



# Monthly Climate Bulletin

February 2021



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Photo Credit: Tropical Cyclone Ana in Fiji Fiji National Disaster Management Office



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# SUMMARY

Issued 09 March 2021

- The 2020-21 La Niña has passed its peak and is now weakening.
- The Madden-Julian Oscillation (MJO) is currently weak and indiscernible. Climate models indicate a pulse of the MJO is expected to develop and move east over tropical Americas and Africa in the coming fortnight.
- The OLR total and anomaly maps suggest the Intertropical Convergence Zone (ITCZ) was less active than normal. The South Pacific Convergence Zone (SPCZ) on the other hand, was active and shifted to the southwest of normal.
- The February Rainfall image shows active convection over the Maritime Continent, northern Australia, and the southwestward-shifted SPCZ.
- February Mean Sea Level Pressure (MSLP) anomaly map shows negative anomalies over New Caledonia, Vanuatu, Fiji and east of about 170° in the tropical Pacific.
- Coral bleaching was on Alert Level 1 and 2 just east of PNG and parts of southern Solomon Islands, Vanuatu, and Cook Islands with watch and warning alerts for remainder of the countries.
- A significant marine heatwave event is persisting to the south of Cook Islands.
- For March to May 2021, the dynamical models (as well as SCOPIC) agree on above normal rainfall for Palau, FSM, central to northern Marshall Islands, areas in Southern Regions of PNG, New Caledonia, Vanuatu, Fiji, Tonga, southern Cook Islands and southern French Polynesia. The models also agree on below normal rainfall for northern PNG, Nauru, Kiribati, Tuvalu, Tokelau, northern Cook Islands and central and northern French Polynesia..

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# EL NIÑO–SOUTHERN OSCILLATION

La Niña weakens, but influence likely to continue into autumn

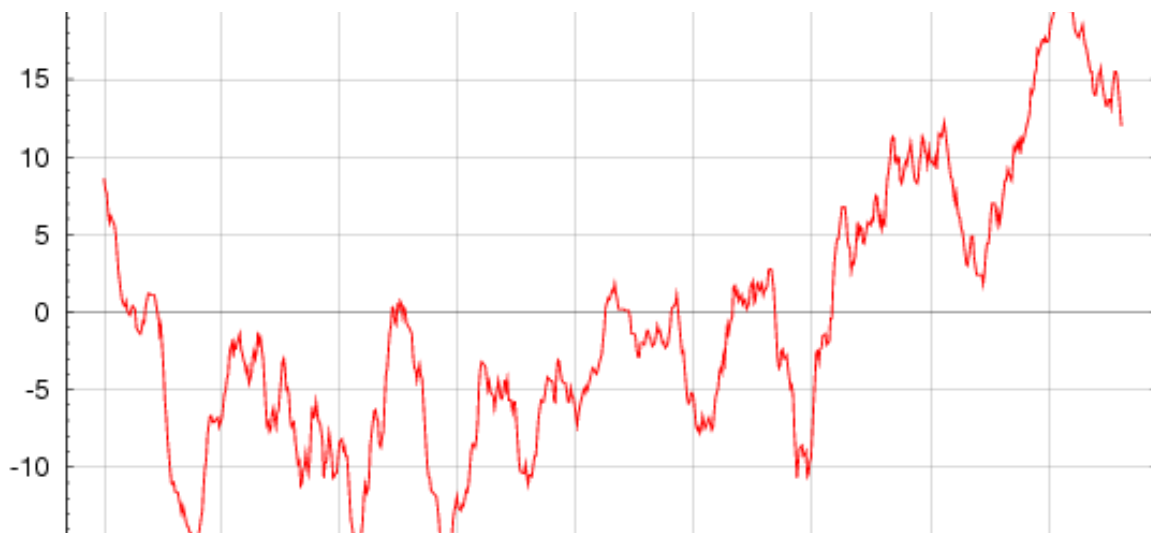
Click link to access [Climate Driver Update issued on 2 March 2021](#)

The 2020-21 La Niña is likely to have peaked with respect to atmospheric and oceanic patterns in the tropical Pacific. However, impacts associated with La Niña such as above-average rainfall, are expected to persist in the western Pacific into early March.

Over the past fortnight the sea surface temperatures across Pacific Ocean basin have warmed by 0.2° C. The 90-day Southern Oscillation Index (SOI) has decreased slightly but continues to remain well above the La Niña threshold of +7, and trade winds have returned to near-average strength in the central tropical Pacific.

Model outlooks indicate a return to neutral conditions (neither El Niño nor La Niña) during February or early March.

The 30-day Southern Oscillation Index (SOI) for the 30 days ending 31 January was +16.5. The 90-day SOI value was +14.8.



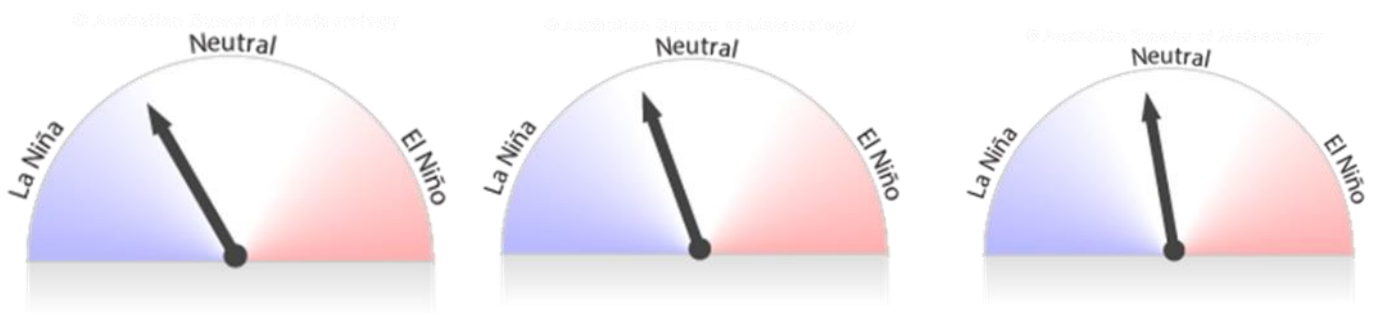


# EL NIÑO–SOUTHERN OSCILLATION

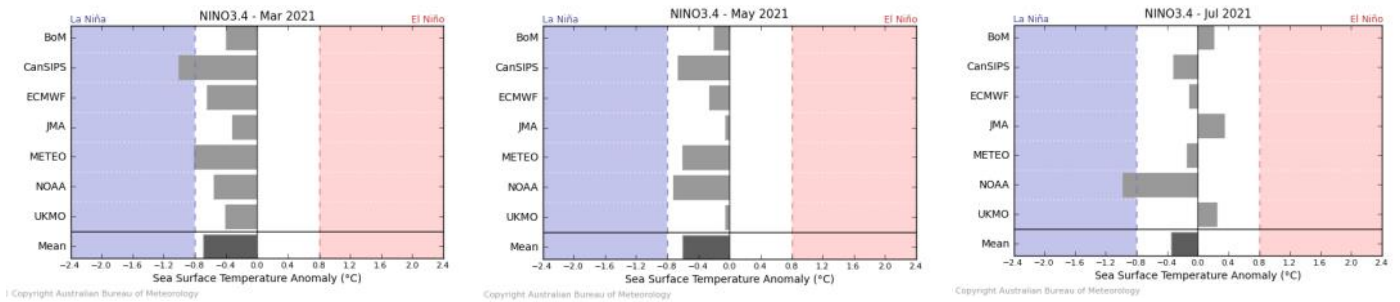
La Niña weakens, but influence likely to continue into autumn

Click link to access [Climate Driver Update issued on 2 March 2021](#)

## Bureau of Meteorology NINO3.4 ENSO Model Outlooks for March, May and July



## 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>

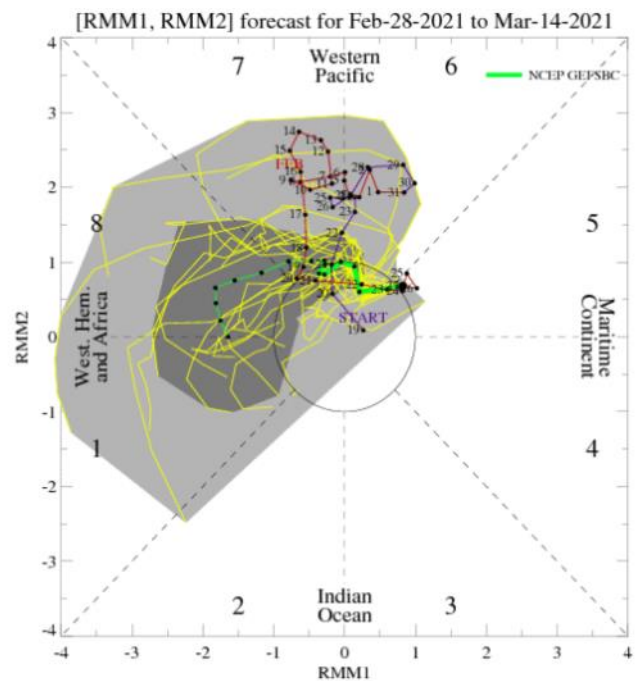
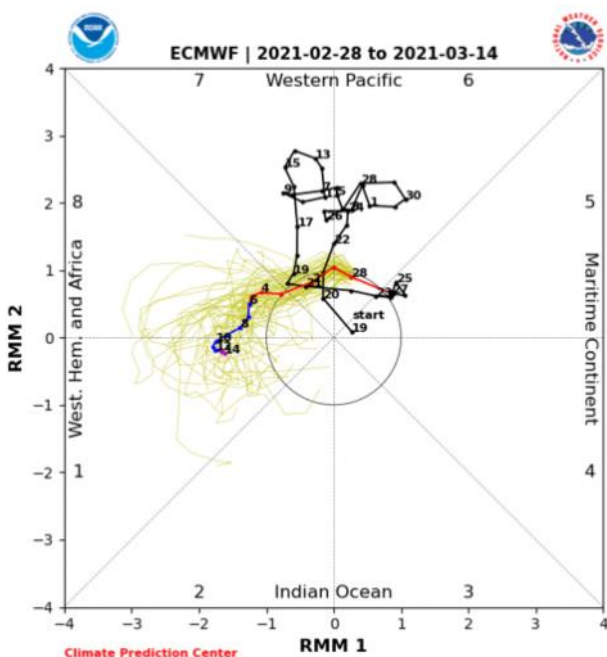
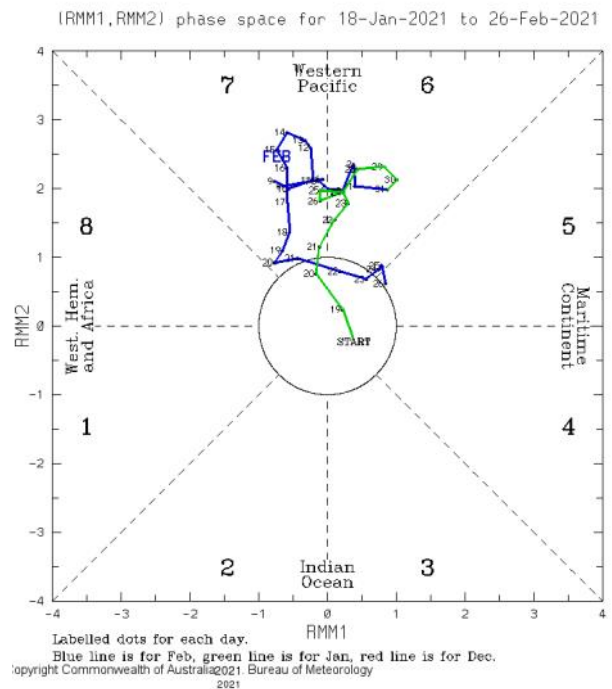


