This project was undertaken with the financial support of:
Ce projet a été réalisé avec l'appui financier de :

Environment and Climate Change Canada | Environnement et Changement climatique Canada

NINTH SESSION OF THE ASEAN CLIMATE OUTLOOK FORUM (ASEANCOF-9)

CONSENSUS BULLETIN FOR DECEMBER-JANUARY-FEBRUARY (DJF) 2017-2018 SEASON

INTRODUCTION

The Ninth ASEAN Climate Outlook Forum (ASEANCOF-9) was held in Hanoi, Vietnam from 15-17 November 2017. The Forum was organised by the National Hydro-Meteorological Service of Viet Nam (NHMS) in cooperation with the ASEAN Specialised Meteorological Centre (ASMC). The Environment and Climate Change Canada (ECCC) provided financial support for the Forum through its funded project: "Building Resilience to High-Impact Hydrometeorological Events through Strengthening Multi-Hazard Early Warning Systems in Small Island Developing States (SIDS) and Southeast Asia (SEA)". The event was co-funded by the World Meteorological Organization (WMO) and NHMS Viet Nam.

The Forum was attended by representatives of the National Meteorological and Hydrological Services (NMHSs) of Indonesia, Lao, Malaysia, Myanmar, Philippines, Singapore, Thailand, and Vietnam who discussed on the consensus outlook. They were joined by experts from the Bureau of Meteorology, Australia (BoM), European Centre for Medium-range Weather Forecast (ECMWF), International Research Institute for Climate and Society (IRI), Korea Meteorological Administration (KMA), and the WMO Lead Center for Long Range Forecast Multi-Model Ensemble (WMO LC-LRFMME). Seasonal climate outlooks from the Japan Meteorological Agency (JMA) and UK MetOffice (UKMO) was presented by ASMC on their behalves.

The Forum also reviewed the present climate conditions in the Southeast Asia region, and discussed the various global and regional climatic factors that will influence the DJF season in the area. In particular, the Forum took into account the influence of the El Niño Southern Oscillation

(ENSO), the Indian Ocean Dipole (IOD), as well as tropical cyclones and monsoon activities on the climate over Southeast Asia.

The ASEANCOF is an avenue to collaboratively develop a consensus-based seasonal climate outlook 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 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.

CONDITIONS AND OUTLOOK FOR DJF 2017-2018

Sea surface temperature (SST) over the tropical Pacific Ocean is currently cool (negative anomaly) with La Niña like or borderline conditions. Atmospheric indicators of ENSO conditions (e.g. the Southern Oscillation Index, SOI) are broadly within neutral at the moment.

> *Chance of a weak La Niña forming in late 2017 of at least 60%, around double the normal likelihood for La Niña. If it forms, the event is not expected to last beyond March 2018.*

However, models suggest the tropical Pacific Ocean will continue to cool. There is chance of a weak La Niña forming in late 2017 of at least 60%, around double the normal likelihood for La Niña. If it forms, the event is not expected to last beyond March 2018. While varying in local impacts, La Niña events are generally associated with wetter-than-average rainfall conditions over the ASEAN region, especially in the southern and eastern halves of the region.

The IOD index was recently slightly positive (warmer western Indian Ocean SST, and cooler eastern Indian Ocean SST) but is predicted to be neutral in DJF 2017-2018. The monsoon trough will be active in the south of Vietnam and over the Philippines for DJF 2017-2018. Thus more convective rainfall and tropical storms activities are expected there.

Taking into consideration the present status of the climate conditions affecting Southeast Asia, the forecasts available from the GPCs and other global centres, and the national-level assessment from the NMHSs, the Forum agreed on the following consensus-based outlook for the DJF 2017-2018 season for Southeast Asia.

RAINFALL

For the upcoming boreal winter monsoon season (Dec-Jan-Feb 2017-2018), above normal rainfall is favoured over the eastern Maritime Continent, southern Vietnam, and central and southern Thailand. Below normal rainfall is slightly favoured over western Borneo and northern Mainland Southeast Asia. Elsewhere near normal rainfall is favoured.

