are expected across western Indian Ocean during SON and NDJ seasons. However, DJF onwards near normal SSTs are likely over most parts of the Indian Ocean. The latest MMCFS forecast indicates that the negative IOD conditions are likely to develop during SON season and likely to continue for a short period of time (see Figs. 4b and 5b).

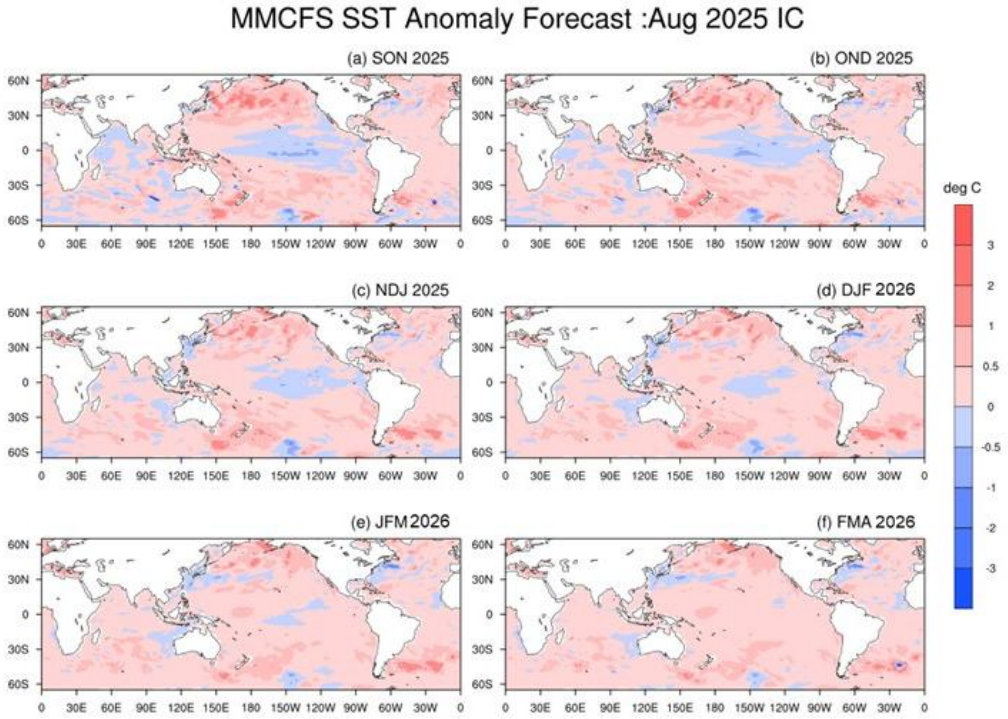

Fig.3: Forecasted Seasonal mean SST anomalies for three-monthly (a) September to November (SON 2025), (b) October to December (OND 2025), (c) November to January (NDJ 2025), (d) December to February (DJF 2025), (e) January to March (JFM 2026) and (f) February to April (FMA 2026) Model bias correction base period: 1999-2008; Climatology base period:1991-2020).

(a) (b)

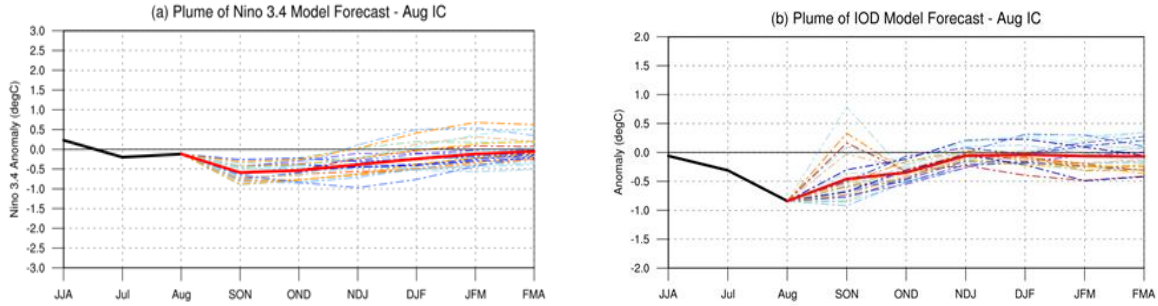

Fig.4: Plume of **(a)** Niño 3.4 SST index, **(b)** Indian Ocean Dipole (IOD) Mode Index forecasted by high-resolution MMCFS. The forecasts were PDF corrected for bias and variance. The solid green line is the observed SST anomaly (ERSSTv5, NOAA) and the solid red line is the ensemble mean SST anomaly forecast of 27 members (MMCFS). The individual ensemble member forecasts are shown in light dotted lines of different colours.

(a) (b)

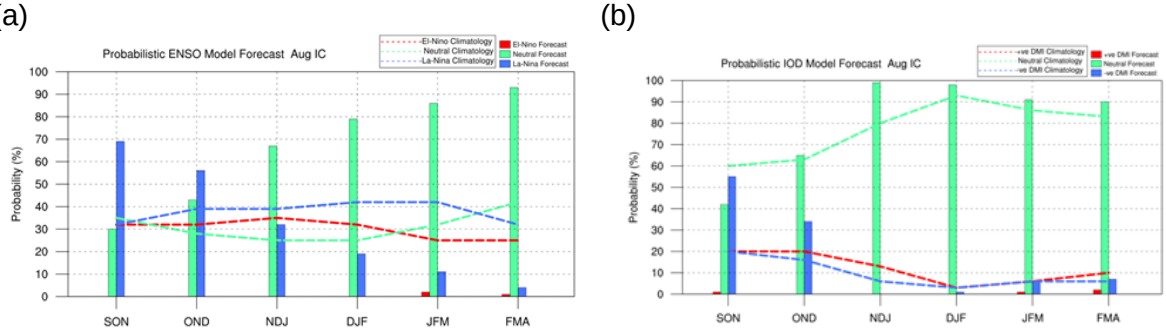

Fig.5: Probability forecast along with climatological probabilities of **(a)** Niño 3.4 and **(b)** Indian Ocean Dipole (IOD) Mode Index from high-resolution MMCFS. The data source for Climatology probabilities: NOAA Extended Reconstructed SST V5. Criteria used for Probabilistic ENSO Forecast: La Niña ≤ -0.5, Neutral <0.5 to >-0.5, El Niño ≥ 0.5. Criteria used for Probabilistic DMI Forecast: negative DMI ≤ -0.4, Neutral <0.4 to >-0.4, positive DMI ≥ 0.4.