

# Monthly Climate Bulletin

January 2021

ISSN: 2617-3565

Photo Credit: S. Chape (Savaii, Samoa Blowholes)





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# SUMMARY

Issued 05 February 2021

- La Niña continues in the tropical Pacific. International climate models suggest it is likely to continue to at least February 2021.
- La Niña is likely to have peaked but impacts are expected to persist to March.
- A moderate to strong Madden-Julian Oscillation (MJO) pulse is expected to move slowly eastwards into the central Pacific in the next week or two.
- 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.
- The January Rainfall image is dominated by a large area of reduced convection stretching over the western to central equatorial Pacific, with the main centre west of the Date Line.
- January Mean Sea Level Pressure (MSLP) anomaly negative anomalies east of about 160° in the tropical Pacific. Positive anomalies were present in the southern subtropical Pacific east of Samoa.
- Coral bleaching was on Alert Level 1 and 2 just north of PNG and parts of western Solomon islands with watch and warning alerts for remainder of the countries.
- For February to April 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, eastern Solomon Islands, New Caledonia, Vanuatu, Fiji, southern Tonga, Niue, southern Cook Islands and southern French Polynesia. The models also agree on below normal rainfall for southern Marshall Islands, New Guinea's Momase and Islands regions, Nauru, Kiribati, Tuvalu, Tokelau, northern Cook Islands and central and northern French Polynesia.

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# EL NIÑO–SOUTHERN OSCILLATION

## La Niña likely past peak, but influence continues

Click link to access [Climate Driver Update issued on 2 February 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.



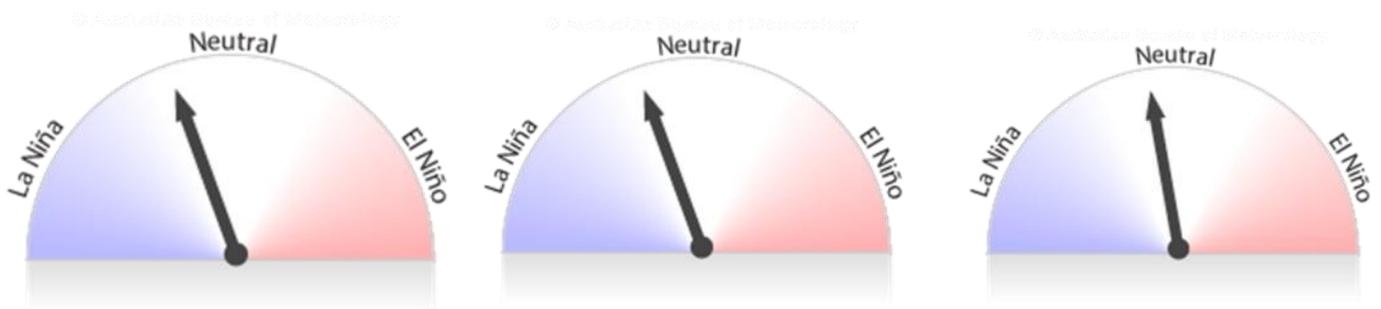


# EL NIÑO–SOUTHERN OSCILLATION

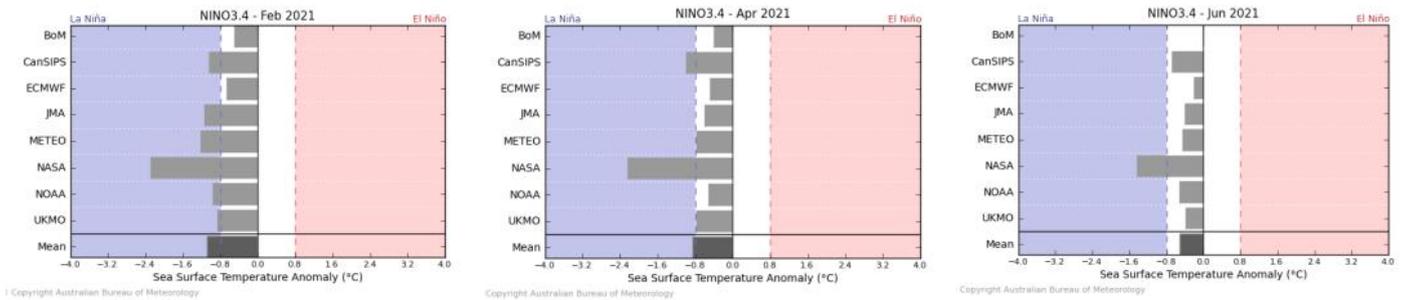
La Niña likely past peak, but influence continues

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

## Bureau of Meteorology NINO3.4 ENSO Model Outlooks for February, April and June



## Bureau of Meteorology NINO3.4 International Model Outlooks



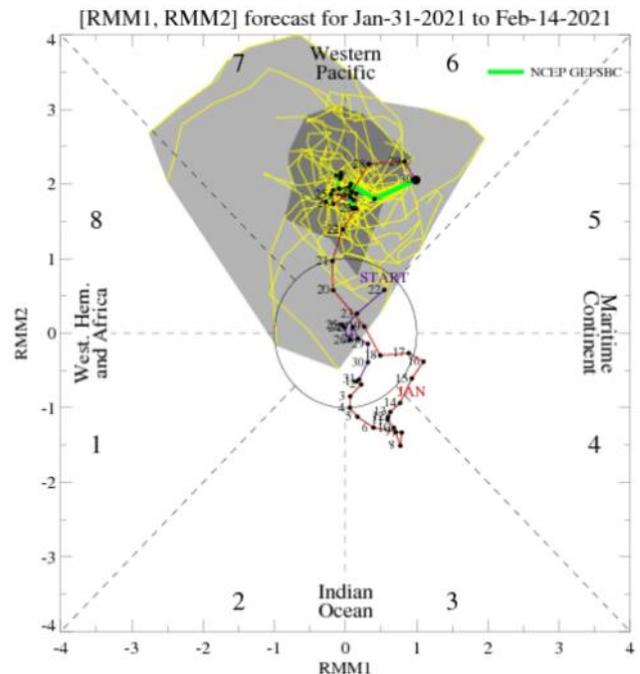
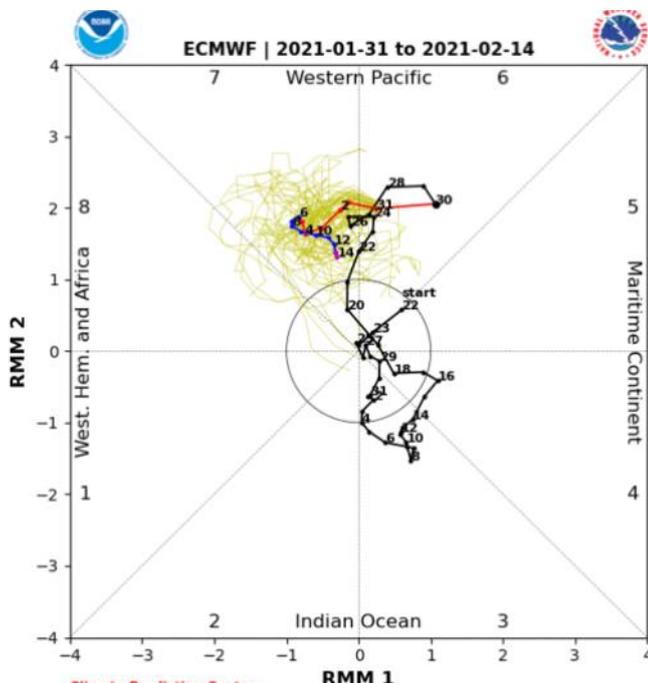
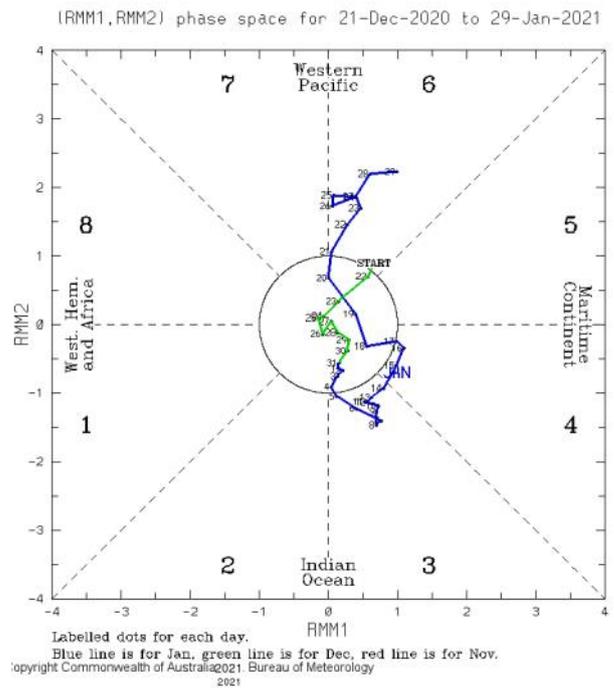
Bureau of Meteorology summary of international model outlooks for NINO3.4: <http://www.bom.gov.au/climate/model-summary/#tabs=Pacific-Ocean>

# MADDEN–JULIAN OSCILLATION

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

The Madden-Julian Oscillation (MJO) is currently at moderate to strong magnitude over the western South Pacific region. Climate models are in good agreement that the MJO pulse will move slowly eastwards into the central Pacific in the next week or two and remain at a similar strength. While an MJO pulse over the western Pacific is typically associated with above-average cloudiness and rainfall over northern Australia at this time of the year, its influence lessens significantly once it is over the central South Pacific region. With the MJO further east, enhanced tropical weather is typically focussed on the South Pacific islands. As a result, conditions in this region are likely to remain favourable for tropical low and cyclone development for much of the next fortnight.

