

Twelfth Session of the ASEAN Climate Outlook Forum (ASEANCOF-12)

**May 2019, Thai Meteorological Department
in collaboration with ASEAN Specialised Meteorological Centre (ASMC)**

Consensus Bulletin for June-July-August (JJA) 2019 Season

INTRODUCTION

The ASEAN Climate Outlook Forum (ASEANCOF) is an avenue to collaboratively develop consensus-based seasonal climate outlooks and related information on a regional scale.

The forum outlook and its activities contribute significantly to one of the key roles of the ASEAN Specialised Meteorological Centre (ASMC), which is to conduct climate and seasonal prediction for ASEAN region through pooling the expertise of ASEAN National Meteorological Services.

The Twelfth ASEANCOF (ASEANCOF-12) was organised by the Thai Meteorological Department in collaboration with Meteorological Service Singapore as host of the ASEAN Specialised Meteorological Centre. Representatives from National Meteorological and Hydrological Services (NMHSs) of ASEAN Member States created a consensus forecast for the Summer Monsoon 2019 in the ASEAN region. The consensus for June-July-August (JJA) 2019 outlooks was achieved through online correspondence. The consensus was made based on completed questionnaires regarding current conditions and predictions for the Southeast Asia region as well as an online discussion. In particular, the forum took into account the significant influence of the El Niño Southern Oscillation (ENSO) and the Indian Ocean Dipole (IOD) on the climate system over Southeast Asia.

CONDITIONS AND OUTLOOK

Recent analysis of Sea Surface Temperature (SST) anomalies over the Equatorial Pacific indicate above average SSTs across most of the Pacific Ocean. Borderline El Niño conditions have been present since SON 2018. The international climate outlooks predict El Niño conditions are likely to continue during JJA 2019. The present neutral Indian Ocean Dipole (IOD) is expected to develop into a positive IOD in JJA 2019 and the later part of the year.

The Summer Monsoon is predicted to be normal throughout Southeast Asia. As such, near normal occurrence of tropical cyclones is expected over the Bay of Bengal. Due to the prediction of a normal Summer Monsoon along with El Niño conditions, the occurrence of tropical cyclones in the Philippines is expected to be below normal.

Taking into consideration the national level forecasts, the present state of the climate, and the forecasts available from GPCs and other global centres, the forum agreed on the following consensus-based outlook for JJA 2019 for the Southeast Asia region:

RAINFALL

For the upcoming Northern Hemisphere Summer Monsoon season (June-July-August), below normal conditions are expected over most parts of the Southeast Asia. However, there is a slightly enhanced probability of wetter than normal conditions over western and southern Myanmar and parts of Sumatra, Northern Celebes, Moluccas, and Papua islands of Indonesia.

TEMPERATURE

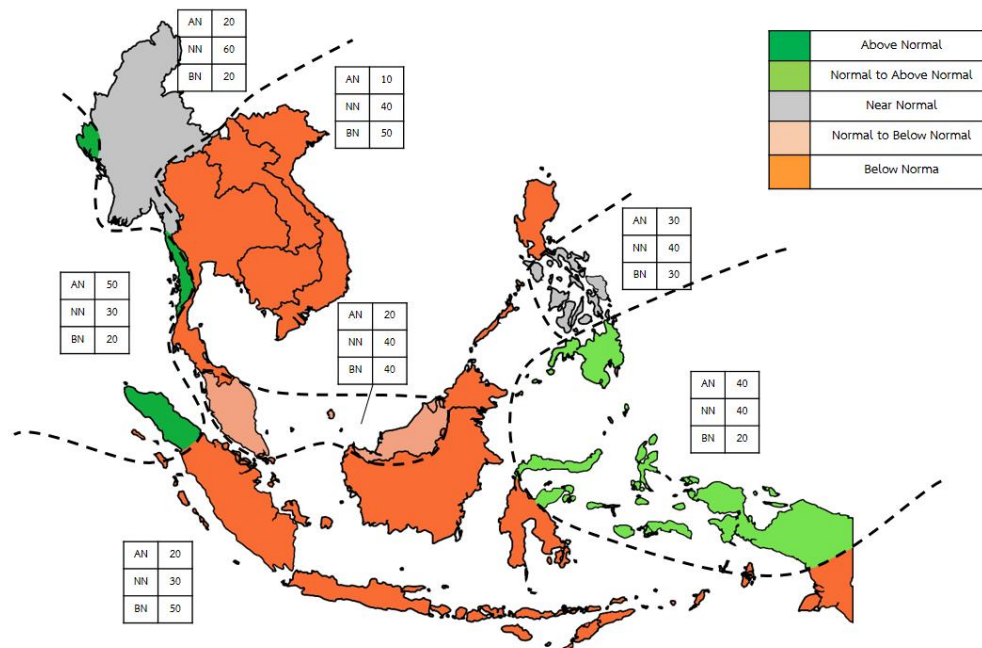
Above normal temperatures are expected over much of central and eastern Southeast Asia, including parts of Peninsular Malaysia, Singapore, central and western Indonesia. Normal to above normal temperature are expected elsewhere, including Philippines, Moluccas and Papua islands of Indonesia.

