Eleventh Session of the ASEAN Climate Outlook Forum (ASEANCOF-11)

October 2018, Malaysian Meteorological Department in collaboration with the ASEAN Specialised Meteorological Centre.

Consensus Bulletin for December-January-February (DJF) 2018-19 Season

INTRODUCTION

The Eleventh ASEAN Climate Outlook Forum (ASEANCOF-11) was held in Kuala Lumpur, Malaysia from 29 October – 01 November 2018. This forum was organised by the Malaysian Meteorological Department in collaboration with the ASEAN Specialised Meteorological Centre (ASMC). The ASEANCOF was started in 2013, as part of the World Meteorological Organisation/Climate Information and Prediction Services (WMO/CLIPS) project for Regional Climate Outlook Forum (RCOFs) in cooperation with National Meteorological and Hydrological Services (NMHSs). It is a platform for regional NMHSs and international partners such as the WMO Global Producing Centres (GPCs) to collaboratively develop a consensus-based seasonal climate outlook and related information on a regional scale. It also provides an avenue for NMHSs to share best practices and get updated on the latest scientific advances in seasonal predictions. The ASEANCOF-11 event was co-funded by the ASEAN Science Technology and Innovation Fund (ASTIF), World Meteorological Organization (WMO) through its partners, and Malaysian Meteorological Department.

The forum's outlook and activities contribute significantly to one of the key roles of the ASMC, which is to conduct climate and seasonal prediction for ASEAN region through pooling the expertise of ASEAN NMHSs. The Forum also supports the activities of the Southeast Asia Regional Climate Centre Network (SEA RCC-Network) – which entered the demonstration phase on 7 November 2017 – by providing the consensus outlook as well as the platform to discuss issues on provision of climate services in the Southeast Asia region.

The forum was attended by representatives from the region's NMHSs, i.e. Brunei, Indonesia, Lao, Malaysia, Myanmar, Philippines, Singapore, Thailand, and Vietnam who presented on their national rainfall and temperature outlook for the upcoming December 2018 – February 2019 (DJF 2018-19) boreal winter monsoon season. The NMHSs were joined by experts from the Bureau of Meteorology, Australia (BoM), China Meteorological Administration (CMA), European Centre for Medium-range Weather Forecast (ECMWF), Japan Meteorological Agency (JMA), UK MetOffice (UKMO), and the WMO Lead Center for Long Range Forecast

Multi-Model Ensemble (WMO LC-LRFMME), who presented on the regional outlook from their respective models. To provide scientific basis for the outlook of DJF 2018-19, the Forum also assessed the various global and regional climatic factors that influence the DJF season in the area. In particular, the Forum took into account the influence on the climate over Southeast Asia from the El Niño Southern Oscillation (ENSO), the Indian Ocean Dipole (IOD), tropical cyclones, and the monsoon circulation patterns.

Three regional end-user agencies from the water resources management and agricultural sectors were also invited, namely, the ASEAN Hydroinformatics Data Centre (AHC), the International Rice Research Institute (IRRI), and the Mekong River Commission (MRC). The agencies shared on their activities that serve the respective communities and, in line with this year's meeting theme, they shared on their requirements for seasonal predictions and monitoring of extreme weather and climate.

CONDITIONS AND OUTLOOK

The ENSO was in warm-neutral conditions in late October 2018. There is a 70% chance for an El Niño event to develop in the season DJF 2018-19 but its intensity is unlikely to be strong, and more likely to be weak than moderate. The Indian Ocean Dipole (IOD) index was also slightly positive (warmer western Indian ocean SST, and cooler eastern Indian Ocean SST). But the IOD is predicted to be neutral in DJF 2018-19.

For monsoon activity, due to warmer conditions predicted over East Asia in the DJF 2018-19 season, a weaker high pressure system is generally expected and consequently may result in weaker northeast monsoon winds. This coupled with potential changes in the Walker Circulation due to El Niño, convective rainfall activity is expected to be relatively suppressed in general for the region in DJF 2018-2019. Typically, during El Niño events, tropical cyclone activity in the Southwest Pacific tends to be less active (less frequent). However, as the El Niño event is not expected to be a strong one, and models are not showing significantly reduced tropical cyclone activity in the DJF 2018-19; a near-normal situation is more likely.

