

Monthly Climate Bulletin

June 2021



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Photo Credit: SPREP Open Day Raising Awareness of Schools on Climate & Ocean Science



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SUMMARY

Issued 09 July 2021

- The Indian Ocean Dipole (IOD) index values continue to be negative.
- El Niño Southern Oscillation (ENSO) remains neutral. Climate model indicate a neutral ENSO state is likely to continue for the remainder of the southern hemisphere winter (June-August) and spring (September-November).
- A Madden-Julian Oscillation (MJO) pulse weakened prior to moving into the western Pacific over the coming week.
- The Intertropical Convergence Zone (ITCZ) was active and shifted north over western Pacific, while the South Pacific Convergence Zone (SPCZ) was active over southern PNG and the Solomon Islands.
- The sea surface temperature anomaly pattern in June shows SSTs were close to average across most of the equatorial Pacific Ocean.
- Coral bleaching status is 'no stress' or 'watch' for almost all countries with patches of warning for Palau and western FSM.
- A notable sea level anomaly of +250mm observed in the eastern Solomon Islands and northern Fiji.
- For July to September 2021, the dynamical models agree on above normal rainfall for southern Marshall Islands, most of PNG, New Caledonia, Vanuatu, Fiji, Tonga, Niue and southern Cook Islands. The models also agree on below normal rainfall for FSM, central and northern RMI, northern Solomon Islands, Kiribati (southern hemisphere), Tuvalu, Tokelau, northern and central Cook Islands, and the northern half of French Polynesia.

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EL NIÑO–SOUTHERN OSCILLATION

Negative IOD event likely in 2021

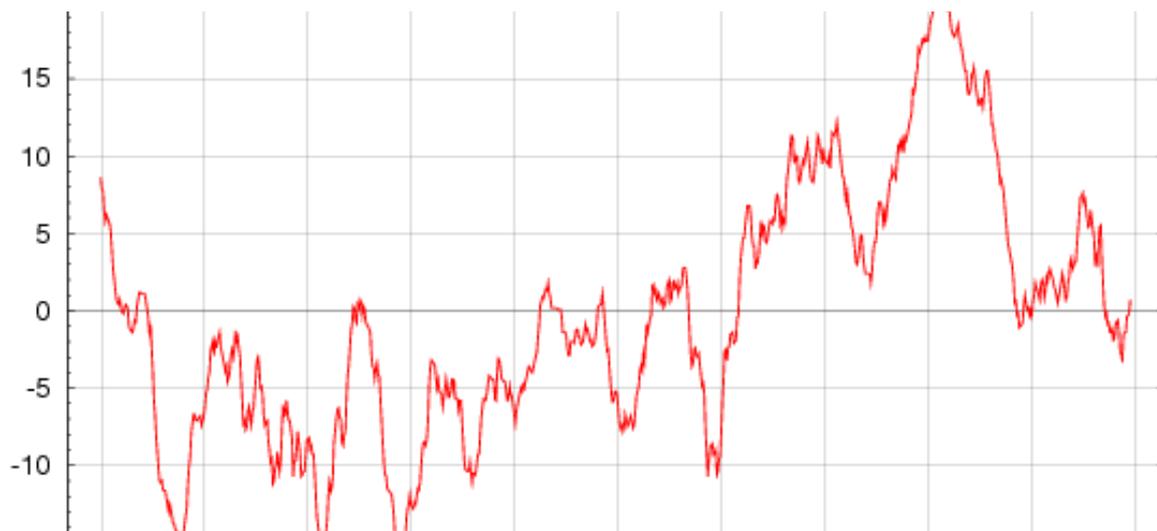
Click link to access [Climate Driver Update issued on 06 July 2021](#)

The Indian Ocean Dipole (IOD) index values continue to be negative. A negative IOD event is declared when there have been at least 8 weeks below the IOD index threshold of -0.4°C . A negative IOD increases the chances of above average winter-spring rainfall for parts of southern Australia.

The most recent weekly IOD value is -0.27°C , which is above the negative IOD threshold (-0.4°C) but follows on from the IOD index being below the negative IOD threshold for the previous six weeks. Most climate models surveyed by the Bureau predict the IOD to return to below the negative IOD threshold, with a negative IOD event likely for the second half of the southern hemisphere winter (June-August) and into spring (September-November).

