

# Monthly Climate Bulletin

June 2020





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# SUMMARY

**Issued 07 July 2020**

- The El Niño Southern Oscillation (ENSO) remains neutral. The Bureau's ENSO outlook has shifted to La Niña WATCH due to continuous cooling in the tropical Pacific Ocean and most models anticipate this cooling will be close to the threshold for La Niña by early spring (September-October).
- The Intertropical Convergence Zone (ITCZ) was suppressed and generally displaced northward. The South Pacific Convergence Zone (SPCZ) was displaced south of its normal position towards Vanuatu, Fiji, Samoa, Cook Islands and French Polynesia.
- Sea level in June was higher than normal for most of countries in the region with anomalies (2-3cm) situated around eastern Palau, New Guinea Islands, Solomon Islands, southern Tuvalu and Samoa. Parts of southern PNG, Solomon Islands, New Caledonia, Vanuatu and Kiribati experienced below normal conditions.
- The Coral Bleaching Alert for early July shows a region of Alert Level 1 spanning northern PNG and southern FSM. Areas of Warning exist around Palau, southern FSM and New Guinea Islands. The remainder of south west Pacific Island countries are on Watch and no stress. The four weeks Coral Bleaching Outlook till 26 July shows the region of Alert Level 1 to persist over south Palau, FSM, northern PNG and New Guinea Islands. The remainder of the south west Pacific countries are on warning, Watch or no stress.
- For July to September, most models agree on below normal rainfall for Nauru, Kiribati and northern Tuvalu and above normal rainfall for the PNG Highlands, western and southern region of PNG, Solomon Islands, central and northern Vanuatu, Fiji, Wallis and Futuna and Samoa. The models disagree elsewhere. Warmer than average maximum and minimum temperature are favoured for most countries.

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# EL NIÑO–SOUTHERN OSCILLATION

## La Niña WATCH -Likelihood of tropical Pacific reaching La Niña in spring increases

*Climate Driver Update issued on 23 June 2020*

Both the El Niño Southern Oscillation (ENSO) and Indian Ocean Dipole (IOD) remain neutral. However, cooling in the tropical Pacific Ocean has continued, and the majority of models anticipate this cooling will be close to the threshold for La Niña by early spring. Consequently, the Bureau's ENSO Outlook has shifted to La Niña WATCH.

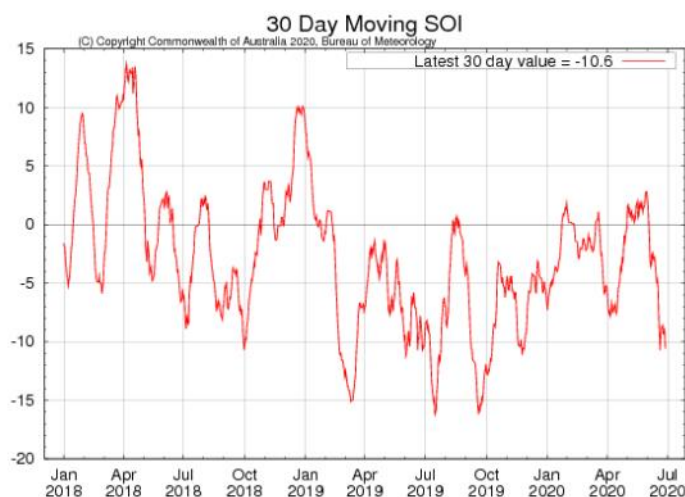
La Niña WATCH means the chance of La Niña forming in 2020 is around 50%- roughly double the average likelihood. Three models indicate a La Niña could form by late winter, with another two models suggesting thresholds could be approached during early spring. La Niña events typically bring above average spring rainfall in northern, central, and eastern Australia.

Key indicators of ENSO, such as the Southern Oscillation Index (SOI), trade winds, cloudiness near the Date Line, and sea surface temperatures in the tropical Pacific Ocean, are consistent with a neutral ENSO state. However, sea surface temperatures across the tropical Pacific Ocean have cooled over the past two months and are supported by temperatures below the surface of the tropical Pacific Ocean, which are also cooler than average.

Most international climate models surveyed by the Bureau indicate central tropical Pacific sea surface temperatures in the NINO3.4 region will cool in the coming months. Three of the eight surveyed models reach the La Niña threshold during August, with another two models approaching thresholds in September and October. The other three models remain more clearly at neutral levels.

Despite recent cooling in the eastern Indian Ocean, three of six models continue to suggest the possibility of a negative IOD developing during winter (June-August) or early spring (September). Most models show a broad spread of likely scenarios between the neutral and negative IOD range. A negative IOD typically brings above average winter to spring rainfall to southern Australia. IOD do not have much influence in the Pacific region.

The approximate 30-day and 90-day Southern-Oscillation Index (SOI) values to 1 July were -9.4 and -1.6 respectively. While the 30-day SOI has dropped over the past fortnight, mostly due to higher pressure at Darwin, the longer-term 90-day SOI is still well within the ENSO neutral range.

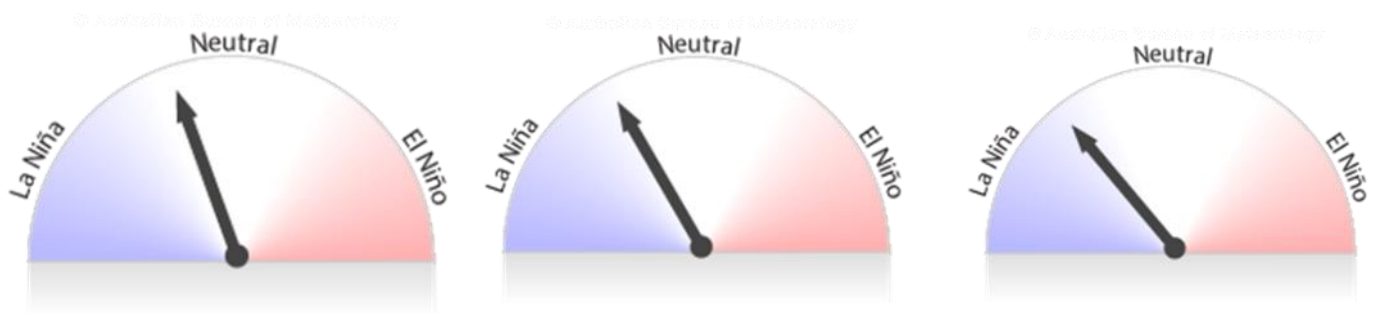


# EL NIÑO–SOUTHERN OSCILLATION

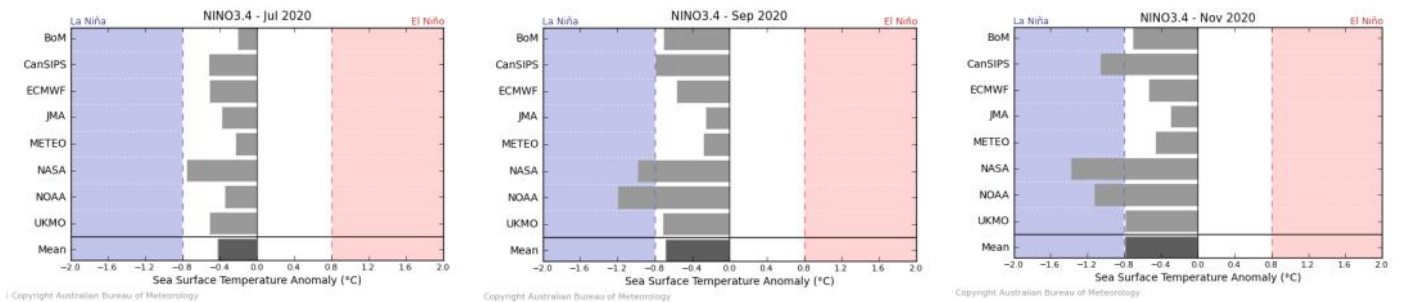
La Niña WATCH -Likelihood of tropical Pacific reaching La Niña in spring increases  
 Climate Driver Update issued on 23 June 2020