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 DJF 2018-19 for the Southeast Asia region:

RAINFALL

For the upcoming boreal winter monsoon season (DJF 2018-19), below-normal conditions are favoured over parts of the Philippines, southern Vietnam, northern Laos, central and southern Myanmar, southern Thailand, and northern Borneo. Elsewhere near- to above-normal rainfall conditions are favoured, with relatively less confident probabilities.
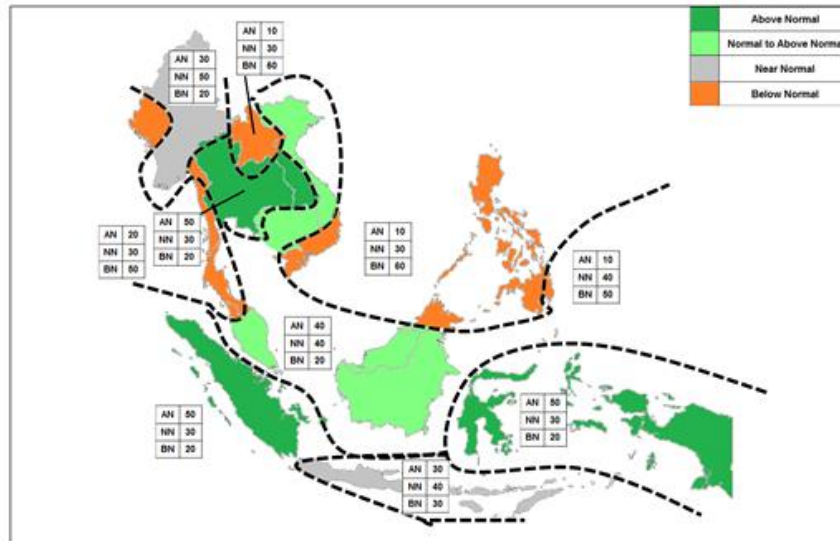
TEMPERATURE

Above-normal temperatures are favoured over much of the Southeast Asia region for the upcoming boreal winter monsoon season (DJF 2018-19). Near-normal to above-normal temperatures are favoured over southern Vietnam, Brunei, and northern-central Myanmar.

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 winter monsoon outlook and further updates on the national scale, the relevant NMHSs should be consulted (see **Annex B**).
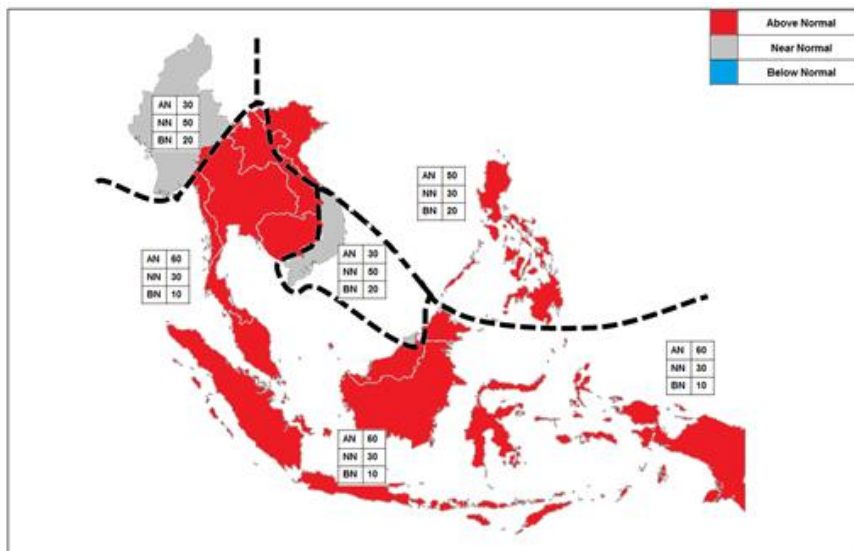
CONSENSUS MAPS FOR DJF 2018-19

The following maps provide the probabilistic outlooks for DJF 2018-19 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. The Forum would also like to thank the ASEAN Secretariat, the WMO Secretariat, and the local organising committee from MMD for the administrative and funding support provided to the meeting.