# MADDEN–JULIAN OSCILLATION

Click link to access [Weekly Tropical Note](#) [Issued on Tuesday 02 March 2021]

The Madden-Julian Oscillation (MJO) is currently weak and indiscernible. Equatorial Rossby (ER) wave activity remains the dominant type of tropical atmospheric wave in the Australian region. An ER wave tracked westwards across Australian longitudes last week, contributing to significant tropical low and rainfall activity across the region, and providing conditions favourable for the formation of tropical cyclone Marian. The focus of ER wave activity this week is currently around western Pacific Ocean longitudes, but is expected to track further west in the coming days before weakening. Climate models indicate a pulse of the MJO is expected to develop and move east over the tropical Americas and Africa in the coming fortnight. At this time of the year, an MJO pulse in these regions is typically associated with below-average rainfall across northern Australia and the Maritime Continent.

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



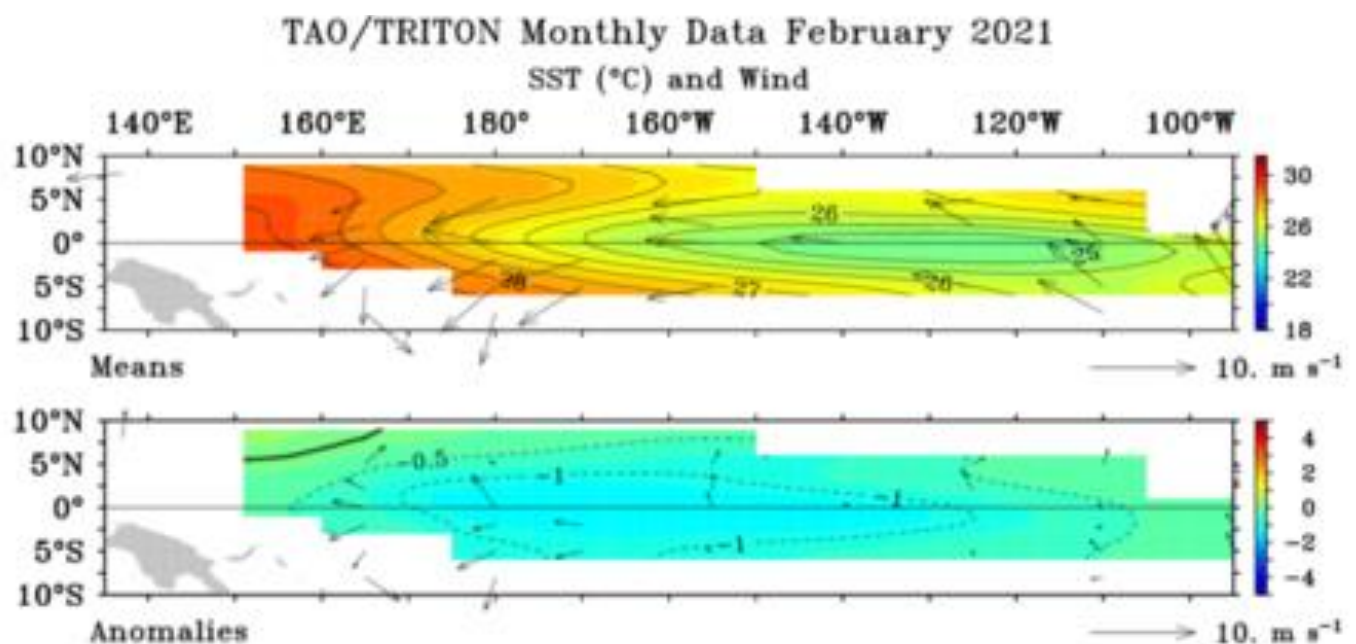
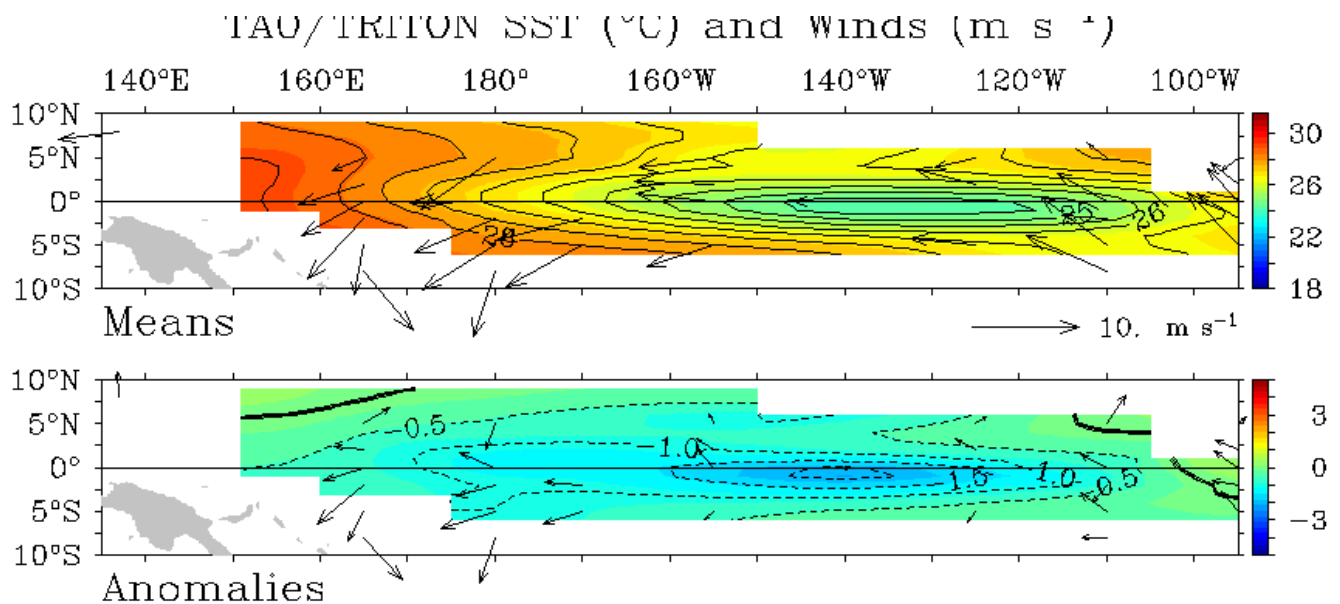


# WIND

Click link to access [Wind plots link](#)

The trade-winds were averaged over February, but were stronger than normal across the equatorial Pacific, especially around the Date Line.

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

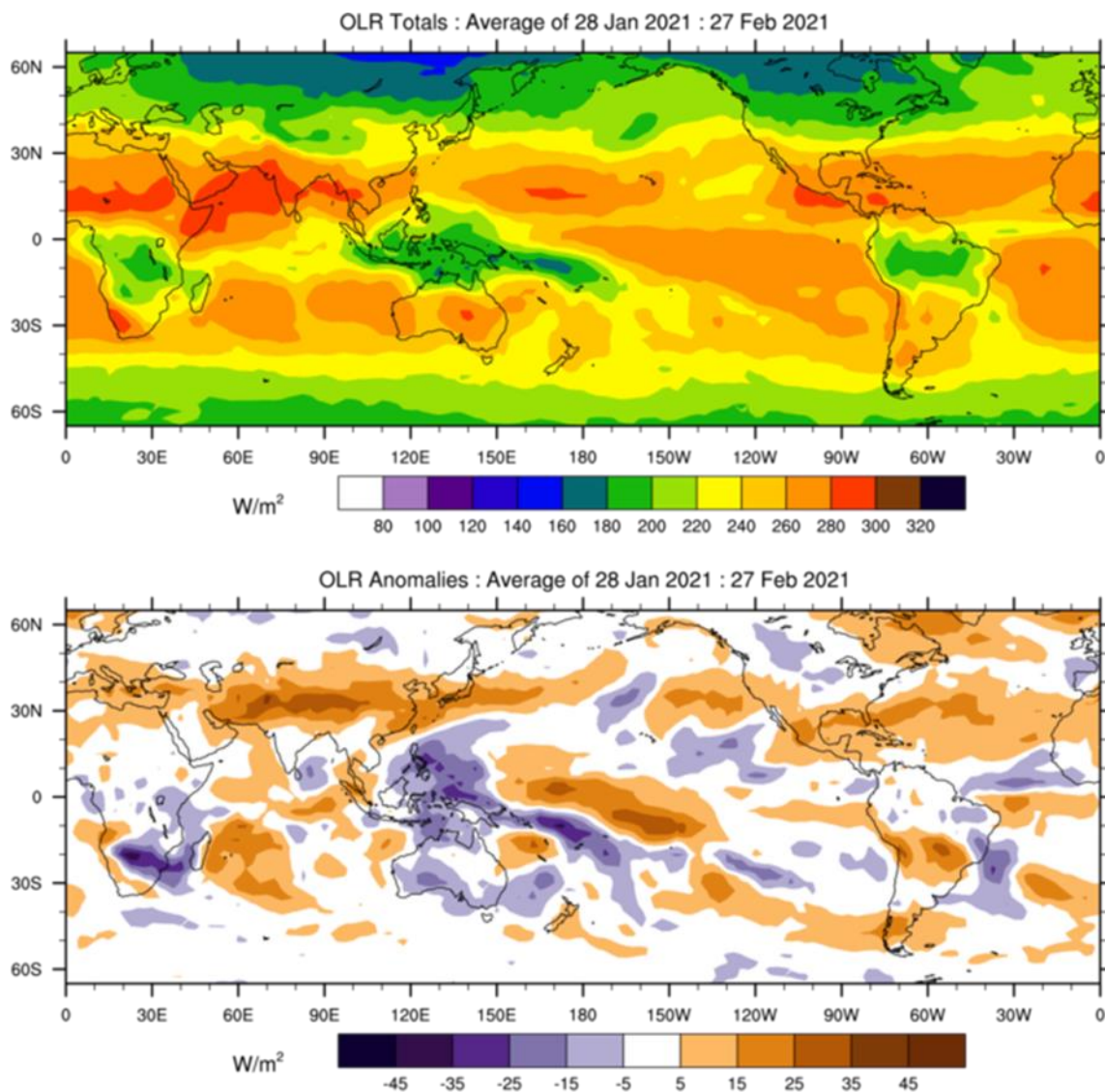
Click link to access [OLR](#)



