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Seventeenth Session of the ASEAN Climate Outlook Forum (ASEANCOF-17)

22 – 26 November 2021, ASEAN Specialised Meteorological Centre



Consensus Bulletin for December-January-February (DJF) 2021/2022 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 seventeenth session of ASEANCOF (ASEANCOF-17) was organised by the ASEAN Specialised Meteorological Centre (ASMC) in conjunction with the ASEANCOF Working Group. Representatives from the NMHSs of ASEAN Member States created a consensus forecast for the boreal winter monsoon 2021/2022 in the ASEAN region. The consensus for December-January-February (DJF) 2021/2022 outlooks was achieved through an online session, which

included presentations from NMHSs and Global Producing Centres (GPCs) of seasonal outlooks, 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 below-average SSTs across most of the central and eastern tropical Pacific Ocean. Most ENSO indicators are now in line with La Niña conditions.

The international climate outlooks predict that La Niña conditions are likely to prevail during DJF 2021/2022. The La Niña conditions are expected to be weak to moderate during this time. Conditions are predicted to weaken in boreal spring 2022.

The current Indian Ocean Dipole (IOD) state is neutral and is expected to remain neutral for DJF 2021/2022.

The onset of the Northeast Monsoon season is expected to be or has been near-normal for much of the region, although the onset was earlier than normal for Viet Nam.

Over much of Southeast Asia, the strength of the Northeast monsoon is expected to be near normal or stronger than normal, based on model predictions and supported by the current La Niña conditions.

Overall, the tropical cyclone frequency is expected to be above-average for the Bay of Bengal, while near-average around the West Philippine Sea/South China Sea and the Western North Pacific (WNP). This is based on model predictions. During La Niña events, there tends to be more tropical cyclones than average, however, the late onset of the La Niña event as well as its predicted strength means that the increase is not expected to be significant in DJF 2021/2022 for much of the region.

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 DJF 2021/2022 for the Southeast Asia region:

RAINFALL

For the upcoming boreal (Northern Hemisphere) winter season (December-January-February¹):

Over much of the Maritime Continent, near- to above-normal rainfall is expected. In particular, above-normal rainfall is predicted for central parts of the Philippines, while near- to above-normal rainfall is predicted over Malaysia, Singapore, and Brunei Darussalam.

Over Mainland Southeast Asia, a mix of below- to above- normal rainfall is predicted. Below- to near- normal rainfall is predicted over northern Myanmar, northern Lao PDR, and northern Viet Nam. Above-normal rainfall is predicted over southern Lao PDR, while near- to above-normal rainfall is predicted over parts of southern Myanmar, southern Thailand, parts of Cambodia, and southern Viet Nam. Elsewhere in Mainland Southeast Asia rainfall is predicted to be near-normal.

TEMPERATURE

For the upcoming boreal (Northern Hemisphere) winter season (December-January-February²):

Over much of the Maritime Continent, near- to above-normal temperature is predicted. Near-normal temperature is predicted for Brunei Darussalam and northern Philippines, with near- to above-normal and above-normal temperature predicted elsewhere.

For Mainland Southeast Asia, a mix of below- to above-normal temperatures are predicted. The highest likelihood of below-normal temperature is over southern Lao PDR and southern Viet Nam. The highest likelihood of above-normal temperature is over central Myanmar, followed by northern Thailand and northern Lao PDR.

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**).

