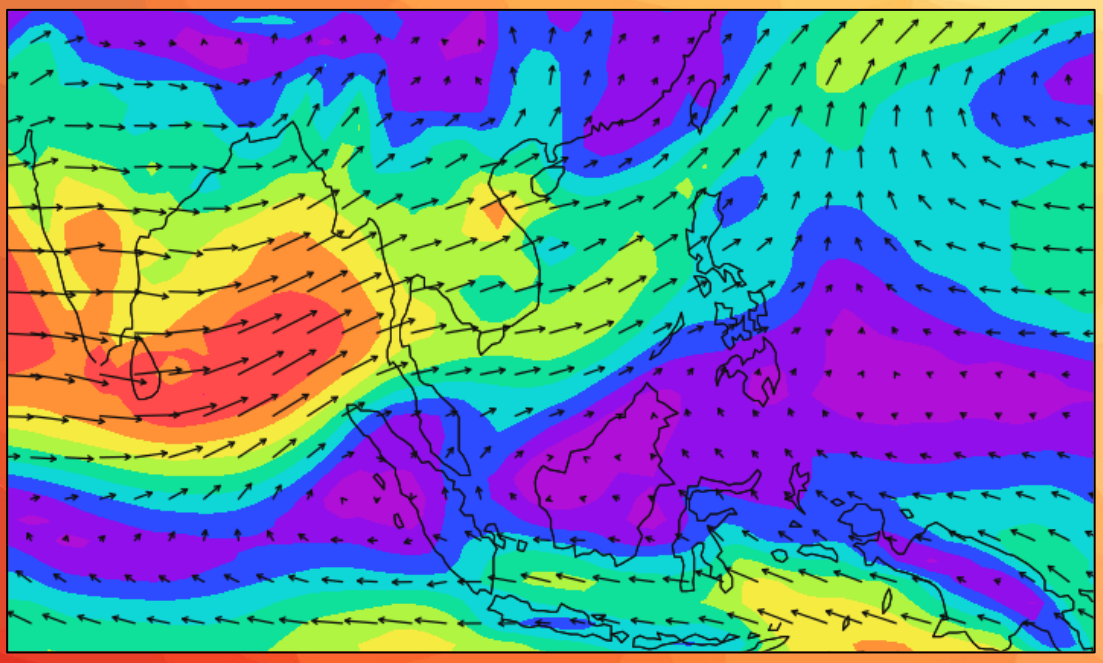
SOUTHWEST MONSOON REPORT

KUALA LUMPUR MONSOON ACTIVITY CENTRE

NOVEMBER 2024



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Introduction

As of mid-August 2024, the equatorial Pacific Ocean continues to experience ENSO-neutral conditions while the sea surface temperatures (SSTs) across the equatorial Pacific ranged between 0.3 °C below and 0.6 °C above normal. Over the past few months, cold subsurface temperatures have persisted in the eastern equatorial Pacific Ocean, extending to the surface. Negative subsurface temperature anomalies continue to be present at depth in the central Pacific Ocean, while slightly above-average temperatures are observed from the surface to a depth of 50 meters in the western and central Pacific.

Overall, negative subsurface temperature anomalies have weakened since early August 2024. The overlying atmospheric conditions, including surface and upper-level winds and patterns of cloudiness and rainfall, remain broadly consistent with ENSO neutral conditions. Climate models and expert assessment indicate a moderate chance (55%) for the onset of La Niña in September-November 2024 and 45% chance for ENSO-neutral conditions to continue. For the record, in Malaysia the Southwest Monsoon started on 17 May 2024 and continues until 24 September 2024 followed by the Monsoon Transition Phase which will continue until early November 2024.

From May up to September 2024, there are eighteen (18) tropical cyclone (TC) detected in the western North Pacific basin of which nine (9) of them evolved into tropical storms, two (2) intensified into severe tropical storms, and seven (7) typhoons. The months of August (6 TC) and September (8 TC) are the climatological peak period of the western North Pacific typhoon season.

