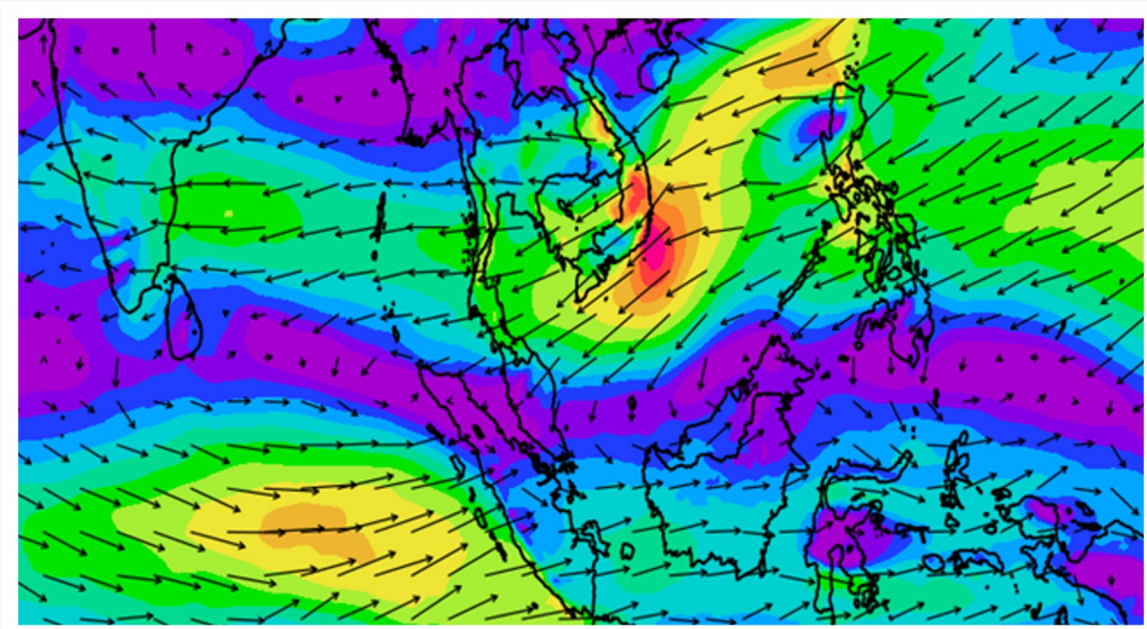
NORTHEAST MONSOON REPORT
KUALA LUMPUR MONSOON ACTIVITY CENTRE
MAY 2025



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1. Introduction

ENSO-neutral conditions are present in May, with equatorial sea surface temperatures (SSTs) near to below average in the east-central and central equatorial Pacific Ocean (PO). The Niño index values in the westernmost regions were close to zero, whereas positive values continued to dominate in the easternmost Niño-3 and Niño-1+2 regions. Below-average subsurface temperatures have weakened, but negative anomalies persist in the central equatorial Pacific, extending to a depth of 250 meters. A shallow layer of above-average subsurface temperatures continues in the far eastern equatorial Pacific. Low-level wind anomalies remain easterly over the western and central PO, while upper-level wind anomalies are westerly over the central PO. Convection is suppressed near the Date Line and enhanced near Indonesia. Both the traditional and equatorial Southern Oscillation Indices are positive. Collectively, the coupled ocean-atmosphere system reflects ENSO-neutral conditions. ENSO-neutral is favoured to persist through the Northern Hemisphere summer, with a greater than 50% chance of continuing during the August–October 2025 period. The Indian Ocean Dipole (IOD) is currently neutral. The latest IOD index value for the week ending 13 April is +0.11 °C. The IOD is forecast to turn negative in late summer and persist into the early boreal winter monsoon.

The RMM1 and RMM2 indices showed the Madden-Julian Oscillation (MJO) was active over the Western Hemisphere in early November. It then moved eastward toward the Indian Ocean (IO) in mid-November, reached the Maritime Continent (MC) by the end of the month, and remained active there until December before progressing toward the western Pacific. It reached the Western Hemisphere again in March, but became inactive by the end of the month. The MJO remained weak during mid-April, with differing forecasts from the GEFS and ECMWF models. While many GEFS ensemble members suggest a strengthening MJO moving eastward and returning to the IO by mid-May, the ECMWF model maintains weak activity; if the MJO strengthens, conditions may become more favourable for early-season tropical cyclone development in the East Pacific.