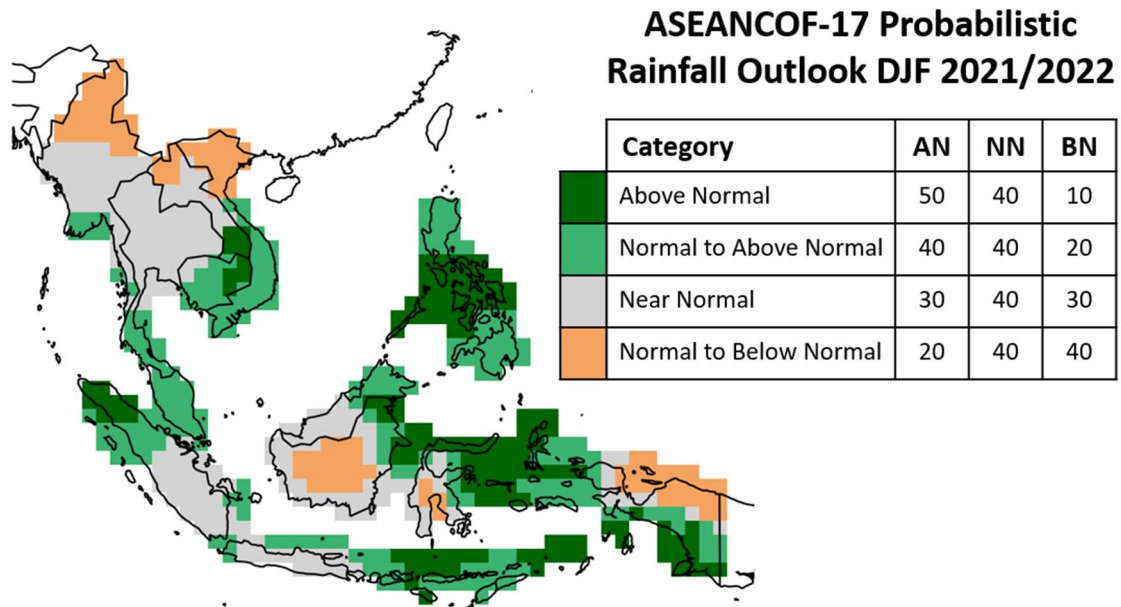
¹ This is based on the climatology period 1991-2020. Note that some ASEAN countries are expected move to the new rainfall climatology period in 2022.

² This is based on the climatology period 1991-2020. Note that some ASEAN countries, including the Philippines are expected move to the new temperature climatology period in 2022.