The El Niño Southern Oscillation (ENSO) remains neutral with most oceanic and atmospheric indicators within the neutral range. Cloudiness near the Date Line has been below average over the past fortnight, although this is weak and a localised pattern. Most climate model outlooks indicate a neutral ENSO state is likely to continue for the remainder of the southern hemisphere winter and spring despite tropical Pacific sea surface temperatures slowly cooling over the coming six months.

The 30-day Southern Oscillation Index (SOI) for the 30 days ending 04 July was $+5.1$. The 90-day SOI value was $+2.8$. Both are within ENSO neutral thresholds.



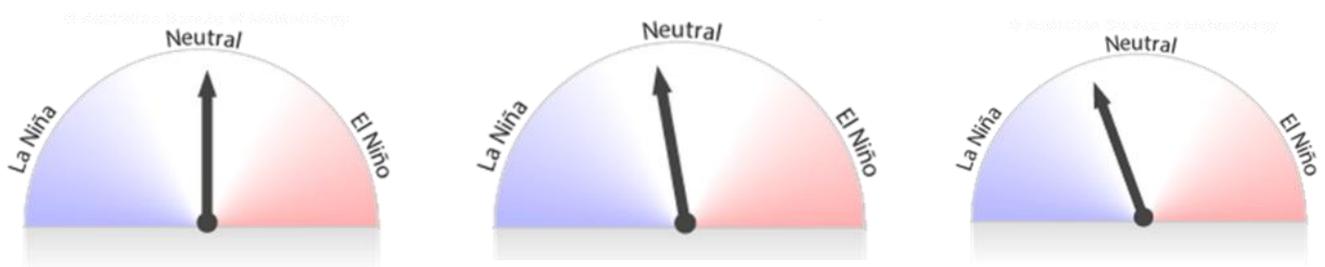


EL NIÑO–SOUTHERN OSCILLATION

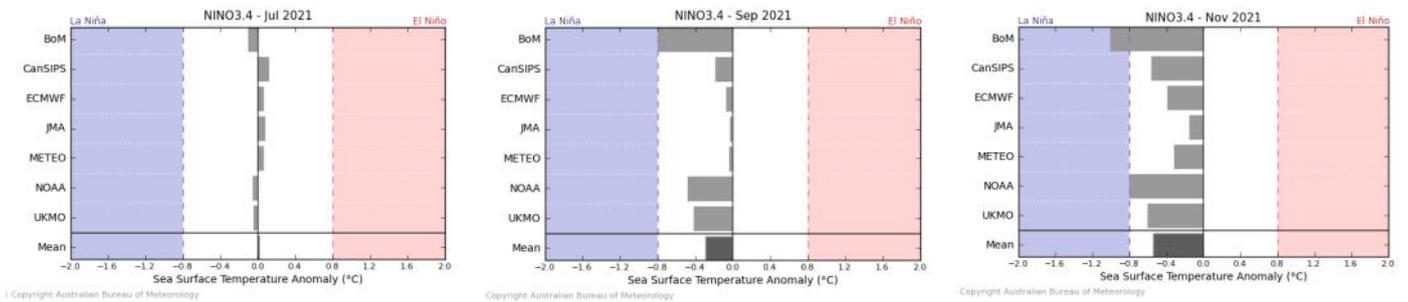
Negative IOD event likely in 2021

Click link to access [Climate Driver Update issued on 06 July 2021](#)