The February 30-day OLR total and anomaly maps suggest the Intertropical Convergence Zone (ITCZ) was less active than normal. The South Pacific Convergence Zone (SPCZ) on the other hand, was active and shifted southeastwards over Fiji, Samoa, Tonga and Niue.

Note: Global maps of OLR below highlight regions experiencing increased or decreased 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.

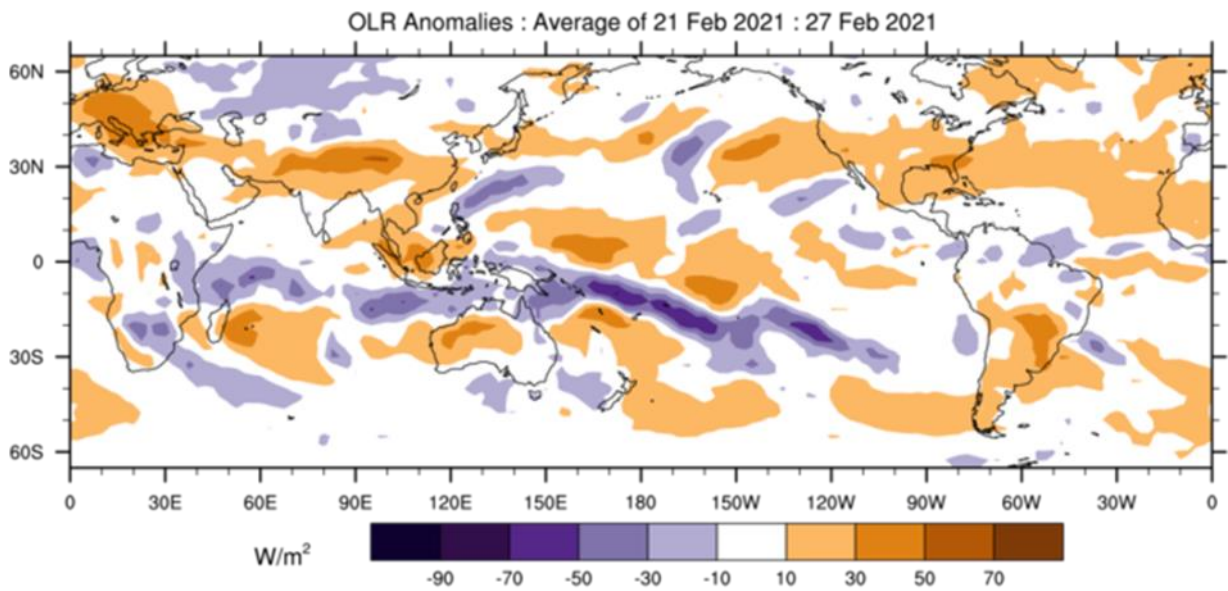
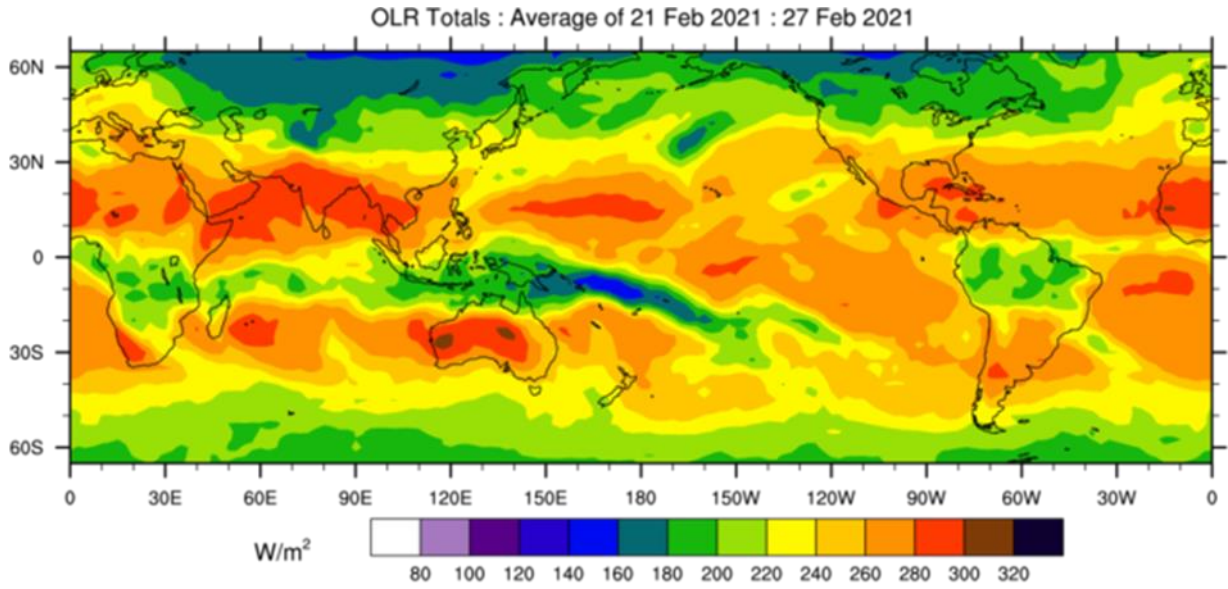
## OLR Total and Anomalies, 30 Day OLR



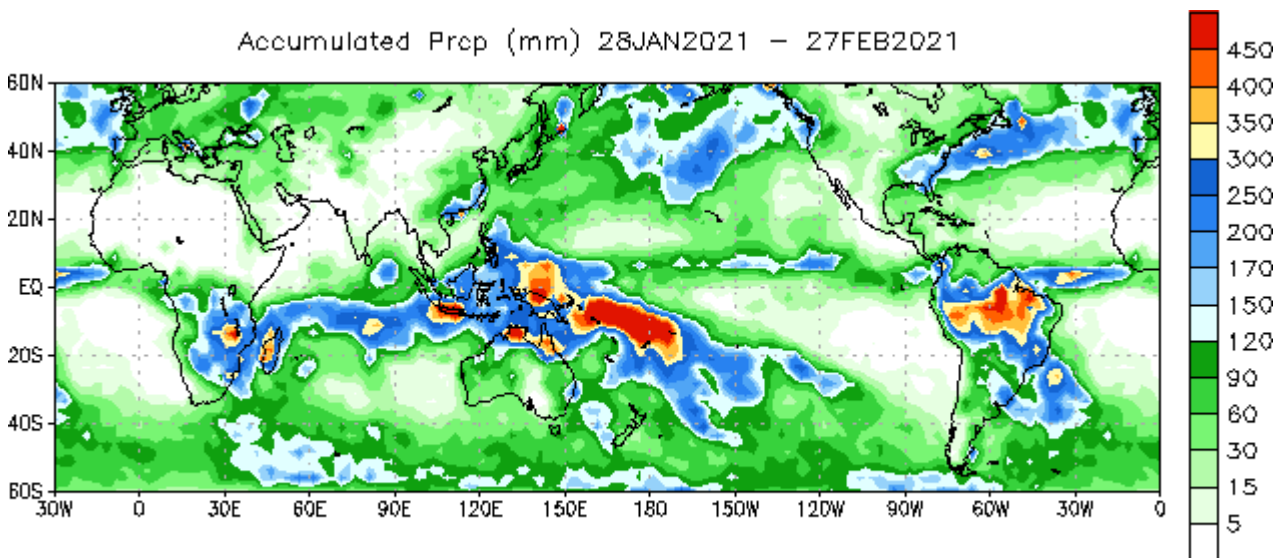
(C) Copyright Commonwealth of Australia 2021. Bureau of Meteorology