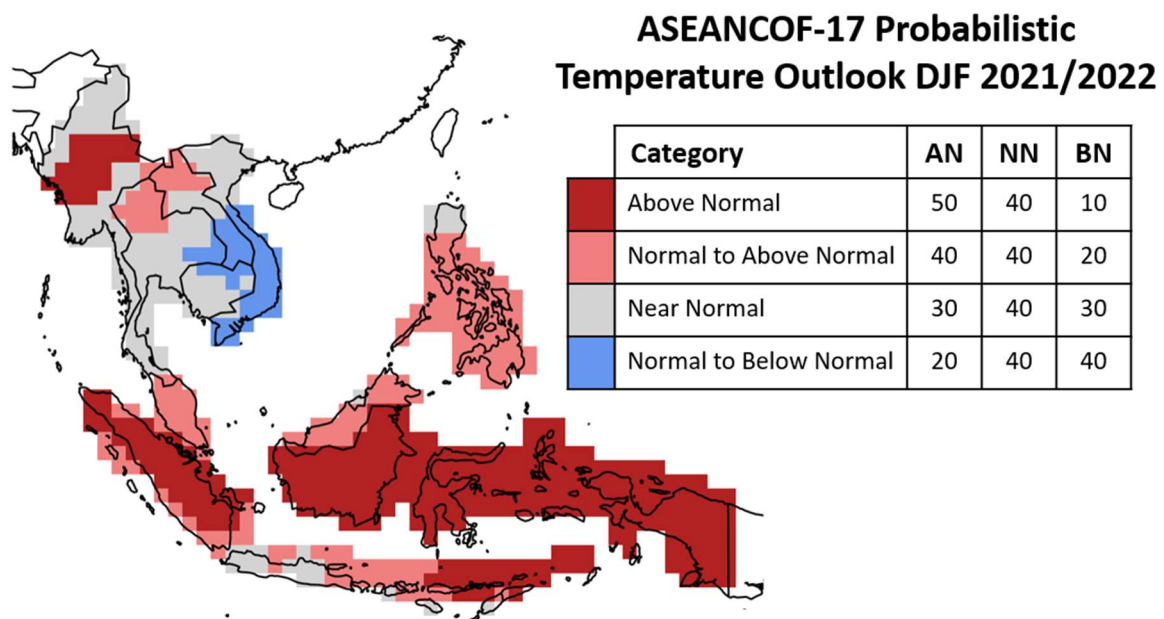
CONSENSUS MAPS FOR DJF 2021/2022

The following maps provide the probabilistic outlooks for DJF 2021/2022 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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ASEANCOF-17 NMHS representatives, presenters, trainers, panellists, and speakers (where photo available). Top row: Nurulinani binti Haji Jahari (BDMD), Mayphou Mahachaleun (DMH Lao PDR), Shwe Yee New (DMH, Myanmar), Mimi Adilla Samarni (MMD), Suhaili Mohd Zahari (MMD), Ryan Kang (MSS). Second row: Rusy Abastillas (PAGASA), Ger Anne Marie Duran (PAGASA), Kesrin Hanprasert and Nichanun Trachow (TMD), Thanh Hoa Nguyen (VNMHA), Gaeun Kim (APCC), Oikawa Yoshinori (JMA). Third row: Yuriy Kuleshov (BoM), Andrew Robertson (IRI), Angel Muñoz (IRI), Khin Seint Seint Aye (UNDP), Keith Paolo Landicho (AHA Centre), Jothi Sundaram (WFP). Fourth row: G. Srinivasan (RIMES), Junie Ruiz (PAGASA), Ana Liza Solis (PAGASA), Gabriel Lim (ASMC), Ryuji Yamada (WMO), Ben Churchill (WMO). Final row: Raizan Rahmat (ASMC), Eugene Chong (ASMC), Tan Wee Leng (ASMC), Thea Turkington (ASMC).

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).

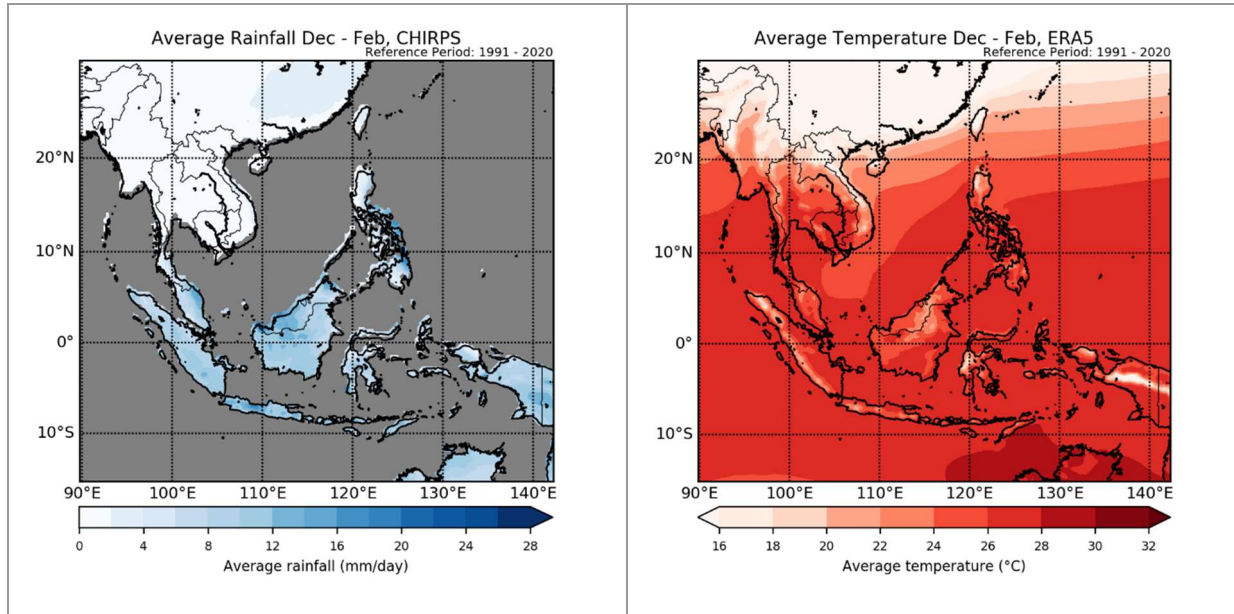


Figure A1: Mean rainfall (left, CHIRPS) and mean temperature (right, ERA5) for DJF for the climatology period 1991-2020.