## Bureau of Meteorology NINO3.4 ENSO Model Outlooks for July, September and November



## Bureau of Meteorology NINO3.4 International Model Outlooks



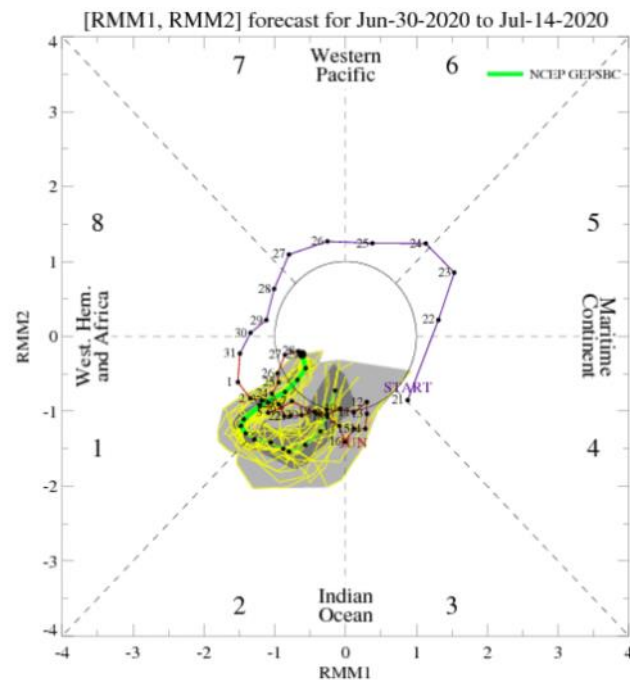
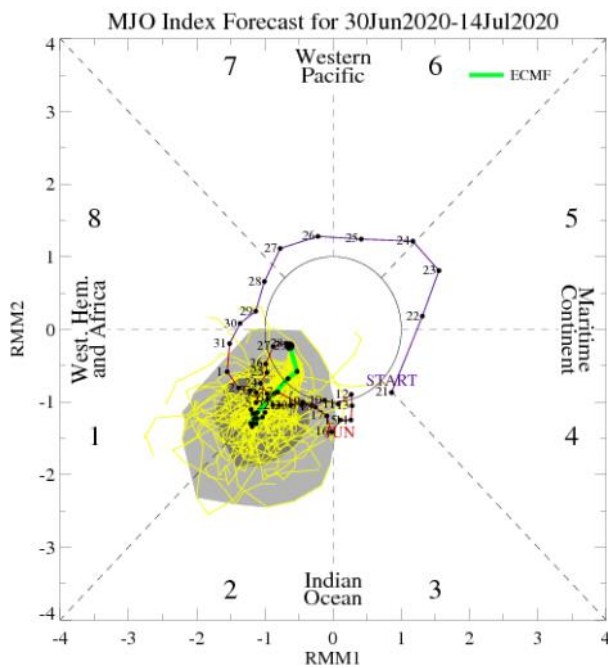
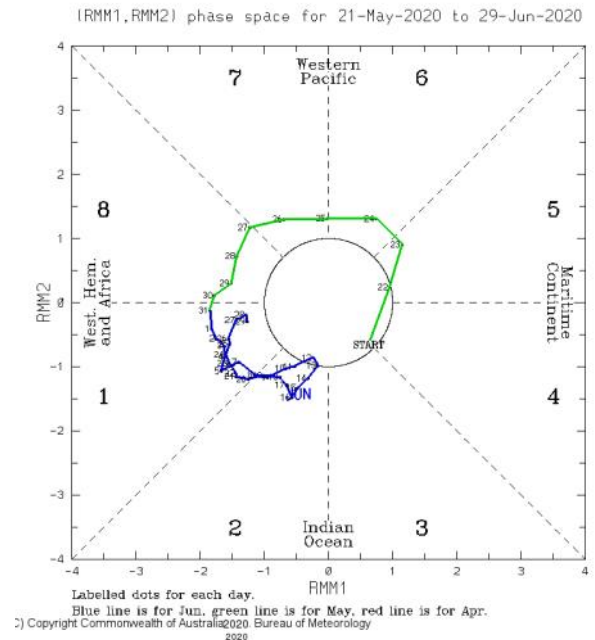
Bureau of Meteorology summary of international model outlooks for NINO3.4: <http://www.bom.gov.au/climate/model-summary/#tabs=Pacific-Ocean>

# MADDEN–JULIAN OSCILLATION

Weekly Tropical Note [Issued on Tuesday 30 June 2020]

The Madden Julian Oscillation (MJO) and other intra-seasonal atmospheric waves across the tropics are currently having no significant influence on weather across northern Australia (and the western Pacific).

This is an abbreviated version of the Weekly Tropical Note. Click on the *Weekly Tropical* for more information

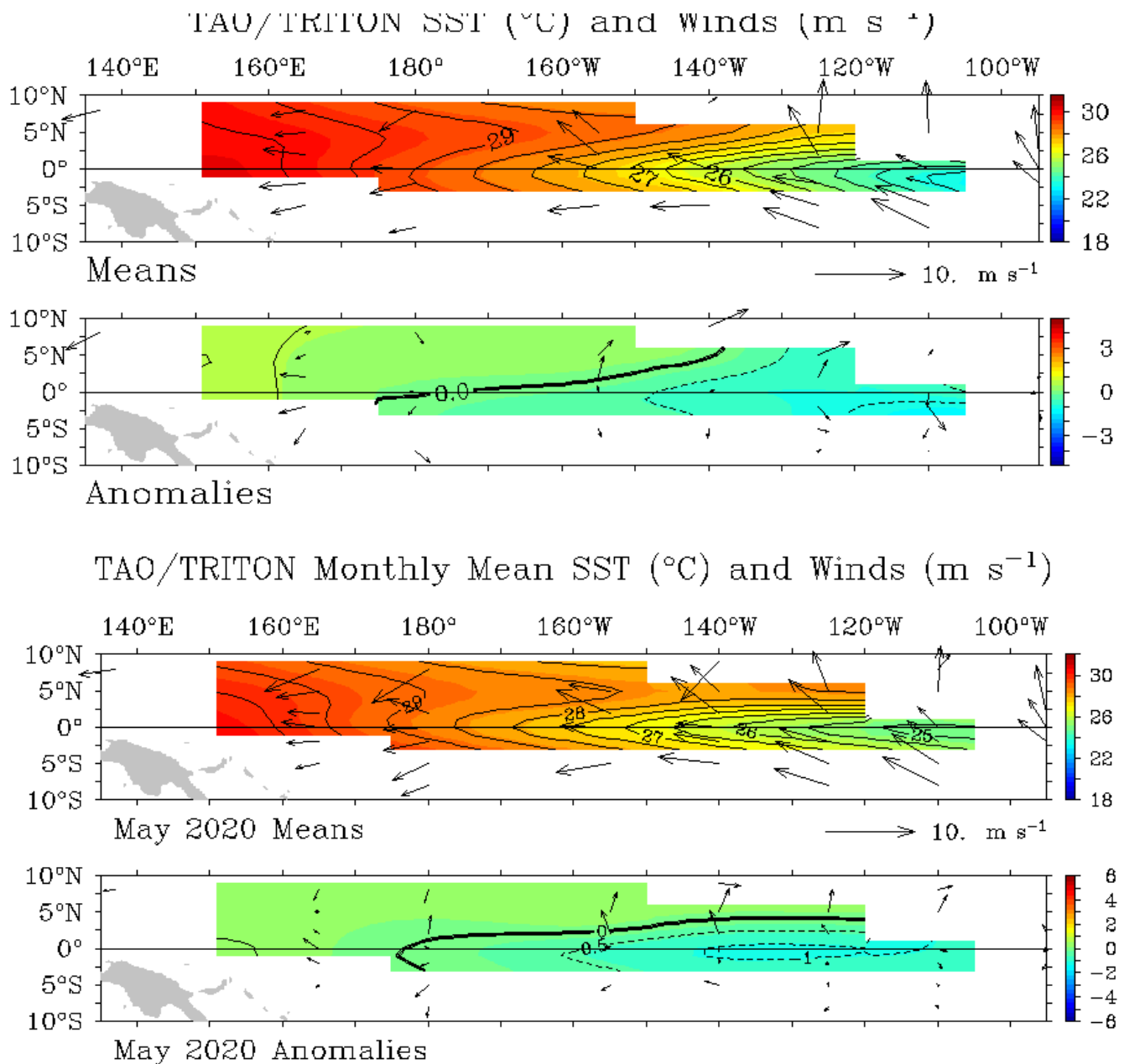




# WIND

The equatorial trade winds in the 5-day snapshot ending 29 June and for the month of June show near normal trade winds across the equatorial tropical Pacific, consistent with neutral EN-SO conditions.

During La Niña events, there is a sustained strengthening of the trade winds across much of the tropical Pacific, while during El Niño events there is a sustained weakening, or even reversal, of the trade winds.



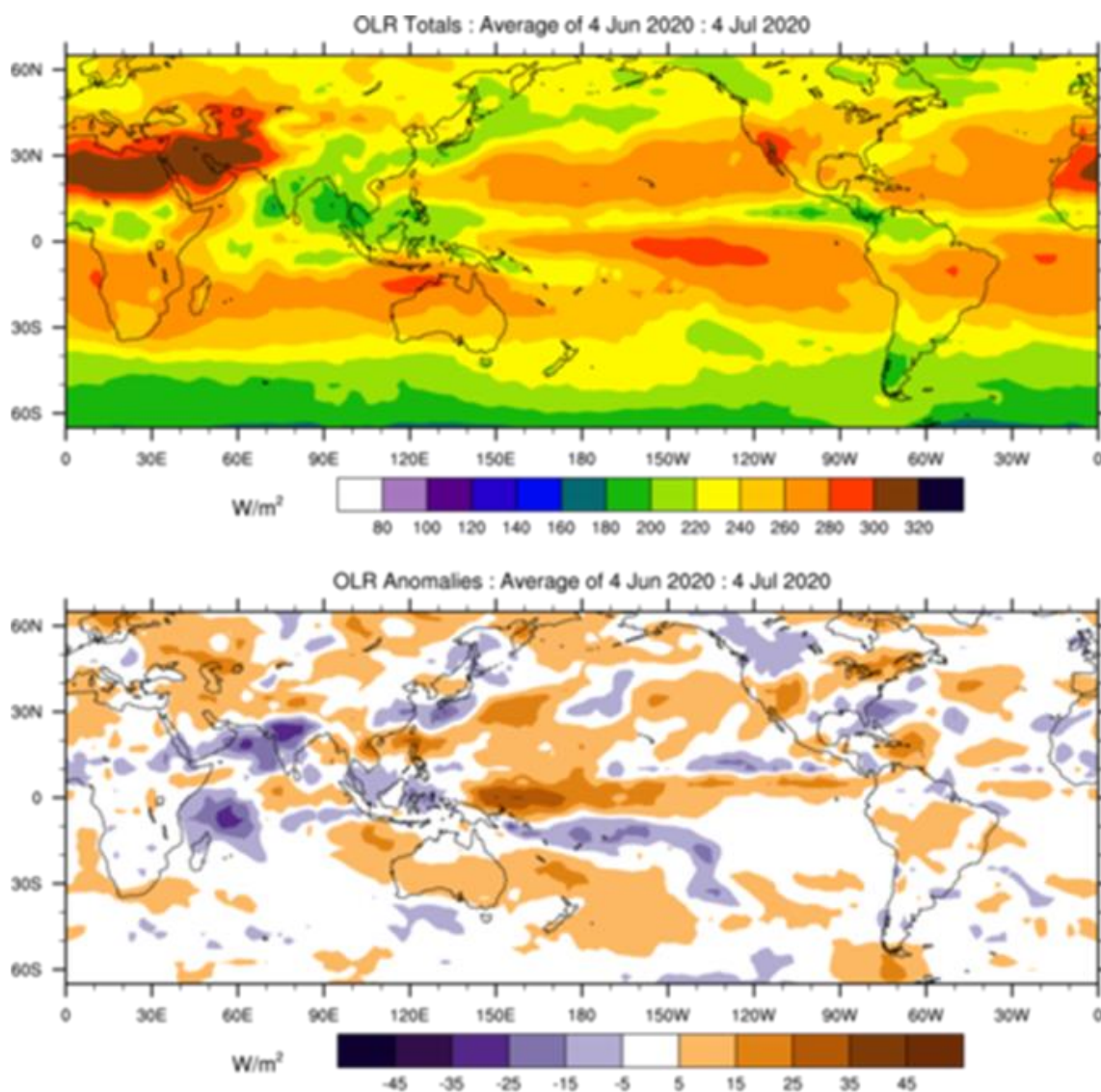
# CLOUD AND RAINFALL



The June 30-day OLR total and anomaly maps suggest the Intertropical Convergence Zone (ITCZ) was suppressed and displaced northward in the western Pacific. It appears to have been suppressed close to the equator in the central and eastern Pacific. The South Pacific Convergence Zone (SPCZ) was displaced south of its normal position towards Vanuatu, Fiji, Samoa, Cook Islands and French Polynesia resulting in higher than normal rainfall for these countries. The southward displacement resulted in drier than normal conditions south of the equator.