# OLR Total and Anomalies, 7 Day OLR

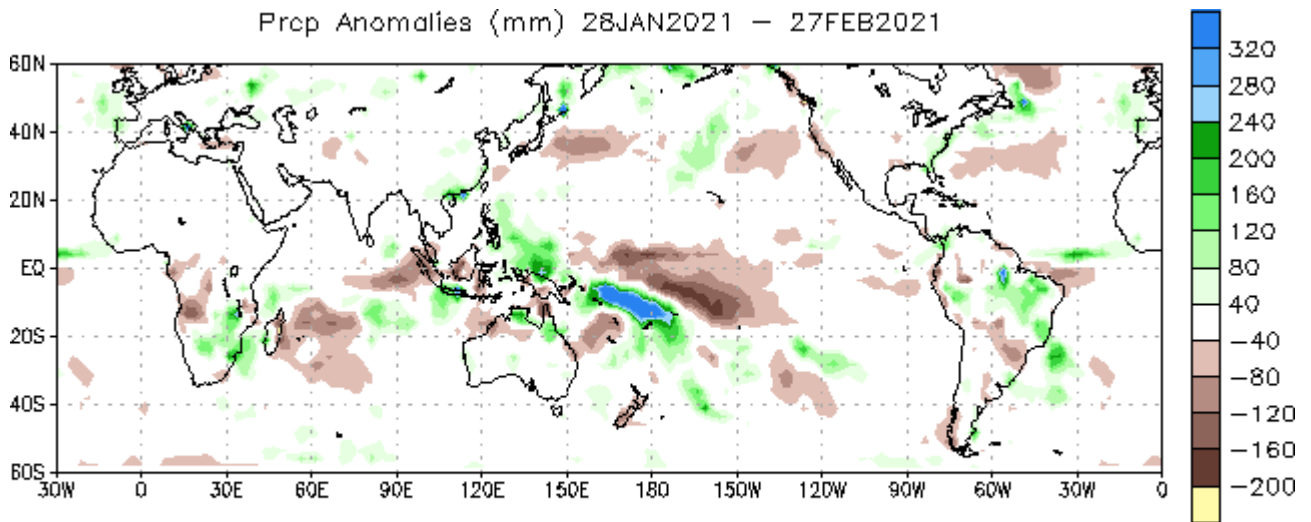


(C) Copyright Commonwealth of Australia 2021. Bureau of Meteorology

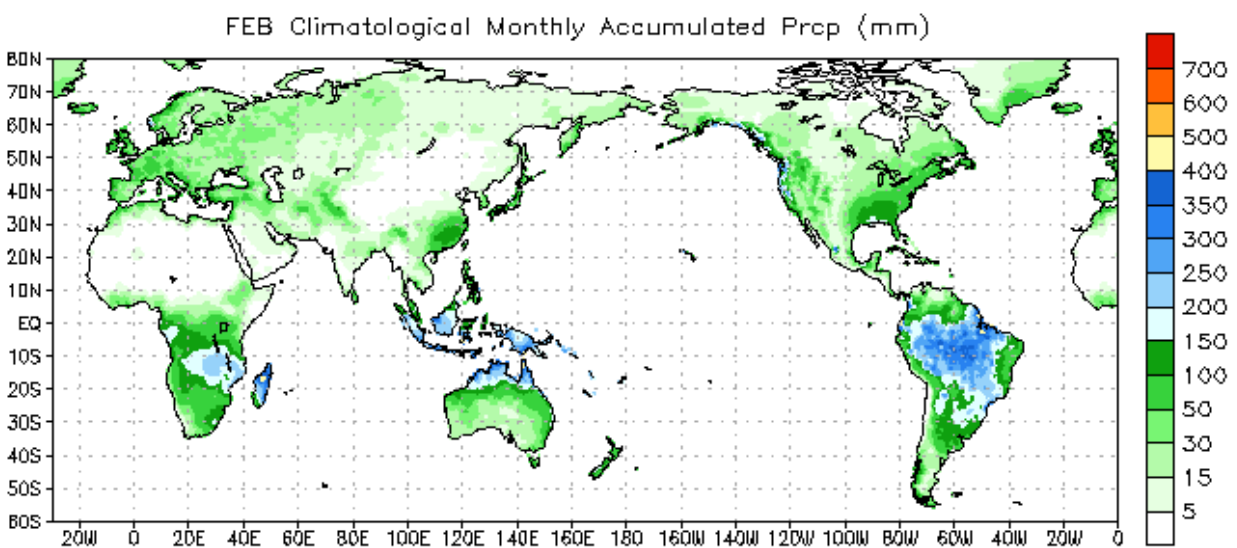


Data Source: NCEP CMAP Precipitation

## 30-Day Rainfall Anomalies



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



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

NOAA Climate Prediction Centre - NCEP CMAP precipitation:  
[https://ww.cpc.ncep.noaa.gov/products/Global\\_Monsoons/Global-Monsoon.shtml](https://ww.cpc.ncep.noaa.gov/products/Global_Monsoons/Global-Monsoon.shtml)

# OCEAN CONDITIONS

## SEA SURFACE TEMPERATURE

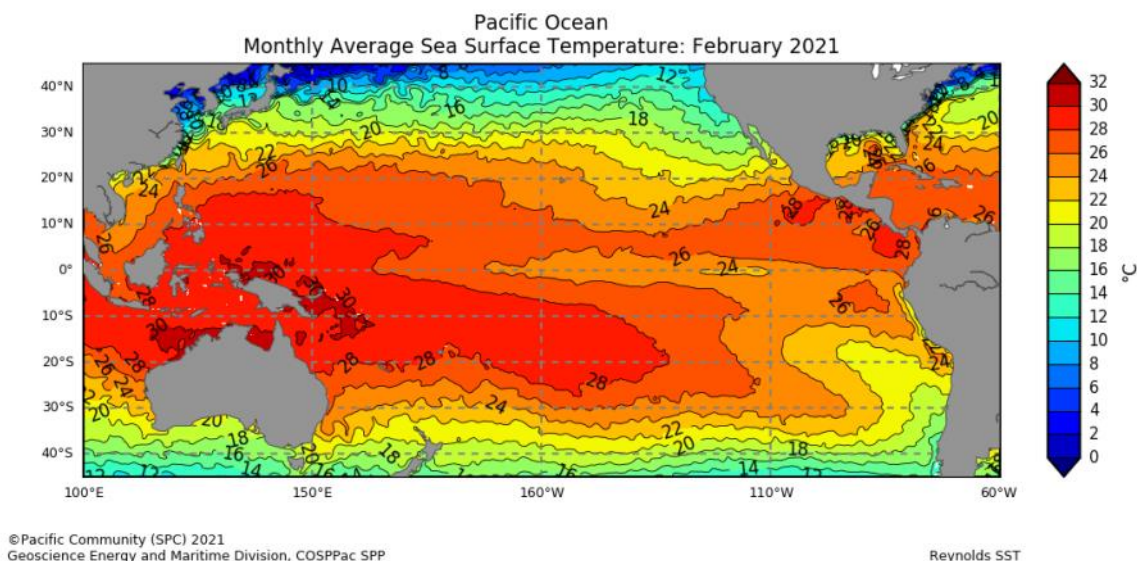


Click link to access [Pacific Community COSPPac Ocean Portal](#)

The SST anomaly pattern in February continued to show the classic La Niña shape, with below average temperatures prevailing along the equator up to the north of PNG. The usual boomerang shape of above average temperatures surrounding the cool equatorial anomalies had a section that now showed cooler than average anomalies centred around Fiji due to the cyclone and storm activity seen in this region in recent weeks. Highest anomalies were experienced by southern Cook Islands which saw an increase of temperature by 2 degrees from a marine heat-wave persisting to the south. Similarly, southern Vanuatu, PNG and countries in the west Pacific namely FSM and Palau experienced warmer conditions with anomalies of 1.0 to 1.5 degrees. Kiribati group continued to experience cooler anomalies getting as low as 1.0 to 1.5 degree below normal.

In terms of the deciles, regions of Highest-on-Record for February occurred in much of Palau, FSM, PNG, and some parts of Cook Islands, with very low much below average at Solomon Islands and Vanuatu. Regions of above average to very much above average (deciles 8-10) SSTs spanned RMI, Tonga and Niue. In contrast, below average to very much below average (decile 1-3) SSTs were observed in Nauru, Kiribati, and Fiji-particularly around Vanua Levu where region of lowest on record is persisting.

### Mean Sea Surface Temperature



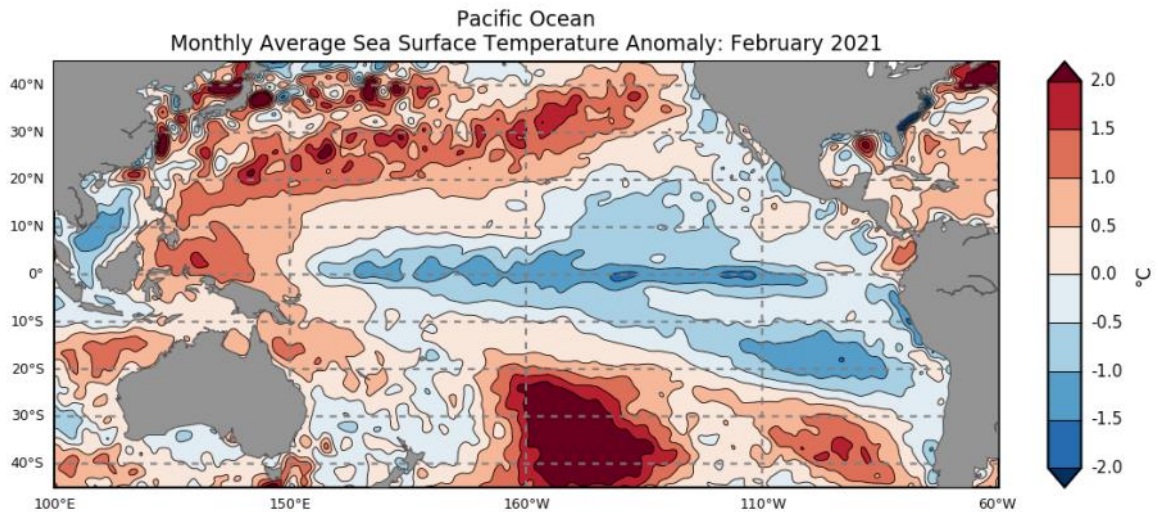


# OCEAN CONDITIONS

Click link to access [SEA SURFACE TEMPERATURE](#)