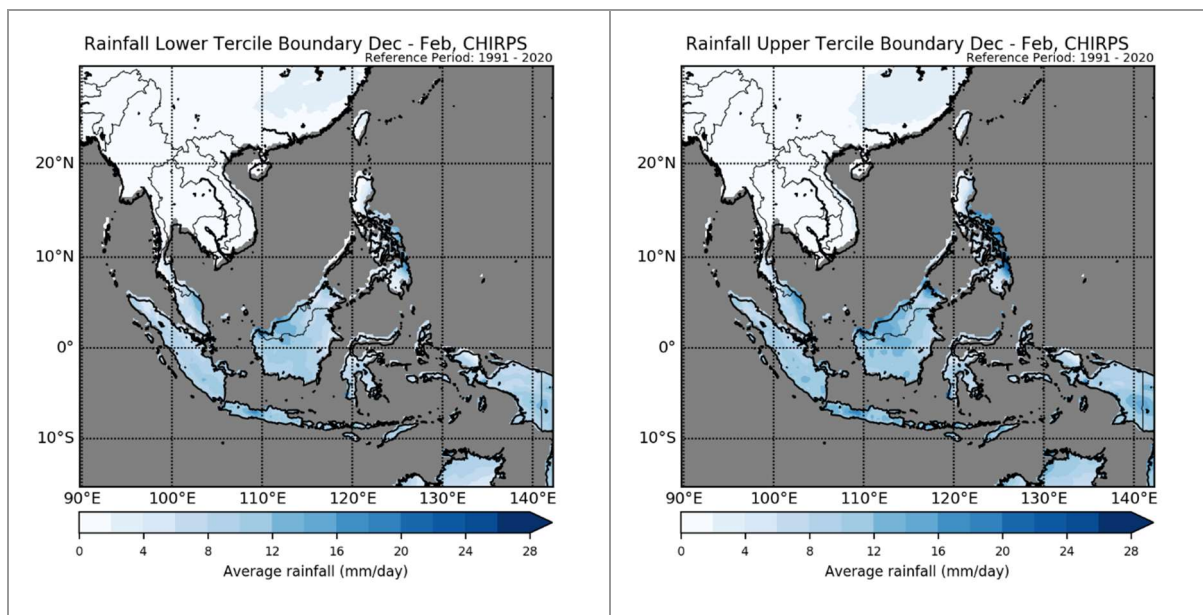


Figure A2: Rainfall climatologies of the lower tercile boundary (left) and the upper tercile boundary (right) for DJF from 1991-2020 using CHIRPS.