Note: Global maps of OLR below highlight regions experiencing more or less cloudiness. The top panel is the total OLR in Watts per square metre ( $W/m^2$ ) and the bottom panel is the anomaly (current minus the 1979-1998 climate average), in  $W/m^2$ . In the bottom panel, negative values (blue shading) represent above normal cloudiness while positive values (brown shading) represent below normal cloudiness.

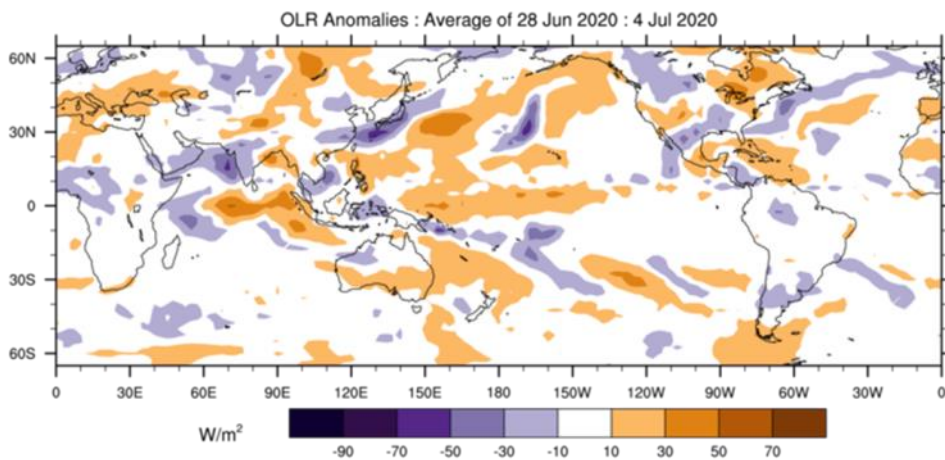
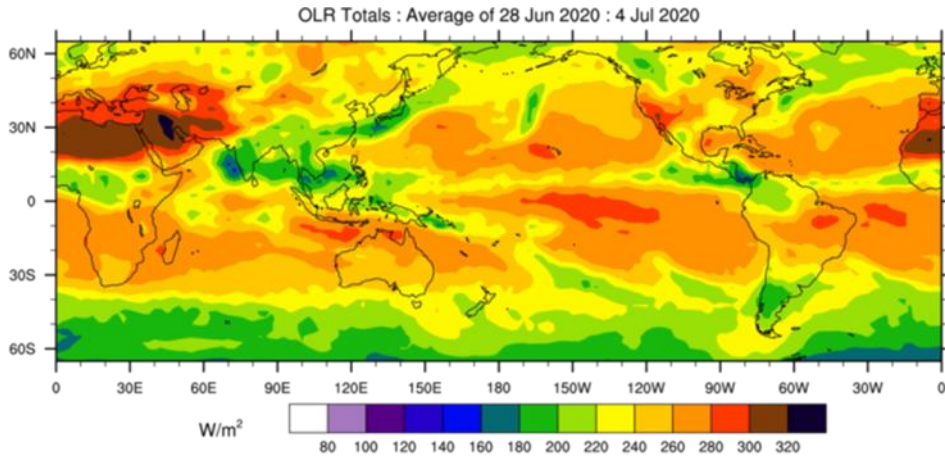
## OLR Total and Anomalies, 30 Day OLR



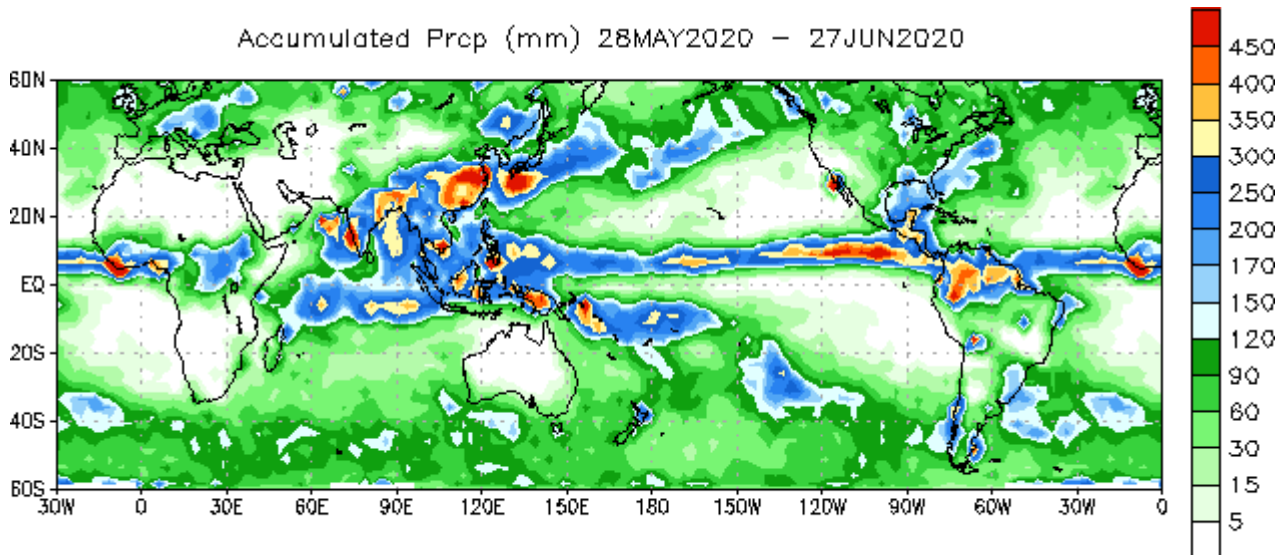
(C) Copyright Commonwealth of Australia 2020. Bureau of Meteorology



# OLR Total and Anomalies, 7 Day OLR

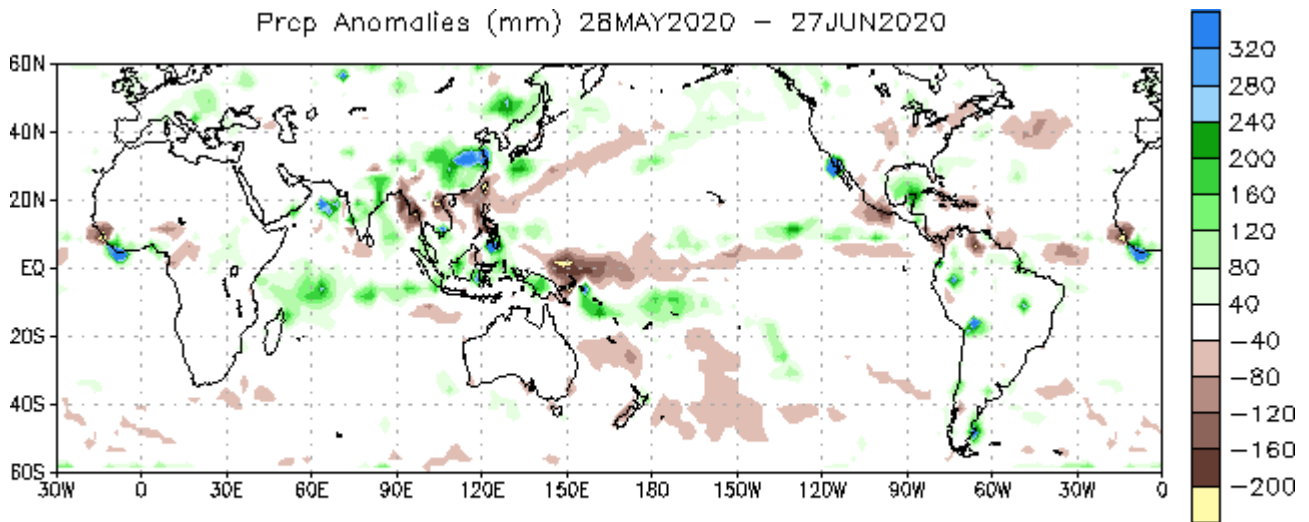


(C) Copyright Commonwealth of Australia 2020. Bureau of Meteorology

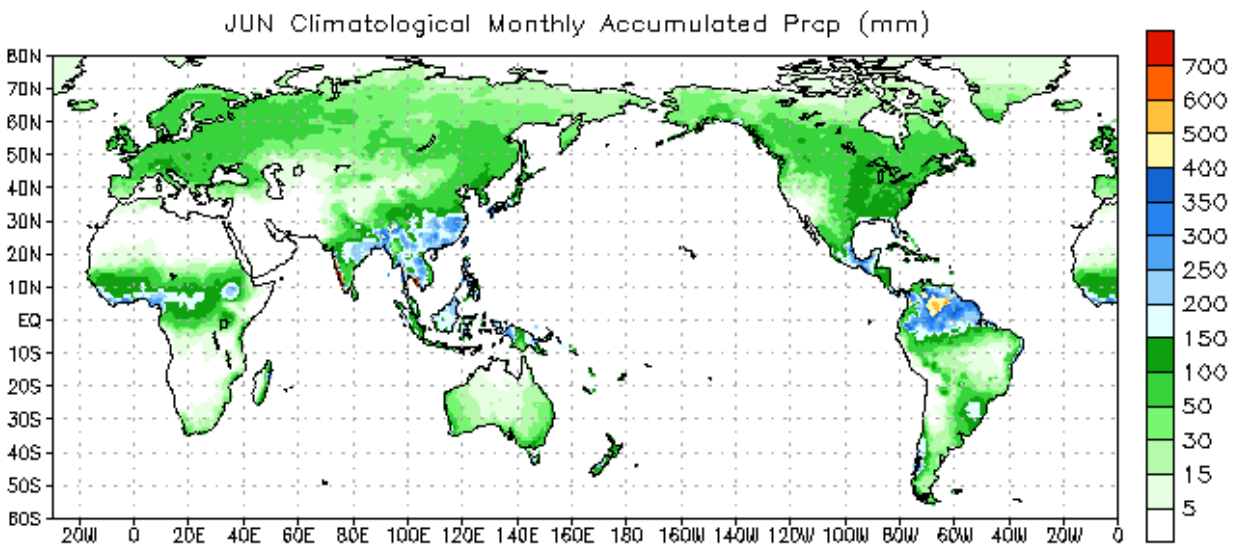


Data Source: NCEP CMAP Precipitation

# 30-Day Rainfall Anomalies



Data Source: NCEP CMAP Precipitation  
Climatology (1979–1995)