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 (CRU, UEA). 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).
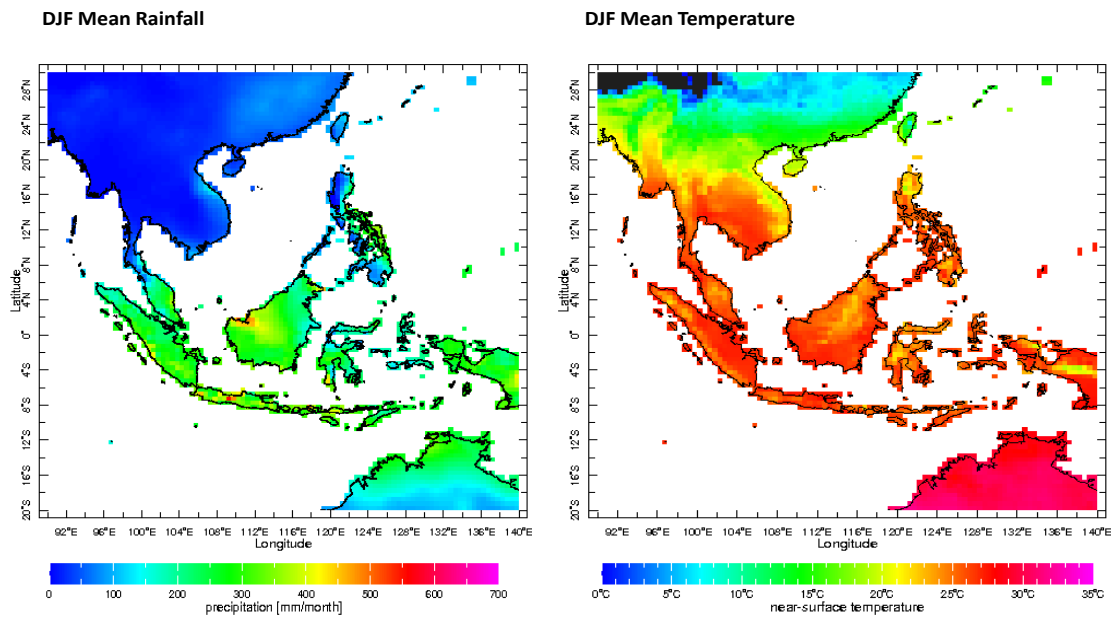

Figure A1: Rainfall mean climatology in mm/month (left) and the temperature mean climatology in degrees Celsius (right) for DJF from 1981-2010 from TS3p22 (CRU, UEA).

