NORTHEAST MONSOON REPORT

KUALA LUMPUR MONSOON ACTIVITY CE

MAY 2021

Introduction

Since mid-March 2021, the equatorial Sea Surface Temperatures (SSTs) were mostly below average from the west-central to the eastern Pacific Ocean. In the meantime, the SSTs in the western Pacific Ocean were observed to be above average. The low-level easterly wind anomalies are present but weak across the equatorial Pacific and are most notable in the far western Pacific, while the upper-level westerly wind anomalies were observed over most of the tropical Pacific. During this period, the tropical convection was practically suppressed in the western and central Pacific, although the enhancement of rainfall around the Philippines and Indonesia weakened. Overall, the trend in the coupled ocean-atmosphere system is consistent with a weakening La-Niña. Based on the multi-model averages from the National Centers for Environmental Prediction (NCEP), a transition from La-Niña to ENSO-Neutral is likely to occur, with an 80% chance of ENSO-neutral during May-July 2021.

Generally, the intra-seasonal variability in the atmosphere which is often related to the Madden-Julian Oscillation (MJO) can significantly impact surface and subsurface conditions across the Pacific Ocean. The MJO has acted in the eastward propagation of low-level wind anomalies on an instance. Based on the Australian Bureau of Meteorology (BOM), the MJO index depicted weak activities over the Maritime Continent (MC) during the northeast monsoon (NEM) from November 2020 to March 2021. This resulted in normal weather development over the MC region. In the Indian Ocean basin, the Indian Ocean Dipole (IOD) is currently neutral with models favouring a neutral outlook for autumn and early winter. In the neutral IOD conditions, most of the water from the Pacific flows between the islands of Indonesia in the western Pacific. The air rises above this area and falls over the western half of the Indian Ocean basin, blowing westerly winds along the equator. The temperatures are close to normal across the tropical Indian Ocean, hence the little changes in temperatures result in a normal weather development over the western Pacific and MC region.

The period of November 2020 to March 2021 witnessed six developments of tropical cyclones (TCs) over the western North Pacific Ocean (WNP), with two of these TCs developed into the typhoon categories as maximum wind speeds near the centre exceed 65 knots. These TCs were Typhoon Goni (28 October – 5 November) and Vamco (9 – 15 November). The typhoon Goni was recorded as the strongest typhoon during this period, with the maximum wind speeds near the centre reached 120 knots. The record of TC during this period was close to the climatology as compared to the data compiled by the Regional Specialized Meteorological Center (RSMC) Tokyo. The data consists of the TCs record from the year 1981 to 2010.

1. Weather Conditions from November 2020 to March 2021

In general, the northeast monsoon (winter) over the Southeast Asian region which lasted from November to March, associated with the rainy season over southern Thailand, the east coast of Peninsular Malaysia, western Borneo, northern Sumatra and the eastern coast of the Philippines. The rainfall amounts are high throughout the regions at an early phase of the season, especially in November and December. The heavy rainfall then shifted to Java and other southern islands of Indonesia in January and gradually decreases during February and March, as a result of the weakening of the northeasterly winds. The low-level tropospheric wind circulation at 925-hPa and anomalous monthly rainfall (**Figure 1**) show stronger than normal season occurred during the first phase of the northeast monsoon 2020/2021, between November and January. This condition indicated by the anomalous wetter than normal weather over the east coast of Peninsular Malaysia in November and expanded to western Borneo during December and January. During this period, the monsoon trough located around 5 ºN across northern Peninsular Malaysia into the South China Sea (SCS). The wetter conditions were due to the cyclonic vortices located within the monsoon trough gets intensified by the prevailing strong northeasterly winds and the easterly winds penetration towards the SCS. This causes widespread torrential rainfall, lasting for a few days that affect the regions. The wetter weather weakens in February and strengthens again in March with western Java and western Borneo experienced wetter than normal weather. By January, the monsoon troughs moved closer to the Equator and shifted to the southern hemisphere in February to March as the signal for the southwest monsoon season (summer) gradually becoming active. By the end of March, the wind near the Equator also weakens and becoming more variable.

The anomalous 850-hPa zonal wind (**Figure 2**) depicts alternate anomalous easterly and westerly winds that were prominent in the MC region. The monsoon flows were stronger from November but started to weaken from mid-December to March as interrupted by the anomalous westerly. The anomalous westerly was associated with the passage of MJO (black-dashed line) from the Indian Ocean toward WNP. Anomalous easterly wind (blue-dashed line) was evident across the equatorial WNP to MC region during November, mid-December and end of February correspond to the propagation of the TCs and intensifying of the easterly surges.