1. Weather Conditions from May to September 2024

The southwest monsoon is associated with dry weather and lesser rainfall over the South China Sea (SCS)-Malaysian region from May to September. The summer monsoon is characterized by the flow of winds from the Southern Hemisphere to the Northern Hemisphere across the Equator. The westerly wind prevailed throughout the Bay of Bengal (BOB) and penetrated Indochina until southern China. Monsoon trough, which extends from Indochina to the western Pacific Ocean. Overall, this wind flow pattern gradual strengthens from May onwards and peak in August. It then weakens in September as the monsoon transition period approaches.

In Malaysia, the southwest monsoon begins in May and continues into September. During this period most places throughout Malaysian region experience more days without rain than the number of rainy days. Typically, the wind will blow consistently from the southwest with lower air humidity and more stable atmospheric conditions. This will result in fewer clouds forming, leading to reduced rainfall during the period. However, heavy rain with strong winds and lightning due to

the squall line phenomenon can still occur in the west coast of the peninsula, north of Sarawak and west of Sabah, especially in the early morning.

The wind circulation at the 850hPa level for each month were depicted in **Figure 1**. On average between May to September, Peninsular Malaysia recorded less rainfall than Borneo. It is also observed that eastern Indian Ocean is more humid than other regions. In May and June, the subtropical ridge well established over the Western Pacific and the monsoon trough incapable to reach the western pacific. Rainfall occurred in the eastern Indian Ocean, while the Maritime Continent (MC) and South China Sea (SCS) are observed with less intensify of rainfall. In August, the subtropical ridge migrates northward and allows southwesterly wind to penetrate SCS as far as the western Pacific. In September, the monsoon flow well established at SCS resulting increase of rainfall in SCS while the western parts of Peninsular Malaysia received slightly less rainfall. This phenomenon is also related to the occurrence of tropical cyclones in the western Pacific.