DJF Lower Tercile Rainfall ("Below Normal")   DJF Upper Tercile Rainfall ("Above Normal")
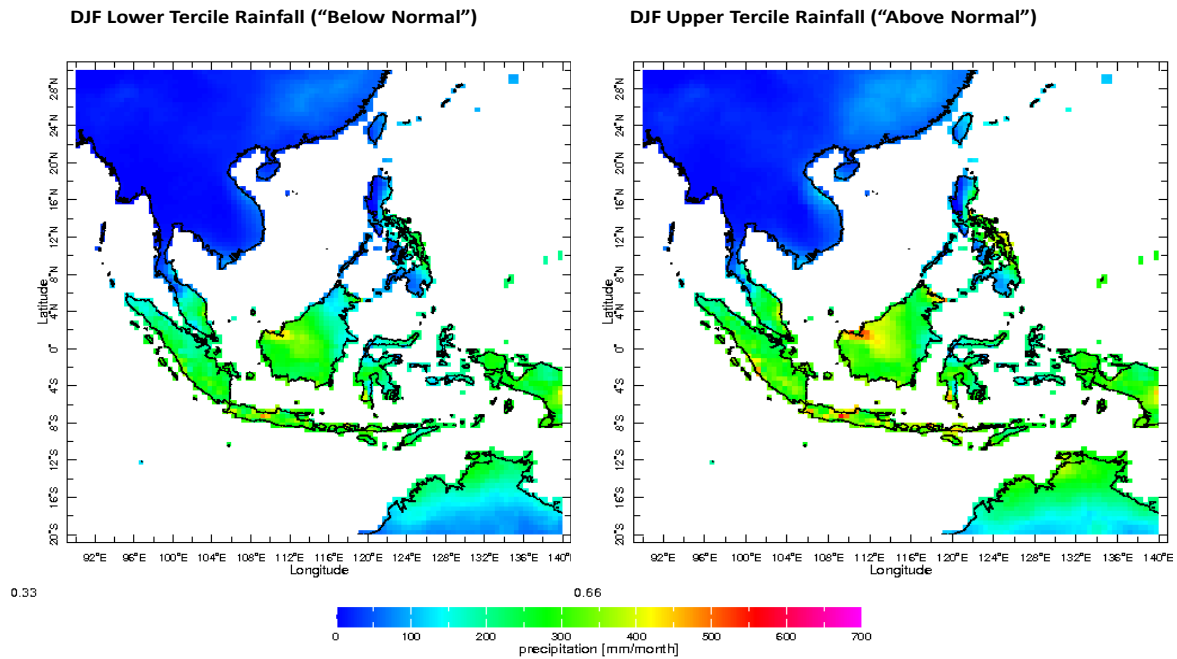
Figure A2: Rainfall climatologies of the lower tercile boundary (left) and the upper tercile boundary (right) for DJF from 1981-2010 from TS3p22 (CRU, UEA) in mm/month

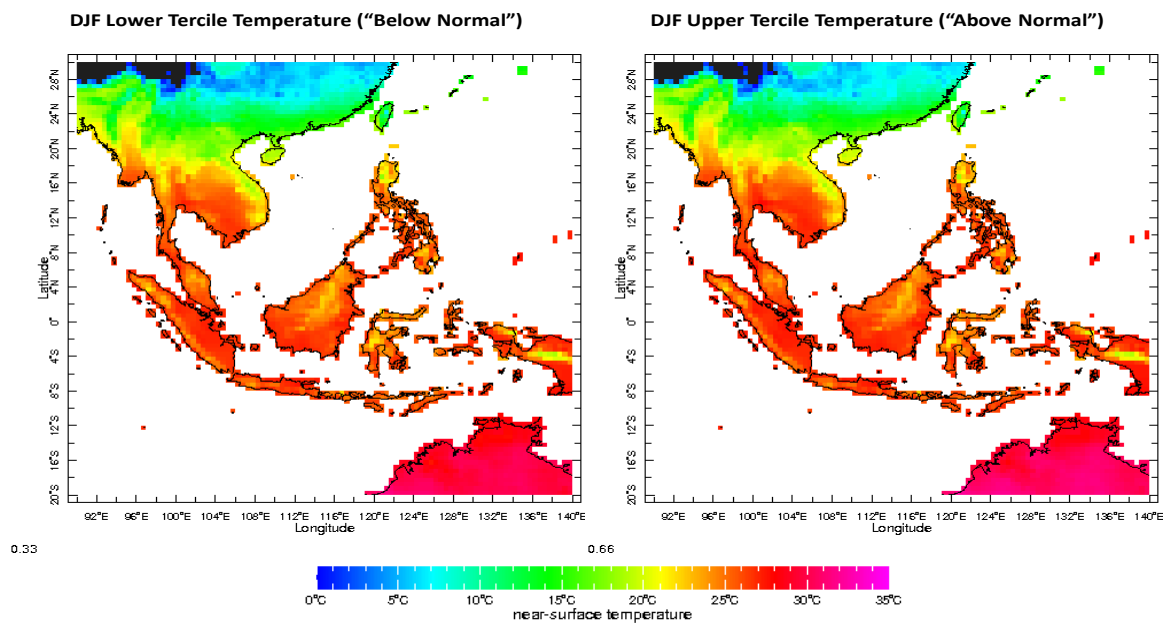DJF Lower Tercile Temperature ("Below Normal")   DJF Upper Tercile Temperature ("Above Normal")