Annex A: Rainfall and Temperature Tercile Climatologies

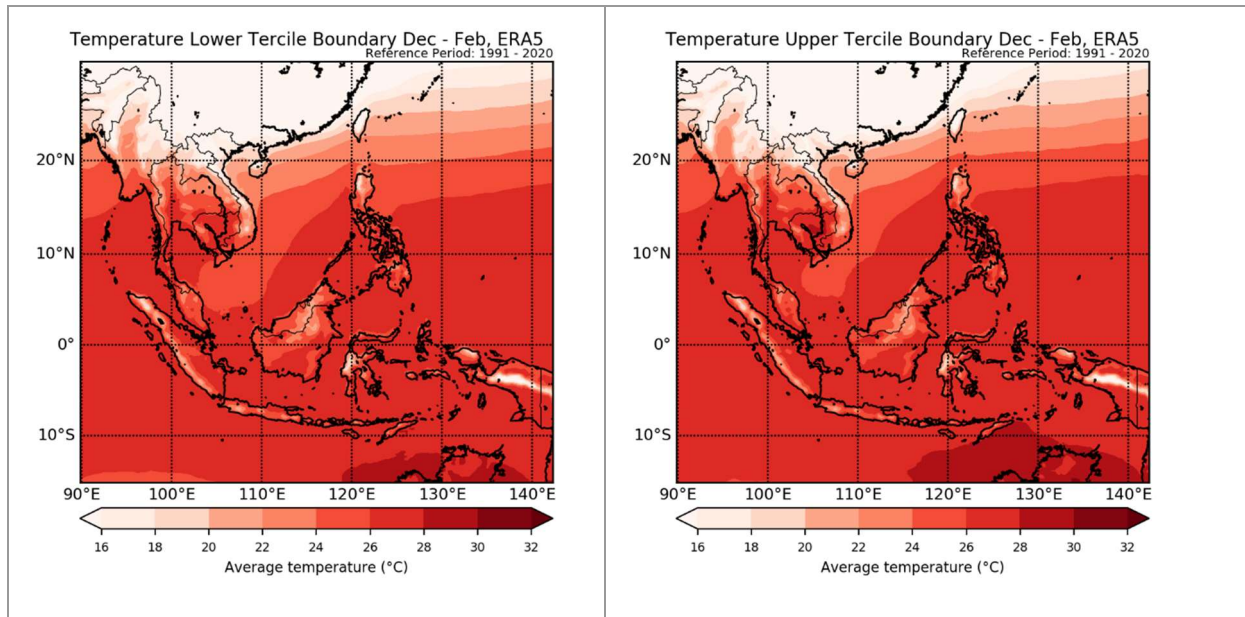


Figure A3: Temperature climatologies of the lower tercile boundary (left) and the upper tercile boundary (right) for DJF from 1991-2020 from ERA5.

Annex B: National Meteorological Services' Contact

ANNEX B: NATIONAL METEOROLOGICAL SERVICES' CONTACT INFORMATION

- Brunei Darussalam Meteorological Department (BDMD)

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

- 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 PDR

<http://www.lacsa.net/>

- Malaysian Meteorological Department (MMD)

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

- Department of Meteorology and Hydrology (DMH), Myanmar

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

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

<https://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 JJA 2021 CONSENSUS OUTLOOK

SUMMARY

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

By May 2021, La Niña conditions had weakened, and most indicators were in line with ENSO-neutral conditions. The international climate outlooks predicted ENSO-neutral conditions during JJA 2021, after which time there was uncertainty as to whether ENSO-neutral conditions would persist or for La Niña conditions to re-develop. The consensus from ASEANCOF was that the ENSO-neutral conditions were likely during JJA 2021, while the IOD to remain neutral for most of JJA 2021 with a small increase in chance that a negative IOD event would develop in the second half of the year.

Based on the assessment as part of ASEANCOF, SEA RCC Climate Monitoring Node (<http://seacm.pagasa.dost.gov.ph/>) and the WMO El Niño/La Niña Updates (<https://community.wmo.int/activity-areas/climate/wmo-el-ninola-nina-updates>), the JJA 2021 period experienced **ENSO-neutral conditions** and while a negative **Indian Ocean Dipole** developed.

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 2021 RAINFALL OUTLOOK

For the upcoming boreal (Northern Hemisphere) summer season (June-July-August), 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 Philippines.

Much of the outlook agreed with the CHIRPS gridded product in **Figure C1** and **Table C1**. For the regions where near- to above-normal rainfall was most likely in the outlook were generally near- to above-normal based on gridded product (50% above-normal and 39% near-normal, Table C1). Similarly, considering all regions where near-normal rainfall was predicted to have a 40% chance of occurrence, followed by equal likelihood of below- and above-normal rainfall, a mix of all three tercile categories were observed, with the highest percentage recording near-normal rainfall (43%, Table C1). Looking regionally, Mainland Southeast Asia, where a slight increase in chance of near-normal rainfall was predicted, experience a mix of more

Annex C: Review of JJA 2021 Consensus Outlook

below- and near-normal. For the Maritime Continent, most of this region experienced near- to above-normal rainfall, apart from the Philippines and parts of Borneo and Papua.

Based on the country reviews by NMHSs (**Table C2**), there was also good agreement between the outlook values averaged over the country and the observed values. The exception was for Brunei, where above-normal rainfall occurred. There were some differences between the country reviews (based on rain gauge data) and the CHIRPS gridded product in Figure C1. Over the Philippines, CHIRPS recorded below-normal rainfall, while the national assessment was for near-normal. For southern Viet Nam, CHIRPS recorded below – to near-normal for the, while the country assessment for this region was near- to above- normal rainfall. However, some differences between the gridded data and rain gauge data are to be expected.