This is an abbreviated version of the Weekly Tropical Note. Click on the [Weekly Tropical](#) for more information



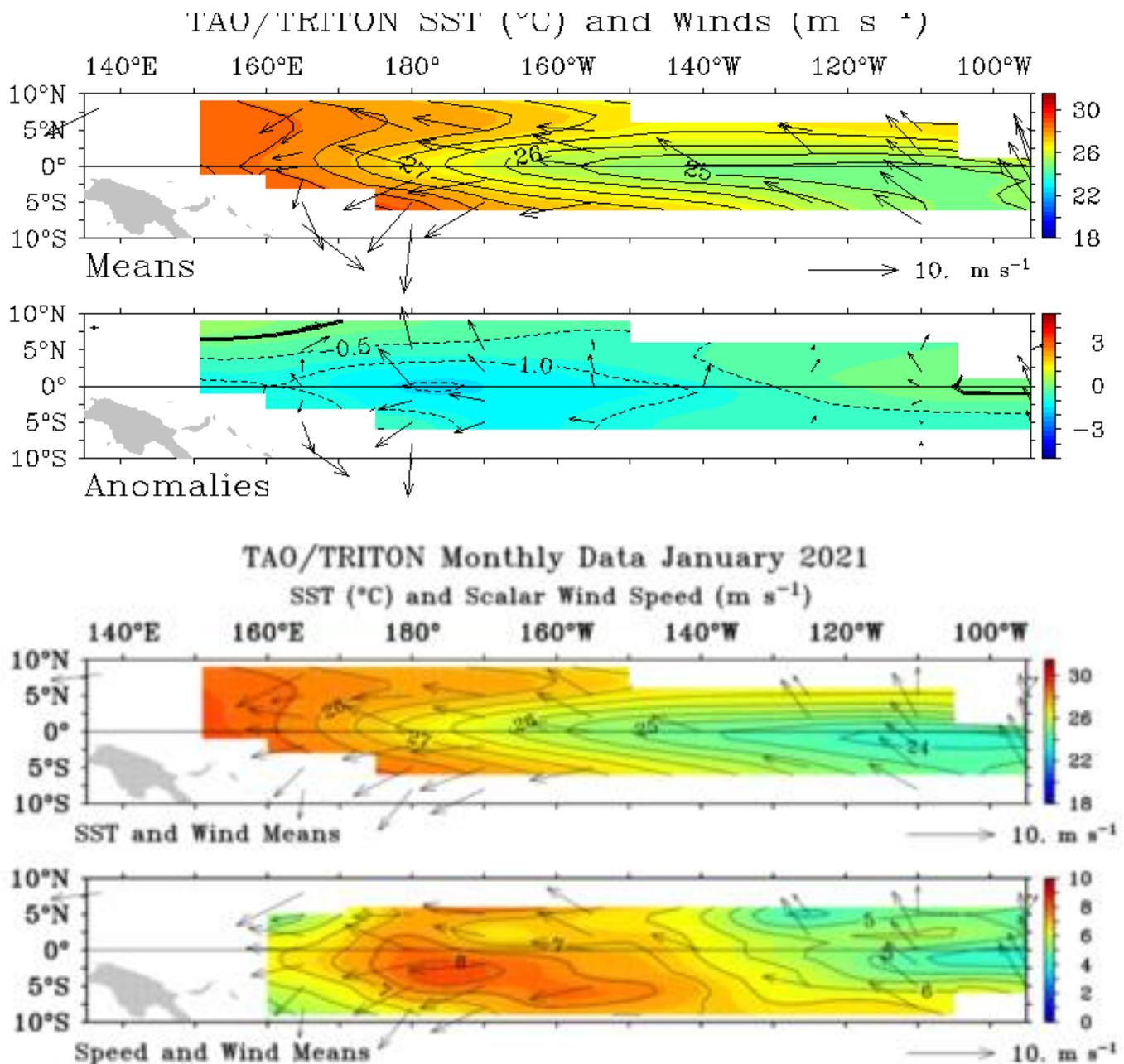


# WIND

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

The trade winds were mainly stronger than normal over the western and central equatorial Pacific during January, which is consistent with the La Niña. In the eastern Pacific, the Trades tended to be weaker than average.

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

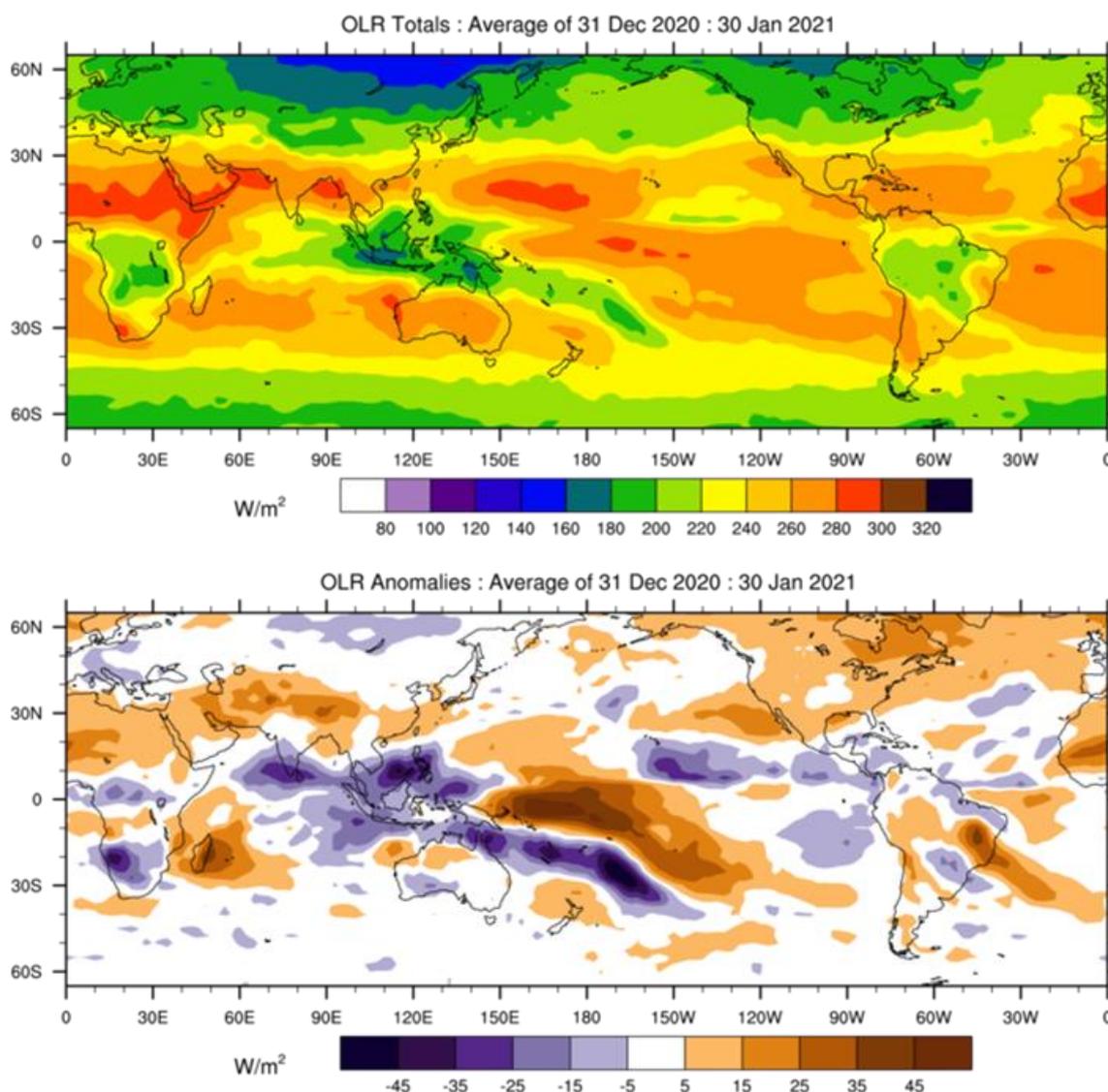
Click link to access [OLR](#)



The January 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 south-westwards over Vanuatu, Fiji, Samoa, Tonga and Niue. This enhanced activity spawned severe Tropical Cyclones *Ana*, *Bina* and *Lucas*.