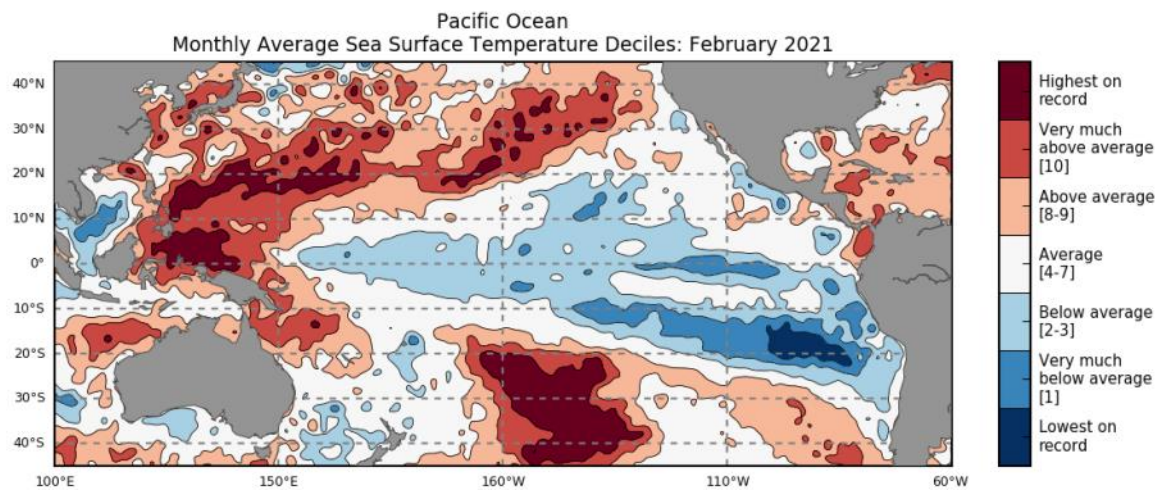
## Anomalous Sea Surface Temperature



©Pacific Community (SPC) 2021  
Geoscience Energy and Maritime Division, COSPPac SPP

Reynolds SST

## Sea Surface Temperatures Deciles



©Pacific Community (SPC) 2021  
Geoscience Energy and Maritime Division, COSPPac SPP

Reynolds SST



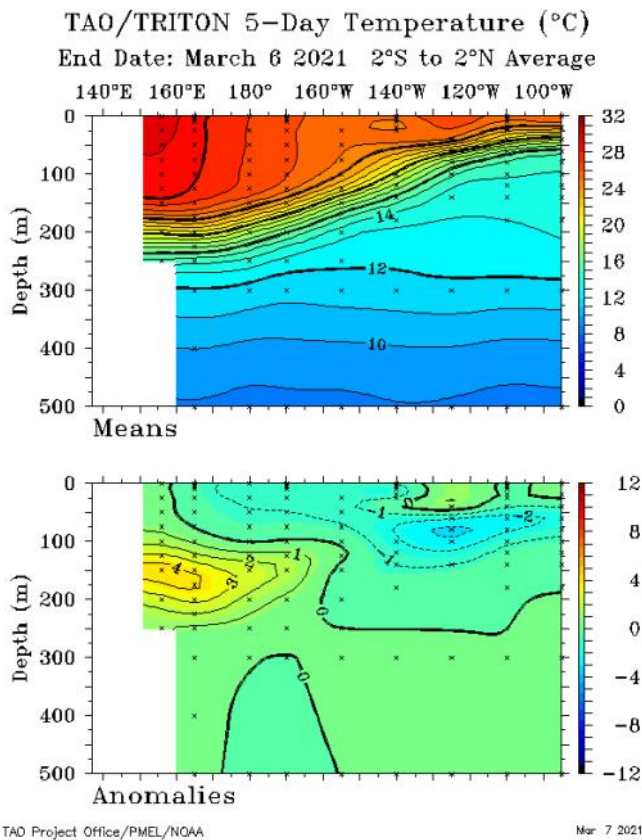
# OCEAN CONDITIONS

## SUB SURFACE

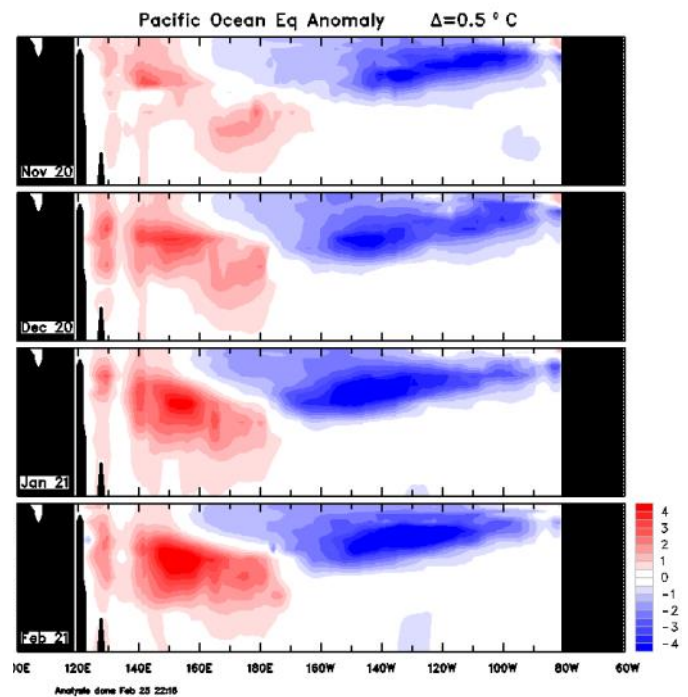


The four-month sequence of equatorial Pacific sub-surface temperature anomalies (to 05 March) shows cooler than average water extending across the top 150 m of the sub-surface of the equatorial Pacific east of around 160°E. The strength and spatial extent of cooler than average water has remained similarly strong in February and January, but now shows signs of weakening. Warm anomalies persist across large parts of the column depth west of the Date Line, however these also look to be weakening from the previous month.

**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

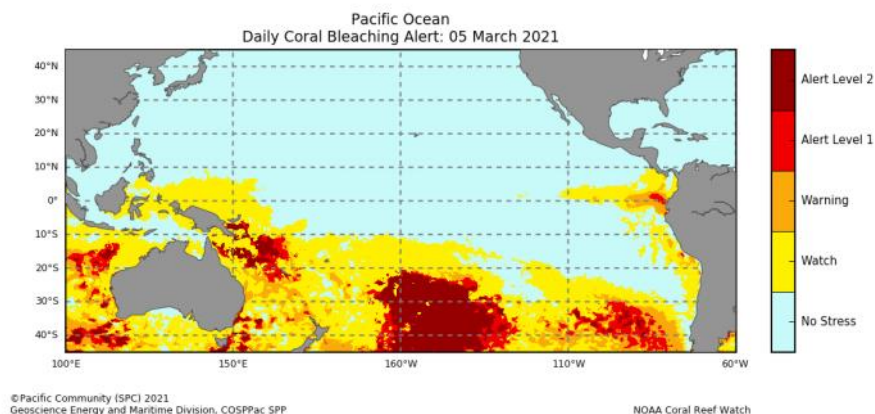
## CORAL BLEACHING



The daily Coral Bleaching Alert for 05 March 2021 shows 'Watch' for much of the COSPPac partner countries, peaking at Alert Level 1 and 2 just east of PNG and parts of southern Solomon Islands, Vanuatu, Fiji and Cook Islands. The four weeks Coral Bleaching Outlook to 29th March shows the 'Watch' alert continuing for most of the countries in the region with PNG, Solomon Islands, Vanuatu and Cook Islands on alert level 1 and 2.

