

Sixteenth Session of the ASEAN Climate Outlook Forum (ASEANCOF-16)
20, 24 May 2021, ASEAN Specialised Meteorological Centre



Consensus Bulletin for June-July-August (JJA) 2021 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's 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 the ASEAN region through pooling the expertise of ASEAN National Meteorological and Hydrological Services (NMHSs). In 2021, the ASEANCOF Working Group was established with the goal to guide and support the long-term development of ASEANCOF, in particular with regard to the implementation of objective outlooks.

The sixteenth session of ASEANCOF (ASEANCOF-16) was organised by the ASEAN Specialised Meteorological Centre (ASMC) in collaboration with the ASEANCOF Working Group. Representatives from the NMHSs of ASEAN Member States created a consensus forecast for the boreal summer monsoon 2021 in the ASEAN region. The consensus for June-July-August (JJA) 2021 outlooks was achieved through an online session, which included presentations from NMHSs, questionnaires and discussions regarding the current conditions and predictions for the Southeast Asia region. In particular, the forum considered the possible 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 analyses of sea surface temperature (SST) anomalies over the equatorial Pacific indicated near- to below-average SSTs across most of the central and eastern tropical Pacific Ocean and that the previous La Niña event has weakened. Most ENSO indicators are now in line with ENSO-neutral conditions.

The international climate outlooks predict ENSO-neutral conditions are likely to prevail during JJA 2021. After JJA 2021, there is uncertainty whether ENSO neutral conditions will persist, or for La Niña conditions to re-develop.

The current Indian Ocean Dipole (IOD) state is neutral and is expected to remain neutral for most of JJA 2021. There is a small increase in chance that a negative IOD event may develop in the second half of the year.

The onset of the Southwest (SW) Monsoon season is expected to be near-normal (typical) for much of the region, although may be slightly delayed for some northern regions.

Over much of Southeast Asia, the strength of the SW monsoon is expected to be near-normal. The development of a negative IOD event may increase the monsoon strength later in the outlook period. Furthermore, models are predicting the West Pacific Subtropical High to be displaced northward, which would bring near- to above-normal SW monsoon conditions to the Philippines.

Overall, the tropical cyclone frequency is expected to be below-average for the Bay of Bengal, while near- to above-average around the West Philippine Sea/South China Sea and the Western North Pacific (WNP). This is due to ENSO-neutral conditions as well as model predictions where above-average tropical cyclone activity in the WNP is forecasted during JJA 2021 with north-westward moving tracks.

Taking into consideration the national level forecasts, the present state of the climate, and the forecasts available from the GPCs and other global centres, the forum agreed on the following consensus-based outlook for JJA 2021 for the Southeast Asia region:

RAINFALL

For the upcoming boreal (Northern Hemisphere) summer season (June-July-August 2021), near-normal rainfall is expected for much of the region, including Myanmar, Thailand, Malaysia, Viet Nam, Brunei Darussalam, and northern Philippines.

Near- to above-normal rainfall is expected for parts of the Maritime Continent, including Singapore and central and southern Philippines¹.

TEMPERATURE

Near- to above-normal temperature is predicted over Southeast Asia for the June-July-August 2021 season. The regions with the highest likelihood of above-normal temperature includes central Myanmar, Malaysia, Singapore, and central and southern Viet Nam².

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

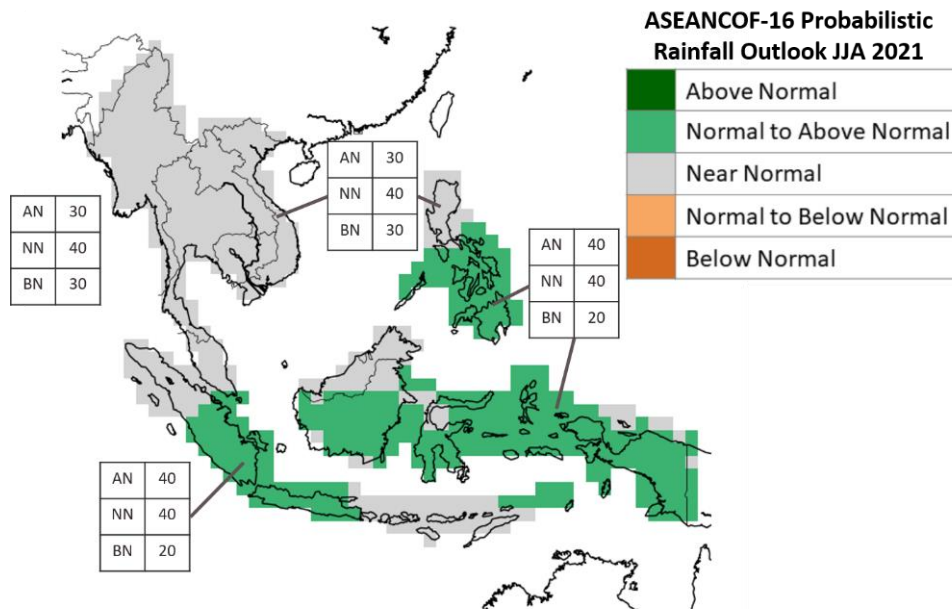
¹ This is based on the climatology period 1981-2010. However, at the national level, Brunei Darussalam and the Philippines have updated the rainfall climatology period to 1991-2020. Other ASEAN NMHSs are expected to move to the new climatology period in late 2021 or 2022.