TEMPERATURE

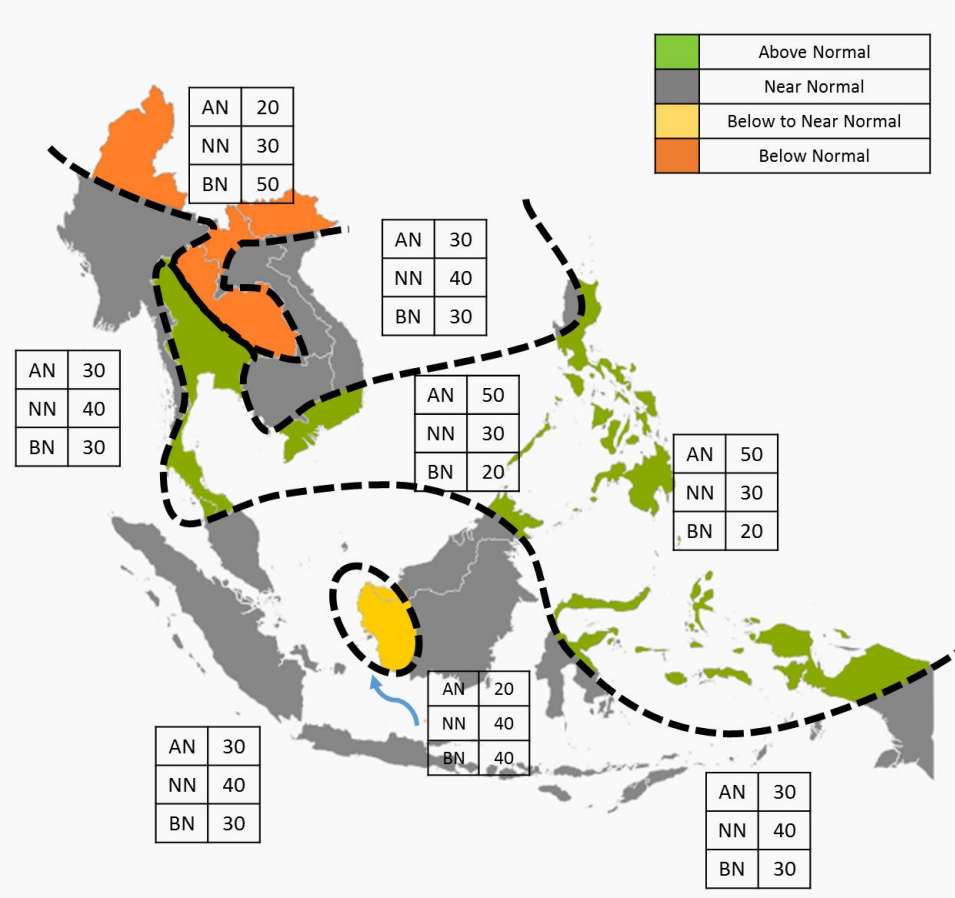
Above normal temperatures are favoured over much of the Southeast Asia region for the upcoming boreal winter monsoon season (Dec-Jan-Feb 2017-2018), with the highest probabilities over the eastern Maritime Continent, northern Mainland Southeast Asia, and Sumatra. Below normal temperatures are favoured over northern Philippines and southern Vietnam.

Refer to Annex A for reference values of "above, near, or below normal" in the outlook. For more information on the boreal winter monsoon outlook and further updates on the national scale, the relevant NMHSs should be consulted (see Annex B). The review for the JJA 2017 consensus outlook from ASEANCOF-8 session is included in Annex C.