Climatologically, the Pacific typhoon season is mostly active during the boreal summer months. However, some storms with tropical storm strength and above can still be observed outside the peak season, including during winter. Overall, five tropical storms were observed from November to December 2024 near the western Pacific and the Philippines region.

2. Weather Conditions from November 2024 to March 2025

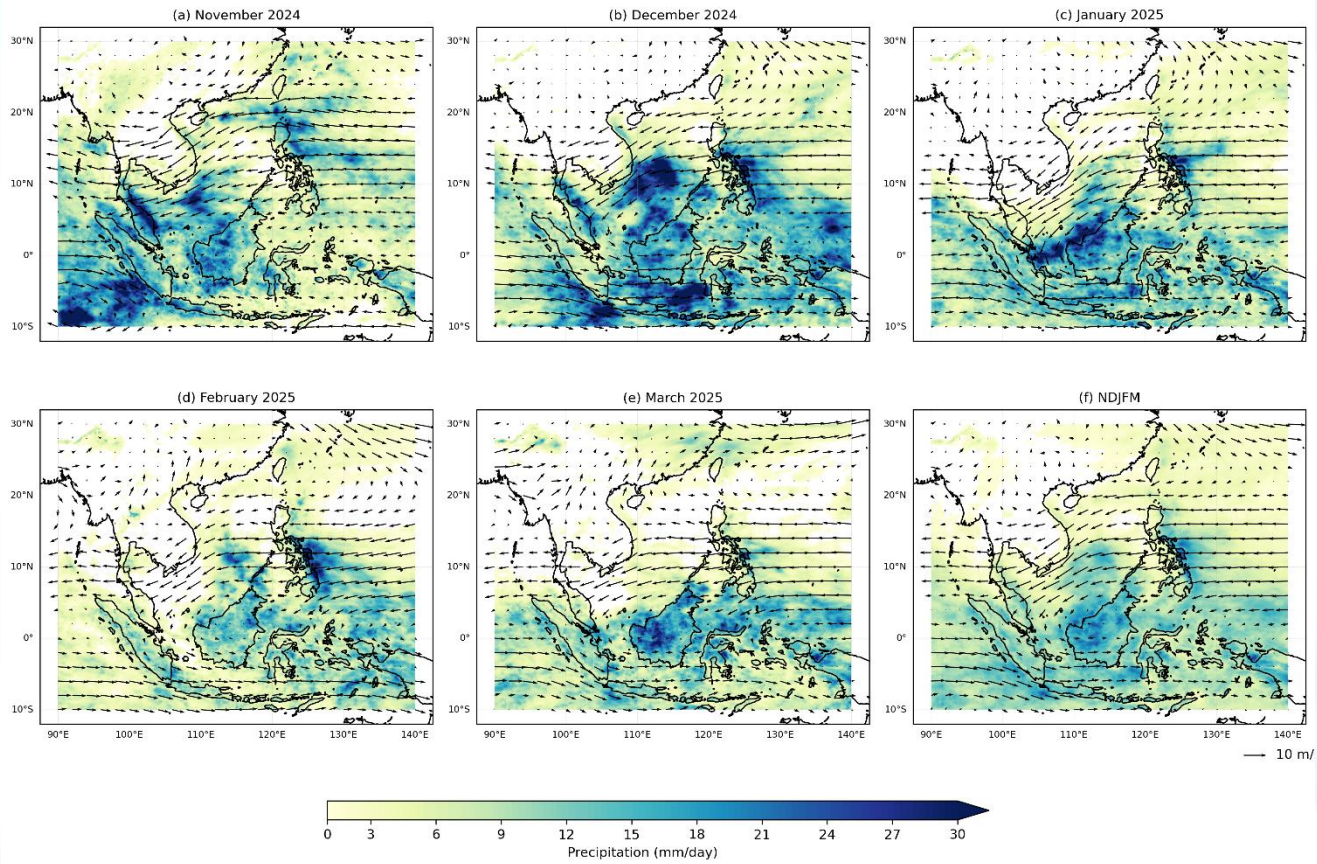

Figure 1. The monthly and seasonal mean wind at 850hPa (vector, ms^{-1}) and rainfall (shaded, mm/day) for (a) November, (b) December, (c) January, (d) February, (e) March, and (f) NDJFM
*Wind data are provided by the ERA5 reanalysis dataset from the Copernicus Climate Data Store (CDS): https://cds.climate.copernicus.eu/datasets/reanalysis-era5-pressure-levels.
*Rainfall data are provided by GPM IMERG Late Precipitation L3 1 day 0.1 degree x 0.1 degree V07 (GPM_3IMERGDL) at GES DISC: https://gpm1.gesdisc.eosdis.nasa.gov/opendap/GPM_L3/GPM_3IMERGDL.07/contents.html

