

## 1. Review of Regional Weather Conditions for First Fortnight of September 2018

1.1 Southwest Monsoon conditions prevailed in the first fortnight of September 2018. During the period, the monsoon rainband situated between latitudes 5°N and 15°N, brought rainy conditions to the northern ASEAN region. Near- to below normal rainfall was recorded over most parts of the northern ASEAN region, except for parts of Myanmar and southern Viet Nam where above-normal rainfall was received. The northern parts of Philippines received above-normal rainfall, contributed partly by the tropical storm activities during the fortnight.

1.2 In the southern ASEAN region, the incursion of dry air from the southern hemisphere brought dry conditions over most parts of the region. Most parts of the southern ASEAN region experienced below-normal rainfall, except for Peninsular Malaysia and the northern half of Sumatra where near-normal rainfall was received.

1.3 The rainfall distribution and the percent of normal rainfall for the first fortnight of September 2018 are shown in Figure 1 and 2.

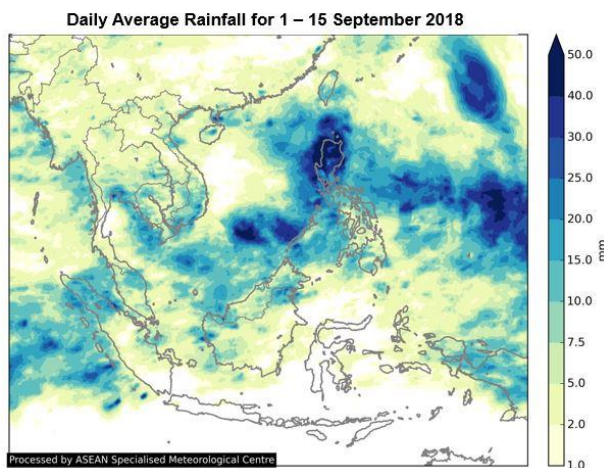


Figure 1: Daily average rainfall for the ASEAN region in the first fortnight of September 2018. (Source: JAXA Global Satellite Mapping of Precipitation)

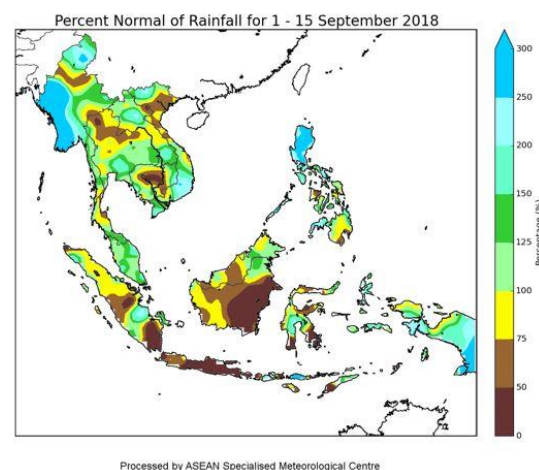


Figure 2: Percentage of Normal Rainfall for 1 – 15 September 2018. The rainfall data may be less representative for areas with a less dense rainfall network. (Source: IRI NOAA/NCEP CPC Unified Precipitation Analyses)

1.4 During the second week of September 2018, Typhoon Mangkhut, developed over the western Pacific Ocean and tracked west to northwestwards toward the Philippines. The storm intensified rapidly into a Super Typhoon and brought heavy rains accompanied by strong winds as it made landfall over Luzon, the Philippines on 15 September 2018. The rainband associated with the Super Typhoon brought wet weather over most parts of the northern ASEAN region, northern Peninsular Malaysia and northern Sumatra.