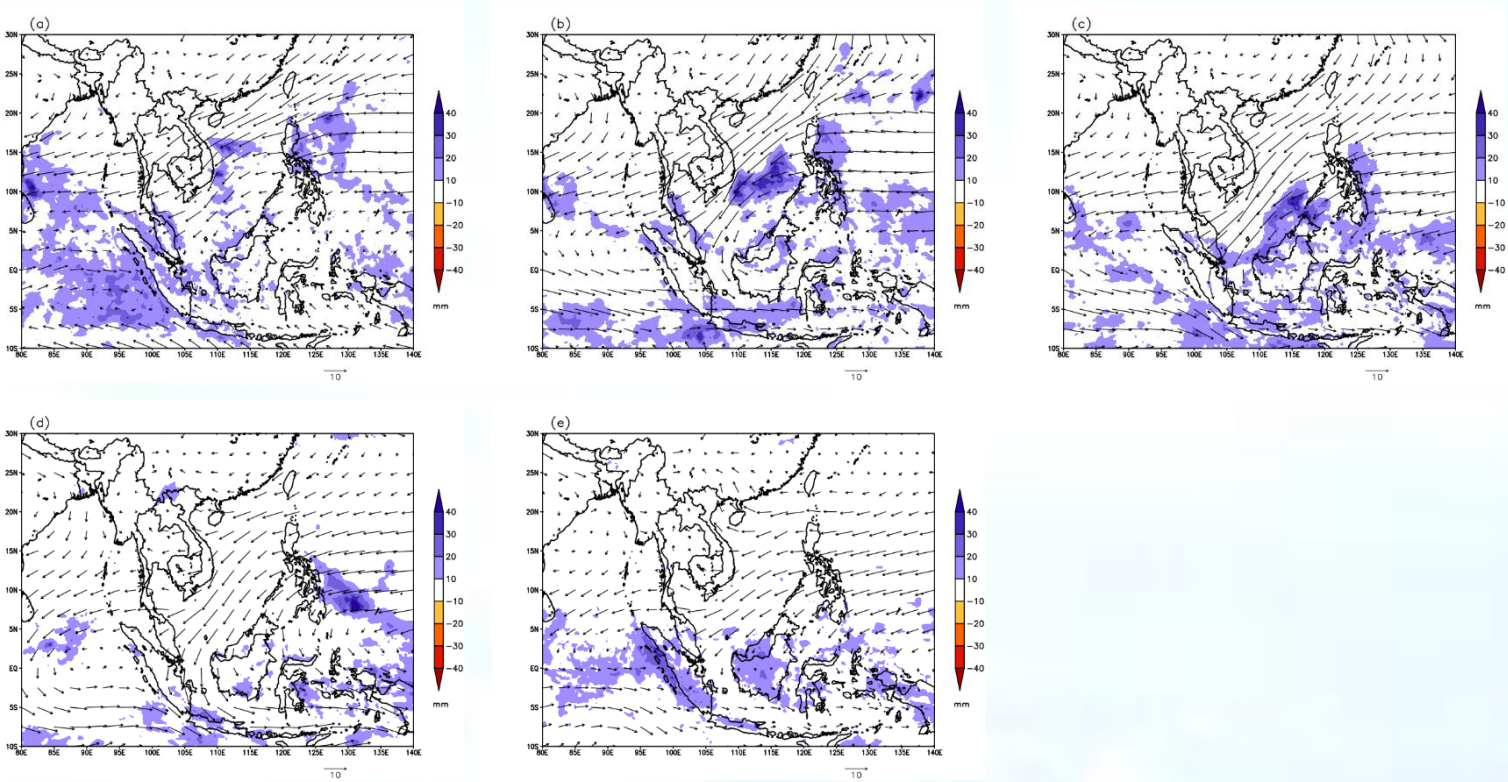

Figure 1: 925-hPa mean wind analysis (vector, ms $^{-1}$) and anomalous monthly rainfall (shaded, mm) for (a) November 2020, (b) December 2020, (c) January 2020, (d) February 2020 and (e) March 2020. Rainfall anomalies represent departures from 2000 to 2020 monthly means