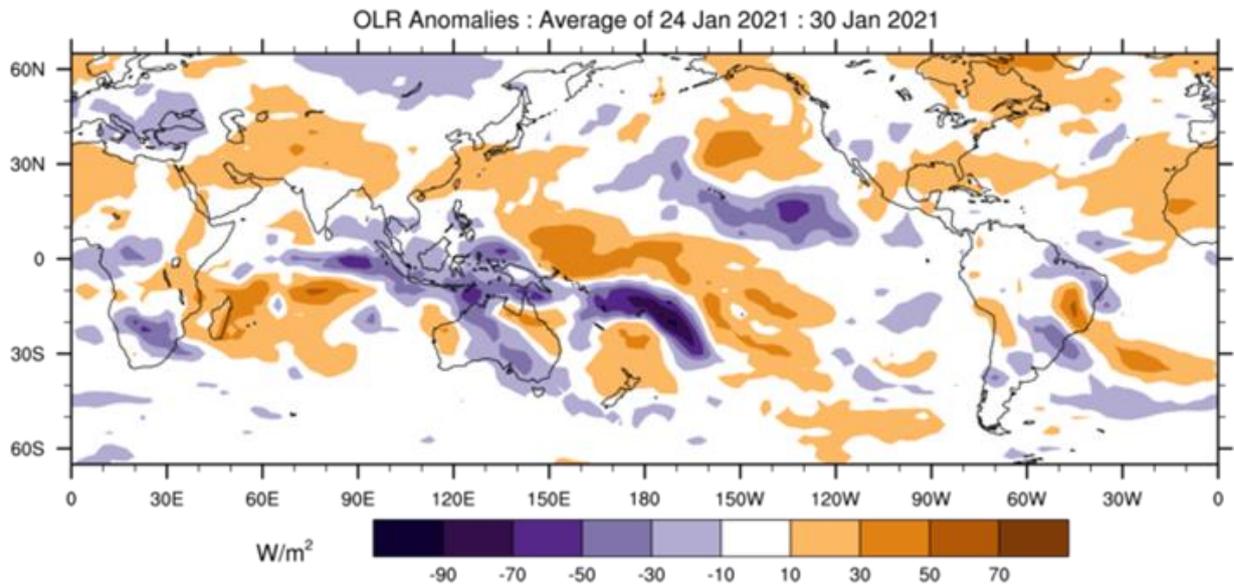
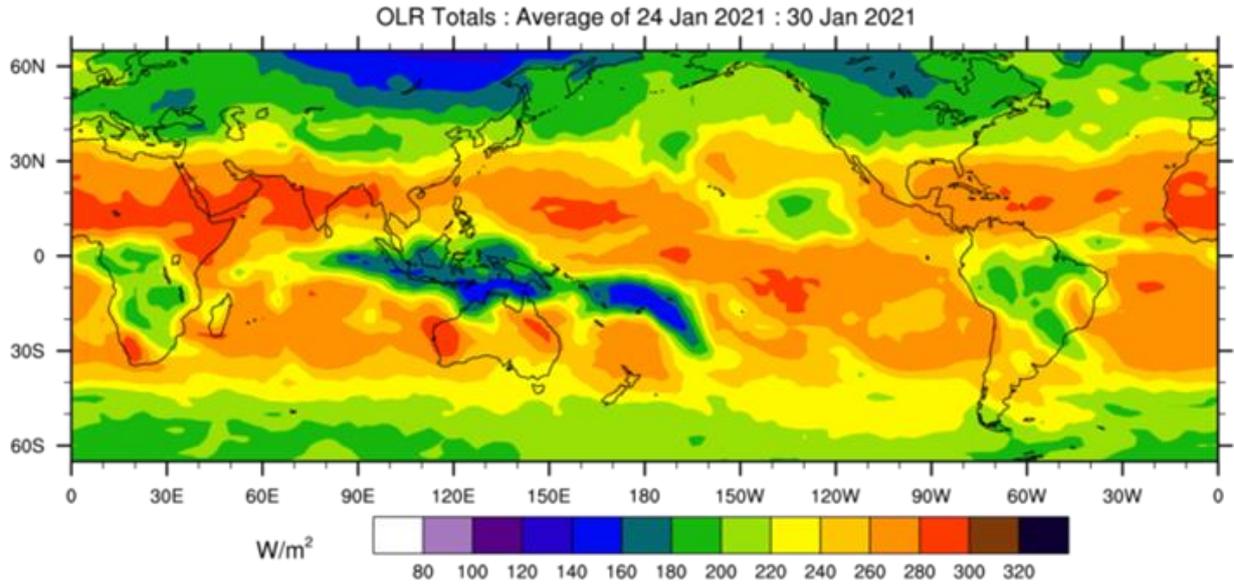
Note: Global maps of OLR below highlight regions experiencing increased or decreased cloudiness. The top panel is the total OLR in Watts per square metre ( $W/m^2$ ) and the bottom panel is the anomaly (current minus the 1979-1998 climate average), in  $W/m^2$ . In the bottom panel, negative values (blue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