Figure 1 presents the monthly and seasonal mean wind circulation at 850 hPa and rainfall distribution during the 2024/25 NDJFM season. In November 2024 **(Figure 1(a))**, strong easterly winds prevailed over the northern equatorial MC and the western Pacific, leading to the concentration of rainfall on the windward side of the Philippines, Peninsular Malaysia and across the South China Sea (SCS). At the same time, a cyclonic circulation centered around 5°S in the Southern Hemisphere contributed to a significant rainfall region over the IO. By December 2024 **(Figure 1(b))**, the confluence of northeasterly and easterly winds in the SCS led to widespread rainfall across the region. In the Southern Hemisphere, strengthened westerly winds resulted in a notable rainfall area over the IO and Java Sea. In January 2025 **(Figure 1(c))**, strong northeasterly winds swept through the SCS toward the equator. Upon crossing the equator, these winds veered anticlockwise, becoming westerly to northwesterly. The Borneo vortex was observed during this period, enhancing rainfall along the Borneo coast. In February 2025 **(Figure 1(d))**, northwesterly winds in midlatitudes enhanced the subtropical high, and therefore led to broad easterlies in the equatorial flank of the subtropical high. Heavy rainfall was observed on the windward side of the islands in the Northwestern Pacific region. The subtropical high persisted throughout March **(Figure 1 (e))**, although it shifted slightly eastward. Meanwhile, broad

easterlies continued to dominate the SCS region. Rainfall was concentrated near the equator, particularly along coastal Borneo, where the convergence of northeasterly and westerly enhanced precipitation. Overall, the 2024/2025 winter monsoon season circulation was generally dominated by broad easterly winds.