Refer to **Annex A** for reference on what is meant by “above, near, or below normal” in the outlook. For more information on the Northern Hemisphere Summer Monsoon outlook and further updates on the national scale, the relevant NMSs should be consulted (see **Annex B**).

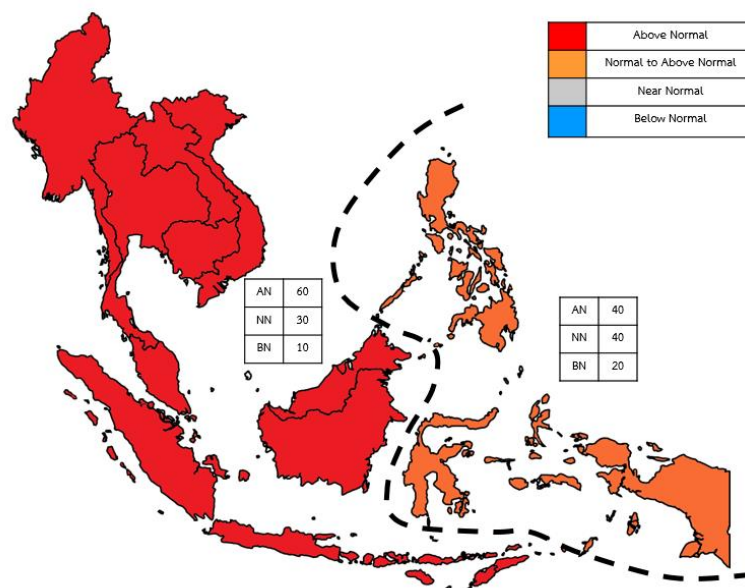
CONSENSUS MAPS FOR JJA 2019

The following maps provide the probabilistic outlooks for JJA 2019 season in terms of tercile categories of “Above Normal” (AN: upper tercile), “Near Normal (NN: middle tercile) and “Below Normal” (BN: lower tercile).

PROBABILISTIC RAINFALL OUTLOOK



PROBABILISTIC TEMPERATURE OUTLOOK



ACKNOWLEDGEMENTS

The Forum would like to convey its appreciation to the National Meteorological Services of the ASEAN Member States for sharing their national-level forecasts, the Global Producing Centres and other participating international climate modelling centres for their products and expertise made available for this Climate Outlook Forum.

ANNEX A: RAINFALL AND TEMPERATURE TERCILE CLIMATOLOGIES

The following figures are rainfall and temperature mean and tercile boundary climatologies to reference against the consensus outlook. Only a single source of data for each variable is provided (ERA-Interim, ECMWF and CHIRPS). For more representative climatologies, reference should be made also against observational datasets known to better characterize local patterns (e.g. quality-controlled station data from the respective National Meteorological Services).