Data Source: CPC Unified (gauge-based) Precipitation  
Climatology (1979–1995)

[https://www.cpc.ncep.noaa.gov/products/Global\\_Monsoons/Figures/curr.p.30day.figb.gif](https://www.cpc.ncep.noaa.gov/products/Global_Monsoons/Figures/curr.p.30day.figb.gif)

# OCEAN CONDITIONS

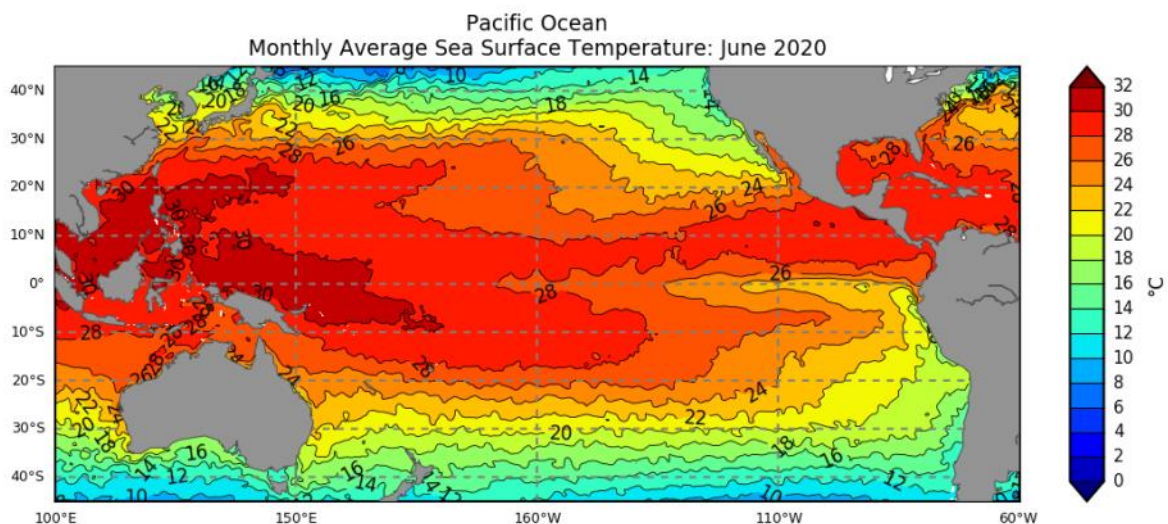
## SEA SURFACE TEMPERATURE



Sea surface temperatures (SSTs) for June were slightly warmer than average across most of the western and central Pacific Ocean with much of the central tropical Pacific SSTs being close to average for this time of the year. Cooler than average SSTs have increased slightly in the eastern half of the equatorial Pacific Ocean.

SSTs also remain warmer than average around most of the COSPPac countries. SSTs ranged from half to one degree warmer than average around Pacific, and up to one and half degree warmer than average around northern PNG, western Solomon Islands, northern Fiji, southern Tuvalu, Tonga, Samoa and Niue. Cooler than average SST were around the Kiribati, New Caledonia, Vanuatu, Fiji and Cook Islands EEZ. In terms of the deciles, regions of Highest on Record for June spanned across parts of Palau and FSM, PNG, Solomon Islands, Tuvalu, Fiji, Tonga, Samoa and Niue EEZs. Average to below average (2-7) spanned across RMI, Kiribati, Vanuatu, Fiji and Cook Islands EEZ.

### Mean Sea Surface Temperature



©Pacific Community (SPC) 2020  
Geoscience Energy and Maritime Division, COSPPac SPP

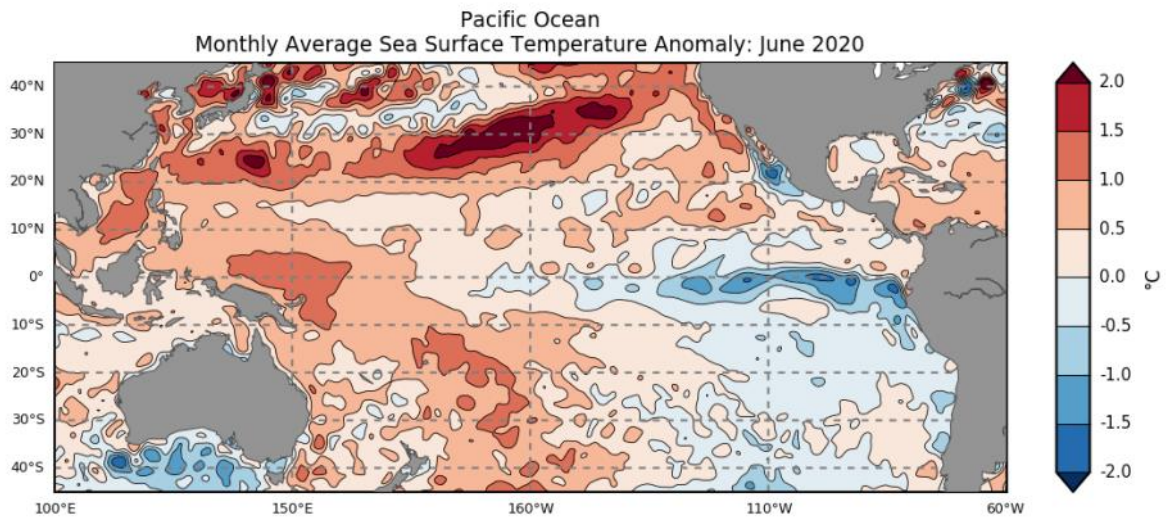
Reynolds SST

# OCEAN CONDITIONS

## SEA SURFACE TEMPERATURE



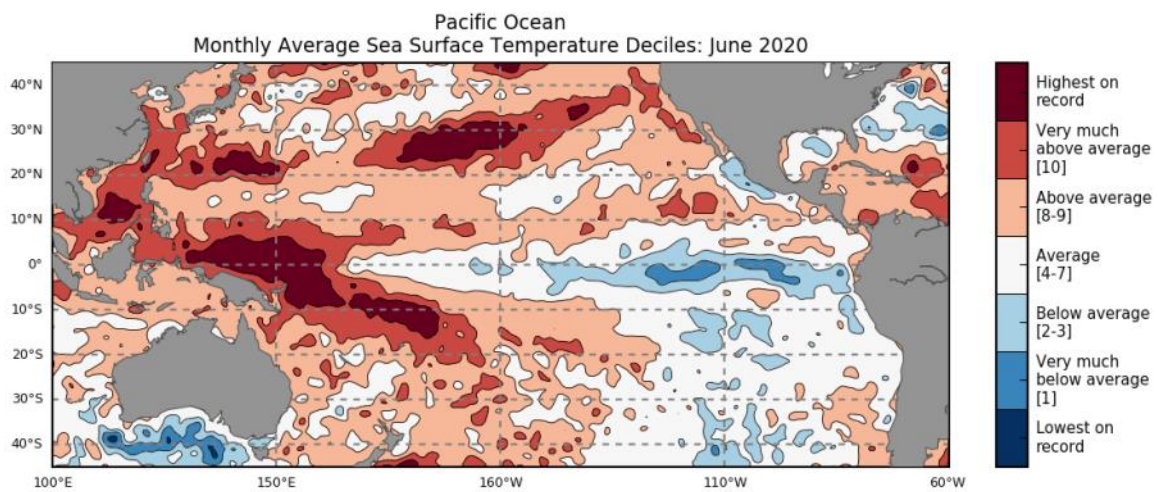
### Anomalous Sea Surface Temperature



©Pacific Community (SPC) 2020  
Geoscience Energy and Maritime Division, COSPPac SPP