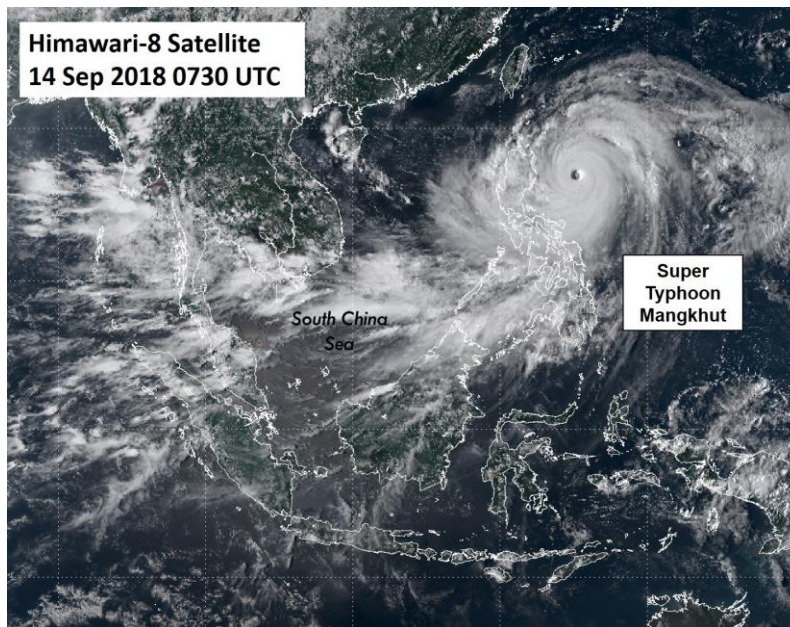


Figure 3: Himawari-8 image on 14 September 2018 shows Super Typhoon Mangkhut over the western Pacific Ocean before it made landfall in the Philippines.

1.5 During the first half of September 2018, anomalous northwesterly winds were observed over southern Thailand and Peninsular Malaysia while over the South China Sea, slightly stronger than usual westerly winds were observed. The anomalous winds were due to the influence of Super Typhoon Mangkhut, as well as Typhoon Jebi (Typhoon Jebi developed in the Pacific Ocean and affected Japan). Figure 4 shows the average and anomalous winds at 5000 feet.

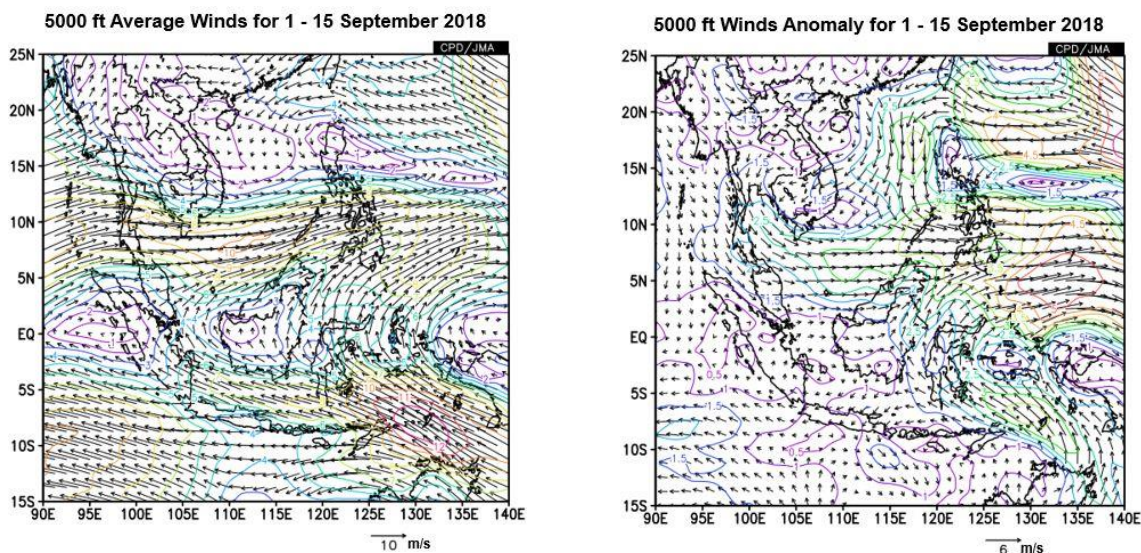


Figure 4: 5000 ft average winds (left) and anomaly (right) for 1 - 15 September 2018. (Source: JMA)

1.6 During the period, the sea surface temperatures were observed to be warmer than average in the central and eastern Pacific Ocean, and the trade winds were observed to be slightly weaker in the western Pacific Ocean. However, the El Niño-Southern Oscillation (ENSO) continued to remain in the neutral state (neither El Niño nor La Niña).