² This is based on the climatology period 1981-2010. However, at the national level, Brunei Darussalam and Singapore have updated the temperature climatology period to 1991-2020. Other ASEAN NMHSs are expected to move to the new climatology period in late 2021 or 2022.

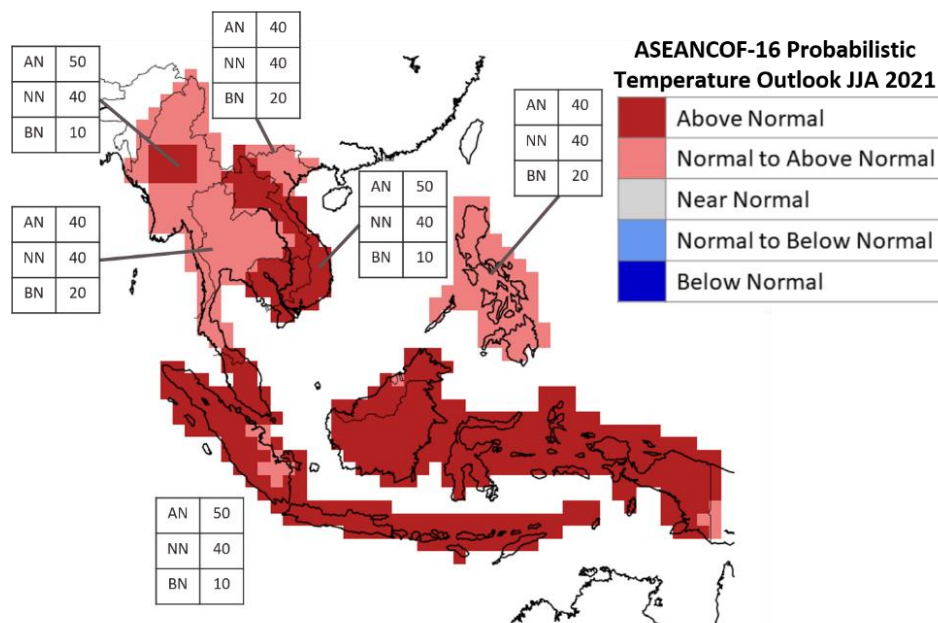
CONSENSUS MAPS FOR JJA 2021

The following maps provide the probabilistic outlooks for JJA 2021 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, the Southeast Asia Regional Climate Centre – Network, and other partners of ASEANCOF for sharing their products and expertise, and WMO for their continued support of ASEANCOF.

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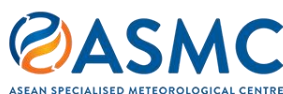


Photo of online participants during the first day of ASEANCOF-16. Top row: Wee Leng Tan (ASMC), Thea Turkington (ASMC), representatives from TMD, Tran Ngoc Van (VNMHA), Raizan Rahmat (ASMC). Second row: Khin Win Maw (DMH, Myanmar), Ryan Kang (MSS), Muhammad 'Afifi bin Junaidi (BDMD), Anahit Hovsepian (WMO), Ger Anne Mariel Duran (PAGASA). Third row: Chalump Oonariya (TMD), Govindarajalu Srinivasan (RIMES), Analiza Solis (PAGASA), Salvador Eleuterio Javier (PAGASA), Ben Churchill (WMO). Fourth row: Li-Sha Lim (WMO), Edino Nonato Nolasco (PAGASA), Nguyen Thanh Hoa (VNMHA), Mimi Adilla Sarmani (Met Malaysia), Remedios Ciervo (PAGASA). Fifth row: Ryuji Yamada (WMO), Jeffrey Zerrudo (PAGASA), Rusy Abastillas (PAGASA), Amirul Nizam Marodzi (Met Malaysia), Michele Chew (ASEC). Bottom row: Jun Yu (WMO), Cherry Jane (PAGASA), Junie Ruiz (PAGASA), Wilfran Moufouma Okia (WMO).