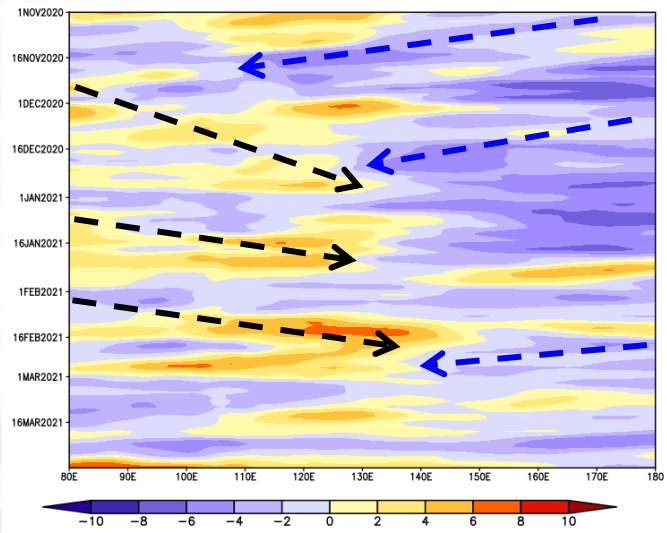

Figure 2: Time-Longitude of Anomalous Zonal Wind (ms $^{-1}$) at 850-hPa average between the Equator to 15 °N. All anomalies represent departures from 1981 to 2010 monthly means

2. Outgoing Longwave Radiation (OLR)

The monthly distributions of Anomalous Outgoing Longwave Radiation (OLR) from November 2020 to March 2021 are represented in **Figure 3**. During November, enhanced convection anomalies (blue shading) were prominent over Borneo, eastern Java and the northern Philippines. The active convection during this period was mostly influenced by the strong easterly wind penetration. As the Siberian High intensified by the end of November, the cold air outbreaks thus strengthen the northeasterly winds and cyclonic vortices over the SCS. This condition resulted in the development of enhanced convection over the MC region during December and January. The enhanced convection during this period also influenced by the active passage of MJO. During February, suppressed convection prevailed over the eastern region of the MC, while enhanced convection prominent over the western region of the MC. This condition continued until March as the enhanced convection was mostly concentrated in the western region of the MC as a result of the strong easterly wind and the weakening of the northeasterly winds.