## OLR Total and Anomalies, 30 Day OLR

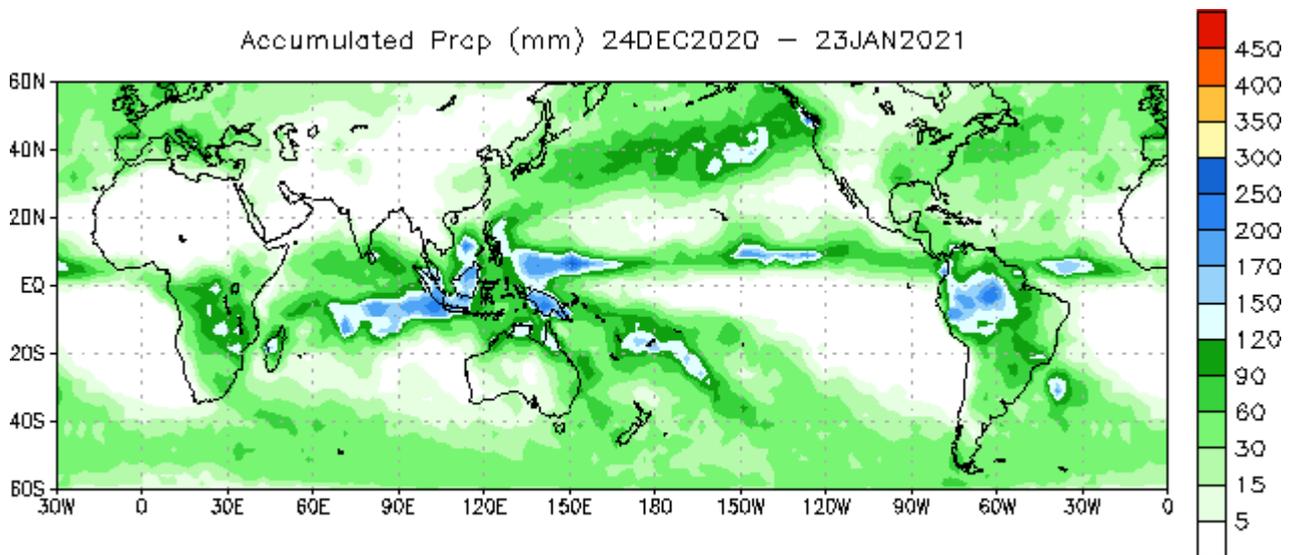


(C) Copyright Commonwealth of Australia 2021. Bureau of Meteorology

# OLR Total and Anomalies, 7 Day OLR

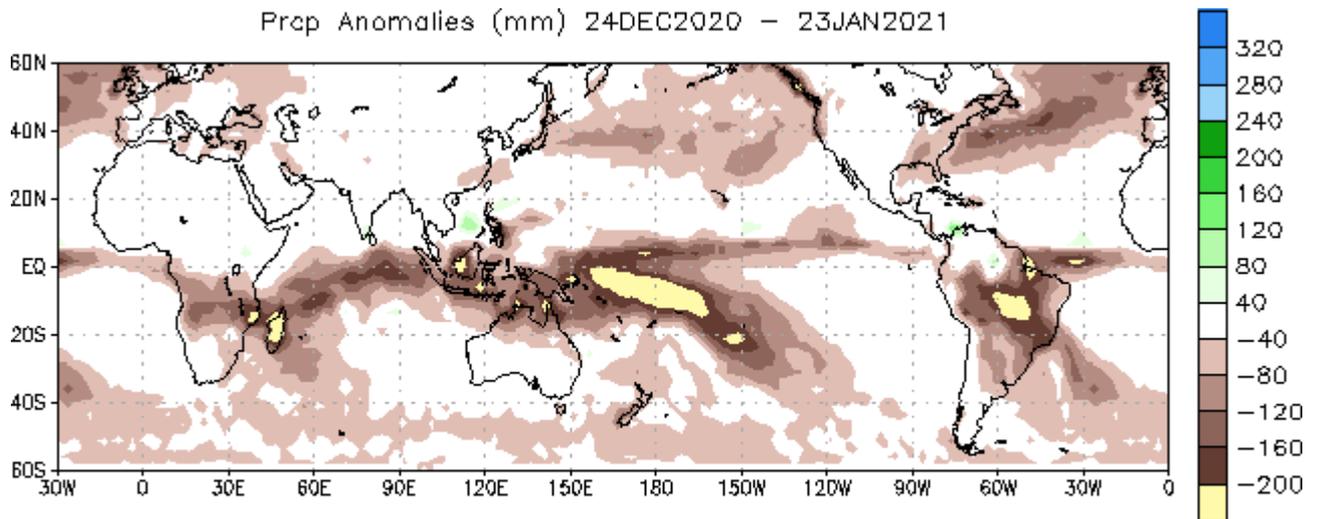


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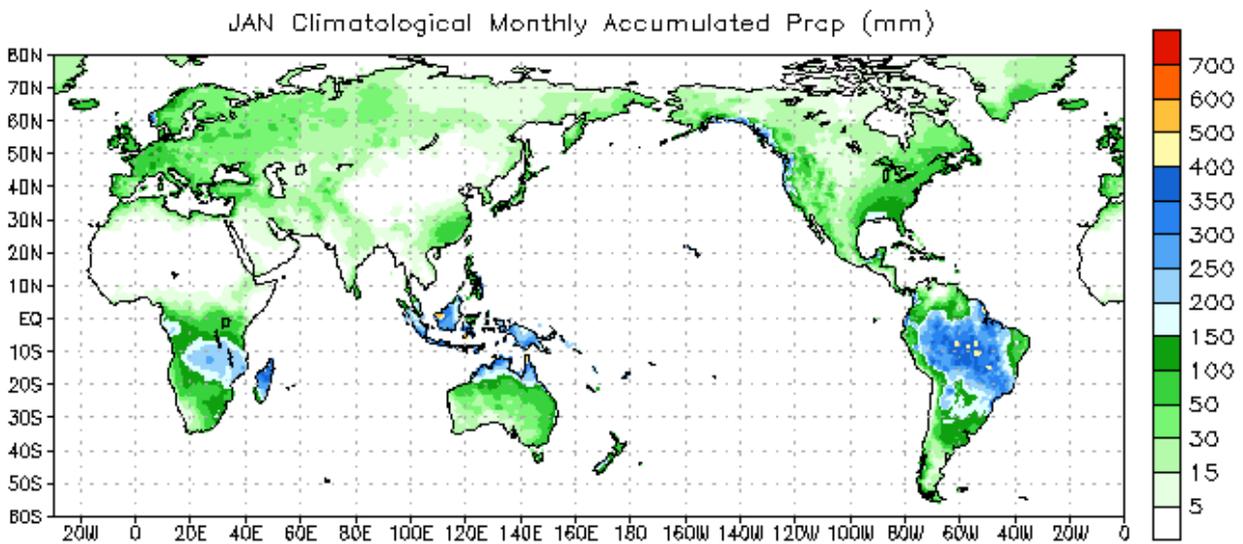


Data Source: NCEP CMAP Precipitation

# 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

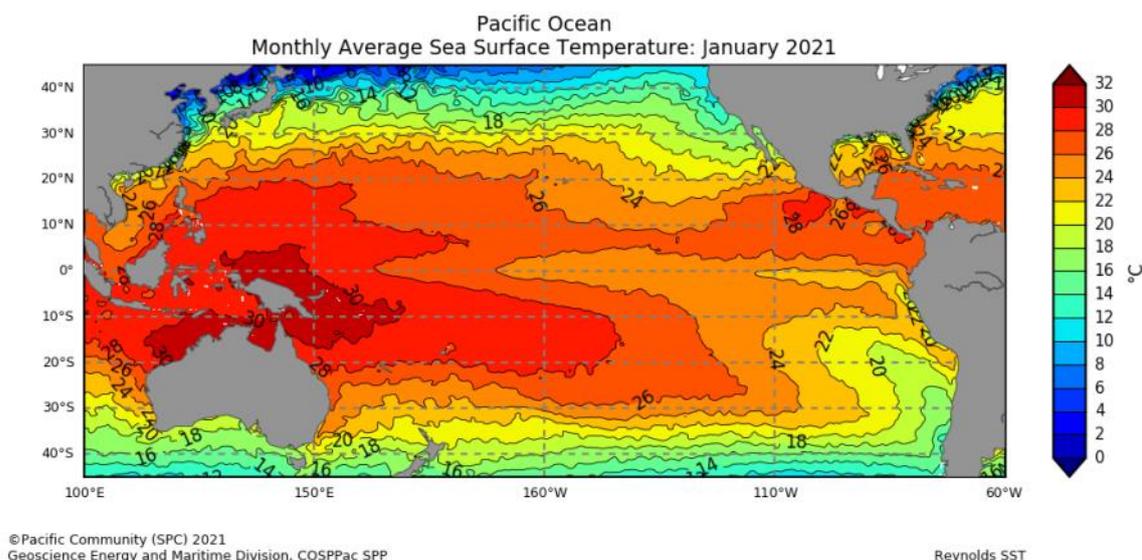


Click link to access [Pacific Community COSPPac Ocean Portal](#)

The SST anomaly pattern in January continued to show the classic La Niña shape, with below average temperatures prevailing along the equator up to the north of PNG, surrounded by a boomerang shape of above average temperatures. Highest anomalies were experienced by southern Cook Islands which saw an increase of temperature by 2 degrees. Similarly, southern Vanuatu, PNG and countries in the west Pacific namely FSM and Palau experienced warmer conditions with anomalies of 1.5 degrees. Kiribati group continued to experience cooler anomalies getting as low as 1.5 degree than normal.

In terms of the deciles, regions of Highest-on-Record for January occurred in much of Palau, FSM, and in parts of PNG, Solomon Islands, Vanuatu and Cook Islands. Regions of above average to very much above average (deciles 8-10) SSTs also spanned across the same countries, as well as 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 was analysed.