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



Bureau of Meteorology NINO3.4 International Model Outlooks



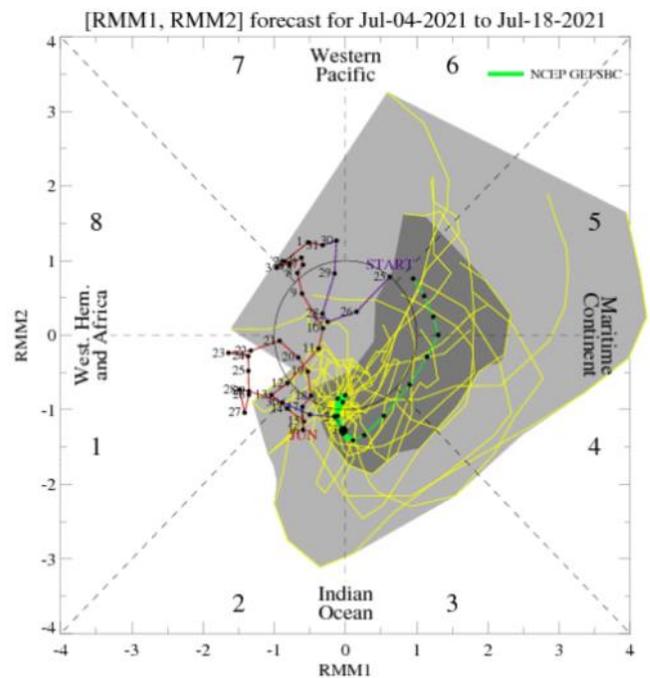
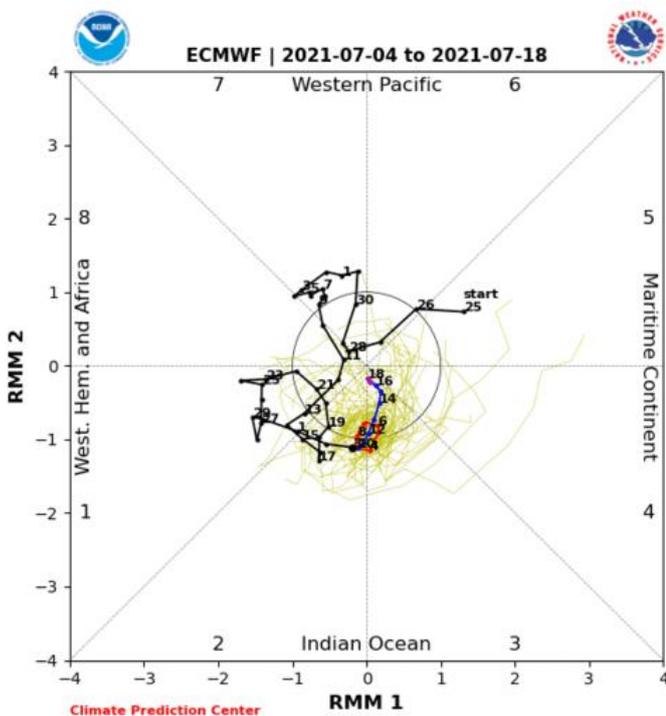
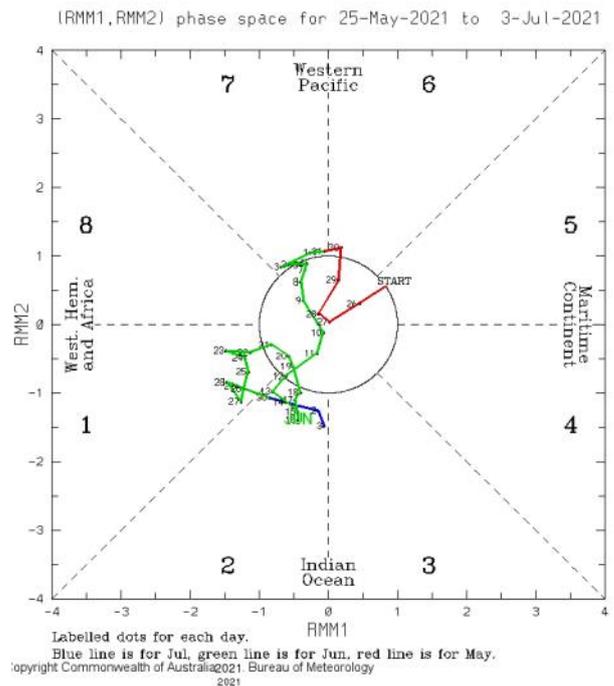
Bureau of Meteorology summary of international model outlooks for NINO3.4: <http://www.bom.gov.au/climate/model-summary/#tabs=Pacific-Ocean>

MADDEN–JULIAN OSCILLATION

Click link to access [Tropical Climate Update](#) [Issued on Tuesday 29 June 2021]

During early June, Madden-Julian Oscillation (MJO) was generally weak until a moderately strong pulse, which tracked across West Hemisphere and Africa during the past fortnight. The Madden-Julian Oscillation is currently over the Indian Ocean. Most climate models indicate the MJO will weaken approaching the Maritime Continent over the coming week. Should the MJO maintain its strength, an MJO near the Maritime Continent typically leads to stronger westerly winds over the Indian Ocean, which can reinforce the negative IOD.