1.7 The Madden Julian Oscillation (MJO)<sup>1</sup> signal was generally weak and non-discernible during the first fortnight of September 2018, and had little or no influence on the weather in the region.

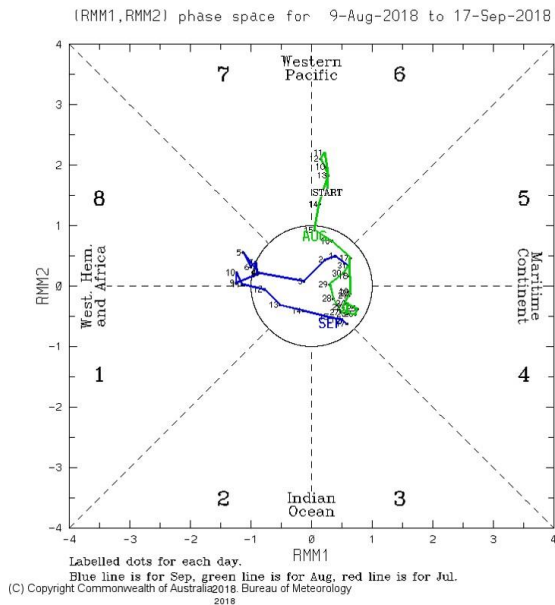


Figure 5: The MJO phase diagram for Sep 2018 (blue). The diagram illustrates the movement of the MJO through different phases, which correspond to different locations along the equator. The distance of the index from the centre of the diagram is correlated with the strength of MJO. When the index falls within the circle, the MJO is considered weak or indiscernible. (Source: Bureau of Meteorology)

## 2. Review of Land/Forest Fires and Smoke Haze Situation

2.1 Rainy weather in the northern ASEAN region helped to keep hotspot activities in the region subdued.

2.2 In the southern ASEAN region, dry air from the southern hemisphere affected the region on some days in the first fortnight of September 2018. In the first week of the fortnight, isolated hotspots with localised smoke plumes were detected mainly in West Kalimantan. In the latter half of the fortnight, the drier weather led to an increase in hotspot activities on some days in Sumatra and Kalimantan. Hotspots with smoke plumes and haze were observed mostly in southern Sumatra and southern and central Kalimantan.

2.3 Figures 6 - 9 show the satellite images over the ASEAN region in the first fortnight of September 2018.

<sup>1</sup> The MJO is characterised by an eastward propagation of clouds and rainfall over the tropics with an average cycle of 30 to 60 days. The MJO is more prominent between the Indian and western Pacific Ocean, and consists of two phases – an enhanced rainfall (convection) phase and a suppressed rainfall phase.

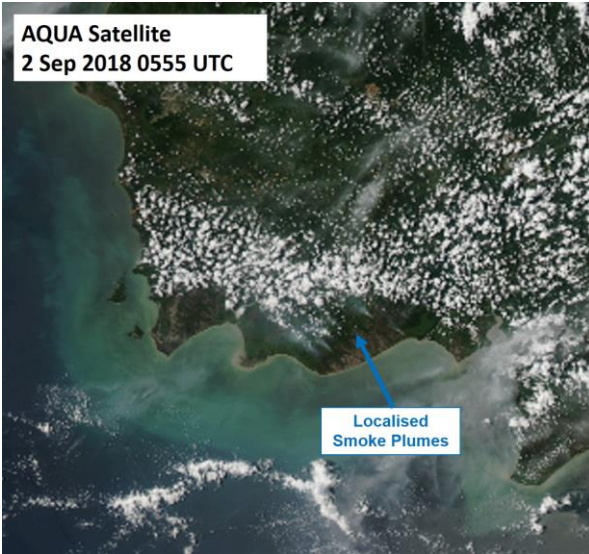


Figure 6: Aqua satellite image on 2 Sep 2018 shows localised smoke plumes in Central Kalimantan.