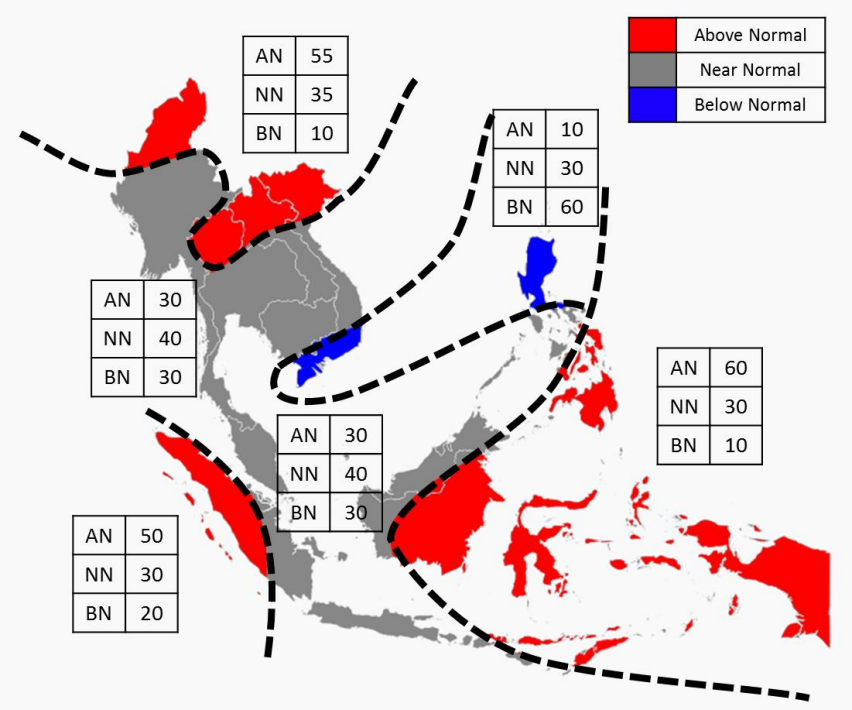
CONSENSUS MAPS FOR DJF 2017-2018

The following maps provides the probabilistic outlooks for DJF 2017-2018 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



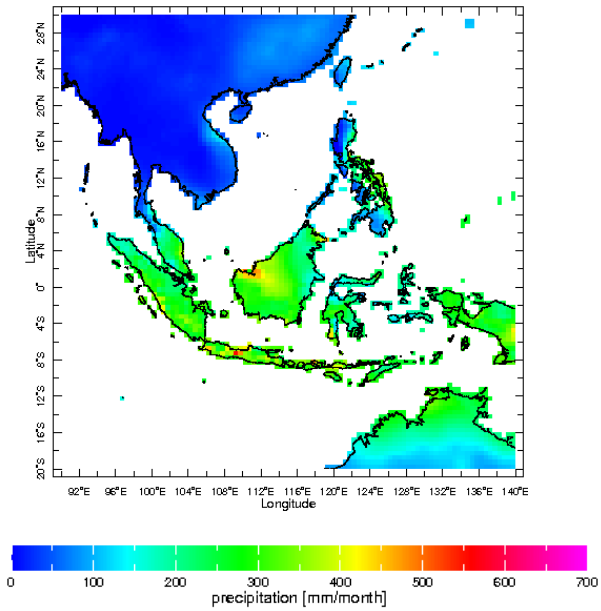
ACKNOWLEDGEMENTS

The Forum would like to thank the WMO Secretariat for providing support and guidance for the conduct of the Forum, the Environment and Climate Change Canada (ECCC) for providing the financial support, and the NHMS Viet Nam for hosting and co-funding the event. The Forum would also like to thank the National Meteorological and Hydrological Services of the ASEAN Member countries for conveying their national-level forecasts, the Global Producing Centres, and other participating international climate modelling centres for their products and expertise shared during this session.

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 that describe local patterns (e.g. quality-controlled station data from the respective NMHSs).