Reynolds SST

### Sea Surface Temperatures Deciles



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Reynolds SST

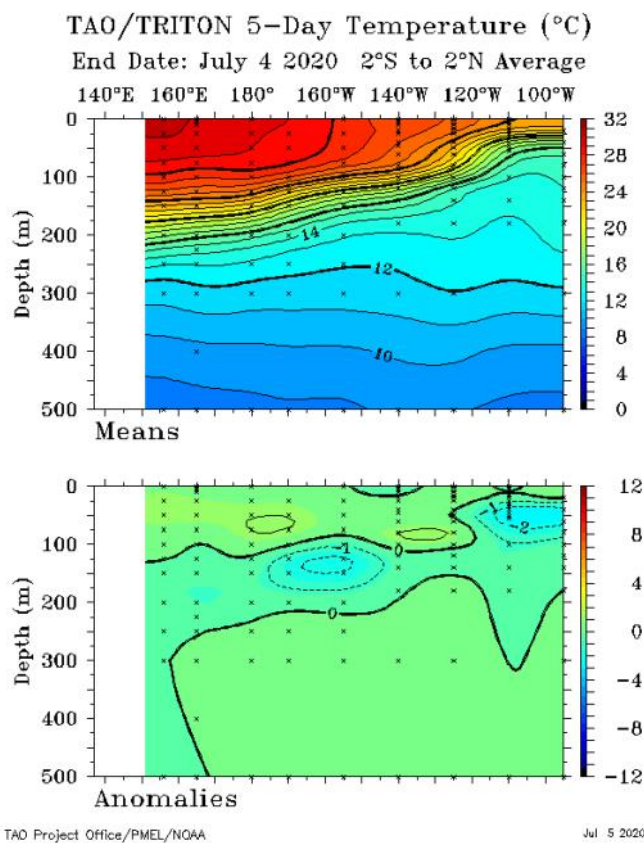
# OCEAN CONDITIONS

## SUB SURFACE

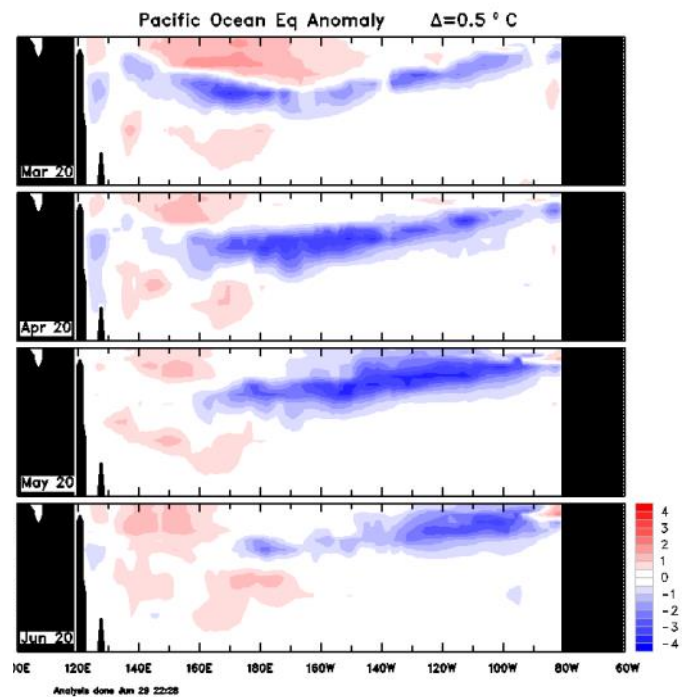


The Bureau of Meteorology's four-month sequence of equatorial sub-surface temperature anomalies (to 18 June) shows cooler than average waters extend in a band across the majority of the equatorial Pacific, between about 100 and 200 m in the western to central equatorial Pacific and rising to the top 50 m depth at the eastern edge of the equatorial Pacific. In the western equatorial Pacific very weak warm anomalies persist and have spread slightly in extent compared to May. Since January, the pattern of cooler anomalies at depth has persisted, providing conditions favourable for potential La Niña development.

### Weekly Temperatures Mean and Anomalies



### Monthly Temperatures Anomalies



Bureau of Meteorology Sea Temperature Analysis: <http://www.bom.gov.au/marine/sst.shtml>

TAO/TRITON Data Display: <http://www.pmel.noaa.gov/tao/jsdisplay/>

# OCEAN CONDITIONS

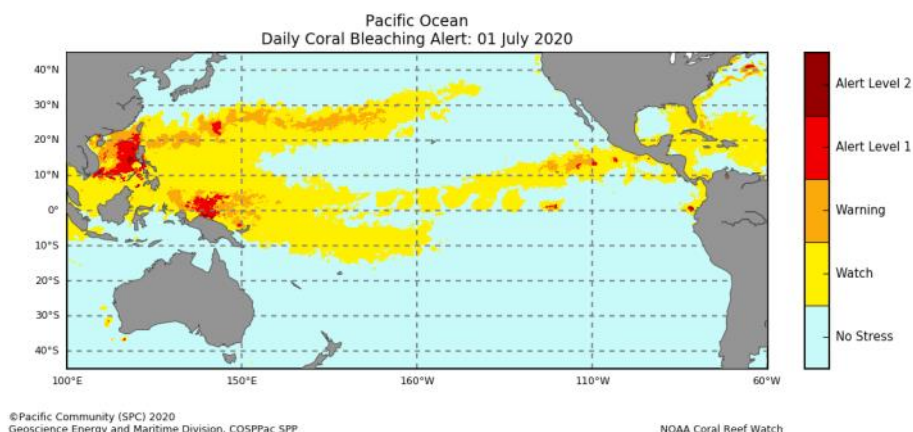
## CORAL BLEACHING



The daily Coral Bleaching Alert for 01 July 2020 shows a region of Alert Level 1 spanning northern PNG and southern FSM. Areas of Warning exist around Palau, southern FSM and New Guinea Islands. The remainder of south west Pacific Island countries are on Watch and no stress. The four weeks Coral Bleaching Outlook till 26 July shows the region of Alert Level 1 to persist over south Palau, FSM, northern PNG and New Guinea Islands. The remainder of the south west Pacific countries are on warning, Watch or no stress.

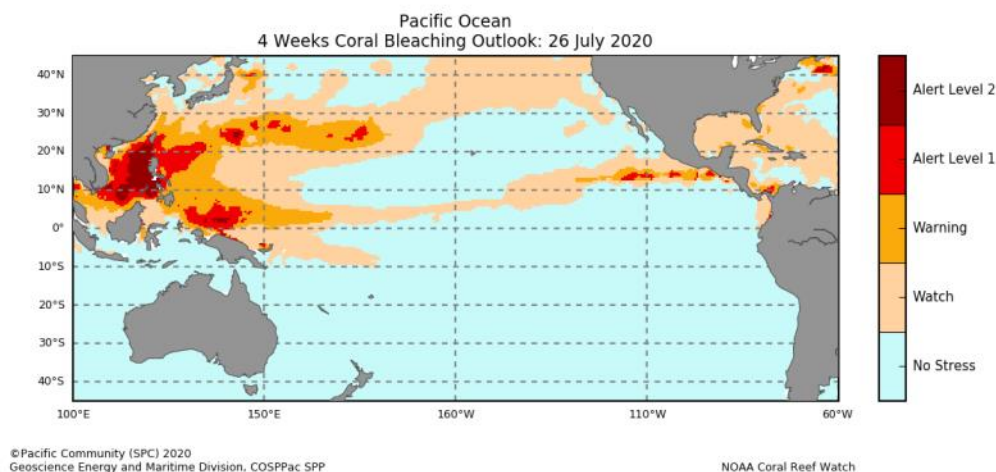
### Daily Coral Bleaching Alert

(Source: [Pacific Community COSPPac Ocean Portal Coral Bleaching](#))



### 4-Weeks Coral Bleaching Outlook

(Source: [Pacific Community COSPPac Ocean Portal](#))



# OCEAN CONDITIONS

## OCEAN SURFACE CURRENTS AND SEA LEVEL

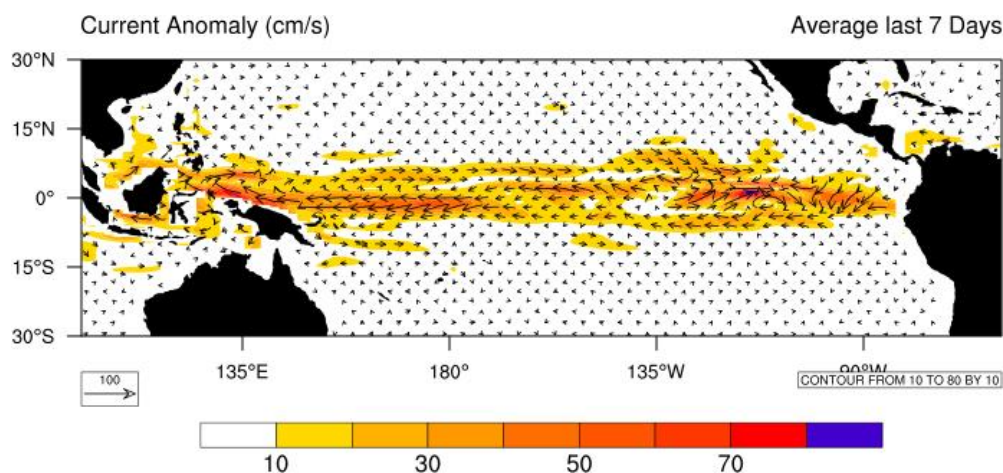


The most recent 7-day ocean surface currents plot shows a stronger than normal westward flowing Equatorial Current in the equatorial Pacific with clear divergence along the equator, especially east of about 160°W.

Sea level in June was higher than normal for most of countries in the region with anomalies (2-3cm) situated around eastern Palau, New Guinea Islands, Solomon Islands, southern Tuvalu and Samoa. Parts of southern PNG and Solomon Islands, New Caledonia, Vanuatu and Kiribati experienced below normal conditions.