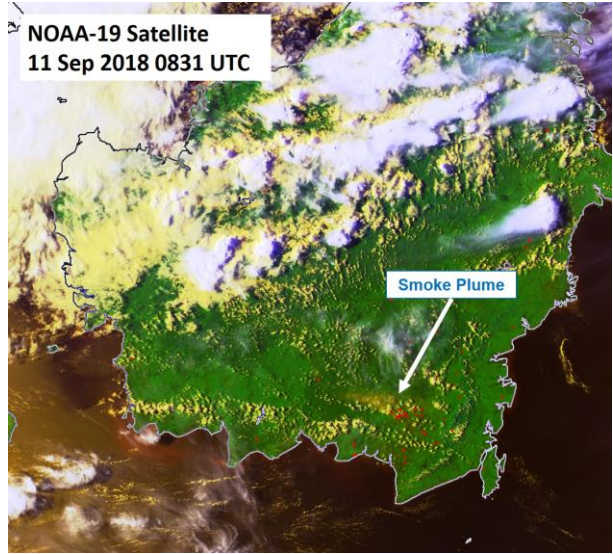


Figure 7: NOAA-19 satellite image on 11 Sep 2018 shows smoke plumes from clusters of hotspots in South Kalimantan.

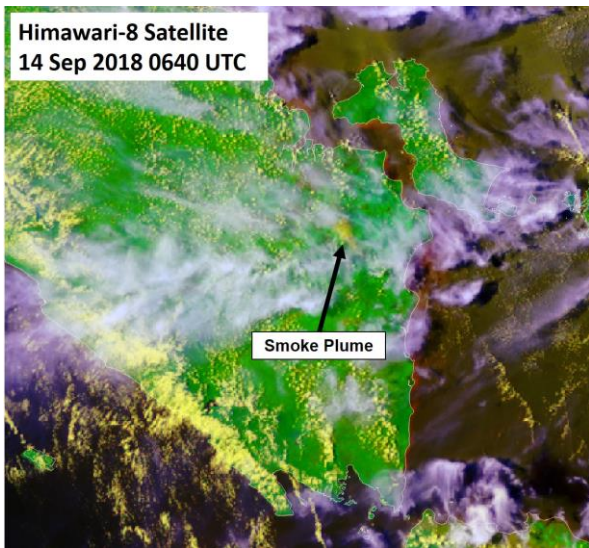


Figure 8: Himawari-8 satellite image on 14 Sep 2018 shows an isolated smoke plumes from hotspots in South Sumatra.

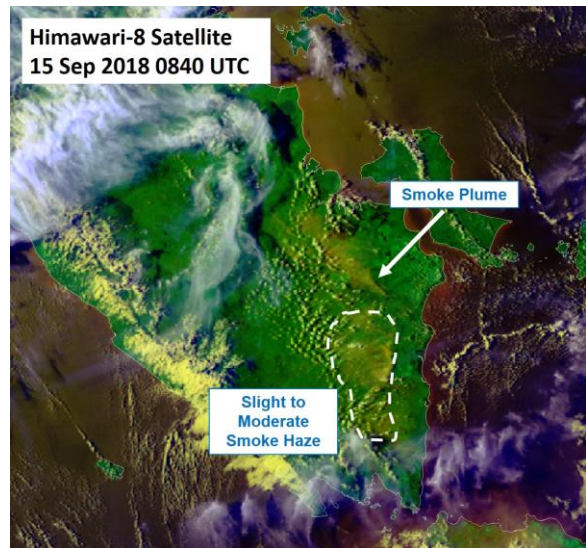


Figure 9: Himawari-8 satellite image on 15 Sep 2018 shows smoke plumes in the provinces of South Sumatra and Lampung.