DJF Mean Rainfall



DJF Mean Temperature

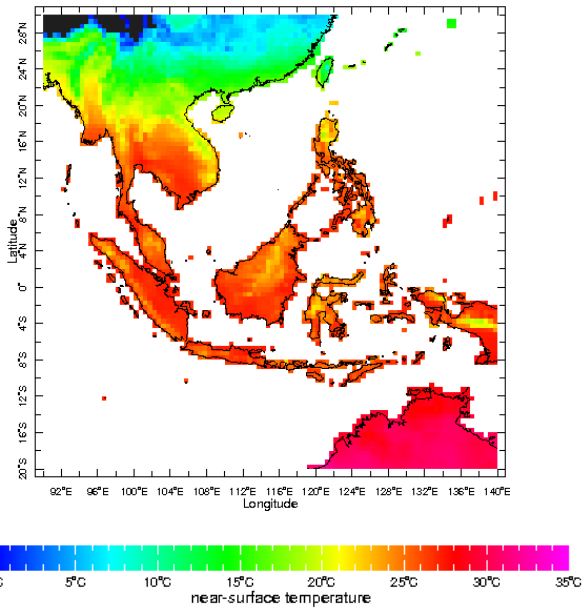


Figure A1: Rainfall mean climatology in mm/month (left) and the temperature mean climatology in degrees Celsius (right) for DJF from 1981-2010 from TS3p22 (CRU, UEA).

DJF Lower Tercile Rainfall ("Below Normal")

DJF Upper Tercile Rainfall ("Above Normal")

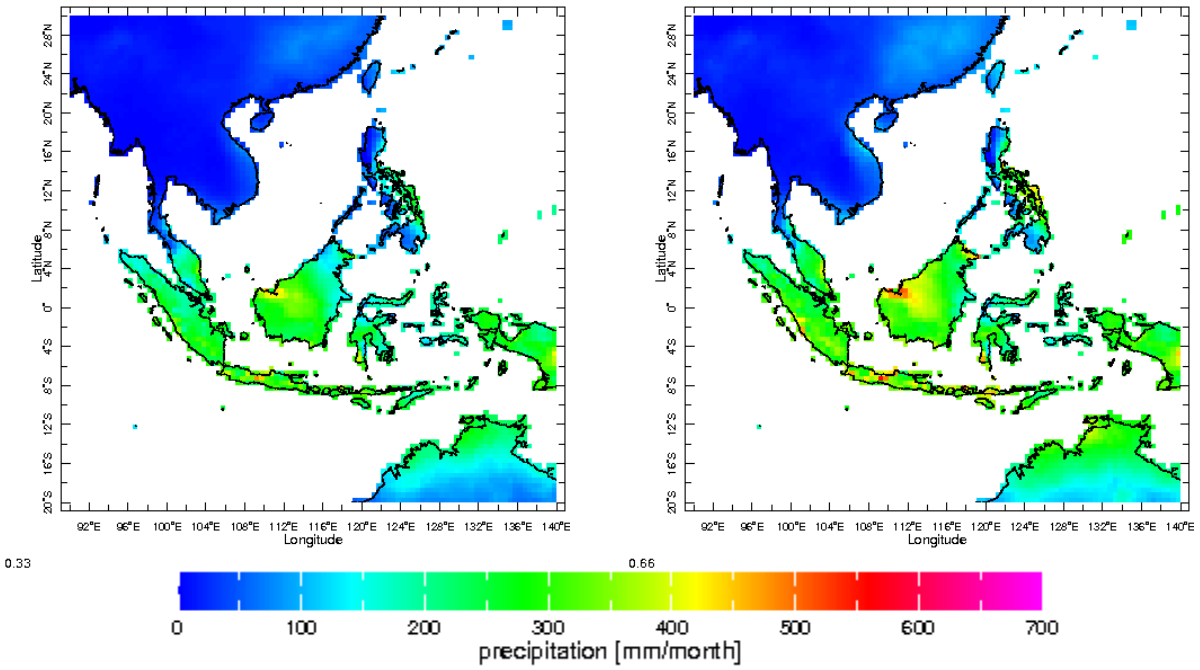


Figure A2: Rainfall climatologies of the lower tercile boundary (left) and the upper tercile boundary (right) for DJF from 1981-2010 from TS3p22 (CRU, UEA) in mm/month.