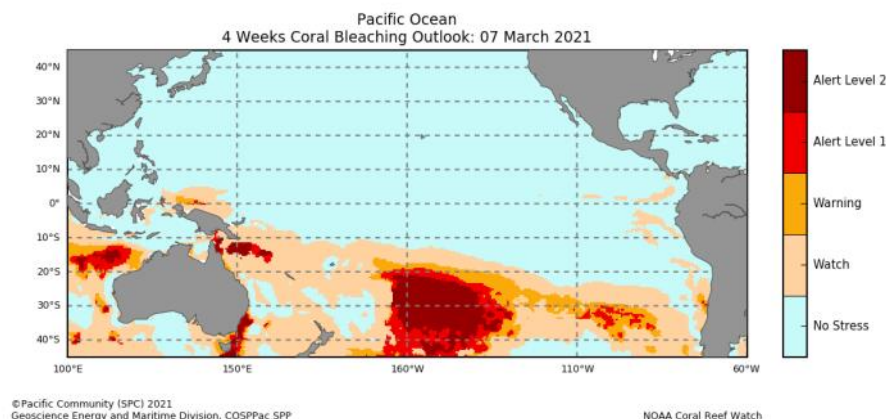
### Daily Coral Bleaching Alert

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



### 4-Weeks Coral Bleaching Outlook

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



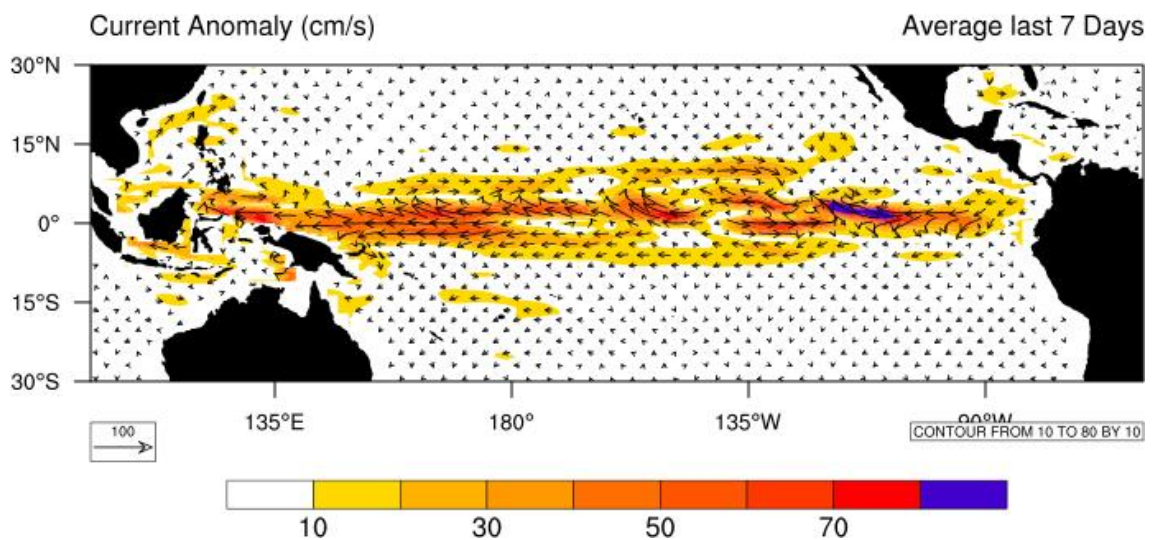
# OCEAN CONDITIONS

## OCEAN SURFACE CURRENTS AND SEA LEVEL



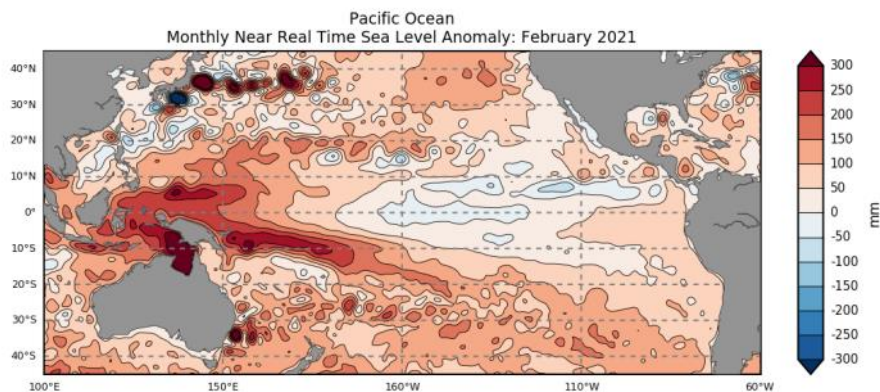
Sea level was above normal for most of the western Pacific region. The distinct boomerang shape was still present with highest anomalies above 200mm above average spanning from Palau and FSM, across PNG, through Solomon Islands, Tuvalu, and Samoa. Marshall Islands, Nauru, and Cook Islands were also above average from 100 mm to 200 mm.

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



### Monthly Sea Level Anomalies

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



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Geoscience Energy and Maritime Division, COSPPac SPP

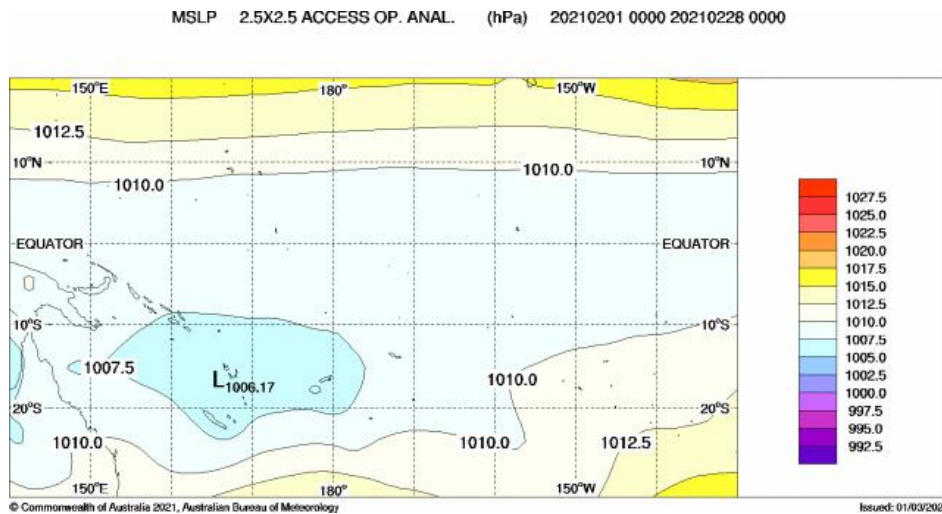
AVISO Ssalto/Duacs SLA

# MEAN SEA LEVEL PRESSURE

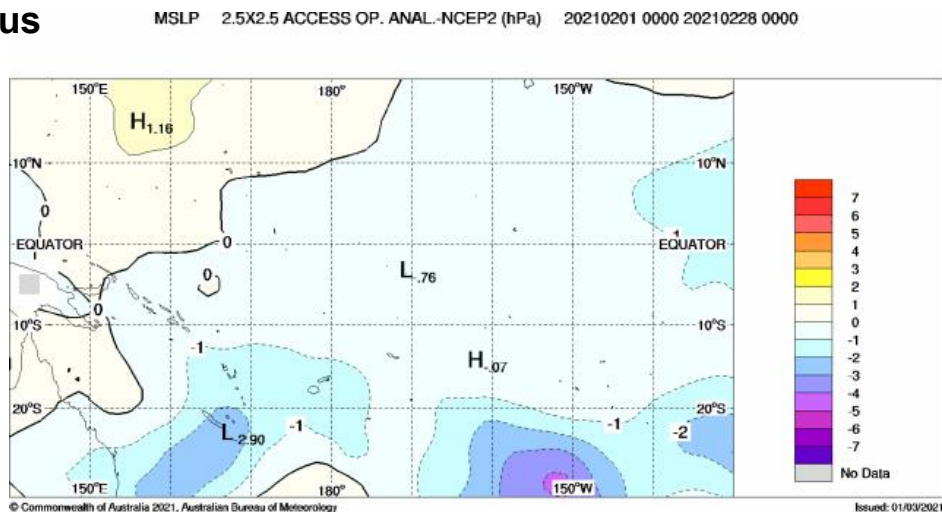
The February mean sea level pressure (MSLP) anomaly map shows negative anomalies over New Caledonia, Vanuatu, Fiji and east of about 170° in the tropical Pacific.

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>



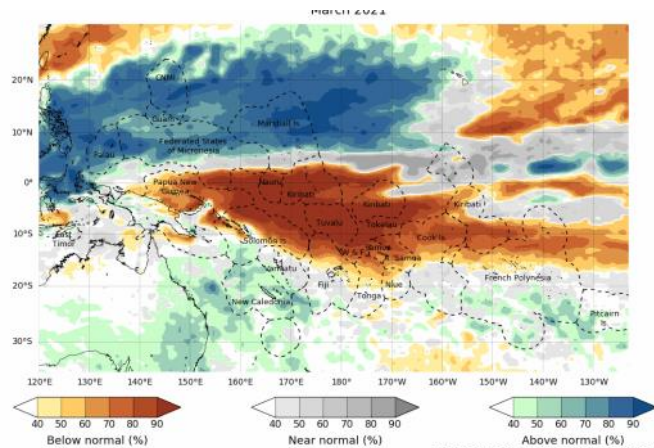
# SEASONAL RAINFALL OUTLOOK

## March—May 2021



The ACCESS-S model forecast for March 2021 strongly favours below normal rainfall for northern PNG, most of Solomon Islands, Nauru, Kiribati, Tuvalu, Tokelau, northern Tonga, Samoa, Niue, the northern Cook Islands and parts of northern French Polynesia. Above normal rainfall is favoured in Palau, FSM, northern and central Marshall Islands, New Caledonia, central and southern Vanuatu and parts of southern French Polynesia. The three-month rainfall outlook (March-May) is very similar to the March pattern: it shows a strong dry signal along the equator, surrounded by bands of increased chance wetter in both hemispheres. Note the very strong gradient in probabilities as you transition from drier to wetter in both hemispheres especially the northern. Above normal maximum and minimum temperatures are favoured for many COSPPac countries, except for areas close to the equator east of 160°E, namely Nauru, Kiribati, northern Tuvalu, Tokelau, northern Cook Islands and northern and central French Polynesia where near-normal to below normal temperatures are favoured.

Monthly [ACCESS-S](#) Maps



The Copernicus multi-model outlook for March to May favours below normal rainfall for northern PNG, Solomon Islands, Nauru, Kiribati, Tuvalu, Tokelau, Samoa, northern and central Cook Islands, and northern and central French Polynesia. Above normal rainfall is favoured for Palau, southern PNG, New Caledonia, Vanuatu, southern parts of Fiji, southern Tonga, Niue and southern Cook Islands.

The SCOPIC statistical model for March to May favours below normal rainfall for northern PNG, west and east Kiribati, Tuvalu, and northern Cook Islands. Above normal rainfall is favoured for Palau, central and eastern FSM, Marshall Islands, the southern region of PNG, Solomon Islands, Vanuatu, Fiji, central and southern Tonga, and southern Cook Islands.

The APEC Climate Centre multi-model for March to May favours below normal rainfall for eastern FSM, far southern Marshall Islands, northern PNG, western and eastern Solomon Islands, Nauru, Tuvalu, Kiribati, Tokelau, Samoa, northern Cook Islands and French Polynesia. Above normal rainfall is favoured for Palau, western and central FSM, southern PNG, central Solomon Islands, New Caledonia, Vanuatu, Fiji, Tonga, Niue, central and southern Cook Islands and parts of southern French Polynesia.