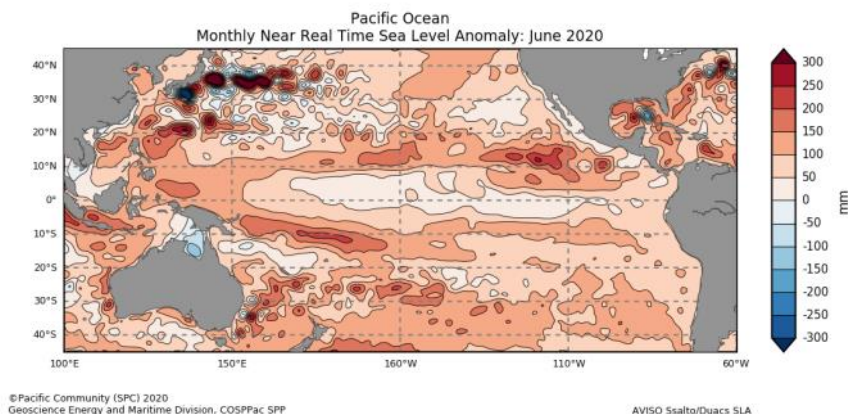
### Ocean Surface Current (Last 7-Days)

[Bureau of Meteorology POAMA](#)



### Monthly Sea Level Anomalies

Source: [Pacific Community COSPPac Ocean Portal](#)

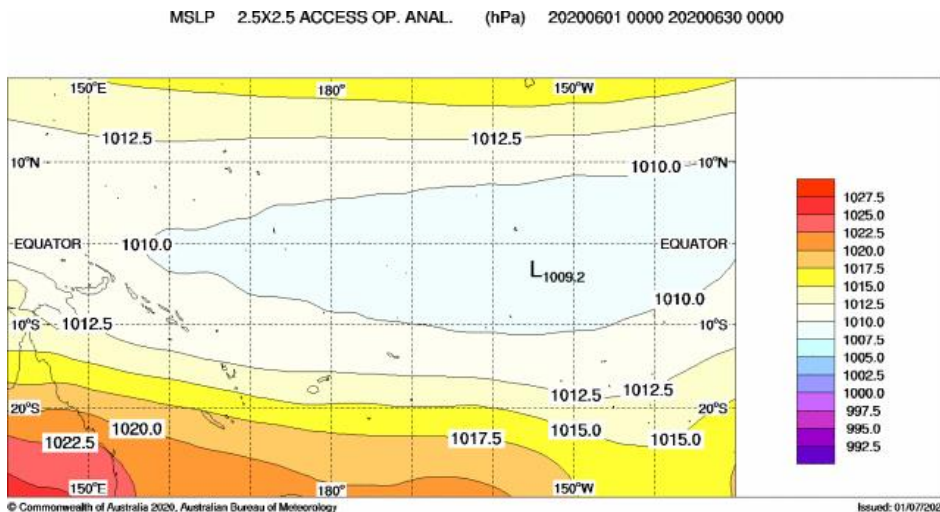


# MEAN SEA LEVEL PRESSURE

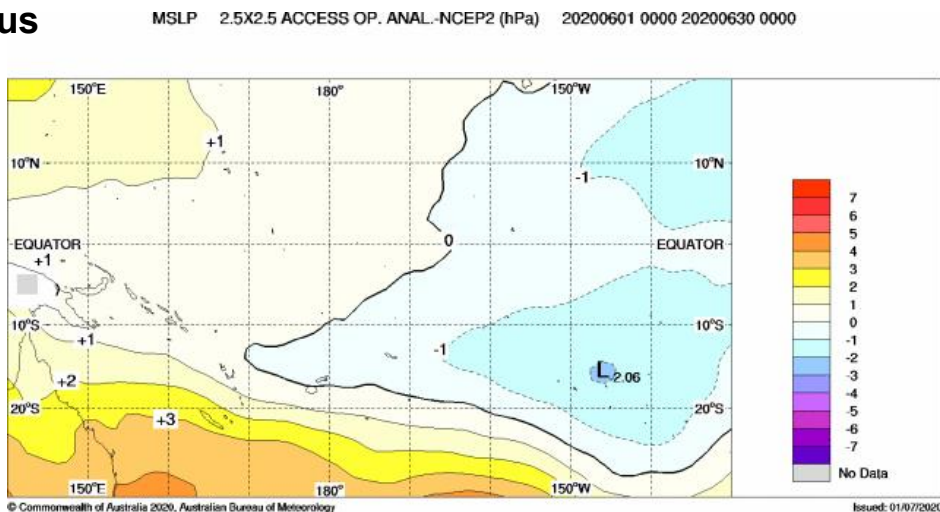
The June mean sea level pressure (MSLP) anomaly map shows negative anomalies east of 165° W in the tropical south Pacific and east of 150°W in the northern tropical Pacific. Positive anomalies were present in the tropical north Pacific west of 165°E (over FSM and the Marshall Islands) and tropical and subtropical south Pacific (over northeast Australia, New Caledonia and southern Vanuatu).

Areas of above (below) average MSLP usually coincide with areas of suppressed (enhanced) convection and rain throughout the month.

## Mean



## Anomalous



Bureau of Meteorology South Pacific Circulation Patterns: <http://www.bom.gov.au/cgi-bin/climate/cmb.cgi?variable=mslp&area=spac&map=anomaly&time=latest>



# SEASONAL RAINFALL OUTLOOK

July—September 2020



For July, the ACCESS-S model favours below normal rainfall for parts of western, central and eastern FSM, northern Marshall Islands, Nauru, New Caledonia, central and southern Vanuatu, Kiribati, northern Tuvalu, eastern islands in the southern Cook Islands and central and southern French Polynesia. Wetter than average conditions is favoured for Palau, southern Marshall Islands, New Guinea Islands, southern region of PNG, Solomon Islands, northern Vanuatu, Rotuma and north-eastern and eastern islands of Fiji, northern Tonga, Samoa, Niue and northern and central Cook Islands. The three months outlook (July-September) favours a similar outlook to that for July with below normal rainfall extending to most of FSM. Above normal rainfall is also favoured for large part of PNG, Vanuatu and central Tonga. With the exception of FSM, this is a typical La Niña rainfall pattern. Warmer than average maximum and minimum temperature are favoured for all COSPPac countries except for western and central Kiribati and Nauru with near normal temperature favoured. The north-eastern equatorial Kiribati Islands are likely to experience below normal temperatures.

The Copernicus multi-model outlook favours below normal rainfall for the northernmost New Guinea Islands, northern Palau, FSM, Nauru, Kiribati and northern Tuvalu and above normal rainfall for southern Palau, southern region of PNG, eastern Solomon Islands, northern Vanuatu, northern Fiji, northern Tonga, Samoa and Niue.

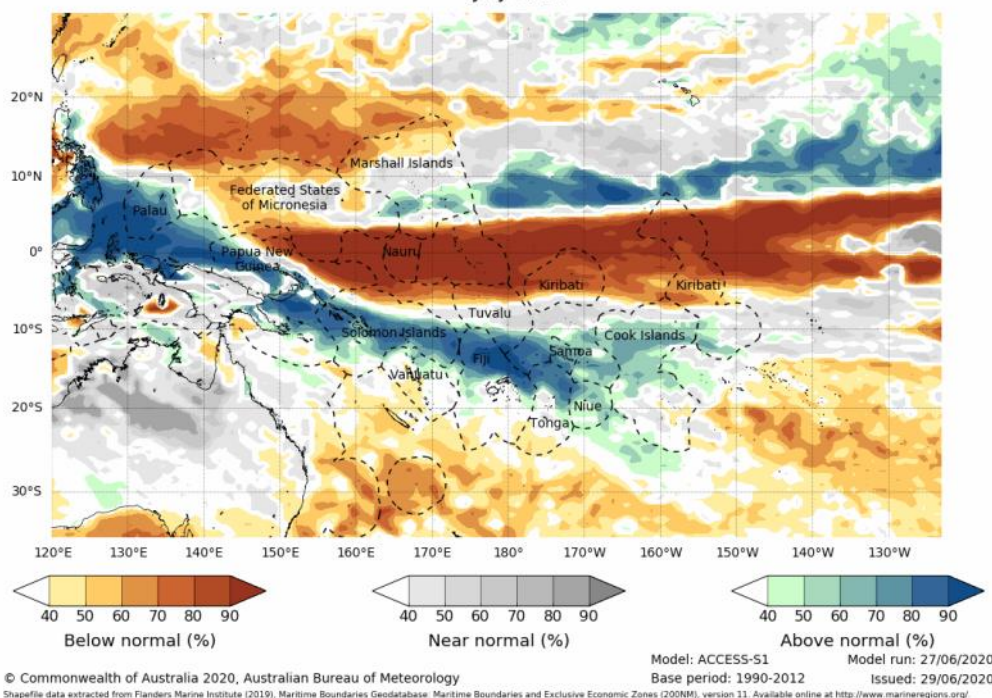
The SCOPIC statistical model favours below-normal rainfall for Momase region and Misima in PNG, central and northern Vanuatu and Fiji. Above normal rainfall is favoured for Kiribati, Tuvalu and northern Cook Islands.

The APEC Climate Centre multi-model favours below normal rainfall for Palau, southern FSM, northern RMI, New Guinea Islands, Nauru, northern Tuvalu, Kiribati and northern French Polynesia. Above normal rainfall is favour for PNG highlands, Momase, western and southern region of PNG, southern Marshall Islands, Solomon Islands, northern Vanuatu, Fiji, Wallis and Futuna, Samoa and central Cook Islands.

For July to September, the dynamical models (excluding SCOPIC) agree on below normal rainfall for Nauru, Kiribati and northern Tuvalu. The models also agree on above normal rainfall for the PNG Highlands, western and southern region of PNG, Solomon Islands, central and northern Vanuatu, northern and eastern Fiji, Wallis and Futuna and Samoa. The models disagree elsewhere.