DJF Lower Tercile Temperature ("Below Normal")

DJF Upper Tercile Temperature ("Above Normal")

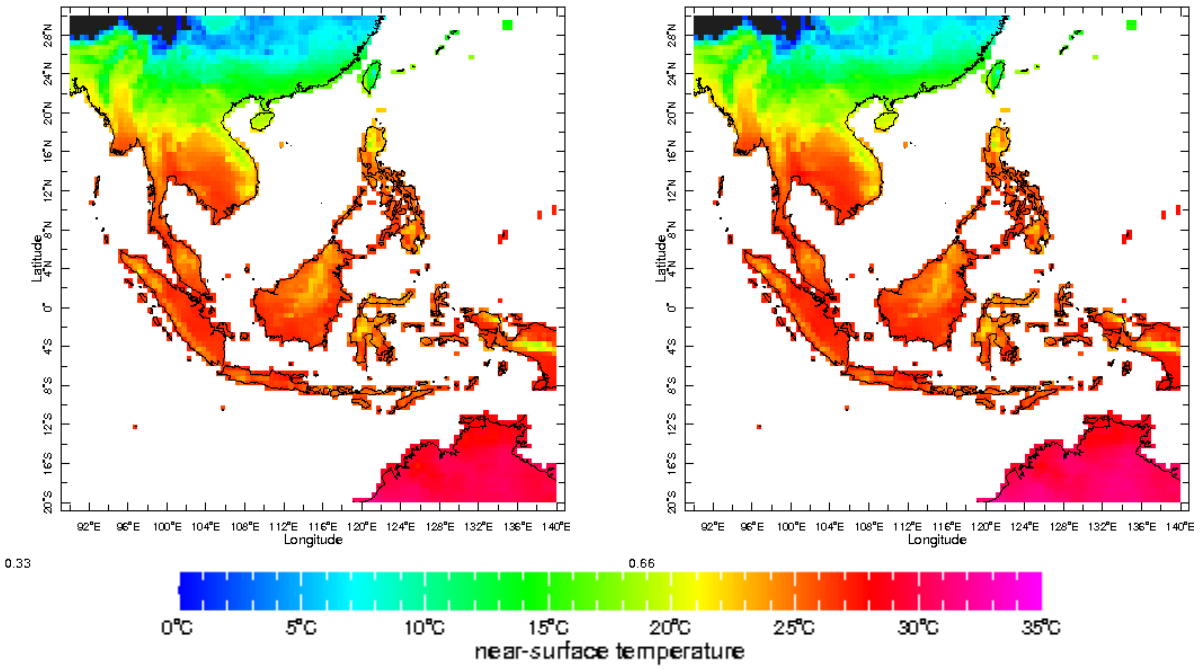


Figure A3: Temperature climatologies of the lower tercile boundary (left) and the upper tercile boundary (right) for DJF from 1981-2010 from TS3p22 (CRU, UEA).

ANNEX B: NATIONAL METEOROLOGICAL SERVICES' CONTACT

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 (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 2017 CONSENSUS OUTLOOK

SUMMARY

The temperature outlook was representative of the actual conditions; however, the rainfall outlook was less representative. Higher than predicted rainfall was recorded in the central and southern Maritime Continent, although this was not associated with any significant climate related events. Several tropical storms affected the region during June-July-August (JJA) 2017.

Sea surface temperature (SST) anomalies at the start of the outlook period indicated an ENSO neutral state in the Tropical Pacific Ocean. During JJA 2017, international climate outlooks showed a near equal chance of conditions remaining neutral and a weak El Niño developing. An El Niño is indicated by warmer SSTs over central and eastern tropical Pacific and often leads to drier conditions for Southeast Asia. In the Indian Ocean, the Indian Ocean Dipole was within the neutral range, although slightly positive. There was uncertainty in whether a positive IOD phase would develop.

For JJA 2017, the SST anomalies were slightly warmer than average in the central Tropical Pacific Ocean until the start of July. From July onwards, these SSTs began to cool, never reaching a sustained El Niño state. Atmospheric indices such as cloudiness and trade winds also remained in a neutral state, further indicating that it was unlikely an El Niño occurred. The IOD also remained within the neutral range, albeit slightly positive. Following JJA, the SST anomalies quickly cooled and became slightly negative.