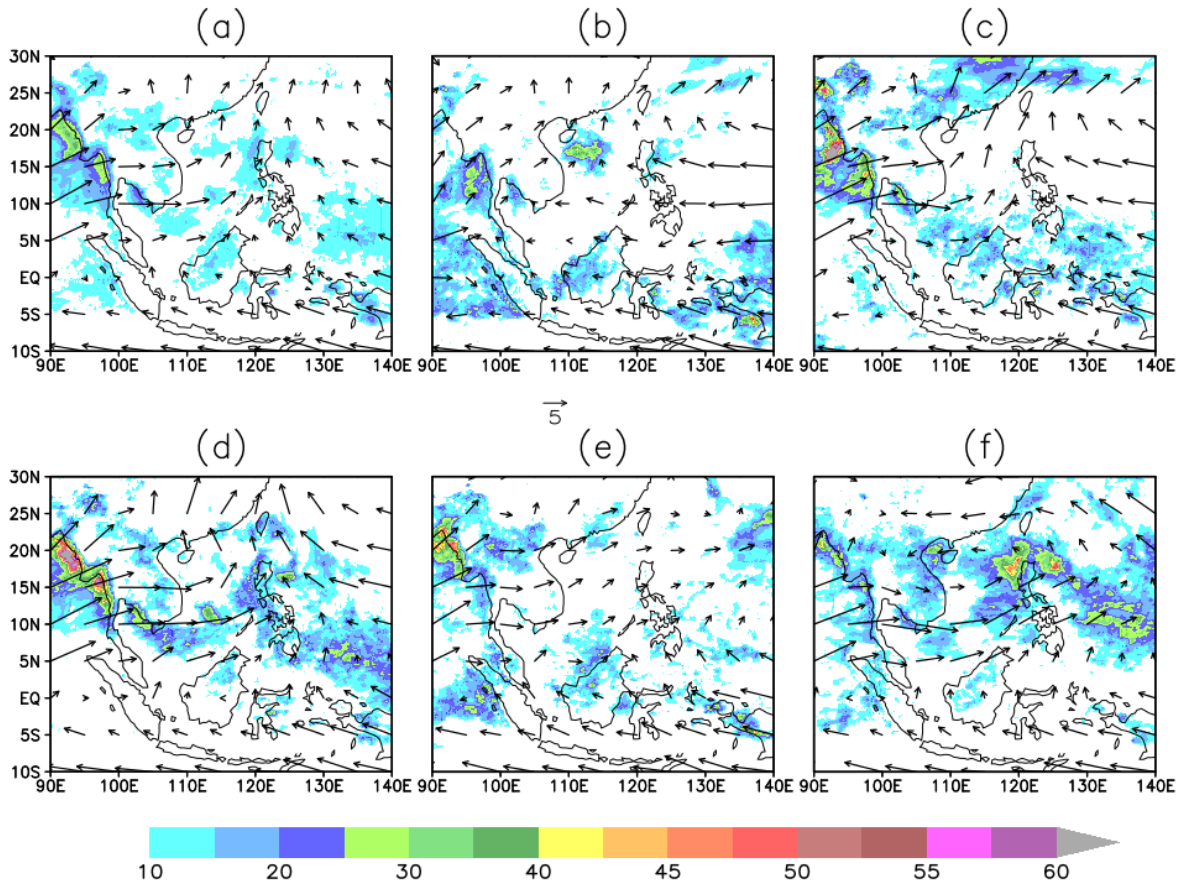

Figure 1. The seasonal and monthly mean wind at 850hPa (vector, ms^{-1}) and precipitation (shaded, mm/day) for (a) MJJAS, (b) May, (c) June, (d) July, (e) August and (f) September.

*wind data from the NCEP-NCAR Reanalysis 1 dataset provided by the NOAA PSL, Boulder, Colorado, USA.

*precipitation data from the GPM IMERG Late Precipitation dataset provided by NASA.

The time-longitude anomalous zonal wind at 850hPa from May to September 2023 averaged between the equator and 20 °N is depicted in **Figure 2**. The westerly wind anomalies are indicated by warm colour shading, while the easterly wind anomalies are indicated by cold colour shading. The westerly winds in the SCS region (110 to 120 °E) were generally weak. It is observed that the easterly wind anomalies have generally dominated the SCS since the beginning of the period. Persistent westerly winds are only seen to dominate the SCS in mid-May, mid-July and September. The eastward propagations of low-level winds anomalies denoted to wet weather in the SCS region.

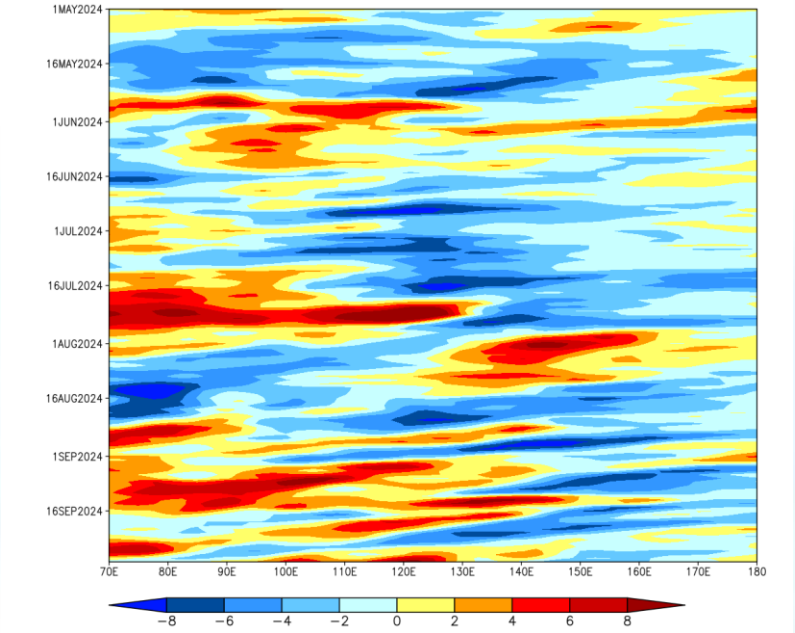

Figure 2. Time (y-axis) longitude (x-axis) section of anomalous zonal wind (shaded, ms^{-1}) at the 850hPa atmospheric pressure level averaged between 0°N and 20°N from May to September 2024.