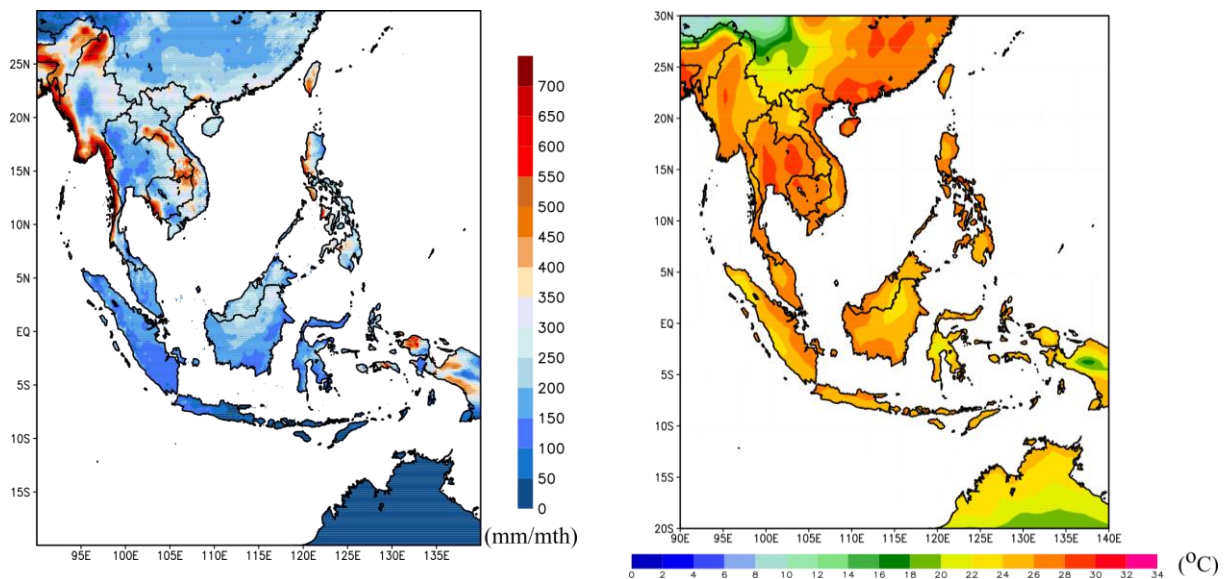


Figure A1: Rainfall mean climatology in mm/month (left, CHIRPS) and the temperature mean climatology (right, ERA-Interim) for JJA from 1981-2010

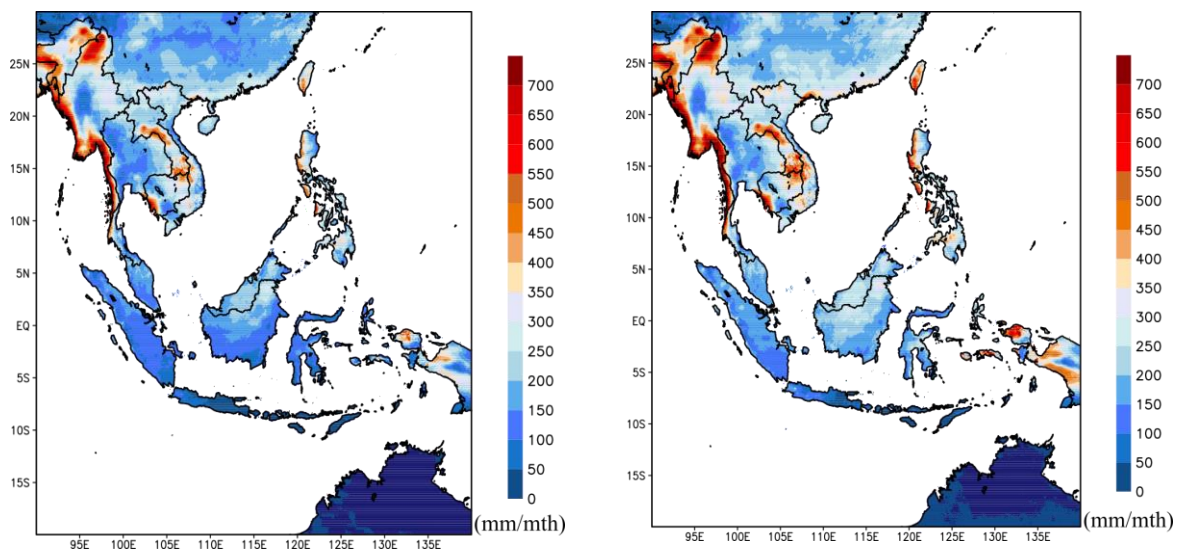


Figure A2: Rainfall climatologies of the lower tercile boundary (left) and the upper tercile boundary (right) for JJA from 1981-2010 from CHIRPS in mm/month