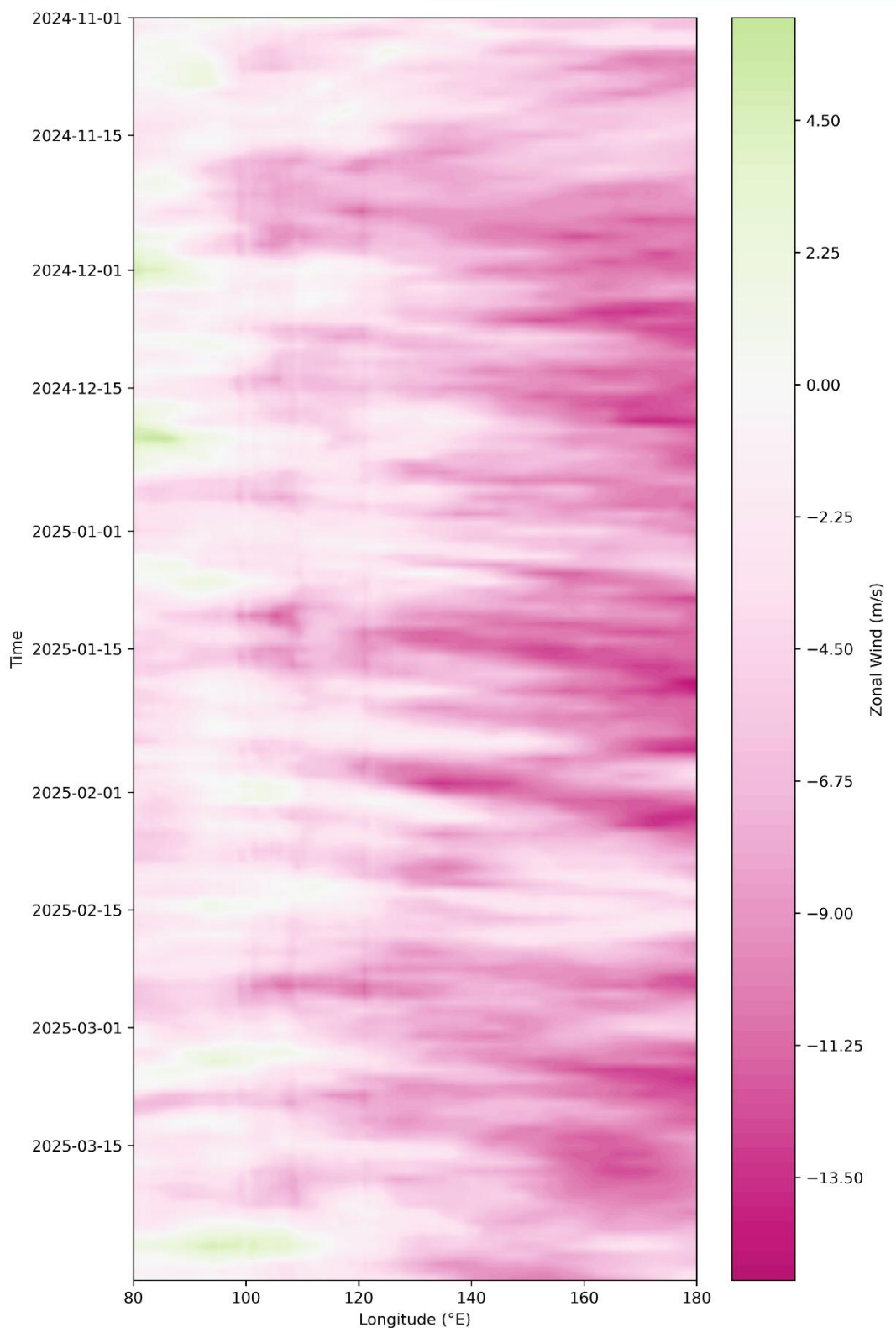

Figure 2: Time-longitude section of zonal wind (ms^{-1}) averaged between 0°N-20°N from 1 November 2024 – 31 March 2025.

Figure 2 shows the time-longitude section of 850-hPa zonal wind (m/s) averaged over the latitude band 0°N to 20°N, covering the period from 1 November 2024 to 31 March 2025. Overall, easterly winds dominated the region, with occasional intrusion of westerlies in the central IO. By late March, westerly winds became more prominent over the MC, signalling the end of the Asian winter monsoon and the onset of the monsoon transition period.