Figure A3: Temperature climatologies of the lower tercile boundary (left) and the upper tercile boundary (right) for DJF from 1981-2010 from TS3p22 (CRU, UEA).

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 JJA-2018 CONSENSUS OUTLOOK

SUMMARY

Sea surface temperature (SST) anomalies at the start of the outlook period indicated ENSO neutral conditions over the Tropical Pacific Ocean. During JJA 2018, international climate outlooks showed ENSO-neutral conditions were present and likely to continue. In the Indian Ocean, the Indian Ocean Dipole (IOD) was within the neutral range, and expected to continue towards the later part of the year.

The Southwest Monsoon was predicted to be generally normal throughout Southeast Asia. As such, the occurrence of five to seven tropical cyclones was expected over the Philippines. Likewise, near-normal occurrence of tropical cyclones was also expected over the Bay of Bengal. Elsewhere, the occurrence of Squalls was favoured during this period.

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 outlooks for JJA 2018 for the Southeast Asia region in italics. A combination of gridded data and reviews by National Meteorological and Hydrological Services were used to verify these outlooks.

JJA 2018 RAINFALL OUTLOOK

For the upcoming Northern Hemisphere summer monsoon season (June-July-August), normal conditions are expected over most parts of the Southeast Asia. However, there is a slightly enhanced probability of wetter than normal conditions over coastal Myanmar and central Philippines.

There were variations between the observed rainfall in **Figure 1** (right) with the rainfall outlook (left). From the CHIRPS dataset, much of Laos PDR, Vietnam and northern Philippines received above-normal rainfall. Drier than expected conditions occurred in Peninunsular Malaysia, northern Sumatra, the southernmost region of Indonesia, as well as southern Cambodia and Vietnam. There was good agreement between the outlook and the CHIRPS dataset for some regions, however, including central regions of Indonesia, coastal Myanmar, and parts of Borneo.
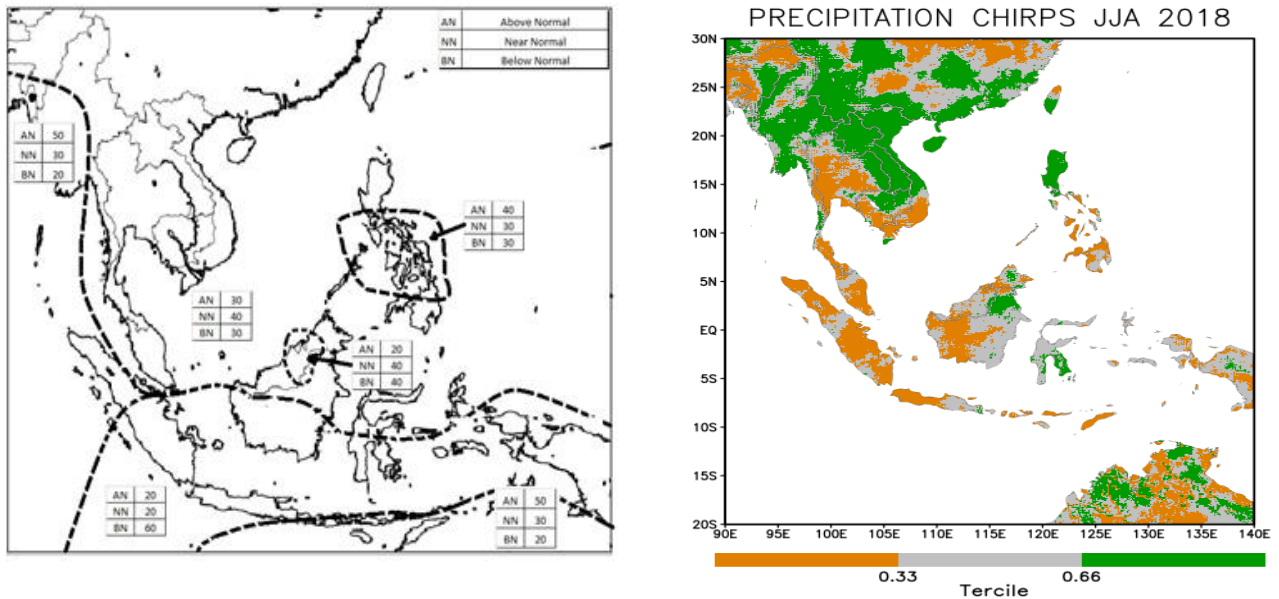
Figure 1: JJA 2018 Rainfall outlook (left) with observed rainfall from CHIRPS (right; Funk et al., 2014)