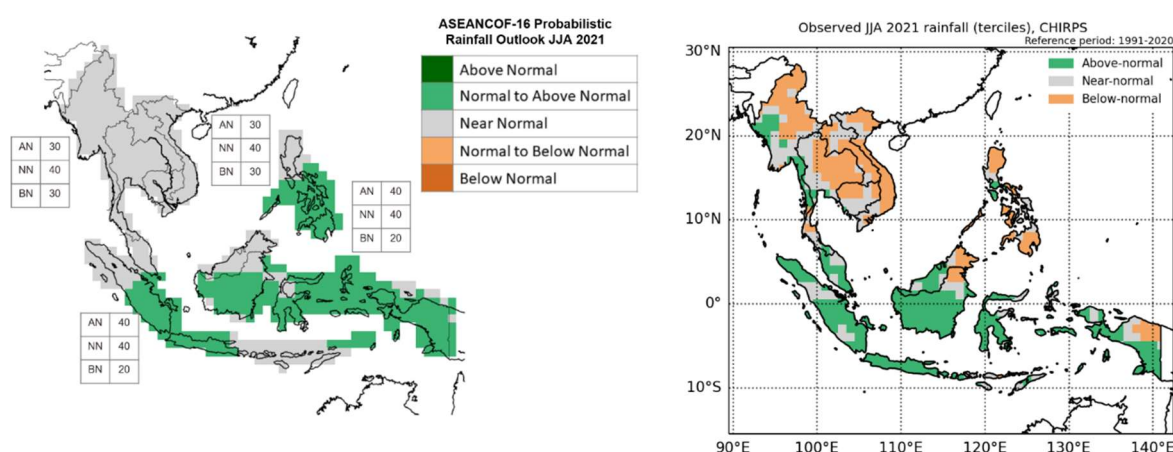


Figure C1: JJA 2021 ASEANCOF outlook (left) observed JJA rainfall in terciles (right, climatology 1991-2020). The rainfall dataset is CHIRPS (Funk et al 2014).

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

	Normal to Above Normal		Near Normal	
	Outlook	Observed	Outlook	Observed
Above normal	40%	50%	30%	23%
Near Normal	40%	39%	40%	43%
Below Normal	20%	11%	30%	34%

Annex C: Review of JJA 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	-	NN (40%)	AN
Lao PDR	-	NN (40%)	NN
Malaysia	-	NN (40%)	NN - AN
Myanmar	-	NN (40%)	NN
Philippines	Northern	NN (40%)	NN
	Rest	NN – AN (40%)	NN
Singapore	-	NN – AN (40%)	AN
Thailand	-	NN (40%)	NN – BN upper, NN – AN southern
Viet Nam	-	NN (40%)	NN - BN

* MLC: Most Likely Category

JJA 2021 TEMPERATURE OUTLOOK

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 Nam.

Most of Mainland Southeast Asia experienced above-normal temperature as depicted in the ERA5-Land data along with eastern and southern parts of the Maritime Continent (**Figure C2**). The western and central Maritime Continent experienced predominantly near-normal temperature (**Figure C2**). While overall, near- to above-normal temperature is in good agreement with the outlook, a higher percentage of above-normal temperature was observed where near- to above-normal temperature was predicted (91%, **Table C3**). A higher percentage of near-normal temperature occurred where there was a 50% chance of above-normal temperature (45%, **Table C3**), particularly due to the closer to normal than predicted temperatures in western and central Maritime Continent.

The results from NMHS country reviews (Table C4) also observed primarily near- to above-normal temperature, although again there were some differences between the country reviews and the ERA5-Land gridded data. The Philippines and much of Myanmar observed near-normal temperature (as opposed to above-normal temperature by ERA5-Land), while southern Viet Nam experienced below-normal temperature during JJA 2021. This is a similar

Annex C: Review of JJA 2021 Consensus Outlook

result as found in the review of DJF 2020/2021, where some of the country reviews were relatively cooler than those reported by ERA5.