Annex A: Rainfall and Temperature Tercile Climatologies

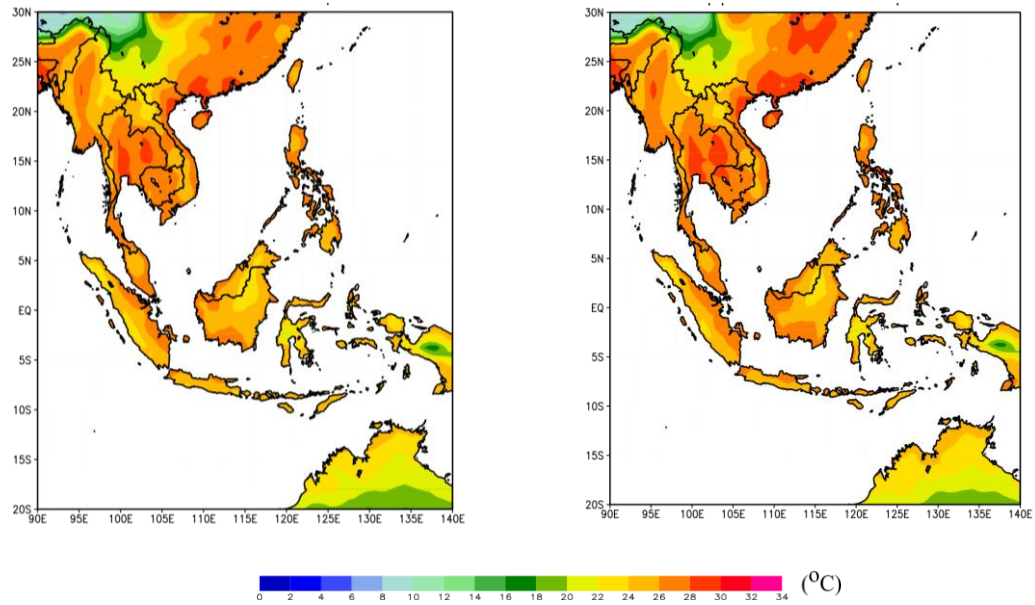


Figure A3: Temperature climatologies of the lower tercile boundary (left) and the upper tercile boundary (right) for JJA from 1981-2010 from ERA-Interim

Annex B: National Meteorological Services' Contact Information

- Brunei Darussalam Meteorological Department (BDMD)

<http://www.met.gov.bn/weather>

- Department of Meteorology, Cambodia

<http://www.cambodiameteo.com/map?menu=3&lang=en>

- Badan Meteorologi, Klimatologi dan Geofisika, Indonesia (BMKG)

<http://www.bmkg.go.id>

- Department of Meteorology and Hydrology (DMH), Lao

<http://dmhlao.etllao.com/>

- Malaysian Meteorological Department (MMD)

<http://www.met.gov.my/>

- Department of Meteorology and Hydrology (DMH), Myanmar

<http://www.dmh.gov.mm/>

**- Philippines Atmospheric, Geophysical and Astronomical Services Administration
(PAGASA)**

<http://www.pagasa.dost.gov.ph/>

- Meteorological Service Singapore Government (MSS)

<http://www.weather.gov.sg/home/>

- Thai Meteorological Department (TMD)

<http://www.tmd.go.th/en/>

- National Center for Hydro-Meteorological Forecasting (NCHMF), Vietnam

<http://www.nchmf.gov.vn/Web/en-US/43/Default.aspx>

ANNEX C: REVIEW OF DJF 2018-19 CONSENSUS OUTLOOK

SUMMARY

The rainfall and temperature outlooks were representative of the actual conditions over most parts of the Southeast Asia. Much of the region experience near-to-above normal temperature and near-to-above normal rainfall, with a few regions also recording below-normal rainfall. Notable events include both droughts and floods, as well as heat waves.

Sea surface temperature (SST) anomalies at the start of the DJF outlook period indicated borderline El Niño conditions over the Equatorial Pacific. During DJF 2018-19, international climate outlooks favoured warm-neutral conditions but the intensity of any El Niño conditions were more likely to be weak than moderate (exceeding approximately 70%) through the Northern Hemisphere winter 2018-19. El Niño is indicated by warmer SSTs over central and eastern tropical Pacific and often leads to dryer conditions for Southeast Asia. In the Indian Ocean, the Indian Ocean Dipole (IOD) was slightly positive, but within the neutral range. During DJF 2018-19, international climate outlooks predicted the IOD to be within the neutral range.

For DJF 2018-2019, the SST anomalies over the central Pacific remained fairly static, indicating borderline El Niño conditions. However, no consistent atmospheric response was seen during most of this period, further supporting either a weak El Niño or neutral conditions. In February, enhanced convection did develop near the dateline, as well as there was a weakening of the trade winds in this region. The IOD remained in the neutral range.