### Mean Sea Surface Temperature

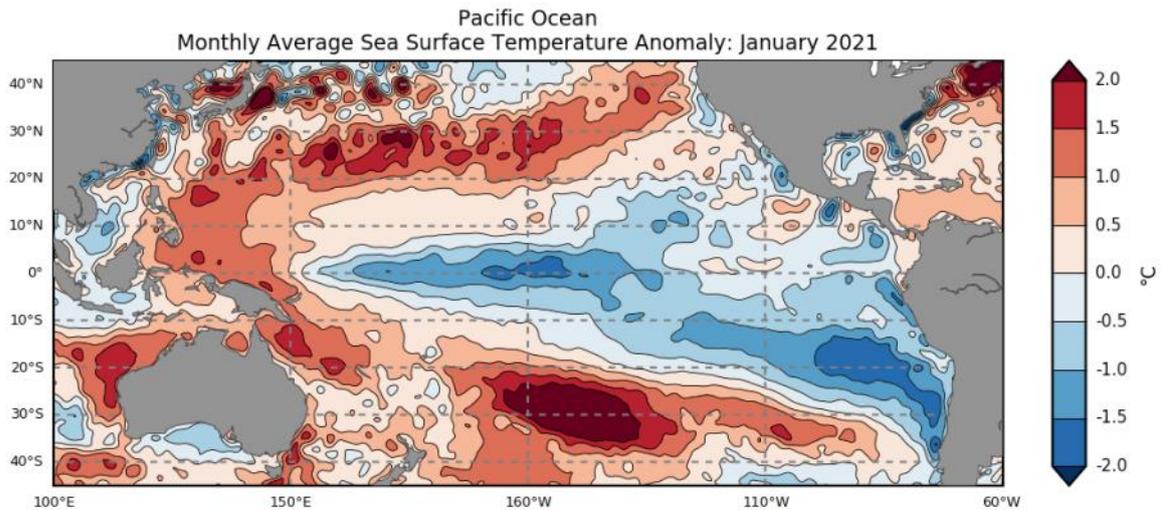


# OCEAN CONDITIONS

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



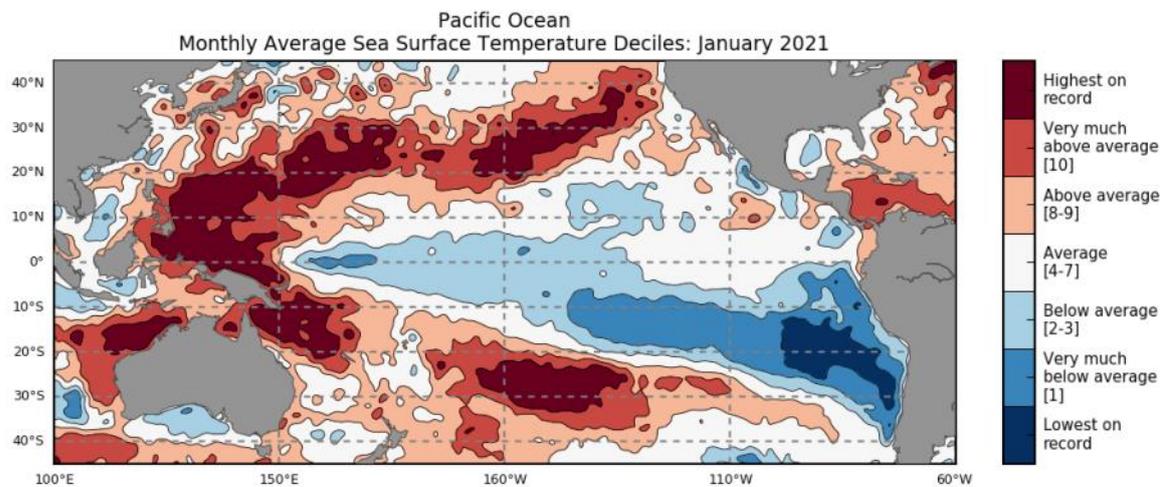
## Anomalous Sea Surface Temperature



©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

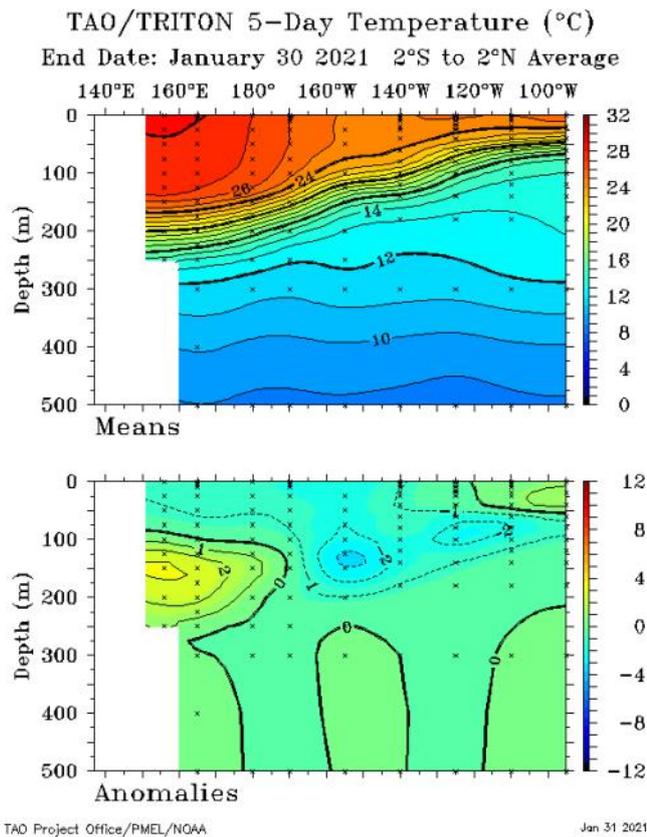
# OCEAN CONDITIONS

## SUB SURFACE

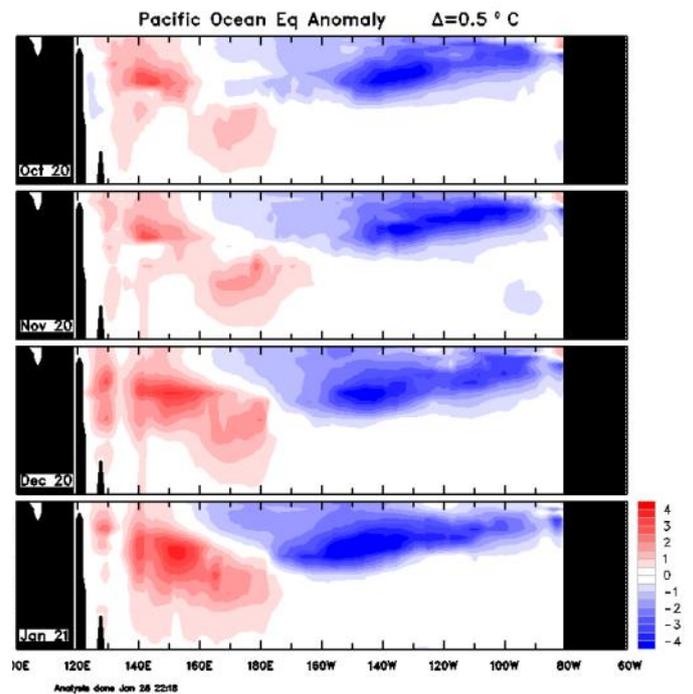


The four-month sequence of equatorial Pacific sub-surface temperature anomalies (to 26 January) shows cooler than average water extending across the top 200 m of the sub-surface of the equatorial Pacific east of around 160°E. The strength and spatial extent of cooler than average water has remained fairly consistent since September with a slight weakening in November and strengthening in January. Warm anomalies persist across large parts of the column depth west of the Date Line, with warm anomalies underlying the shallower cool anomalies between the Date Line and 160°E. These warm anomalies have strengthened month-on-month since October.

### 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

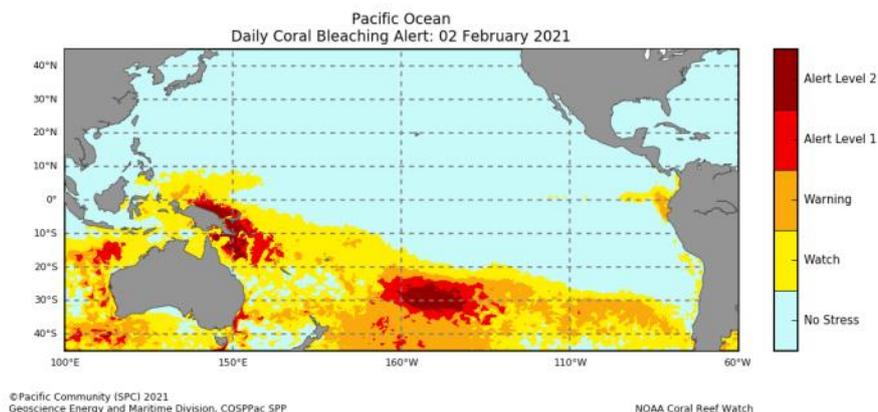
## CORAL BLEACHING



The daily Coral Bleaching Alert for 02 February 2021 shows 'Watch' for much of the COSPPac partner countries, peaking at Alert Level 1 and 2 just north of PNG and parts western Solomon islands. Parts of Vanuatu, Fiji, Samoa and Cook islands were on warning alerts as well. The four weeks Coral Bleaching Outlook to 21st February shows the 'Watch' alert continuing for most of the countries in the region with PNG and Cook Islands on alert level 1 and 2.

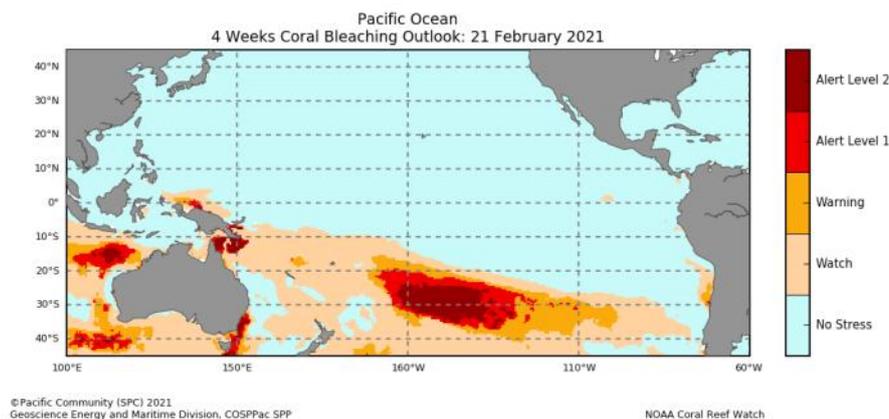
### Daily Coral Bleaching Alert

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



### 4-Weeks Coral Bleaching Outlook

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



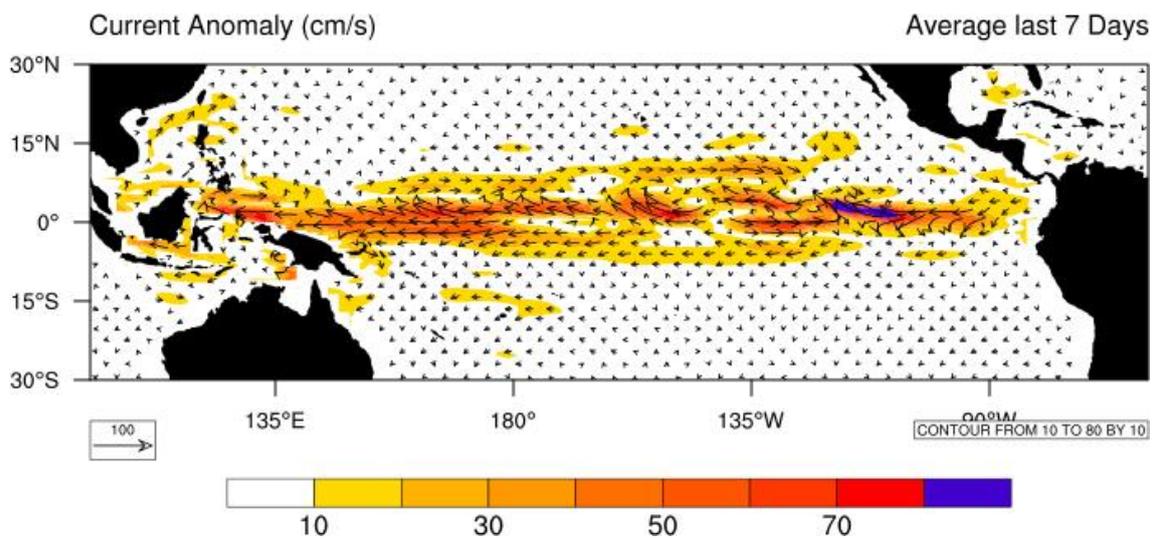
# OCEAN CONDITIONS

## OCEAN SURFACE CURRENTS AND SEA LEVEL



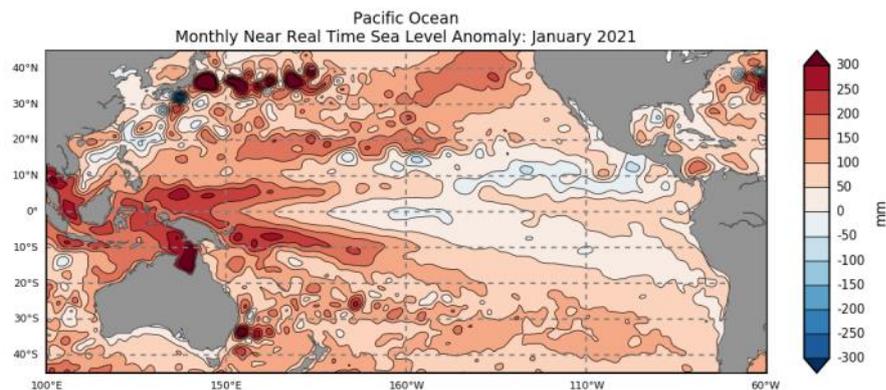
The Sea level was above normal for most of the western Pacific region. A distinct boomerang shape was visible in the western Pacific with conditions higher than normal by 200mm for Palau, FSM, PNG, Tuvalu and Samoa. Apart from the northern Line Islands of Kiribati which showed a patch of below normal, remainder of the COSPPac partner countries experienced near normal to above normal conditions.