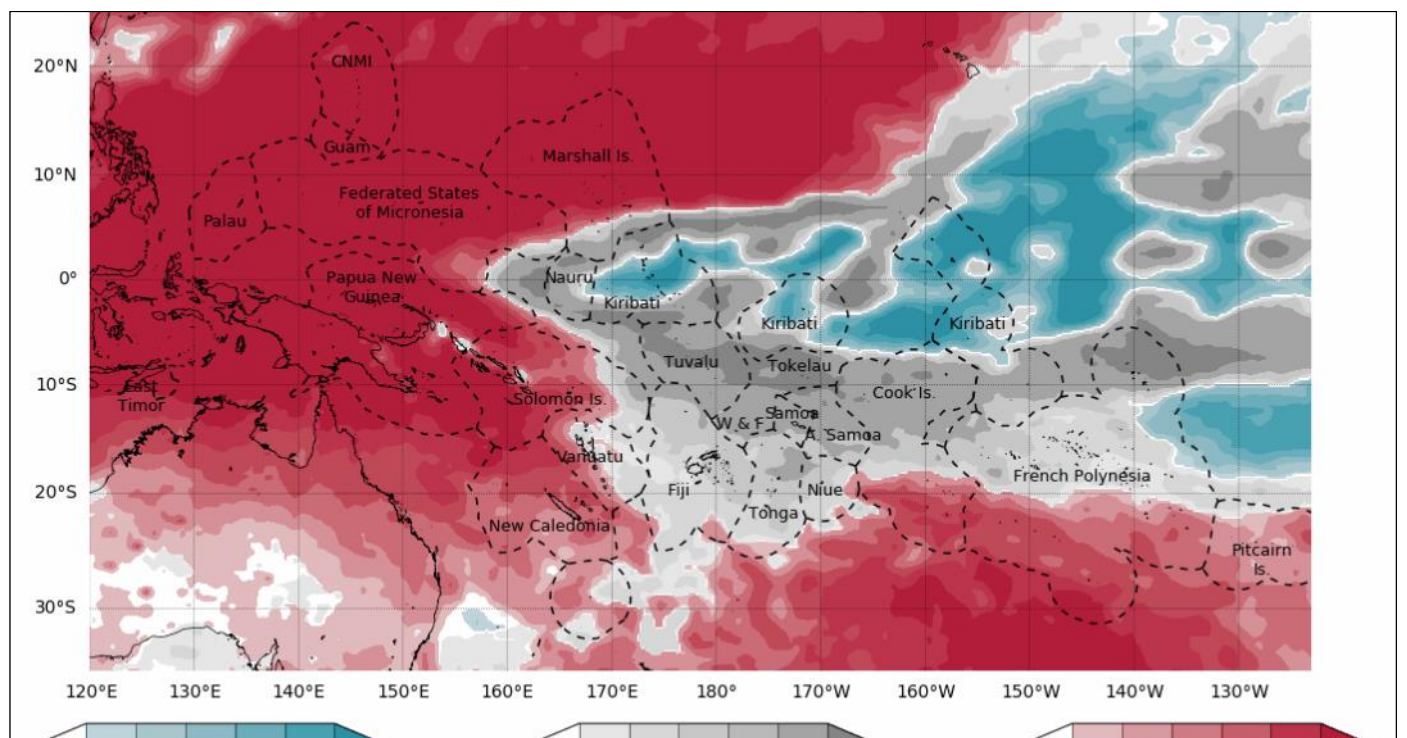
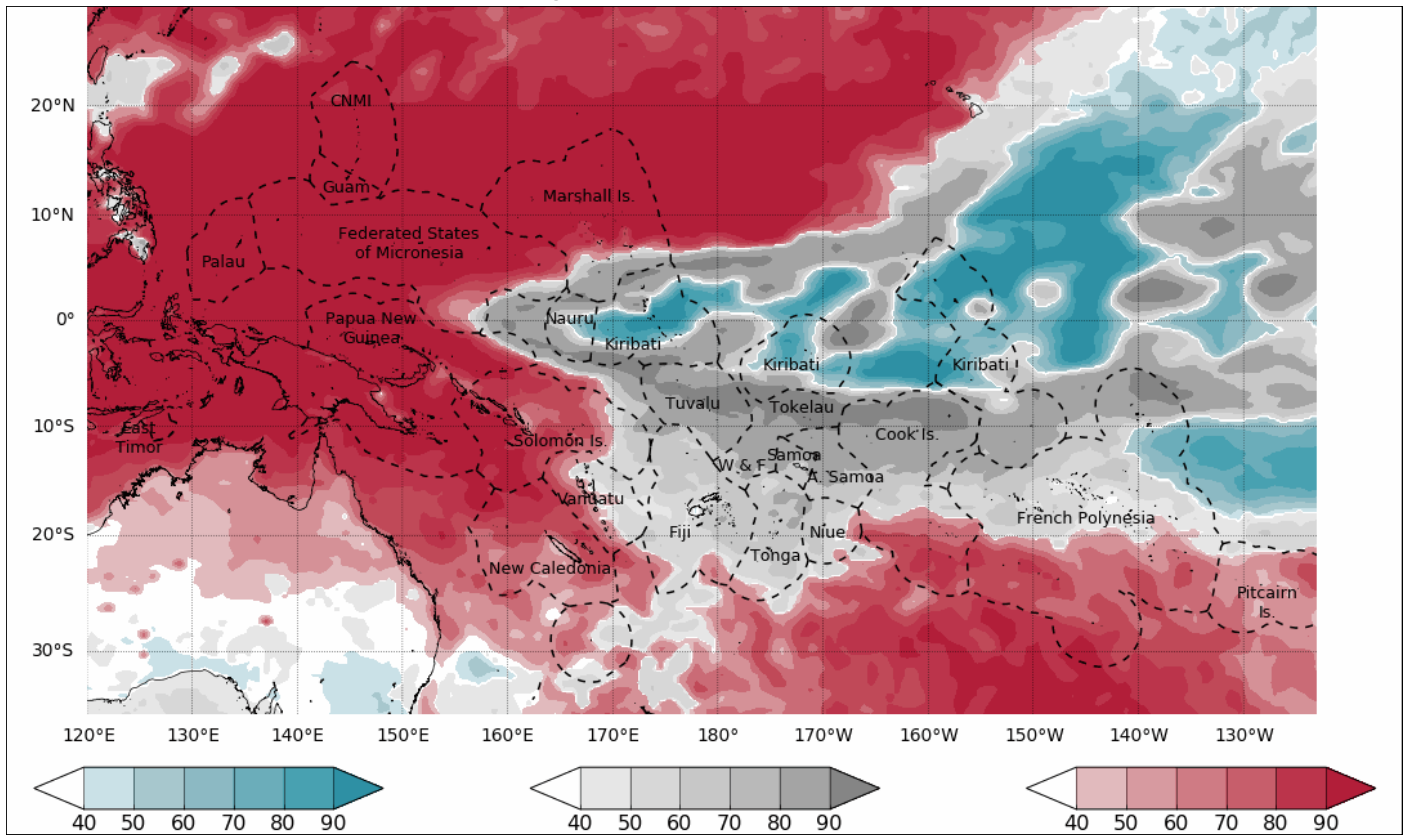
For March to May 2021, the dynamical models (as well as SCOPIC) agree on above normal rainfall for Palau, FSM, central to northern Marshall Islands, areas in Southern Regions of PNG, New Caledonia, Vanuatu, Fiji, Tonga, southern Cook Islands and southern French Polynesia. The models also agree on below normal rainfall for northern PNG, Nauru, Kiribati, Tuvalu, Tokelau, northern Cook Islands and central and northern French Polynesia.

# SEASONAL TEMPERATURE OUTLOOK

March—May 2021



## Monthly **ACCESS-S** Maps





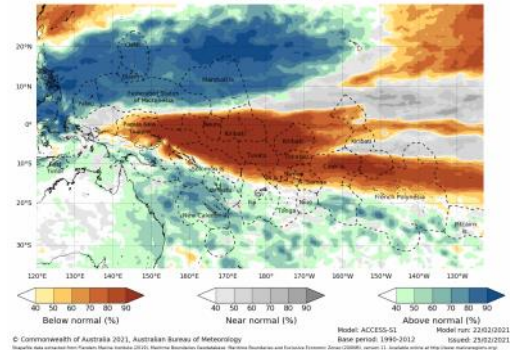
# SEASONAL RAINFALL OUTLOOK

March—May 2021

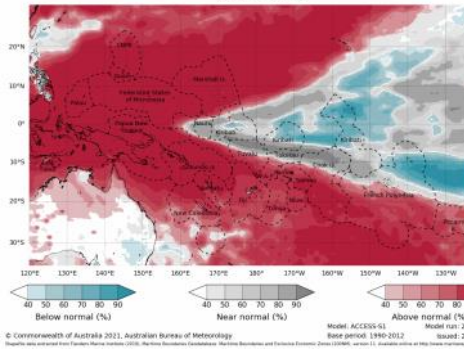


## Seasonal ACCESS-S maps

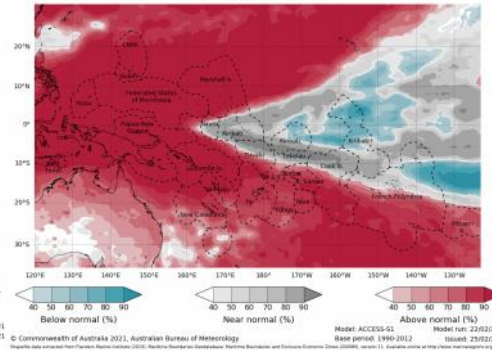
Tercile rainfall probabilities for March to May 2021



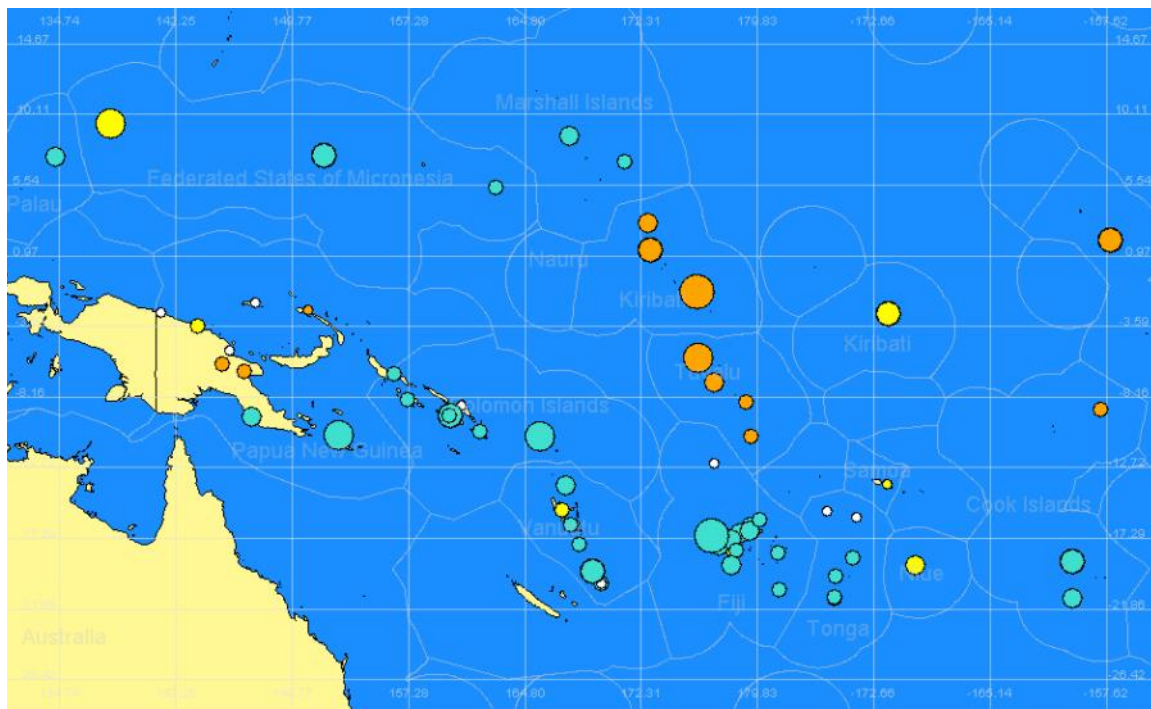
Tercile maximum temperature probabilities for March to May 2021