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.

JJA 2017 RAINFALL OUTLOOK

> *For the upcoming Northern Hemisphere summer monsoon season (June-July-August), drier than normal conditions are expected over central and southern Southeast Asia, including southern Sumatra, southern Kalimantan, Java, Singapore and Sarawak. There is a slightly enhanced probability of wetter than normal conditions over coastal Myanmar, northern Thailand, northern Philippines, northern Papua, and northern Kalimantan. Near normal conditions are predicted for the rest of the region, including most of mainland Southeast Asia.*

There were areas where there was good agreement between observed conditions and the most likely tercile categories from the outlook. Based on the two gridded products below (CHIRPS and CAMS_OPI), above normal rainfall occurred over Northern Thailand, in agreement with the outlook. Mostly near normal conditions were observed in Peninsular Malaysia and central

Sumatra. Based on the NMHSs' reviews (Table 1), however, other representative forecasts included Laos, Northern and Central Myanmar, Northern Sumatra, and Singapore.

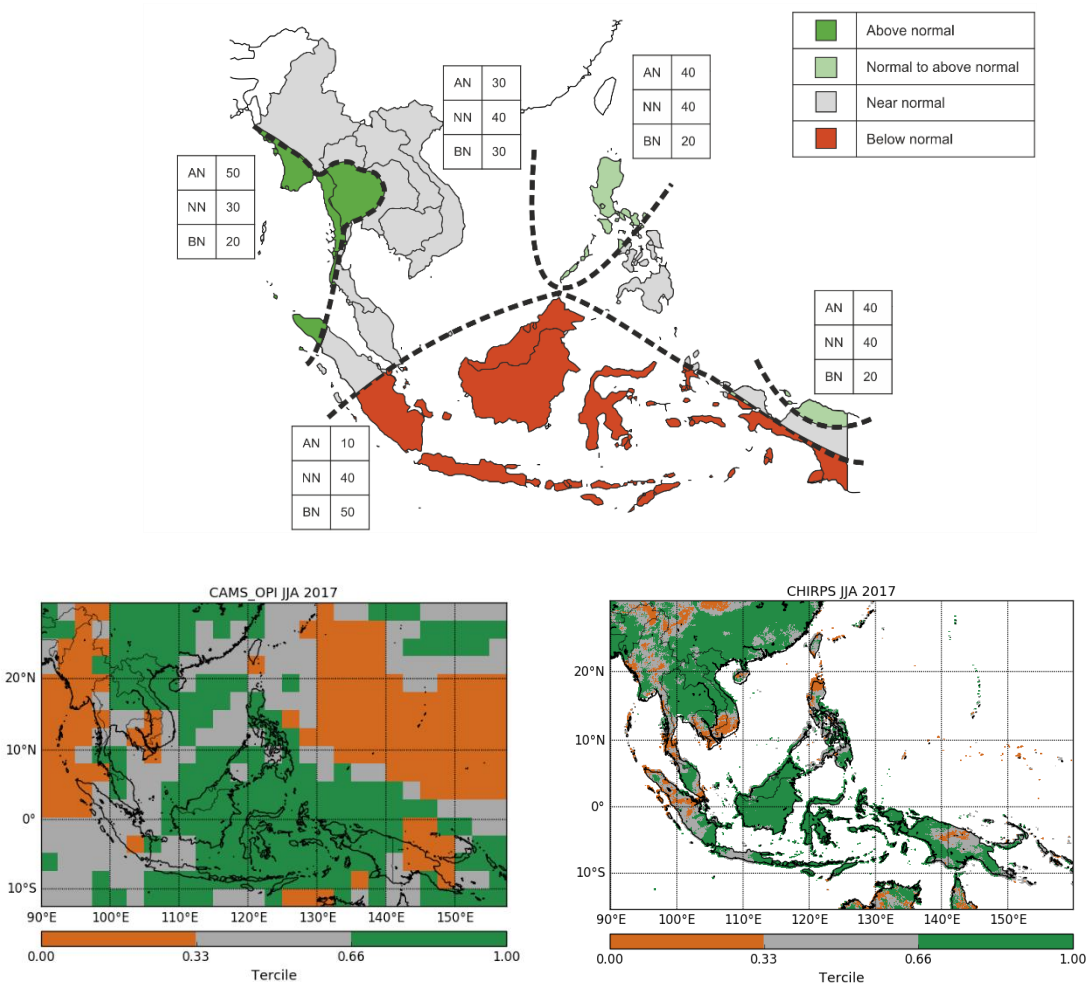


Figure 1: JJA Rainfall outlook (top) with observed rainfall from the CAMSOPI (bottom left; Janowiak and Xie, 1999) and CHIRPS (bottom right; Funk et al, 2014) datasets.

There was a large portion of the region that received higher rainfall amounts than predicted. Based on both gridded products (Figure 1) and reviews by NMHSs (Table 1), most of Borneo and Indonesia experienced above normal rainfall, in contrast to the low forecasted probability of 10%. This may be tied to the smaller than anticipated impact of the possible El Niño and the positive IOD. However, JJA is the dry season for these regions, which makes anomalous wet conditions difficult to forecast.