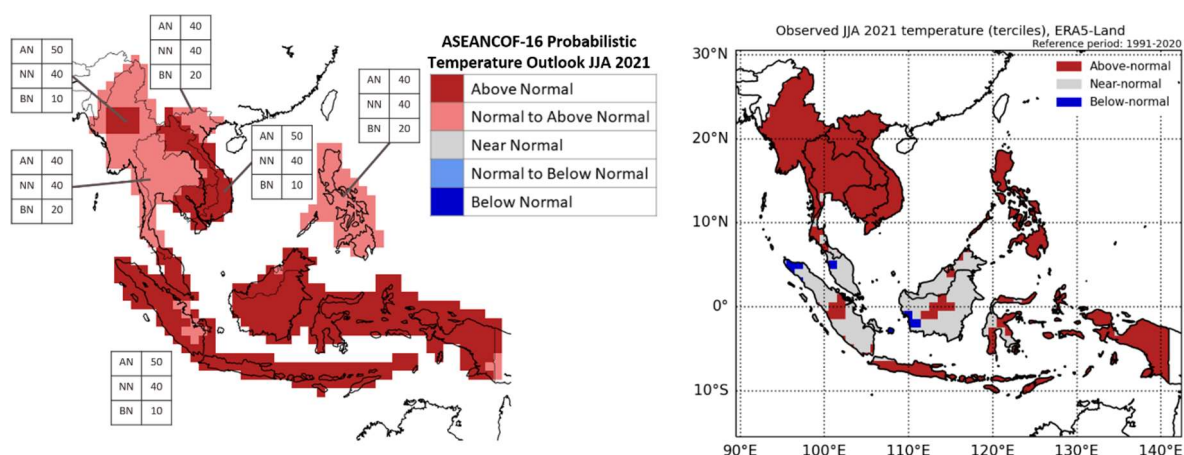


Figure C2: JJA 2021 ASEANCOF outlook (left) observed JJA temperature in terciles (right, climatology 1991-2020). The temperature dataset is ERA5-Land (Muñoz Sabater, J. et al. 2019).

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

	Above Normal		Normal to Above Normal	
	Outlook	Observed	Outlook	Observed
Above normal	50%	54%	40%	91%
Near Normal	30%	45%	40%	9%
Below Normal	20%	02%	20%	0%

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	-	AN (50%)	NN
Myanmar	Central	AN (50%)	AN
	Rest	NN - AN (40%)	NN
Philippines	-	NN - AN (40%)	NN
Singapore	-	AN (50%)	NN
Thailand	Northern	NN – AN (40%)	AN
Viet Nam	Northern	NN - AN (40%)	BN
	Rest	AN (50%)	NN

Annex C: Review of JJA 2021 Consensus Outlook

SIGNIFICANT EVENTS

There were several notable rainfall-related events throughout the ASEAN region between June and August 2021. For the northern ASEAN region, both flood and drought related events were reported. In Myanmar, river levels exceeded the danger 11 times, while drought was reported in various regions and states 16 times. Thailand recorded a dry spell between 17 June and 2 July, followed by flooding on 27 and 29 August. The Philippines experienced fewer tropical cyclones than average, however multiple flooding events were still reported in the second half of July.

For the southern ASEAN region, notable rainfall related events were recorded in Malaysia in all three months. Both Brunei Darussalam and Singapore recorded very wet conditions in August. Singapore experienced the wettest August island-wide since 1980, with the climate station also recording the highest daily rainfall total for August. For Brunei Darussalam, the August rainfall total was 193% above average, with the highest daily rainfall on 21 August, leading to flash floods. For both countries, the heavy rainfall was associated with MJO activity, as well as other climate drivers.

There were fewer notable temperature-related events in the ASEAN region between June and August 2021. The Philippines experienced extreme temperatures between 22 and 26 July, while Viet Nam recorded record hot temperatures in August.

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:10.3133/ds832.

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

Muñoz Sabater, J., (2019): ERA5-Land monthly averaged data from 1981 to present. Copernicus Climate Change Service (C3S) Climate Data Store (CDS). (Accessed on < 01-Nov-2021 >), 10.24381/cds.68d2bb3