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



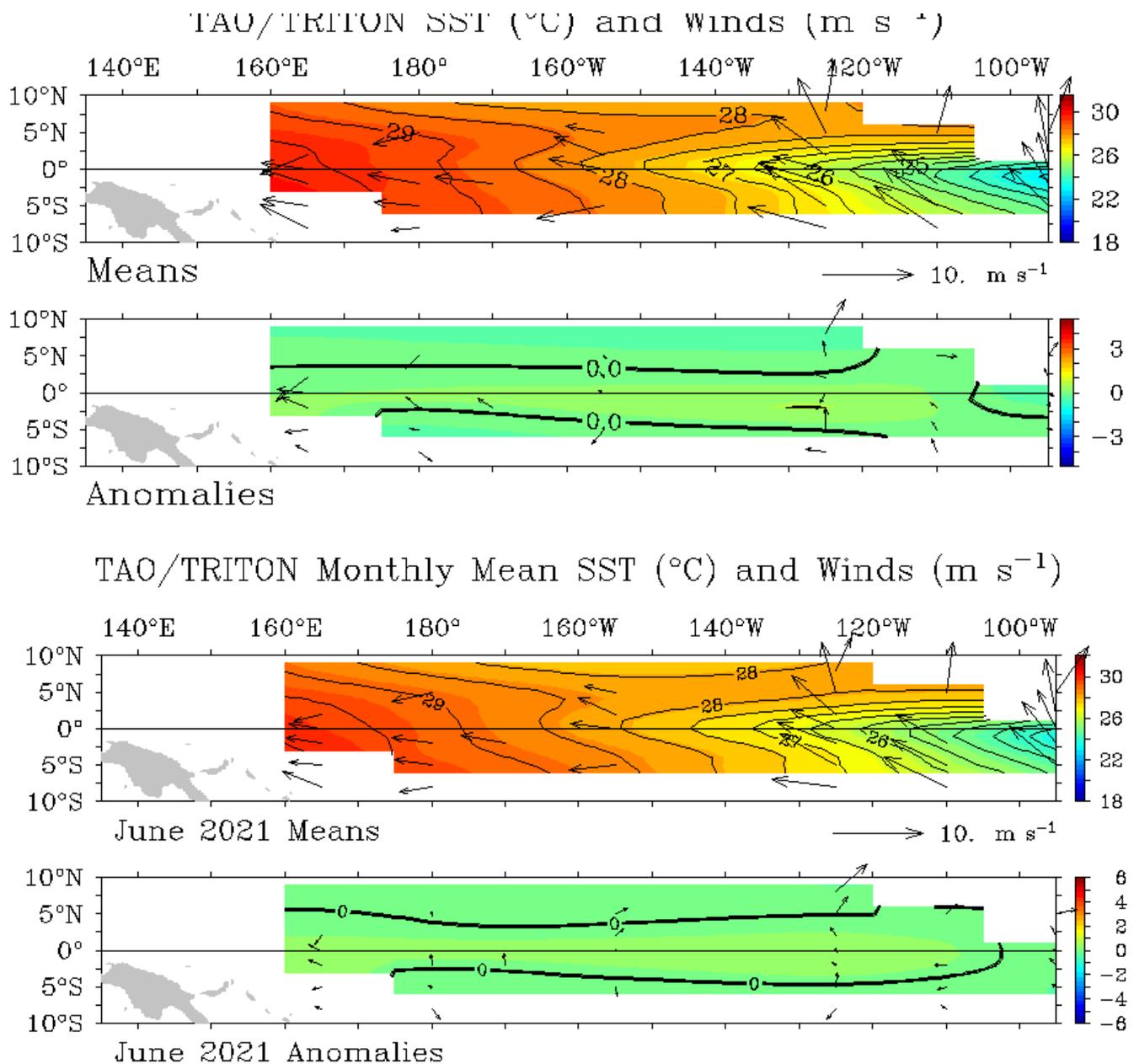


WIND

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

The trade winds in June were average over the equatorial Pacific for most of the month.