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	NN to AN	Y	N	N	N
Indonesia	NN to AN	NN	Y	N	Y	N
-Papua	NN	BN				
	BN	NN				
-Northern Sumatra	AN	AN				
	NN	NN				
-Rest	BN	NN to AN				
Laos	NN	NN	Y	N	Y	N
Malaysia -Peninsular	NN	NN	Y	N	N	N
-Borneo	BN	NN to AN				
Myanmar -Northern	NN	NN	Y	N	N	Y
-Central	AN	AN				
-Southern	AN	NN				
Singapore	BN to NN	BN to NN	Y	N	N	N
Thailand -Northern	AN	AN	Y	N	Y	Y
-Southern	NN	NN				
Vietnam -Southern	NN	AN	Y	N	N	N
-Rest	NN	BN				

JJA 2017 TEMPERATURE OUTLOOK

Near normal or above normal temperatures are expected over much of Southeast Asia for the Northern Hemisphere summer monsoon season (June-July-August). Above normal temperature is expected over much of Indonesia, Singapore, Brunei, Sarawak, Thailand, and northern Myanmar.

Based on the ERA Interim and CAMS_GHCN data (Figure 2 bottom left and right, respectively) and reviews by NMHSs (Table 2), most of Southeast Asia observed normal to above normal temperature. Although below normal temperature was observed in Vietnam based on the CAMS_GHCN data, ERA Interim data and Vietnam's national assessment recorded above normal temperature. Comparing the NMHSs' reviews with the two gridded products, more stations in Peninsular Malaysia as well as central and southern Myanmar recorded near normal

temperatures rather than above normal, closer to the JJA temperature outlook. A smaller proportion of Borneo, Java, and Sumatra was above normal than in the outlook. The cooler temperatures may be associated with the higher than predicted rainfall.