Annex A: Rainfall and Temperature Tercile Climatologies

ANNEX A: RAINFALL AND TEMPERATURE TERCILE CLIMATOLOGIES

The following figures include mean rainfall and temperature and tercile boundary climatologies to reference against the consensus outlook. Only a single source of data for each variable is provided: for rainfall CHIRPS (Funk et al. 2014) and for temperature ERA5 (Hersbach et al. 2019). 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 NMHSs).

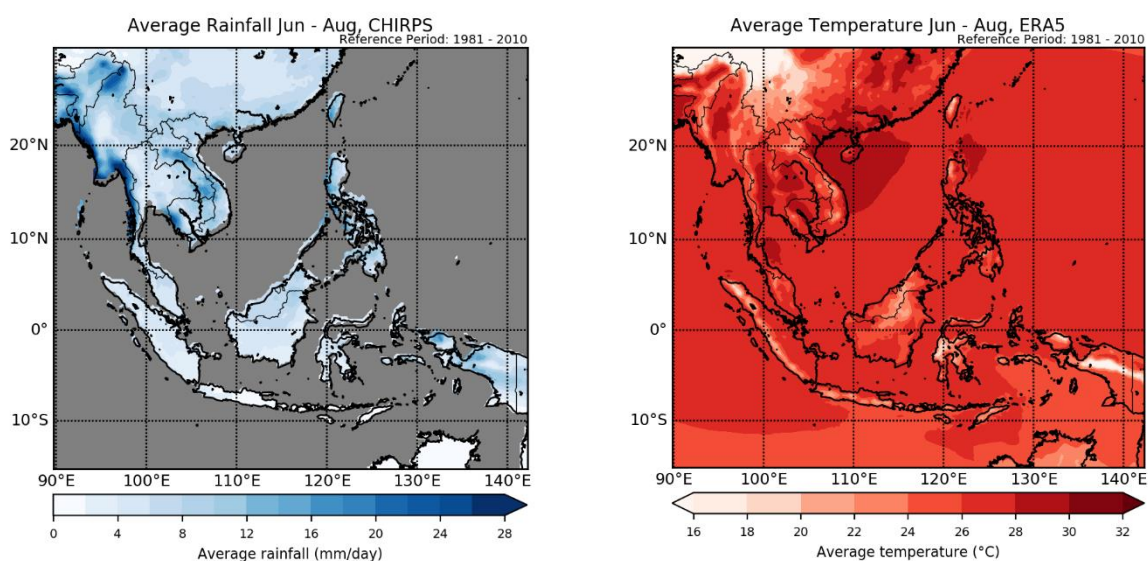


Figure A1: Mean rainfall (left, CHIRPS) and mean temperature (right, ERA5) for JJA for the climatology period 1981-2010.