### 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

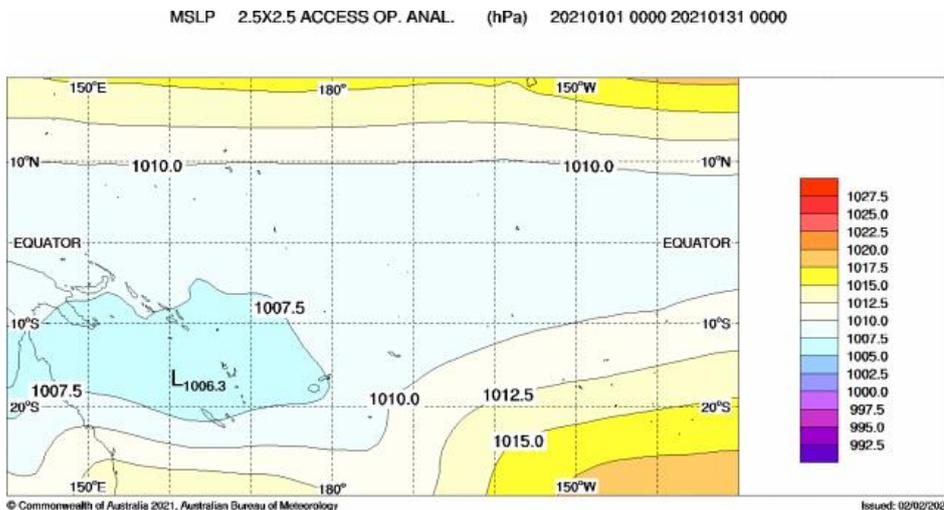
AVISO Ssalto/Duacs SLA

# MEAN SEA LEVEL PRESSURE

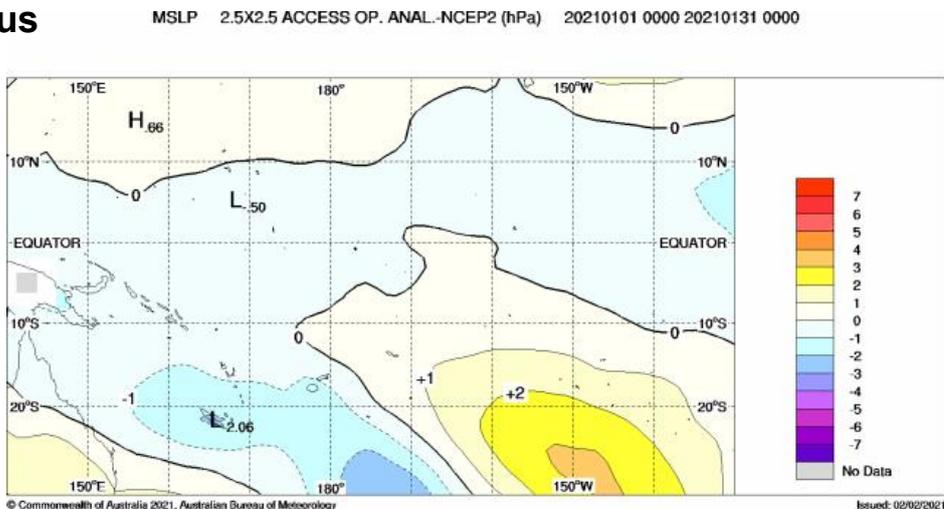
The January mean sea level pressure (MSLP) anomaly map shows negative anomalies east of about 160° in the tropical Pacific. Positive anomalies were present in the southern sub-tropical Pacific east of Samoa.

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>

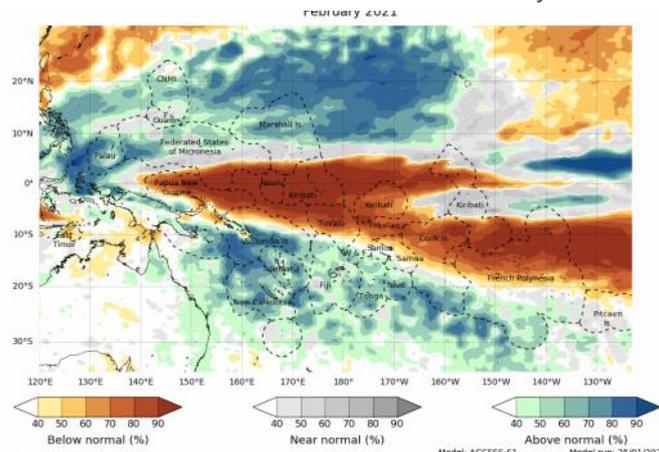
# SEASONAL RAINFALL OUTLOOK

February—April 2021



The ACCESS-S model forecast for February 2021 strongly favours below normal rainfall for Nauru, Kiribati, Tuvalu, Tokelau, the northern Cook Islands and parts of central and northern French Polynesia, extending as far west as the northern and eastern areas of the PNG Islands. Above normal rainfall is favoured in a boomerang-shaped zone wrapping around the below normal wedge. Countries affected include Palau, parts of FSM, northern and central Marshall Islands, northern parts of PNG mainland, central and eastern Solomon Islands, New Caledonia, Vanuatu, Fiji, Tonga, Niue and southern Cook Islands. The three-month rainfall outlook (February-April) is very similar to the February pattern: it shows a strong dry signal along the equator, surrounded by bands of increased chance wetter in both hemispheres. It is a typical La Niña pattern. Note the very strong gradient in probabilities as you transition from drier to wetter in both hemispheres. Above normal maximum and minimum temperatures are favoured for many COSPPac countries, except for areas close to the equator east of 155°E, namely the far southern Marshall Islands, 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 February to April favours below normal rainfall for the northern Momase and New Guinea Islands region of PNG, western 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, parts of southern PNG, central and eastern Solomon Islands, New Caledonia, Vanuatu, Fiji, southern Tuvalu, Tonga, Samoa, Niue and southern Cook Islands.

The SCOPIC statistical model for February to April favours below normal rainfall for northern PNG, Kiribati, northern and central Tuvalu, and northern Cook Islands. Above normal rainfall is favoured for Palau, FSM, southern Marshall Islands, the southern region of PNG, most parts of Solomon Islands, Vanuatu, Fiji, Tonga, Samoa, and southern Cook Islands.