* Anomalous zonal wind from NCEP-NCAR Reanalysis 1; calculated using the 1991-2020 climate normal.

2. Outgoing Longwave Radiation (OLR)

The monthly distributions of anomalous outgoing longwave radiation (OLR) from May to September 2024 are depicted in **Figure 3**. Enhanced convection is denoted by cold colour, while suppressed convection is denoted by warm colour. In general, the negative OLR anomalies (enhanced convection) were observed over the equatorial MC with the maximum center located mainly near Peninsular Malaysia, the west coast of Borneo and Indonesia. Enhanced convection was also observed in the northern part of South China Sea. In the summer monsoon rain belt region, the positive OLR anomalies (suppressed convection) were prominent from China and extended to SCS. In the eastern Indian Ocean, strong suppression began to appear in June and intensified in July.

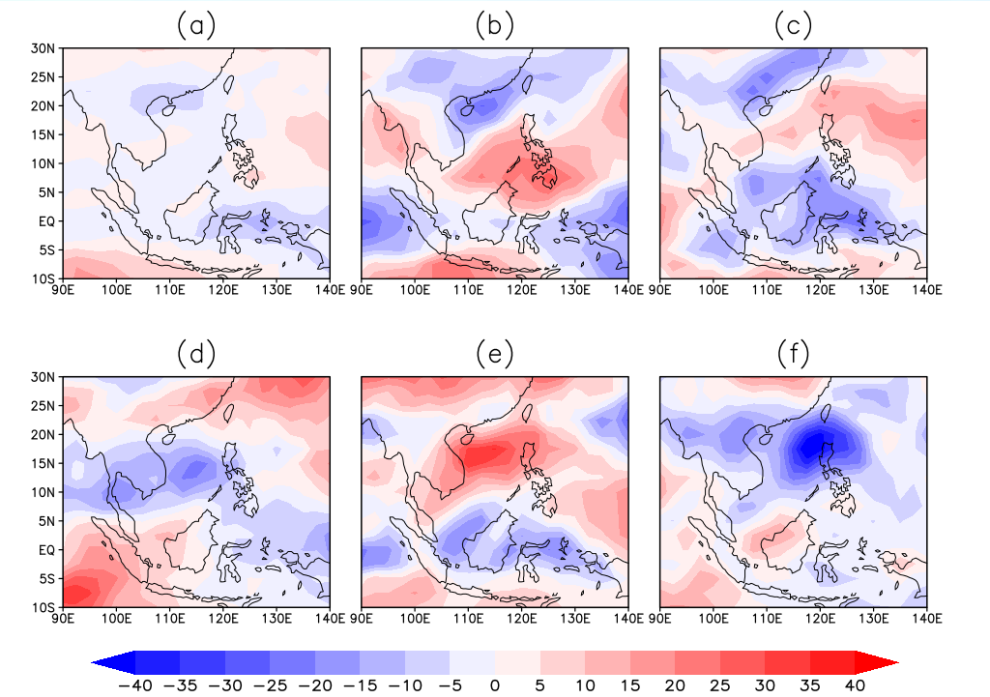

Figure 3. The anomalous OLR (Wm^{-2}) for (a) MJJAS, (b) May 2024, (c) June 2024, (d) July 2024, (e) August 2024 and (f) September 2024. All anomalies are calculated using the 1991-2020 climate normal.

* Anomalous OLR data was sourced from the CPC Blended Outgoing Longwave Radiation (OLR) dataset.

The time-longitude of anomalous OLR from May to September 2024 averaged between the equator and 20ºN is shown in **Figure 4**. Enhanced convection is denoted by green shading, while suppressed convection is denoted by orange shading. From the beginning of the period, positive OLR anomalies (suppressed convection) were evident over the western Pacific Ocean. Meanwhile, the negative OLR anomalies (enhanced convection) were observed over SCS and Indonesia (100 –120 ºN) in July and September.