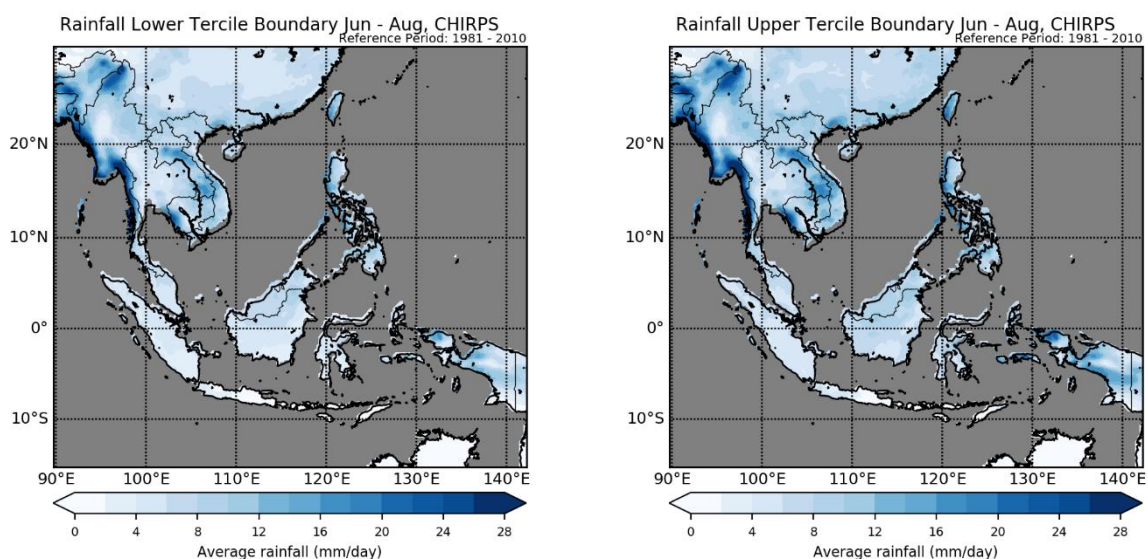


Figure A2: Rainfall climatologies of the lower tercile boundary (left) and the upper tercile boundary (right) for JJA from 1981-2010 using CHIRPS.

Annex A: Rainfall and Temperature Tercile Climatologies

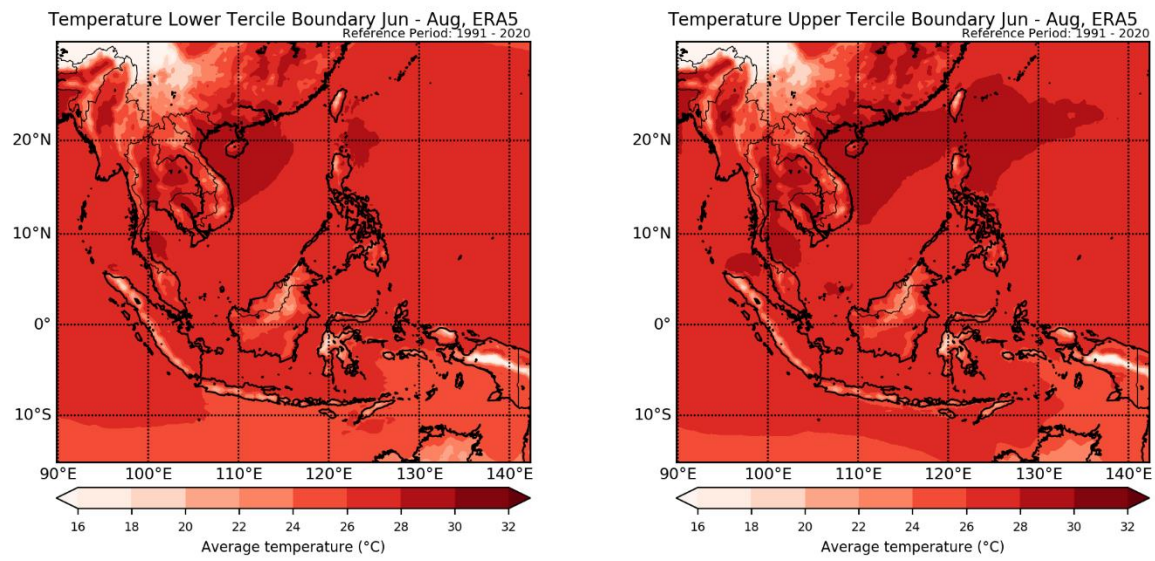


Figure A3: Temperature climatologies of the lower tercile boundary (left) and the upper tercile boundary (right) for JJA from 1981-2010 from ERA5.

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://dmh.monre.gov.la/>

- Malaysian Meteorological Department (MMD)

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

- Department of Meteorology and Hydrology (DMH), Myanmar

<https://www.moezala.gov.mm/>

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

<http://bagong.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

<https://nchmf.gov.vn/KttvsiteE/en-US/2/index.html>

ANNEX C: REVIEW OF DJF 2020/2021 CONSENSUS OUTLOOK

SUMMARY

The rainfall and temperature outlooks were representative of the actual conditions over much of the Southeast Asia. Much of the equatorial region experience above-normal rainfall with a range of below- to above-normal rainfall elsewhere.