In the sections below, a combination of global gridded data and reviews by National Meteorological and Hydrological Services (NMHSs) was used to verify the outlook.

DJF 2018-19 RAINFALL OUTLOOK

For the upcoming boreal winter monsoon season (Dec-Jan-Feb 2018-2019), above-normal rainfall is favoured over the western and eastern Maritime Continent, central Lao PDR, and upper Thailand. Below-normal rainfall is slightly favoured over part of northern Borneo and northern Lao PDR, southern Vietnam, and Philippines. Elsewhere near-normal rainfall is favoured.

Annex C: Review of DJF 2018-19 Consensus Outlook

Much of the outlook was in good agreement with the CHIRPS gridded product in **Figure 1** including parts of Indonesia, Myanmar, Lao PDR, and Thailand. In particular, central Lao PDR and upper Thailand, received above-normal rainfall. Near-normal conditions were observed over most of Borneo, northern Vietnam, and northern Myanmar which reflected the outlook. However, the Philippines, southern Vietnam, and southern Thailand experienced near-to above-normal rainfall using CHIRPS, contrary to the below normal prediction.

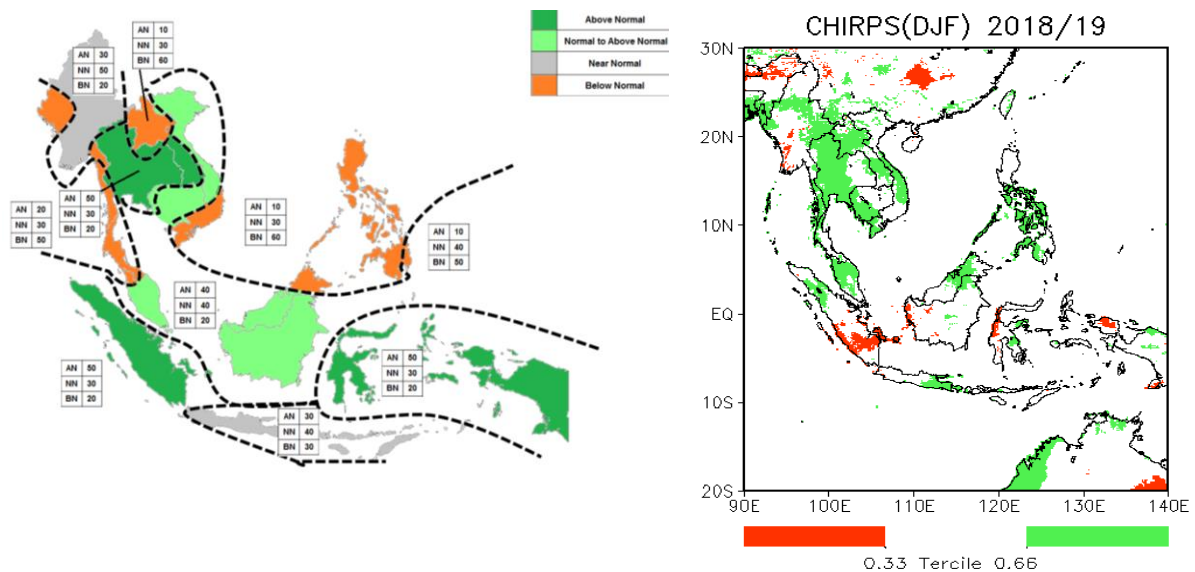


Figure 1: DJF 2018-19 Rainfall outlook (left) with observed rainfall from CHIRPS (right; Funk et al., 2014)

Based on the reviews by NMHSs (**Table 1**), the outlooks were also in good agreement with what was observed over parts of Indonesia (Sumatera, Celebs and Papua), parts of Philippines, Myanmar, and upper Thailand. As was seen using the CHIRPs data, southern Thailand received more rainfall than predicted by the dominant tercile category (**Figure 1** CHIRPS and **Table 1**). However, the national level assessment for the Philippines did observe below-normal rainfall for some regions, which was closer to the rainfall outlook than using the CHIRPS data.

The occurrence of above-normal rainfall over most of Mainland Southeast Asia may be associated with the presence of westerly trough associated with tropical storms. For the regions where predictions favoured near-normal conditions, but the season developed into above- or below normal-conditions, the near-normal predictions were considered low-confidence predictions due to the low probability attached to the middle tercile category.