Based on the reviews by NMHSs (**Table 1**), the outlooks were in good agreement with what was observed over Brunei, Malaysia, Myanmar, Philippines, and Singapore. A few regions received more rainfall than predicted by the dominant tercile category, including Vietnam, Lao PDR, and parts of Thailand.

The occurrence of above-normal rainfall over northern Mainland Southeast Asia (Figure 1 CHIPRS and Table 1) may be associated with the presence of strong Southwest Monsoon and low pressure system. 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.

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 MLC	Observed	Product used			
			Weather Stations	Gridded Stations	Satellite	Reanalysis
Brunei	NN to BN	BN	Y	N	N	N
Lao PDR	NN	AN	Y	N	N	N
Malaysia						
Peninsular	NN	NN				
			Y	N	N	N
East Malaysia						
-West	NN	NN				
-Central of Borneo	NN to BN	BN				
-East	NN	NN				
Myanmar						
-Northern	NN	NN	Y	N	N	Y
-Central	NN	NN				
-Southern	AN	AN				
Philippines						
-Northern	NN	NN				
-Central	AN	AN	Y	y	N	Y
-Southern	NN	NN				
Singapore	NN	NN	Y	N	N	N
Thailand						
-Central Northern	NN	BN	Y	N	Y	Y
-Rest part	NN	AN				
-Southern	NN	BN				
Vietnam						
-Northern	NN	AN	Y	N	N	N
-Central	NN	AN				
-Southern	NN	AN				

JJA 2018 TEMPERATURE OUTLOOK

Above-normal temperatures are expected over much of central and eastern Southeast Asia, including parts of Peninsular Malaysia, Singapore, northern Borneo, central and southern Philippines, and eastern Indonesia. Near-normal temperature are expected elsewhere, including over Mainland Southeast Asia.

The Southeast Asia region experienced normal- to above-normal temperature as depicted in the ERA Interim data gridded product and generally consistent with the JJA 2018 Temperature Outlook (**Figure 2**). However, the location of the above- and near-normal temperatures