In November 2020, La Niña conditions were present with cool sea surface temperatures (SSTs) across most of the central and eastern tropical Pacific Ocean. The international climate outlooks predicted moderate to strong La Niña conditions during DJF 2020/2021. La Niña conditions were then expected to weaken during the boreal (Northern Hemisphere) winter season. In the Indian Ocean, the Indian Ocean Dipole (IOD) was neutral. The consensus from ASEANCOF was that the La Niña conditions were very likely to continue during DJF, with the IOD to remain neutral.

Based on the assessment as part of ASEANCOF, as well as by [SEA RCC Climate Monitoring Node](#), the DJF 2020/2021 period experienced **La Niña conditions** and the **Indian Ocean Dipole was neutral**.

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 2020/2021 RAINFALL OUTLOOK

For the upcoming boreal (Northern Hemisphere) winter season (December- January- February 2020/2021), near-normal to above-normal rainfall is expected over much of the region (Brunei Darussalam, Malaysia, the Philippines, Singapore, Thailand, and southern parts of Myanmar and Viet Nam). The highest probabilities of above-normal rainfall are over Brunei Darussalam, southern Thailand, and parts of Malaysia and the Philippines.

Elsewhere, near-normal or a range of below-normal to above-normal rainfall is predicted.

Much of the outlook agreed with the CHIRPS gridded product in **Figure C1** and **Table C1**. Almost all of the regions with the highest probability of above-normal rainfall, Brunei Darussalam, southern Thailand, and parts of Malaysia and the Philippines, recorded above-normal rainfall based on CHIRPS (92%, Table C1). Similarly, above-normal rainfall was observed for much of the region where near- to above normal rainfall was predicted, including parts of Malaysia, the Philippines and Singapore (57%, Table C1). For the parts of Mainland Southeast Asia where close to climatological probabilities were predicted, central

Annex C: Review of DJF 2020/2021 Consensus Outlook

and northern Myanmar, Lao PDR and Viet Nam, a mix of below- to above-normal rainfall was observed (36% above-normal, 27% near-normal, and 37% below-normal, Table C1).

Based on the country reviews by NMHSs (**Table C2**), there was also good agreement between the outlook and the observed values. An exception was for southern Viet Nam, where near- to below-normal rainfall was recorded.

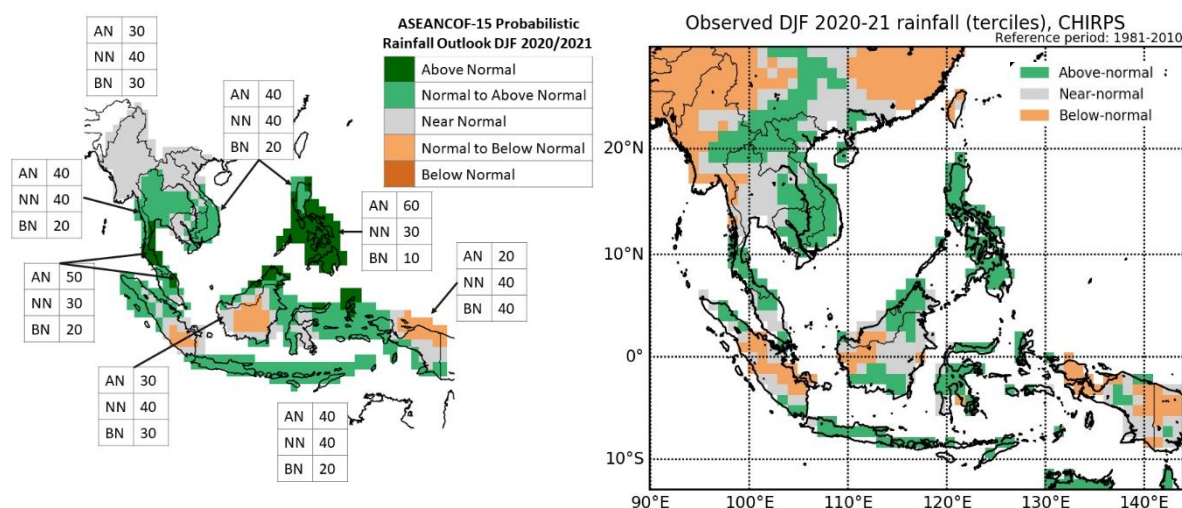


Figure C1: DJF 2020/2021 ASEANCOF outlook (left) observed DJF rainfall in terciles (right, climatology 1981-2010). The rainfall dataset is CHIRPS (Funk et al 2014).