Annex C: Review of DJF 2018-19 Consensus Outlook

Table 1: Observed Rainfall based on national level assessment. The Most Likely Category from the outlook (MLC), the observed rainfall (observed) and the verification datasets used: weather stations, gridded weather station (Gridded Stations), satellite data (Satellite), and reanalysis data (Reanalysis). The tercile categories are above-normal (AN), near-normal (NN), and below-normal (BN). The qualifier ‘to’ indicates two categories of equal probability (MLC) or occurrence (Observed). Red highlights discrepancy between outlook and observed.

Country	Outlook	Observed	Product used			
			Weather Station	Gridded Stations	Satellite	Reanalysis
Indonesia			Y	Y	Y	N
- Sumatera	AN	AN				
- Java	BN	BN				
- Borneo	AN	BN				
- Celebs	AN	AN				
- Maluku	AN	BN				
- Papua	AN	AN				
Malaysia			Y	N	N	N
- Peninsular	AN/NN	NN				
- Sabah	AN/NN	NN				
- Sarawak	AN/NN	NN				
Myanmar			Y	N	N	N
- Bago	BN	BN				
- kayin	BN	NN				
- The rest of Southern	BN	AN				
- Central	NN	NN				
- Northern	NN	NN				
- Western	BN	BN				
- Eastern	NN	NN				
Philippines			Y	Y	Y	Y
-Luzon	BN	BN in NW of Luzon; NN – AN in central and southern Luzon				
-Visayas	BN	NN				
-Mindanao	BN	BN				
Singapore	AN/NN	BN	Y	N	N	N
Thailand			Y	N	N	N
- Northern	AN	AN				
- Northeastern	AN	AN				
- Central	AN	NN				
- Eastern	AN	NN-AN-BN				
- Southern	BN	AN				

DJF 2018-2019 TEMPERATURE OUTLOOK

Above-normal temperatures are favoured over much of the Southeast Asia region for the upcoming boreal winter monsoon season (Dec-Jan-Feb 2018-19), with the highest probabilities over the eastern Maritime Continent, northern Mainland Southeast Asia, and Sumatra. Near-normal temperatures are favoured over upper Myanmar and southern Vietnam.

Most of Southeast Asia experienced near- to above-normal temperature as depicted in the GHCN-CAMS data (**Figure 2**) and reviews by NMHSs (**Table 2**). The gridded product observed above-normal temperatures over most of the ASEAN regions, except for southern Vietnam and parts of southern Indonesia that experienced below-normal conditions, while Sumatra, northern Myanmar, and northern Borneo experienced near-normal conditions. Based on the national level assessments, Thailand, Lao PDR, northern Vietnam, northern Philippines, Singapore and southern Borneo experienced above-normal temperatures, in agreement with the DJF outlook. The near-normal temperature for most of Myanmar (Table 2) was also in line with the DJF outlook, although the near-normal temperature observed over parts of Indonesia was predicted to have a low probability of occurrence.