## Monthly **ACCESS-S** Maps

Tercile rainfall probabilities for July 2020

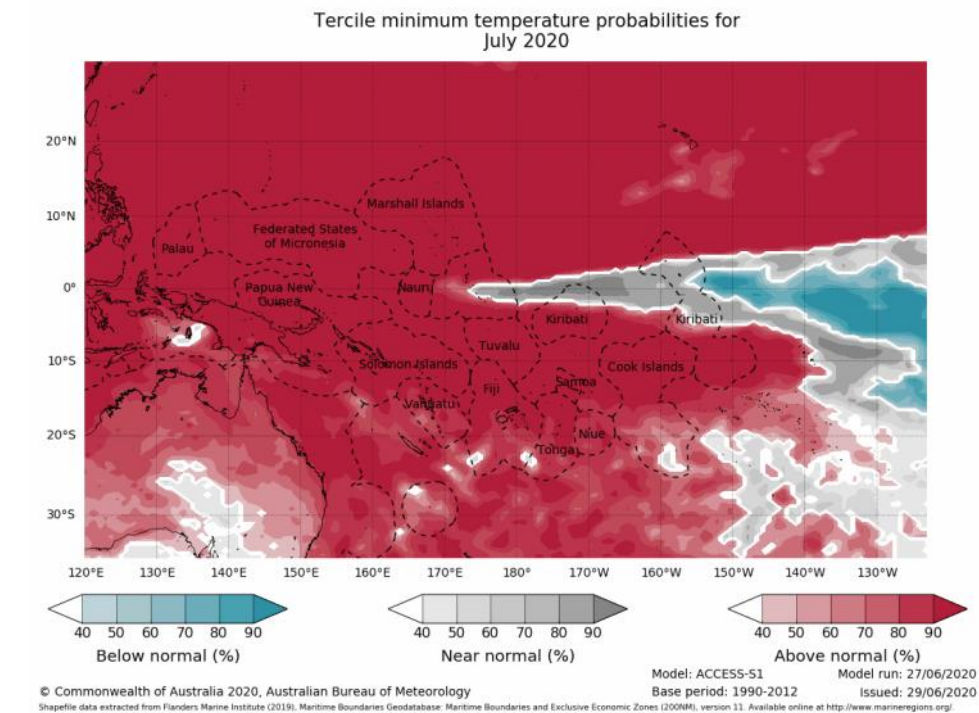
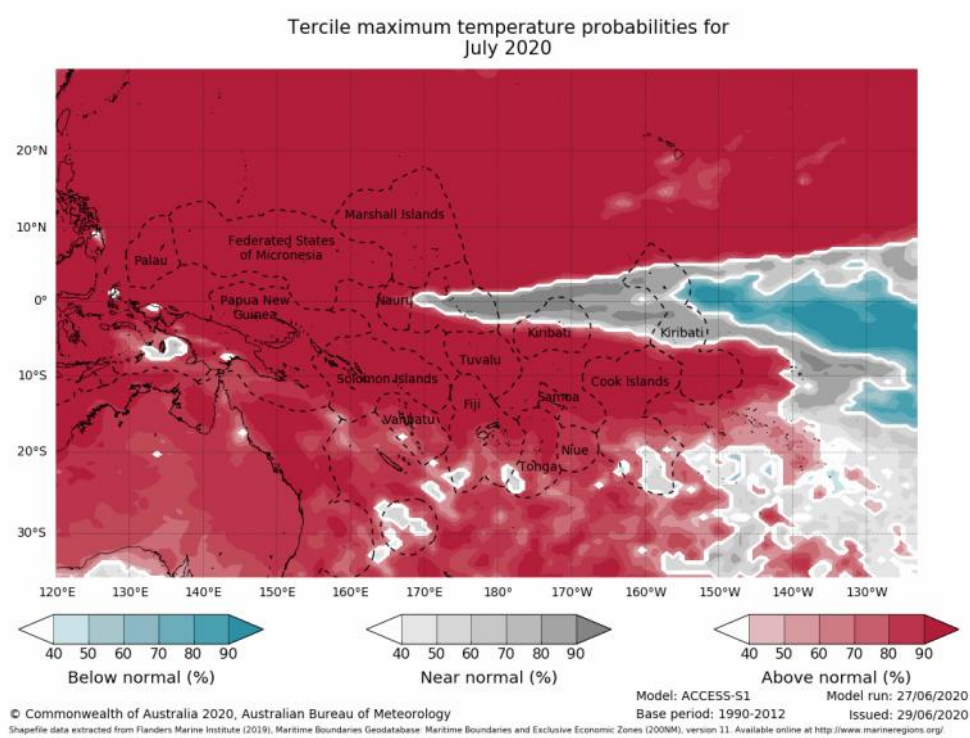


# SEASONAL RAINFALL OUTLOOK

July—September 2020



## Monthly ACCESS-S Maps



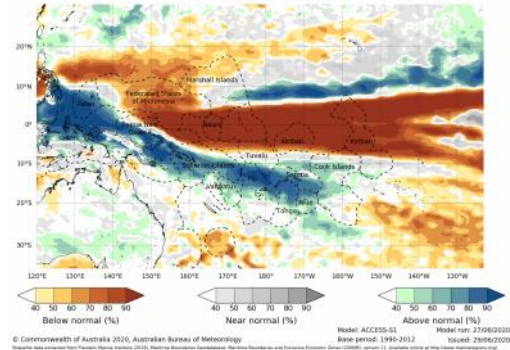
# SEASONAL RAINFALL OUTLOOK

July—September 2020

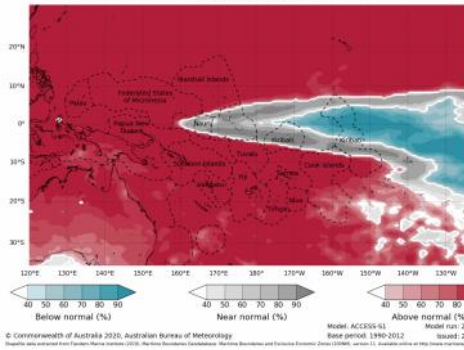


## Seasonal ACCESS-S maps

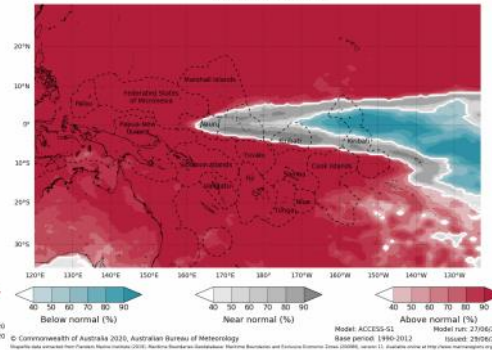
Tercile rainfall probabilities for July to September 2020



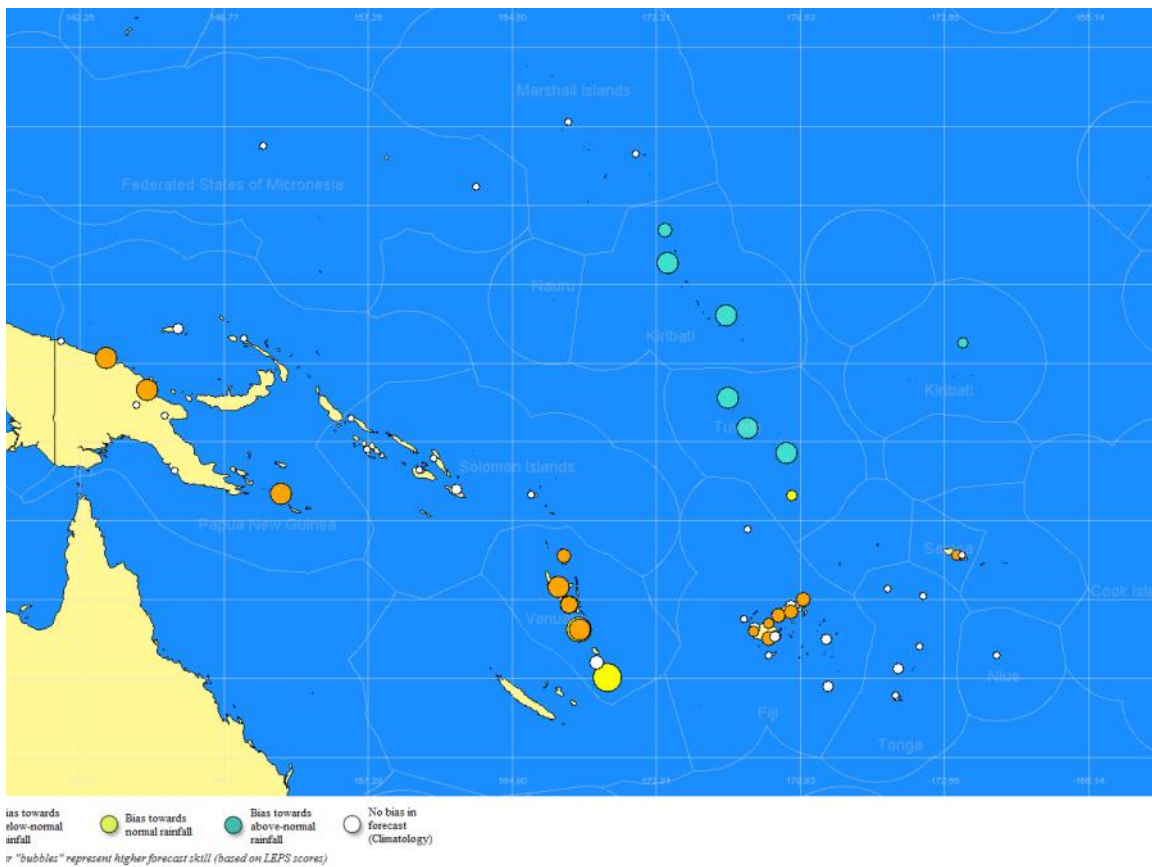
Tercile maximum temperature probabilities for July to September 2020



Tercile minimum temperature probabilities for July to September 2020



## SCOPIC



'About SCOPIC' [www.pacificmet.net/project/climate-and-ocean-support-program-pacific-cosppac](http://www.pacificmet.net/project/climate-and-ocean-support-program-pacific-cosppac)