Table C1: Summary of the percentage of grid boxes that observed above- near- and below-normal rainfall during DJF 2020/2021, using the CHIRPS dataset. The average outlook probability for each of the colours is also shown.

	Above normal		Normal to Above Normal		Near Normal		Normal to Below Normal	
	Outlook	Observed	Outlook	Observed	Outlook	Observed	Outlook	Observed
Above normal	50%-60%	92%	40%	57%	30%	36%	20%	26%
Near Normal	30%	8%	40%	31%	40%	27%	40%	44%
Below Normal	10%-20%	0%	20%	13%	30%	37%	40%	30%

Annex C: Review of DJF 2020/2021 Consensus Outlook

Table C2: Observed Rainfall based on the national level assessment. The Most Likely Category from the outlook (MLC), the observed rainfall as noted by the NMHS (obs. tercile) are included. The tercile categories are above-normal (AN), near-normal (NN), and below-normal (BN). Bold texts highlights discrepancies between the outlook and observed.

Country	Location (- indicates the entire country)	Outlook (MLC)	NMHS obs. tercile
Brunei	-	AN (60%)	AN
Malaysia	Parts of eastern Malaysia	AN (50%)	NN - AN
	Rest	NN – AN (40%)	NN – AN
Myanmar	Southern	NN – AN (40%)	NN – BN
	Rest	NN (40%)	NN
Philippines	Northern	NN – AN (40%)	AN
	Rest	AN (60%)	AN
Singapore	-	NN – AN (40%)	AN
Thailand	Southern	AN (50%)	AN
	Rest	NN – AN (40%)	NN
Viet Nam	Southern parts	NN – AN (40%)	BN, except western south: AN
	Rest	NN (40%)	NN, except northern east mountains: BN

* MLC: Most Likely Category

DJF 2020/2021 TEMPERATURE OUTLOOK

For the southern half of Southeast Asia near-normal to above-normal temperature is predicted, including Brunei Darussalam, Malaysia, Singapore, and the southern half of the Philippines.

In the northern half of Southeast Asia, near-normal to below-normal temperature is expected for parts of Lao PDR and Viet Nam. An increased chance of above-normal temperature is expected over northern Thailand and northern Lao PDR. Elsewhere, near-normal temperature is expected, particularly over most of Thailand, Myanmar, and northern Philippines.

On top of these temperature outlook, there may be increased chance of cold surges due to the stronger Northeast Monsoon predicted for the coming December-January-February 2020/2021 season.

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Most of the Maritime experienced above-normal temperature as depicted in the ERA5 data while there was a transition over Mainland Southeast Asia between above-normal temperature in the west to below-normal temperature in the east (**Figure C2**). This was generally in good agreement with the outlook (**Table C3**), although based on ERA5 dataset, the above-normal temperature covered a larger area than predicted. However, when comparing with the observations from the NMHS weather stations (Table C4), the temperature for some regions, including Brunei Darussalam, Malaysia, Singapore, and the Philippines was reported on average to be near-normal.