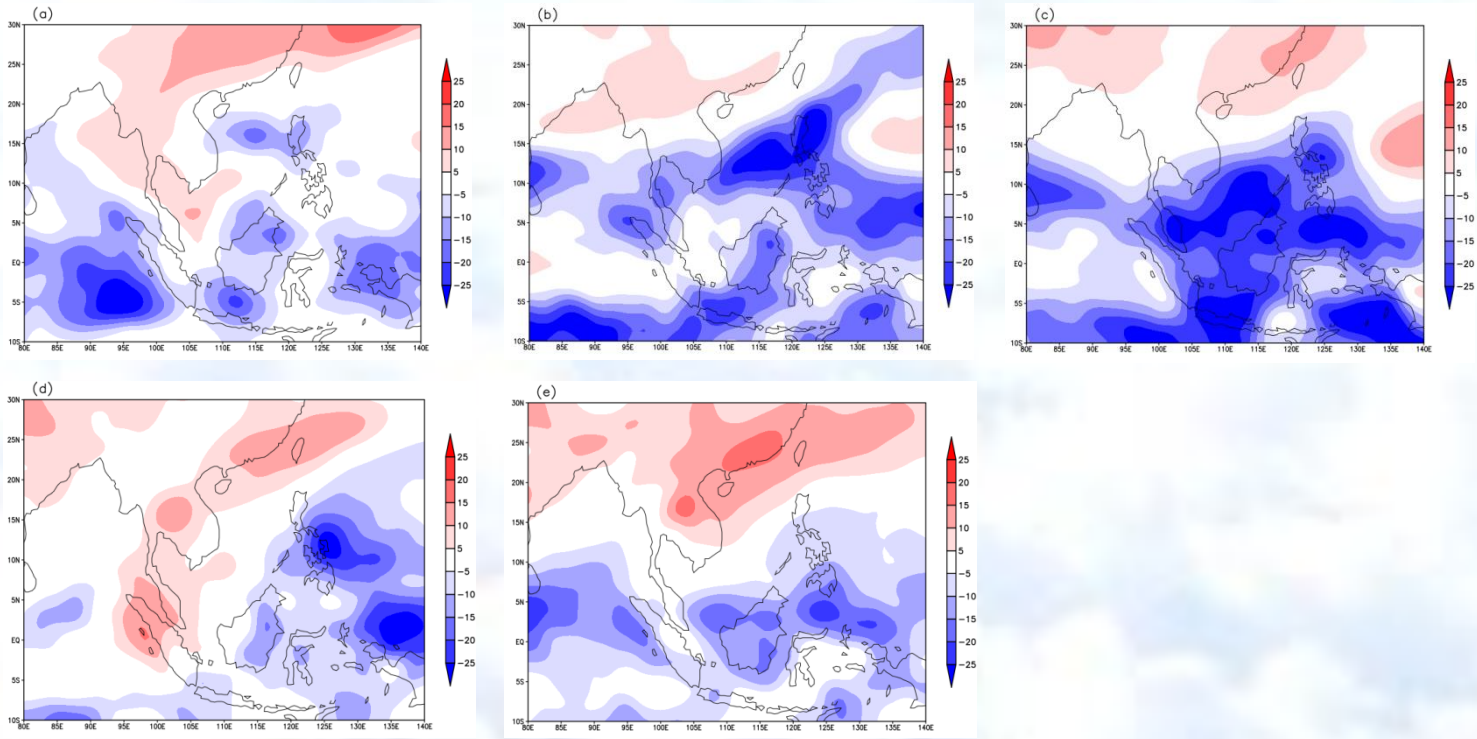

Figure 3: Anomalous OLR analysis (Wm $^{-2}$) for (a) November 2020, (b) December 2020, (c) January 2020, (d) February 2020 and (e) March 2020. All anomalies represent departures from 1981 to 2010 monthly means

The Time-Longitude of anomalous OLR from November 2020 to March 2021 averaged between the Equator and 15 ºN is shown in **Figure 4**. Enhanced convections associated with the propagation MJO (black-dashed line) were seen in the MC region (95 – 125 ºE). In addition to the eastward propagating of the MJO, alternating westward-moving of enhanced convections were also observed in the MC region due to the dissemination of TCs (yellow-dashed line) from WNP to the MC region. As the northeasterly wind weakens during the end of the season, the enhanced convection was influenced by the westward propagating waves which are mostly devised by the strong easterly winds.

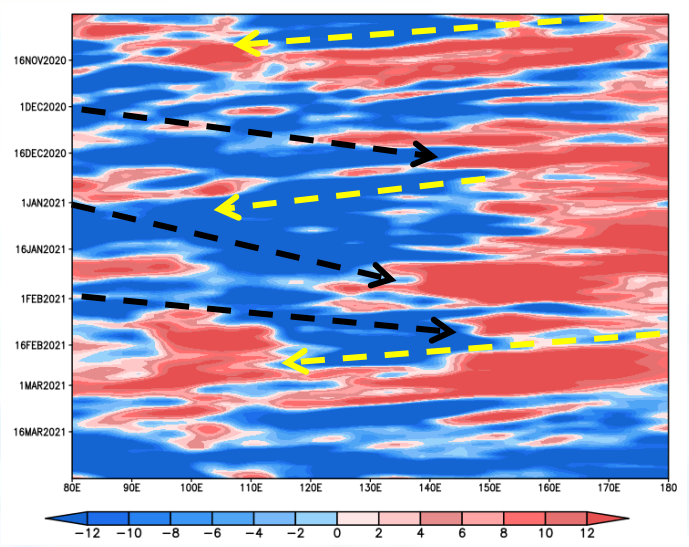

Figure 4: Time-Longitude of Anomalous OLR (Wm $^{-2}$) average between the Equator to 15 °N. All anomalies represent departures from 1981 to 2010 monthly means

3. Weather Outlook from May–June–July 2021

Generally, the southwest monsoon associates with relatively dry weather and less number of rainy days over the MC region. Based on the ASEAN Climate Outlook Forum (ASEANCOF), European Centre of Medium-Range Weather Forecast (ECMWF), UK Met Office and National Centers for Environmental Prediction (NCEP) climate model outlooks, most of the region in the equatorial MC (10 – 20 ºN) are expected to receive slightly above normal rainfall during the Southwest Monsoon 2021 period of May-Jun-July. In the meantime, western Borneo, Java and Papua Islands are expected to experience slightly below normal rainfall. As for Malaysia, slightly below normal rainfall is predicted to occur on the west coast of Peninsular Malaysia and Sarawak during May. Meanwhile, from Jun to July, all states are expected to experience normal rainfall.

(Acknowledgements: The wind and OLR data analyses were utilized using the dataset of the JRA-55 from the Japan Meteorological Agency (JMA), while the rainfall data were obtained from the Global Precipitation Measurement (GPM), the National Aeronautics and Space Administration (NASA)).