Tercile minimum temperature probabilities for March to May 2021



## SCOPIC



Legend  Bias towards below-normal rainfall  Bias towards normal rainfall  Bias towards above-normal rainfall  No bias in forecast (Cimatology)

Larger "bubbles" represent higher forecast skill (based on LEPS scores)

'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

March—May 2021



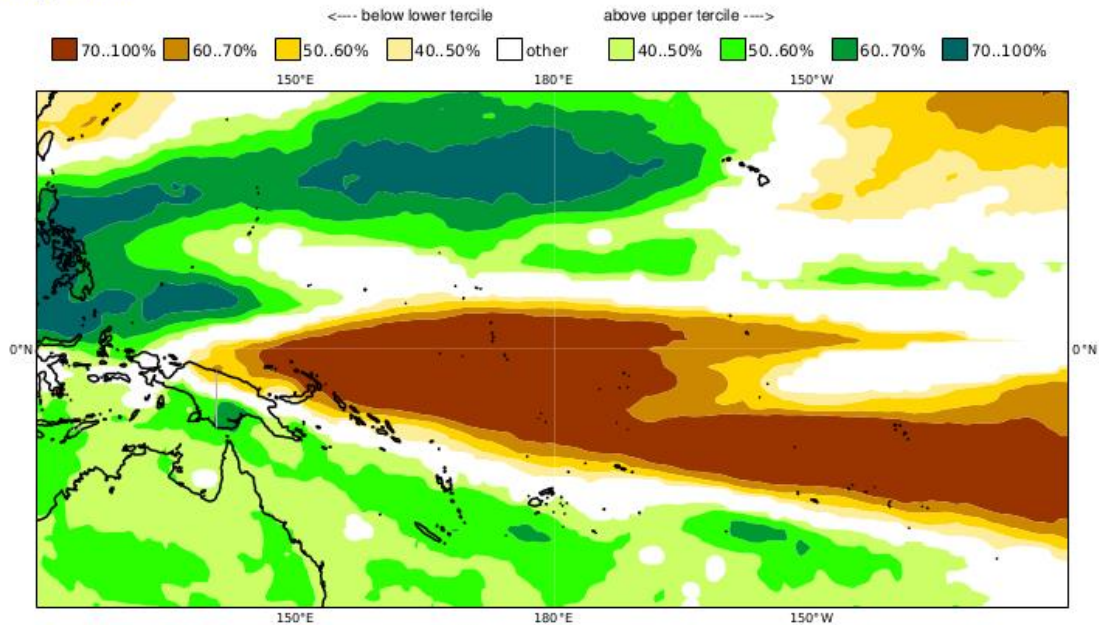
## Copernicus (C3S multi-system)-Rainfall

Prob(most likely category of precipitation)

MAM 2021

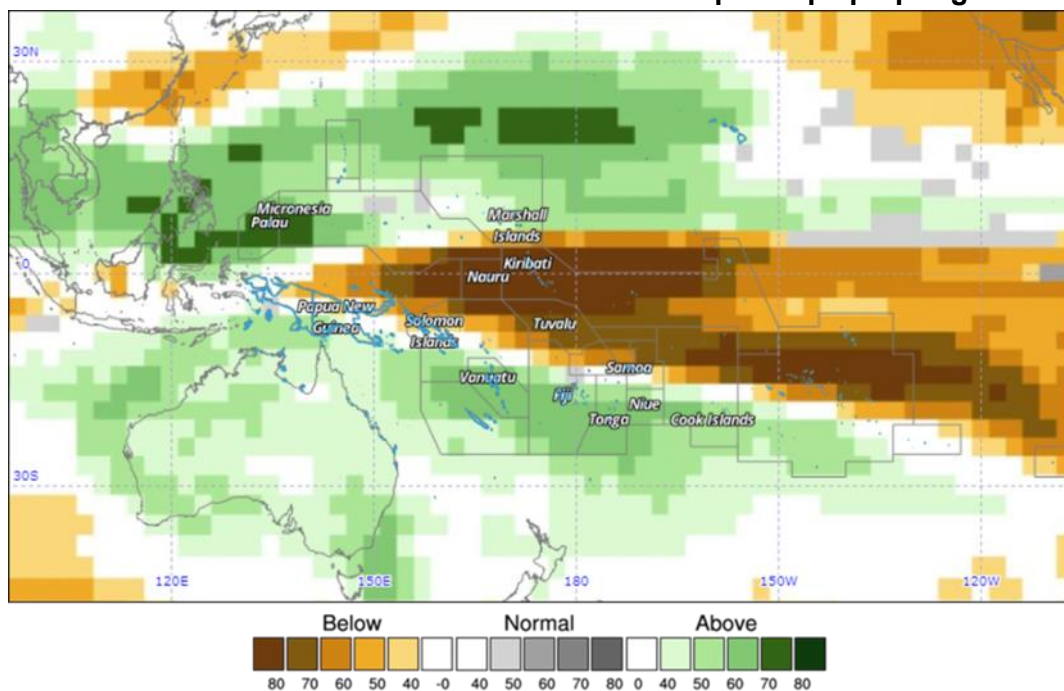
Nominal forecast start: 01/02/21

Unweighted mean



Copernicus Rainfall: <https://climate.copernicus.eu/charts/>

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



Year: 2021, Season: MAM, Lead Month: 3, Method: GAUS

Model: APCC, CWB, MSC, NASA, NCEP, PNU, POAMA

Generated using CLIK® (2021-3-3)

© APEC Climate Center



# TROPICAL CYCLONE

## 2020/2021 Season



There were eight (8) Tropical Depression (TD) where 5 TD's intensified into Tropical Cyclone (TC's) namely TC Yasa (Category 5), TC Zasu (Category 2), TC Ana (Category 2), TC Bina (Category 1) and TC Lucas (Category 2).

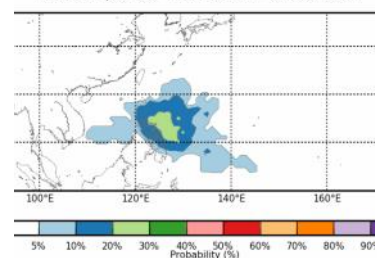
The weekly tropical cyclone forecast from ACCESS-S model shows low risk in the week ending 19 March 2021 for the southwest Pacific; especially areas in between Vanuatu and the Coral Sea region. Low tropical cyclone risk for the northwest Pacific.

The tropical cyclone season outlook for 2020-21 is available via: <http://www.bom.gov.au/climate/cyclones/south-pacific/>

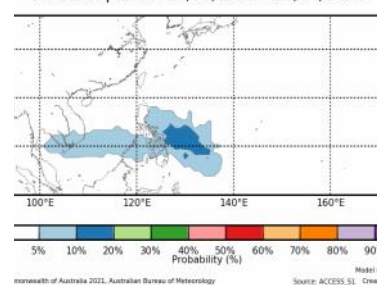
The tropical cyclone season outlook for 2020-21 is available via: <http://www.bom.gov.au/climate/cyclones/south-pacific/>

### ACCESS-S Weekly Forecasts –Northwest Pacific

Tropical Cyclone probabilities in the Northern Pac  
Forecast period: 13/03/2021 - 19/03/2021

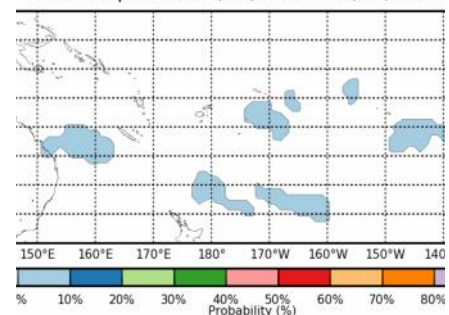


Tropical Cyclone probabilities in the Northern Pac  
Forecast period: 20/03/2021 - 26/03/2021

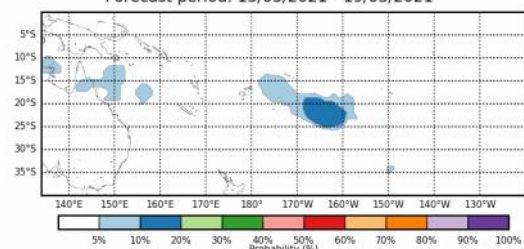


### ACCESS-S Weekly Forecasts –Southwest Pacific

Tropical Cyclone probabilities in the South Pac  
Forecast period: 06/03/2021 - 12/03/2021



Tropical Cyclone probabilities in the South Pacific  
Forecast period: 13/03/2021 - 19/03/2021



© Commonwealth of Australia 2021, Australian Bureau of Meteorology Source: ACCESS\_S1 Model run: 26/03/2021 Created: 26/03/2021

### 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.

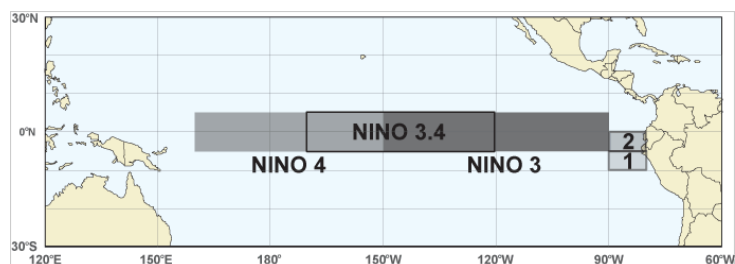
## 20 degrees Celsius Isotherm Depth

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