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

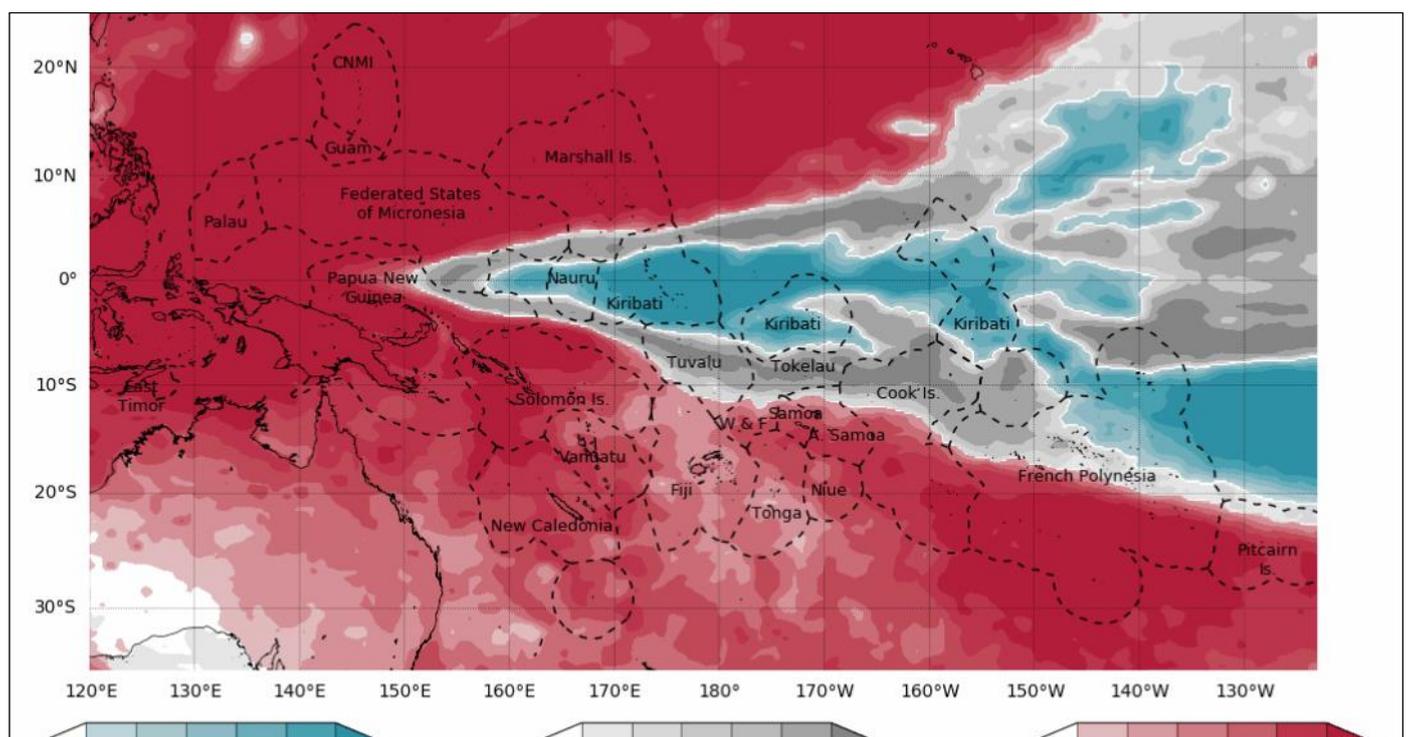
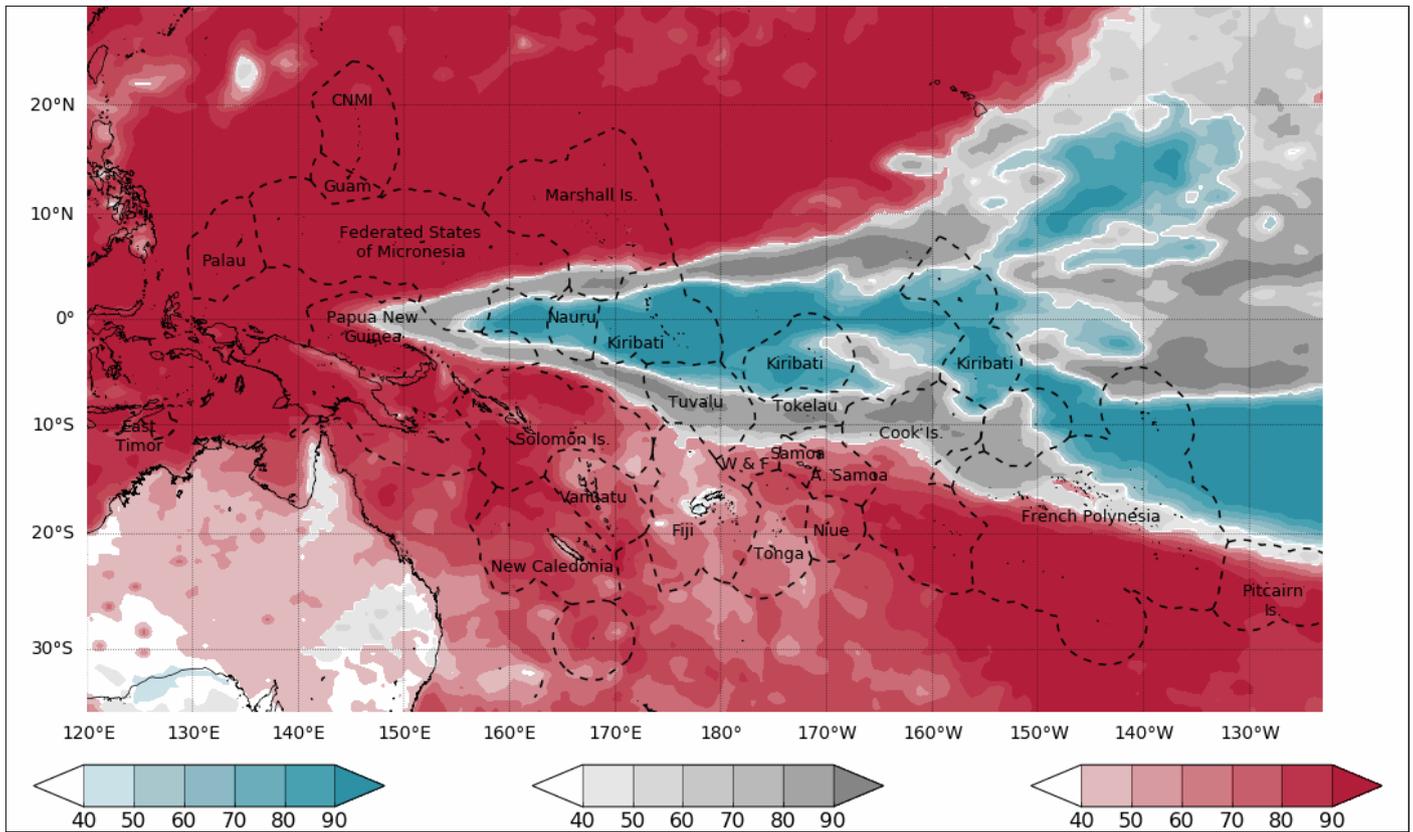
For February to April 2021, the dynamical models (as well as SCOPIC) agree on above normal rainfall for Palau, FSM, central to northern Marshall Islands, areas in Southern Regions of PNG, eastern Solomon Islands, New Caledonia, Vanuatu, Fiji, Tonga, Niue, southern Cook Islands and southern French Polynesia.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

# SEASONAL TEMPERATURE OUTLOOK

February—April 2021



## Monthly **ACCESS-S** Maps



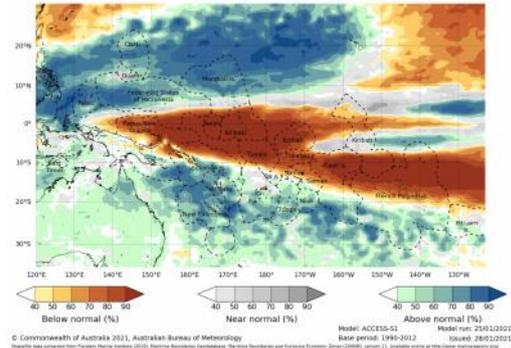
# SEASONAL RAINFALL OUTLOOK

February—April 2021

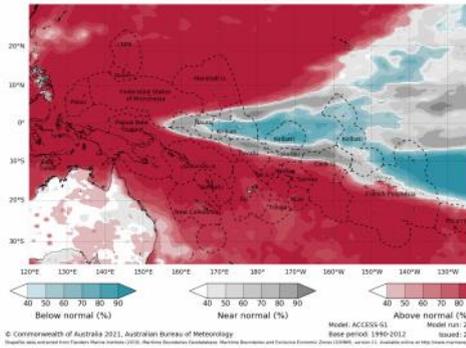


## Seasonal ACCESS-S maps

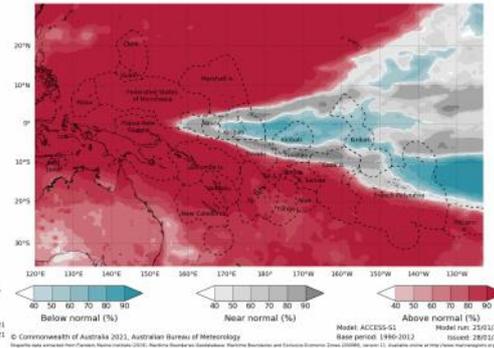
Tercile rainfall probabilities for February to April 2021



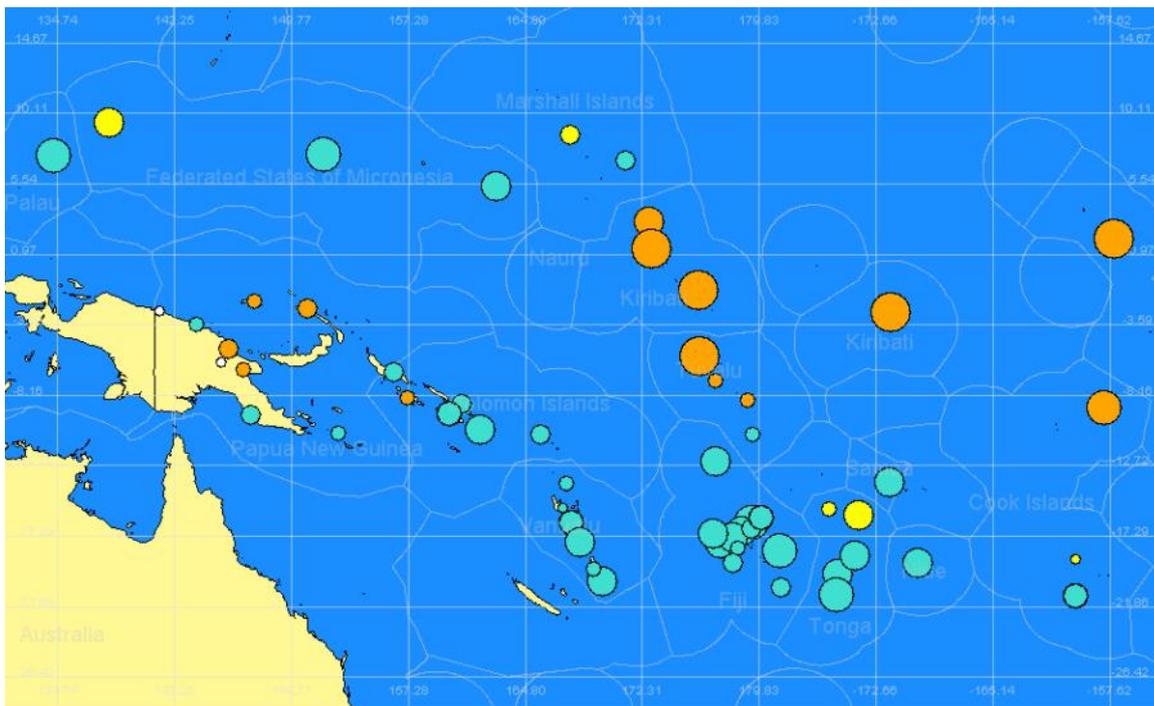
Tercile maximum temperature probabilities for February to April 2021