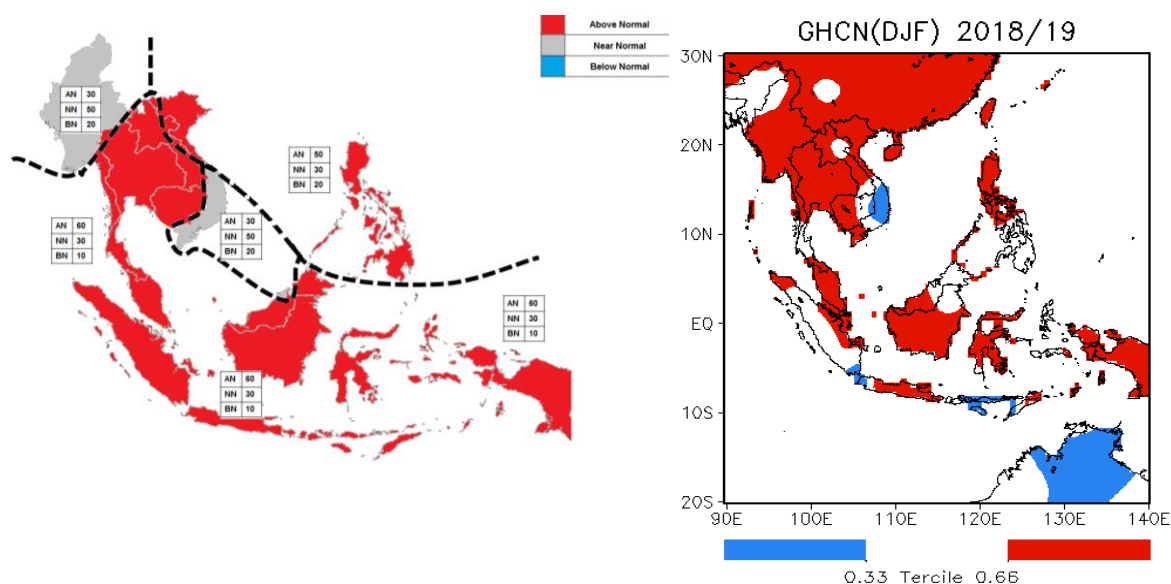


Figure 2: DJF 2018-19 Temperature outlook (left) and observed temperature from GHCN-CAMS (right; Fan, Y., and H. van den Dool., 2008)

Annex C: Review of DJF 2018-19 Consensus Outlook

Table 2: Observed temperature based on national level assessment where applicable. The Most Likely Category from the outlook (MLC), the observed temperature (observed) and the verification datasets used: Weather stations, gridded weather station (Gridded Station), satellite data (Satellite), and reanalysis data (Reanalysis). The tercile categories are above-normal (AN), near-normal (NN) and below-normal (BN). The qualifier ‘to’ indicates two categories of equal probability (MLC) or occurrence (Observed). Red highlights discrepancy between outlook and observed.

Country	Outlook	Observed	Product used			
			Weather Stations	Gridded Stations	Satellite	Reanalysis
Indonesia			N	N	N	Y
- Sumatera	AN	AN				
- Java	NN	NN				
- Borneo	AN	AN				
- Celebs	AN	NN				
- Maluku	AN	NN				
- Papua	AN	NN				
Malaysia			Y	N	N	N
- Peninsular	AN	AN				
- Sabah	AN	AN				
- Sarawak	AN	AN				
Myanmar			Y	N	N	N
- Northern Shan State	NN	AN				
- Shan (Southern & Eastern) State and Yangon Region	NN	BN				
- the rest of Northern	NN	NN				
- Central	NN	NN				
- Western	NN	NN				
- The rest of Southern	AN	AN				
Philippines			Y	Y	N	Y
- NCR	AN	AN				
-Luzon	AN	NN - AN				
-Visayas	AN	NN – AN				
-Mindanao	AN	AN				
Singapore	AN	AN	Y	N	N	N
Thailand	AN	AN	Y	N	N	N

SIGNIFICANT EVENTS

Notable events that occurred during DJF 2018-19 in the Southeast Asia include warmer than normal temperature in Singapore with the second and third warmest January and February, respectively since 1929, while Malaysia experienced a heat wave in February 2019. Droughts were found in Malaysia for the months of January and February 2019 and the Philippines in February was affected by a meteorological dry spell and meteorological drought. There were floods in Indonesia: East Java and Sumatra provinces in December 2018, and South Sulawesi province in February 2019. Besides these floods, Southern Luzon and Eastern Visayas in the Philippines received heavy rainfall from tropical depression “Usman”, which caused floods and landslides in December 2018. Meanwhile, the tropical storm “Pabuk” made landfall in southern part (Thailand peninsula) and crossed southern Thailand in January 2019 and brought torrential rain, squall inducing flash flooding and storm surge in coastal areas.

REFERENCES

CHIRPS: Funk, C. C, Peterson, P. J., Landsfeld, M. F., Pedreros, D. H., Verdin, J. P., Rowland, J. D., Romero, B. E., Husak, G. J. Michaelsen, J. C., and Verdin, A. P. (2014) A quasi-global precipitation time series for drought monitoring: U. S. Geological Survey Data Series 832, 4 p., dx.doi.org/10.3133/ds832.

GHCN-CAMS: Fan Y., H. van den Dool (2004), Climate Prediction Center global monthly soil moisture data set at 0.5° resolution for 1948 to present, J. Geophys. Res., 109, D10102, [doi:10.1029/2003JD004345](https://doi.org/10.1029/2003JD004345).

GHCN-CAMS: Fan, Y., and H. van den Dool (2008), A global monthly land surface air temperature analysis for 1948-present, J. Geophys. Res., 113, D01103, [doi:10.1029/2007JD008470](https://doi.org/10.1029/2007JD008470).