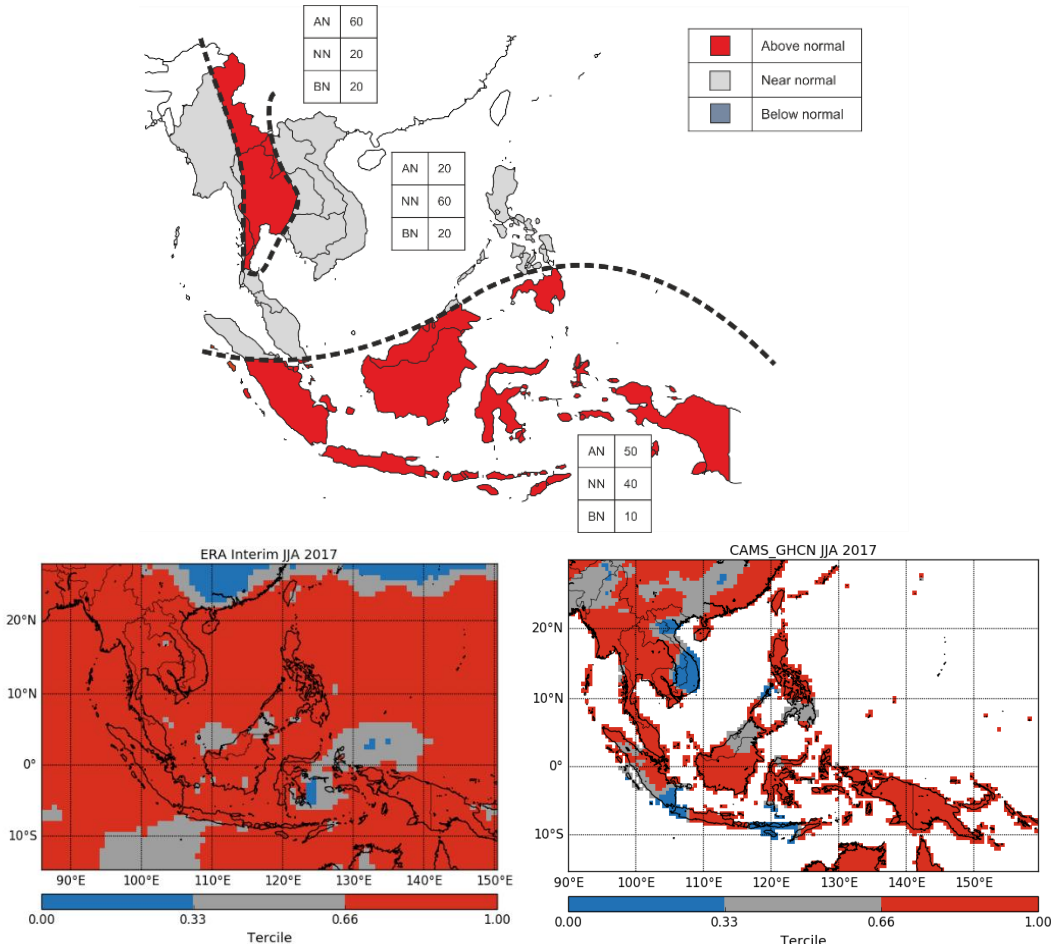


Figure 2: JJA Temperature outlook (top) and observed temperature from ERA Interim (Dee et al, 2011), and CAMS GHCN (right; Fan and van den Dool, 2008).

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 MLC	Observed	Product used			
			Weather Stations	Gridded Station	Satellite	Reanalysis
Brunei	AN	NN	Y	N	N	N
Indonesia	AN	AN	Y	N	N	N
Laos	NN	NN	Y	N	N	N
Malaysia -Peninsular	NN	NN to AN	Y	N	N	N
-Borneo	AN	NN				
Singapore	AN	AN	Y	N	N	N
Thailand	AN	AN	Y	N	N	Y
Vietnam	NN	AN	Y	N	N	N

SIGNIFICANT EVENTS

The significant climate events during JJA for Southeast Asia can be split between the northern and southern halves of the region. For the southern half of Southeast Asia (Indonesia, Brunei, and parts of Malaysia), the wetter than normal conditions were seen in some regions as beneficial, as it reduced the number of forest fires in Sumatra and Borneo. Areas of East Java, West and East Nusa Tenggara, however, had more than 100 days with no rainfall that led to localized drought affecting the agriculture sector. The other event of note in this region was in Brunei, which recorded an unusual period of 11 days in July with no rain and contributed to localised bush fires.

Tropical storms Talas and Sonca brought heavy rainfall to Mainland Southeast Asia in July, as well as Hato and Pakar in late August. The total rainfall in central and northern Vietnam for July was four to five times higher than average for some stations. Other notable tropical storms included Tropical Storm Roke, Typhoon Nesat and Tropical Storm Haitang in July.

REFERENCES

CAMS_OPI: Janowiak, J. E. and Xie, P. (1999), CAMS_OPI: A Global Satellite-Rain Gauge Merged Product for Real-Time Precipitation Monitoring Applications. J. Climate, vol. 12, 3335-3342.

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.

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

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.