Tercile minimum temperature probabilities for February to April 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

February—April 2021



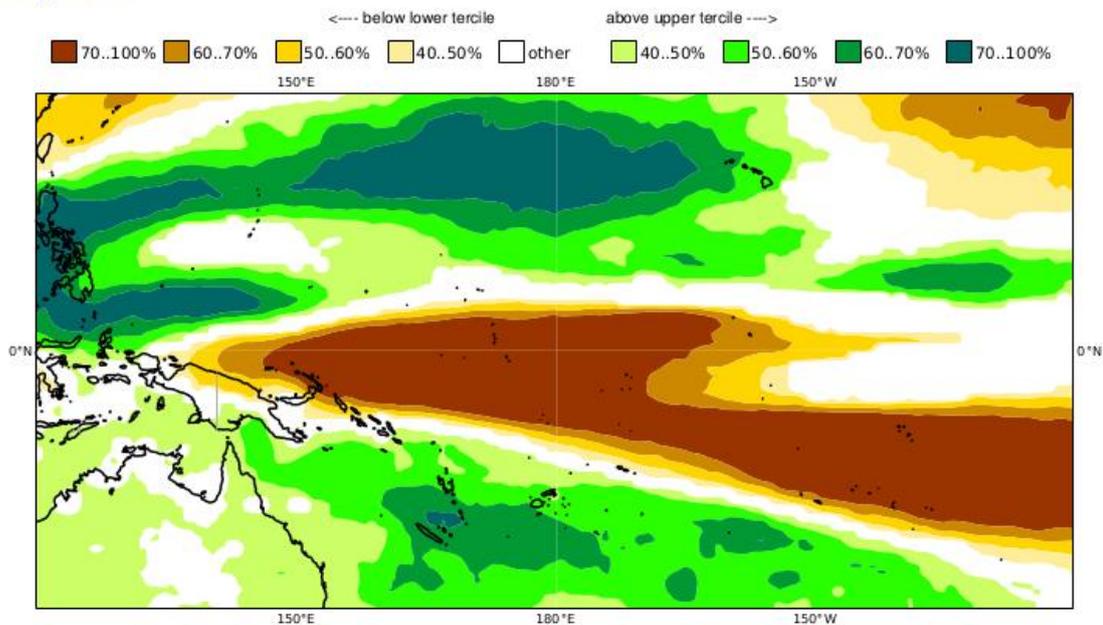
## Copernicus (C3S multi-system)-Rainfall

Prob(most likely category of precipitation)

FMA 2021

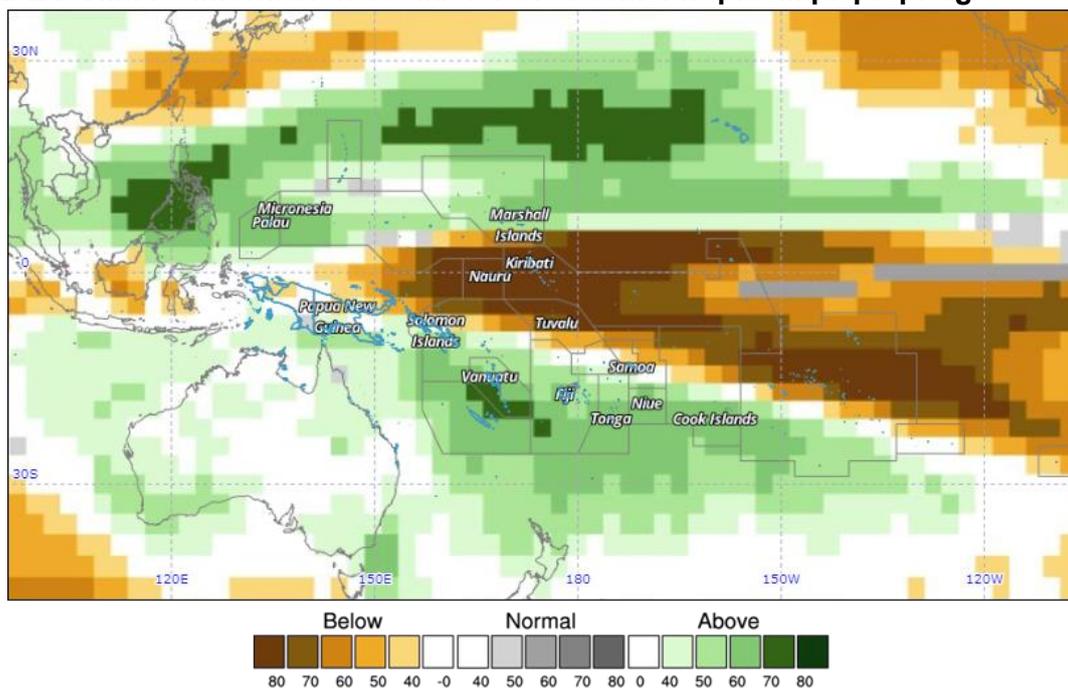
Nominal forecast start: 01/01/21

Unweighted mean



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

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



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

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

Generated using CLIK® (2021-2-2)

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# TROPICAL CYCLONE

## 2020/2021 Season



To date, 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).

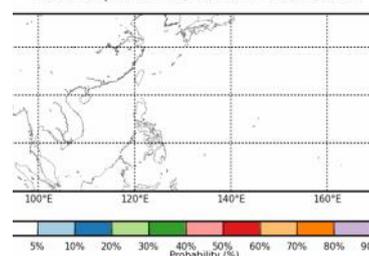
The weekly tropical cyclone forecast from ACCESS-S model shows elevated risk in the week ending 19 February 2021 for the southwest Pacific; especially areas in between Vanuatu and the Coral Sea region. No tropical cyclone risk for the northwest Pacific.

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

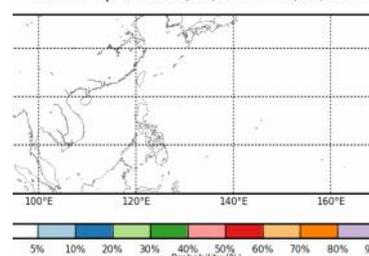
The tropical cyclone season outlook for 2020-21 is available via: <http://www.bom.gov.au/climate/cyclones/south-pacific/>

### ACCESS-S Weekly Forecasts –Northwest Pacific

Tropical Cyclone probabilities in the Northern Pac  
Forecast period: 06/02/2021 - 12/02/2021

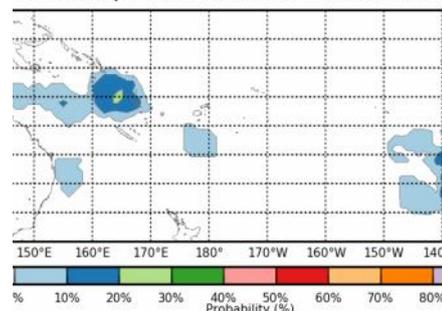


Tropical Cyclone probabilities in the Northern Pac  
Forecast period: 13/02/2021 - 19/02/2021

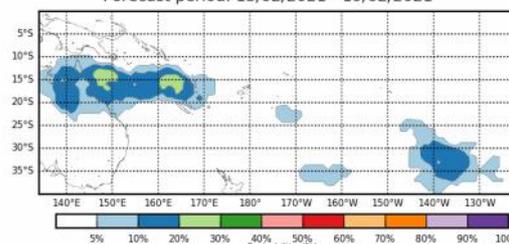


### ACCESS-S Weekly Forecasts –Southwest Pacific

Tropical Cyclone probabilities in the South Pac  
Forecast period: 06/02/2021 - 12/02/2021



Tropical Cyclone probabilities in the South Pacific  
Forecast period: 13/02/2021 - 19/02/2021



© Commonwealth of Australia 2021, Australian Bureau of Meteorology Source: ACCESS\_S1 Model run: 26/01/2021 Created: 31/01/2021

### 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.

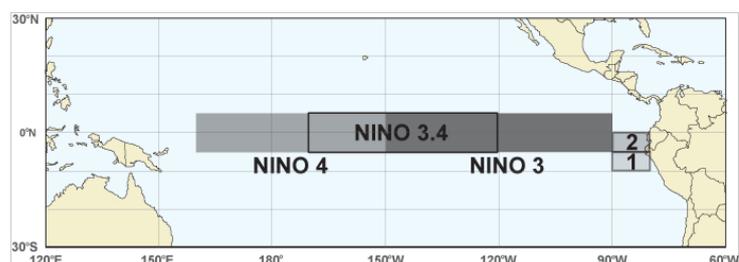
## 20 degrees Celsius Isotherm Depth

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