differed between the observations and the outlook, as well as between the two observation sources (ERA-Interim and NMHS reviews in Table 2). In particular, the gridded product indicated above-normal temperatures over most of the ASEAN region, except for central parts of Thailand, southern Myanmar and parts of the Philippines, which experienced near-normal temperatures. However, based on national level assessments (**Table 2**), fewer regions experienced above-normal temperature. From Table 2, Brunei, Singapore, and southern Vietnam also experienced near-normal temperatures, while central and southern Lao PDR and parts of the Philippines recorded below-normal temperatures.
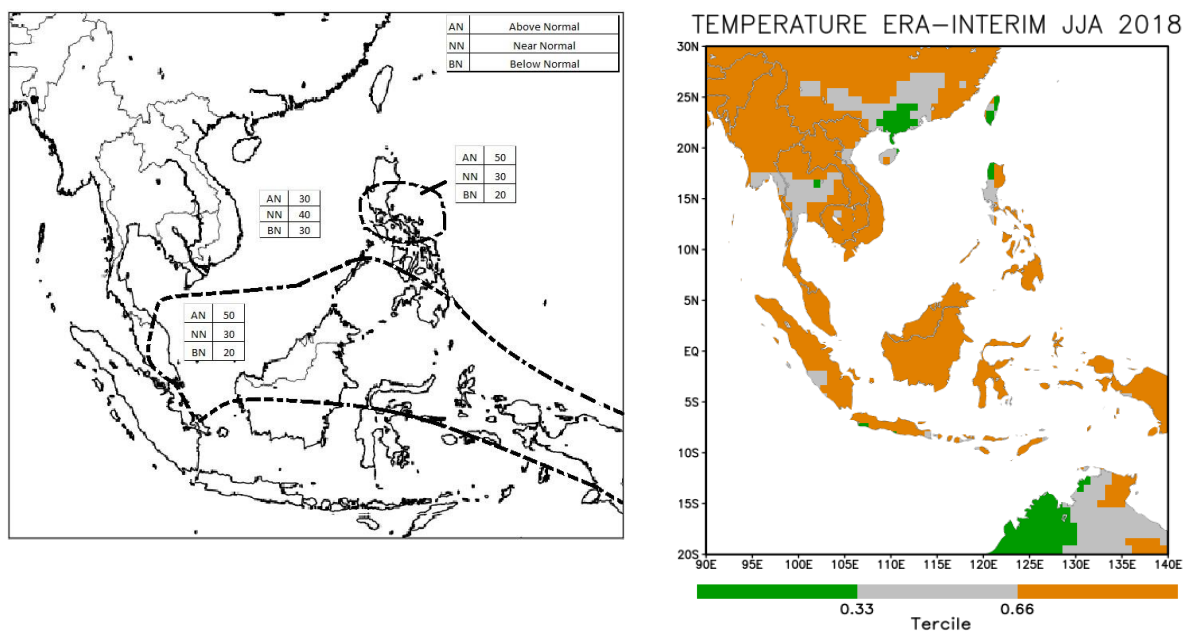

Figure 2: JJA 2018 Temperature outlook (left) and observed temperature from ERA Interim (right; Dee et al., 2011)

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' indicate two categories of equal probability (MLC) or occurrence (Observed). Red highlights discrepancy between outlooks and observed.

Country	Outlook MLC	Observed	Product used			
			Weather Stations	Gridded Station	Satellite	Reanalysis
Brunei	AN	NN	Y	N	N	N
Indonesia						
-Java	NN	-	Y	N	N	N
-Rest	NN	-				
Lao PDR						
-Northern	AN	AN	Y	N	N	N
-Central	AN	BN				
-Southern	AN	BN				
Malaysia						
-East Peninsular	AN	AN	Y	N	N	N
-West Peninsular	NN	NN				
-East Malaysia	AN	AN				
Myanmar						
-Northern	NN	-	Y	N	N	Y
-Central	NN	-				
-Southern	NN	-				
Philippines						
-Northern	NN	BN-NN	Y	Y	N	Y
-Central	AN	BN-NN				
-Southern	NN	BN-NN				
Singapore	AN	NN	Y	N	N	N
Thailand	NN	NN	Y	N	Y	Y
Vietnam						
-Northern	NN	AN	Y	N	N	N
-Central	NN	AN				
-Southern	NN	NN				

* Blue color indicates that temperature is not monitored at the national level

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/110.3133/ds832.

ERA Interim: Dee, D. P., Uppala, S. M., Simmons, A. J., Berrisford, P., Poli, P., Kobayashi, S., Andrae, U., Balmaseda, M. A., Balsamo, G., Bauer, P., et al. (2011), The ERA-Interim reanalysis: configuration and performance of the data assimilation system. Q.J.R. Meteorol. Soc., 137: 553–597. doi:10.1002/qj.828.