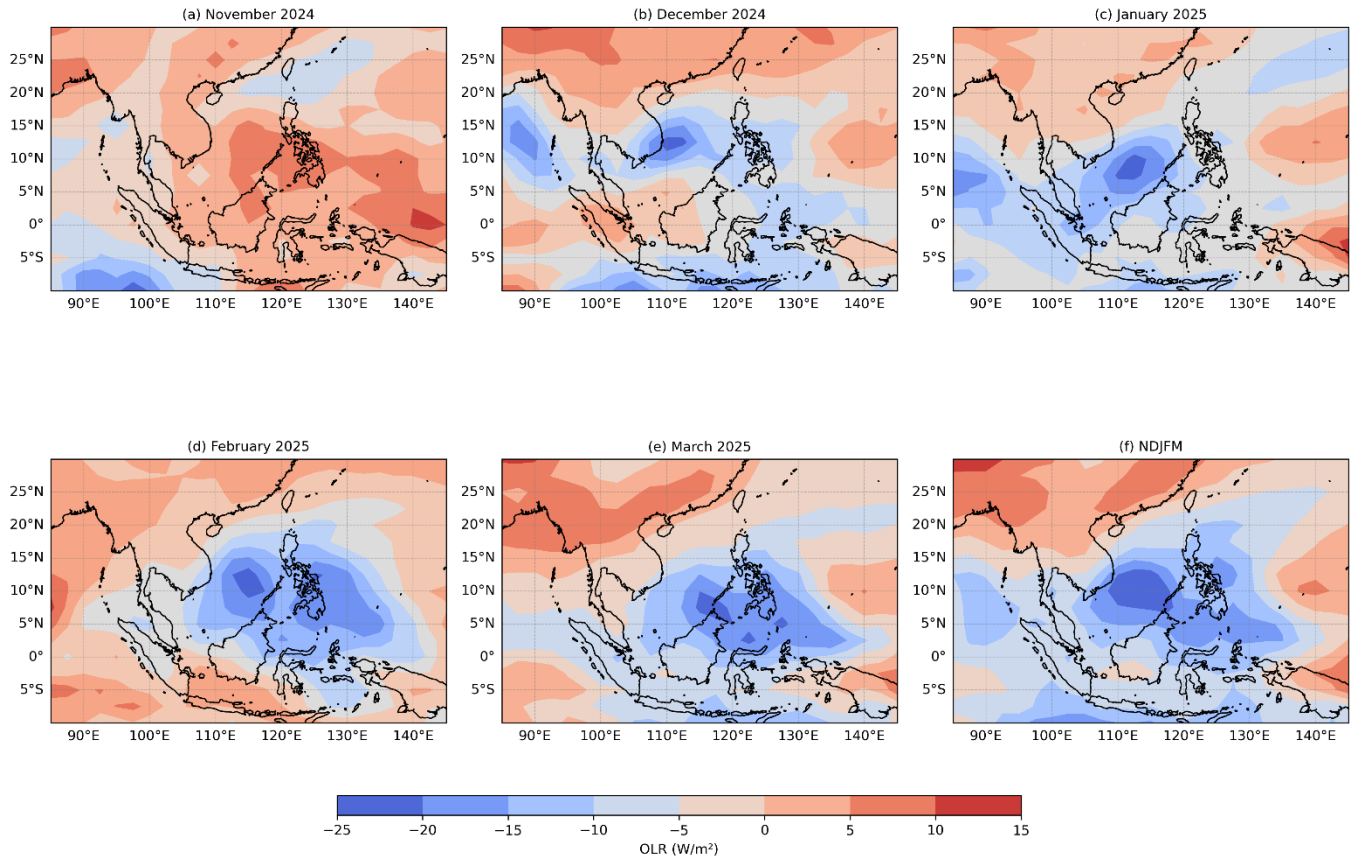

Figure 3: The anomalous OLR (Wm-2) for (a) November 2024, (b) December 2024, (c) January 2025, (d) February 2025, (e) March 2025 and (f) NDJFM. All anomalies represented departures from 1991-2020 monthly means.
*Outgoing Longwave Radiation (OLR) data are obtained from NOAA Physical Sciences Laboratory (PSL): https://www.psl.noaa.gov/mddb2/search/search.html.

Figure 3 shows both the monthly and seasonal anomalous outgoing longwave radiation (OLR). Blue shades indicate enhanced convection, while red shades indicate suppressed convection. In November 2024, most of the MC experienced suppressed convection, while enhanced convection was observed over the IO. This is consistent with the Madden-Julian Oscillation (MJO) signal being active in Phases 2 and 3 during this period. By December 2024, suppressed convection was observed in the equatorial region. However, this suppressed convection was replaced by enhanced convection in January 2025. The enhanced convection shifted eastward and was located over the eastern side of MC by February 2025. This enhanced convection remained in a quasi-stationary state in March 2025. Overall, during the NDJFM season, anomalous enhanced convection was observed in the MC.

3. Seasonal Outlook from May to July 2025

According to the seasonal outlook from the ASEAN Specialized Meteorological Centre (ASMC), winds are expected to shift from light and variable to predominant southeasterly or southwesterly winds by the end of May. This transition will mark the onset of the Asian Summer Monsoon, bringing the start of the dry season to parts of the southern ASEAN region, while wet conditions are likely to persist over the northern areas as the monsoon rainband shifts further northward.

For the May to July (MJJ) 2025 period, above-normal rainfall is forecasted over much of the eastern MC, while a slight increase in the likelihood of below-normal rainfall is expected in the western MC, based on the multi-model ensemble. The UK Met Office (UKMO) and ECMWF models both indicate a higher probability of above-normal rainfall, particularly in the eastern MC. In contrast, the NCEP model shows a more mixed outlook, suggesting a range from below- to above-normal rainfall across the region. Specifically, the NCEP model predicts below-normal rainfall over the western and equatorial MC, whereas the ECMWF model indicates below-normal rainfall only in the western MC. The UKMO model, however, does not show any increased chance of below-normal rainfall.

Model skill is expected to be generally good for forecasting above-normal rainfall and moderate to good for below-normal rainfall across the MC. For Mainland Southeast Asia, the models are expected to disagree, with no dominant rainfall category (tercile) projected for much of the region based on the multi-model ensemble. Model skill is low to moderate for Mainland Southeast Asia at this time of the year.

Acknowledgements: The MJO forecast is based on data from the Climate Prediction Center (CPC), NWS/NCEP, accessed online on 21 April 2025. The records and climatology of tropical cyclones developed in the WNPO were sourced from the Regional Specialised Meteorological Centre (RSMC) Tokyo. The seasonal outlook is derived from the ASMC update issued online on 2 May 2025.