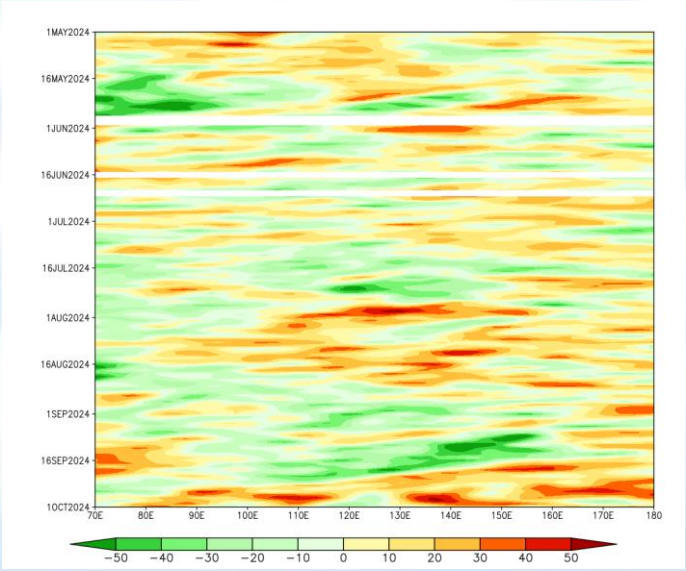

Figure 4. Time (y-axis) longitude (x-axis) section of anomalous OLR (shaded, Wm^{-2}) averaged between 0ºN and 20ºN from May to September 2024. White bands indicate missing observation.

* Anomalous OLR data was sourced from the CPC Blended Outgoing Longwave Radiation (OLR) dataset.

3. Weather Outlook from Nov 2024 to Jan 2025

This long-term weather outlook is based on consensus from meteorologists through analysis of several selected climate forecast models such as NCEP Coupled Forecast System Model Version 2 (CFSv2), JMA Ensemble Prediction System (Tokyo Climate Centre), European Center for Medium Range Weather Forecast (ECMWF) and Seasonal Climate Forecast, International Research Institute for Climate Society (IRI). Global phenomena that change the country's current weather, such as the El-Niño Southern Oscillation (ENSO), the Madden-Julian Oscillation (MJO) and the Indian Ocean Dipole (IOD) are also discussed.

The majority of international climate models show the current El Niño Southern Oscillation (ENSO) state to be neutral. The ongoing ENSO-neutral conditions are expected to continue until November 2024 with the latest Ocean Nino Index (ONI) in the Niño 3.4 monitoring area for July, August and September 2024 being - 0.1°C. A 60% likelihood exists for the formation of a La Niña event between September and November, with the phenomenon anticipated to extend until March 2025.

Based on the seasonal outlook from MET Malaysia updated on 1st November 2024, the transitional phase of the monsoon which started on 24 September 2024 is expected to end in early November and will be followed by the Northeast Monsoon which expected to start in early November 2024 and end in March 2025. This MTL is characterized by wind flow from the northeast direction continuously and during this period the country is expected to receive five to seven episodes of heavy rain. Heavy rain if it continues for a period of several days can result in flooding in low-lying areas and areas that frequently flood. If heavy rain occurs at the same time as high tide, the risk of flooding can be worse. In addition, continuous and strong northeasterly winds can cause rough seas and large waves in the waters of the South China Sea.

Acknowledgements: The wind charts were analyzed using ECMWF ERA5 reanalysis dataset. The OLR charts were generated using NOAA daily uninterpolated dataset, while the rainfall data were obtained from the Global Precipitation Measurement (GPM) dataset produced by the National Aeronautics and Space Administration (NASA). In this report, wind anomalies were taken with respect to 1979–2020 base period, while OLR anomalies were taken with respect to 1991–2020, which was provided by NOAA. Seasonal outlook for Southeast Asia was obtained from ASMC (updated 31st October 2024) meanwhile for Malaysia was produced by MET Malaysia (updated 1st November 2024). The records and climatology of tropical cyclones developed in WNPO were from the Regional Specialized Meteorological Centre (RSMC) Tokyo.