# SEASONAL RAINFALL OUTLOOK

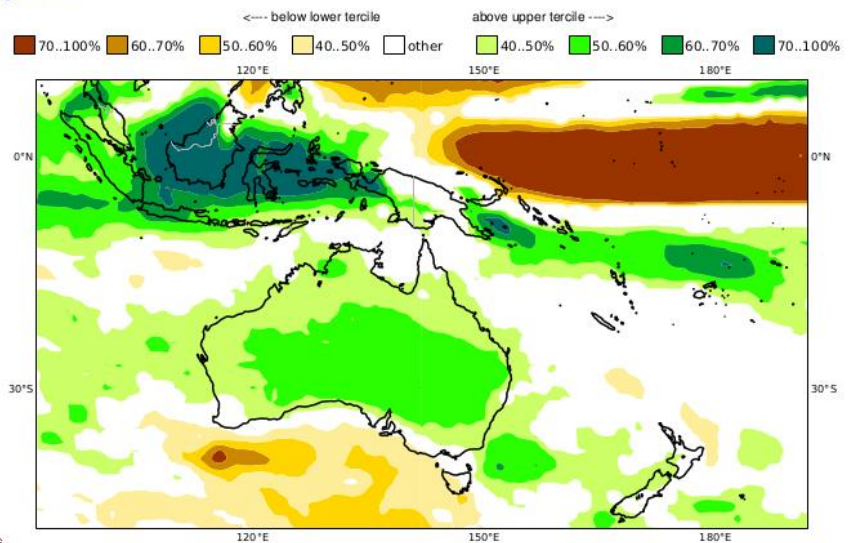
July—September 2020



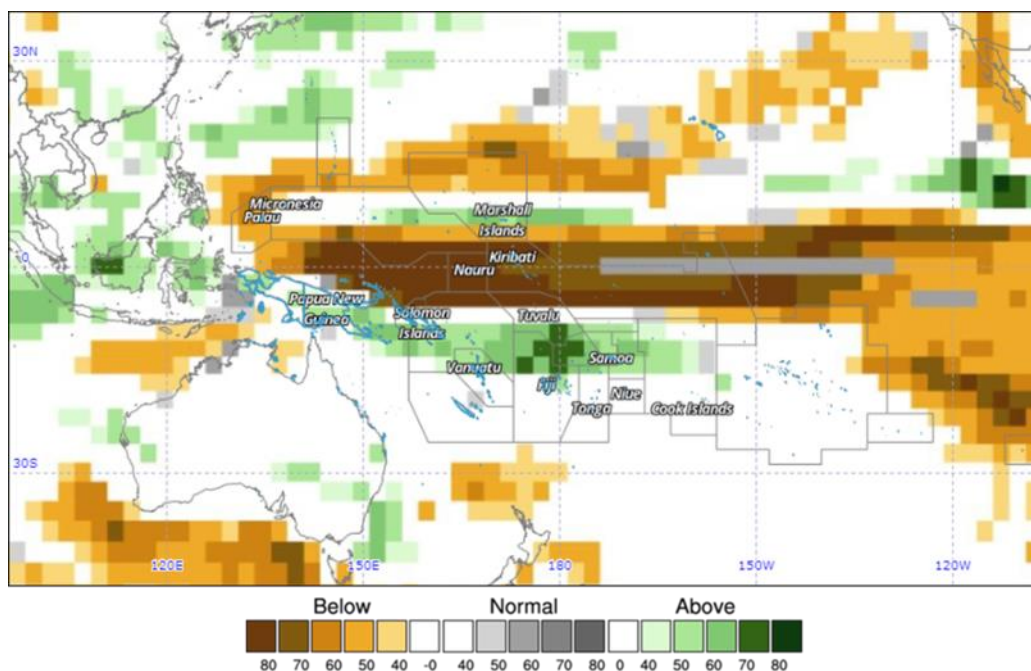
## Copernicus (C3S multi-system)-Rainfall

C3S multi-system seasonal forecast  
 Prob(most likely category of precipitation)  
 Nominal forecast start: 01/06/20  
 Unweighted mean

ECMWF/Met Office/Météo-France/CMCC/DWD/NCEP  
 JAS 2020



APEC Climate Information Toolkit for the Pacific: <http://clikp.sprep.org/>



Year: 2020, Season: JAS, Lead Month: 3, Method: GAUS

Model: APCC, MSC, NASA, NCEP

Generated using CLIK® (2020-7-3)

© APEC Climate Center

# TROPICAL CYCLONE

## 2019/2020 Season

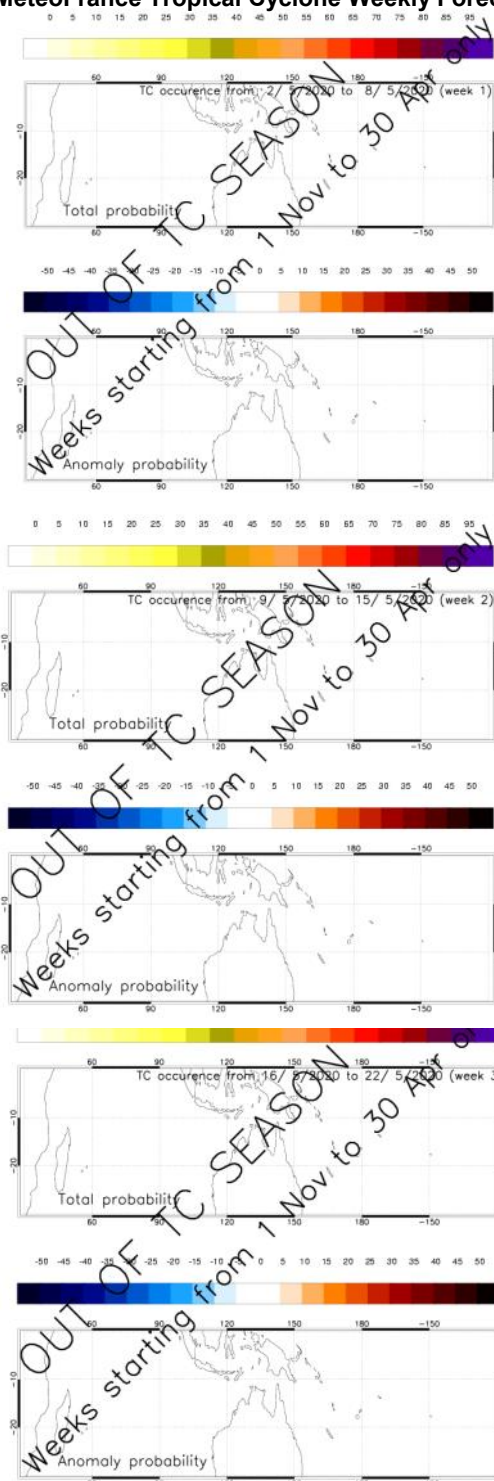


Eight tropical cyclones (Rita, Sarai, Tino, Uesi, Vicky, Wasi, Gretel and Harold) formed in the 2019-20 south Pacific (east of the tip of Cape York, Queensland) cyclone season. These cyclones affected Solomon Islands, New Caledonia, Vanuatu, Fiji, Wallis and Futuna, Tonga, American Samoa, Samoa and Niue. Out of the eight cyclones, four severe cyclones: Rita, Tino, Uesi, and Harold. Harold was one of the most intense cyclones to make landfall in the Pacific Islands during April on record (minimum mean sea level pressure 912 hPa). The long-term average for the period 1969-70 to 2017-18 is nine cyclones. Although the official cyclone season ended in April 2020, historical data has shown that cyclones can form outside the normal cyclone season. Updates on tropical cyclone forecast from the Meteo France weekly forecasts will resume in October 2020.

The tropical cyclone season outlook for 2019-20 is available via: <http://www.bom.gov.au/climate/cyclones/south-pacific/>

The tropical cyclone season outlook for 2018-19 is available via: <http://www.bom.gov.au/climate/cyclones/south-pacific/>

### MeteoFrance Tropical Cyclone Weekly Forecasts



### Individual Model Links

UKMO Global long-range model probability maps: <http://www.metoffice.gov.uk/research/climate/seasonal-to-decadal/gpc-outlooks/glob-seas-prob>

ECMWF Rain (Public charts) - Long range forecast: <http://www.ecmwf.int/en/forecasts/charts/seasonal/rain-public-charts-long-range-forecast>

POAMA Pacific Seasonal Prediction Portal: <http://poama.bom.gov.au/experimental/pasap/index.shtml>

APEC Climate Center (APCC): <http://www.apcc21.org/eng/service/6mon/ps/japcc030703.jsp>

NASA GMAO GEOS-5: <http://gmao.gsfc.nasa.gov/research/ocean/>

NOAA CFSv2: <http://www.cpc.ncep.noaa.gov/products/CFSv2/CFSv2seasonal.shtml>

IRI for Climate and Society: <http://iri.columbia.edu/our-expertise/climate/forecasts/seasonal-climate-forecasts/>

# OTHER INFORMATION

## Southern Oscillation Index

The Southern Oscillation Index, or SOI, gives an indication of the development and intensity of El Niño and La Niña events across the Pacific Basin. The SOI is calculated using the difference in air pressure between Tahiti and Darwin. Sustained negative values of the SOI below  $-7$  often indicate El Niño episodes. These negative values are usually accompanied by sustained warming of the central and/or eastern tropical Pacific Ocean, and a decrease in the strength of the Pacific Trade Winds. Sustained positive values of the SOI greater than  $+7$  are typical of La Niña episodes. They are associated with stronger Pacific Trade Winds and sustained cooling of the central and eastern tropical Pacific Ocean. In contrast, ocean temperatures to the north of Australia usually become warmer than normal.

## Multivariate ENSO Index (MEI)

The Climate Diagnostics Center Multivariate ENSO Index (MEI) is derived from a number of parameters typically associated with El Niño and La Niña. Sustained negative values indicate La Niña, and sustained positive values indicate El Niño.

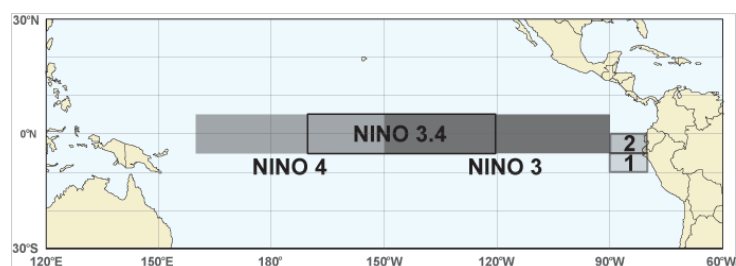
## 20 degrees Celsius Isotherm Depth

The 20°C Isotherm Depth is the depth at which the water temperature is 20°C. This measurement is important, as the 20°C isotherm usually occurs close to the thermocline, the region of most rapid change of temperature with depth, or the division between the mixed surface layer and deep ocean. A deeper than normal 20°C isotherm (positive anomaly) implies a greater heat content in the upper ocean, whilst a shallower 20°C isotherm (negative anomaly) implies a lower than normal heat content in the upper ocean.

## Regions

SST measurements may refer to the NINO1, 2, 1+2, 3, 3.4 or 4 regions. These descriptions simply refer to the spatially averaged SST for the region described. The NINO regions (shown in the figure below) cover the following areas:

Region	Latitude	Longitude
NINO1	5-10°S	80-90°W
NINO2	0-5°S	80-90°W
NINO3	5°N to 5°S	150-90°W
NINO3.4	5°N to 5°S	120-170°W
NINO4	5°N to 5°S	160°E to 150°W



NOTE: NINO1+2 is the combined areas 1 and 2