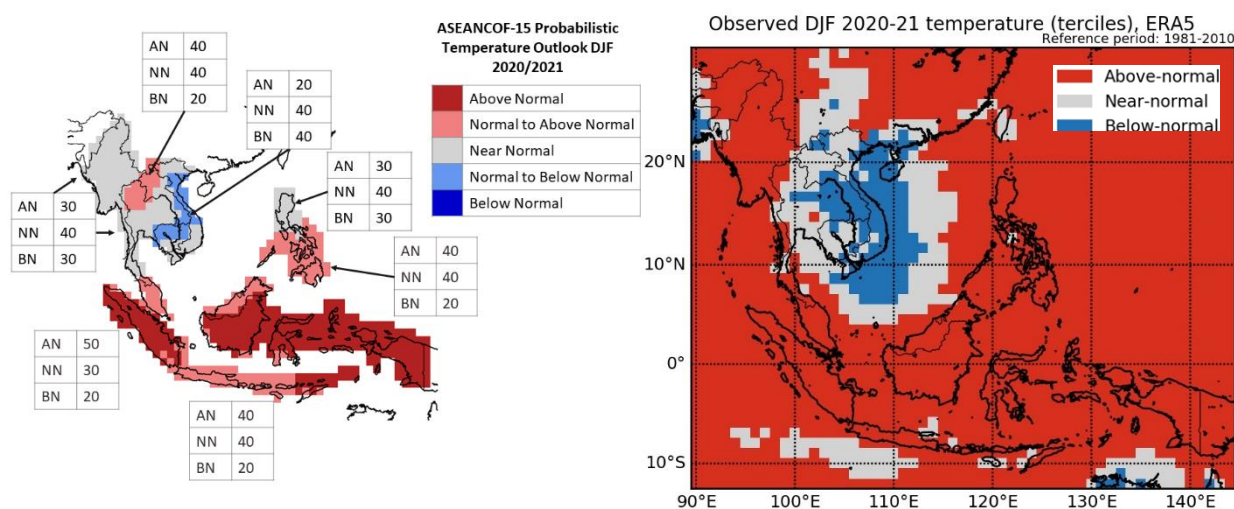


Figure C2: DJF 2020/2021 ASEANCOF outlook (left) observed DJF temperature in terciles (right, climatology 1981-2010). The temperature dataset used is ERA5 reanalysis dataset (Hersbach et al. 2019)

Table C3: Summary of the percentage of grid boxes that observed above- near- and below-normal temperature during DJF 2020/2021, using the CHIRPS dataset. The average outlook probability for each of the colours is also shown.

	Above Normal		Normal to Above Normal		Near Normal		Below to Near Normal	
	Outlook	Observed	Outlook	Observed	Outlook	Observed	Outlook	Observed
Above normal	50%	100%	40%	85%	30%	62%	20%	4%
Near Normal	30%	0%	40%	14%	40%	25%	40%	50%
Below Normal	10%	0%	20%	1%	30%	13%	40%	46%

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Table C4: Observed temperature based on the national level assessment. The Most Likely Category from the outlook (MLC), the observed temperature as noted by the NMHS (obs. tercile) are included. The tercile categories are above-normal (AN), near-normal (NN), and below-normal (BN). Bold texts highlights discrepancies between the outlook and observed.

Country	Location	Outlook (MLC)	NMHS obs. tercile
Brunei	-	NN - AN (40%)	NN
Malaysia	-	NN – AN (40%)	NN
Myanmar	-	NN (40%)	NN
Philippines	Northern	NN (40%)	NN
	Rest	NN – AN (40%)	NN
Singapore	-	NN – AN (40%)	NN
Thailand	Northern	NN – AN (40%)	AN
	Rest	NN (40%)	NN (apart from SW coast: AN)
Viet Nam	Central	BN – NN (40%)	BN
	Rest	NN (40%)	NN

SIGNIFICANT EVENTS

There were a number of notable rainfall related events in DJF 2020/2021. In December, Tropical Storm Krovanh crossed the Philippine landmass and brought heavy rains and caused flooding, landslides, and other secondary damage. In January, Singapore recorded the second wettest January on record (based on the climate station). In February, Severe Tropical Storm Dujan lead to immense floods and landslides over central and southern Philippines that results to damage to properties and agriculture. On the 8th and 9th, cold air and wind convergence led to widespread showers and thunderstorms in Northern and Northern Central Viet Nam, with hail and snowfall recorded in Lai Chau province. Untimely rainfall also occurred over Upper and Eastern Myanmar due to westerly wave and unstable atmospheric conditions, with new rainfall records recorded in Centra and Naypyitaw regions. Malaysia recorded numerous floods during the period, leading to over the entire DJF period 116,646 evacuations in Peninsular Malaysia, 8,806 people in Sarawak, and 2,863 people in Sabah.

There were a number of notable temperature events in DJF. Singapore's climate station recorded a monthly mean value of 26°C, the lowest monthly mean temperature for January in the past 30 years. Also in January, mountains areas of northern Luzon, the Philippines, experienced cold surges, resulting in frost. In February, new minimum temperature was

Annex C: Review of DJF 2020/2021 Consensus Outlook

recorded in TadaU (Central Myanmar) and Sittwe (western Myanmar), although other parts of Myanmar recorded near-normal or above-normal night-time temperatures.

REFERENCES

CHIRPS: Funk et al. 2014: A quasi-global precipitation time series for drought monitoring: U.S. Geological Survey Data Series 832, 4 p., doi:110.3133/ds832.

ERA5: Hersbach et al. 2019: Global reanalysis: goodbye ERA-Interim, hello ERA5. ECMWF Newsletter, doi:10.21957/vf291hehd7.