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

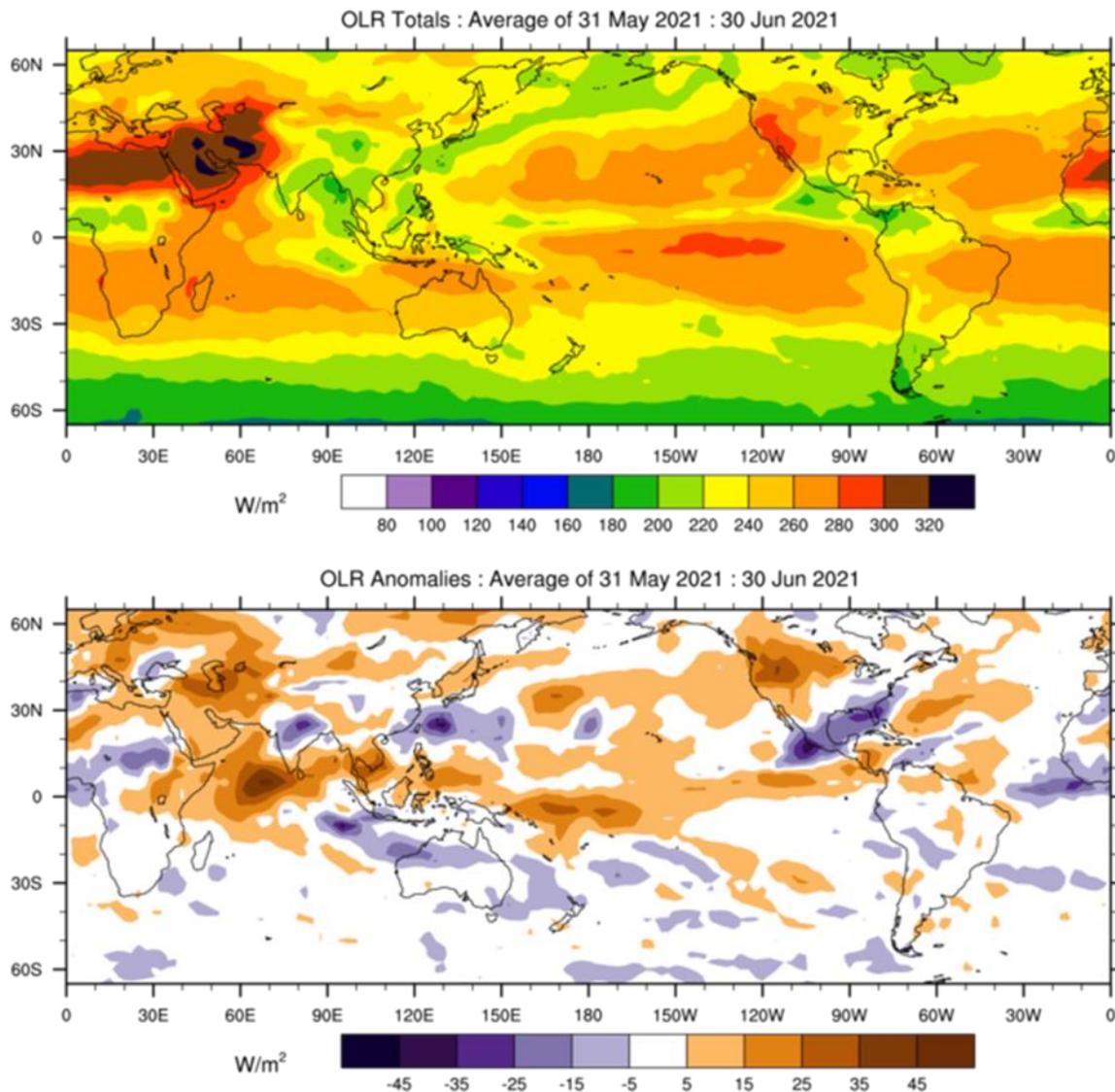
Click link to access [OLR](#)



The June 30-day OLR total and anomaly maps suggest the Intertropical Convergence Zone (ITCZ) was active and shifted a little north of its normal position over the western Pacific. The South Pacific Convergence Zone (SPCZ) was also active over southern PNG and the Solomon Islands.

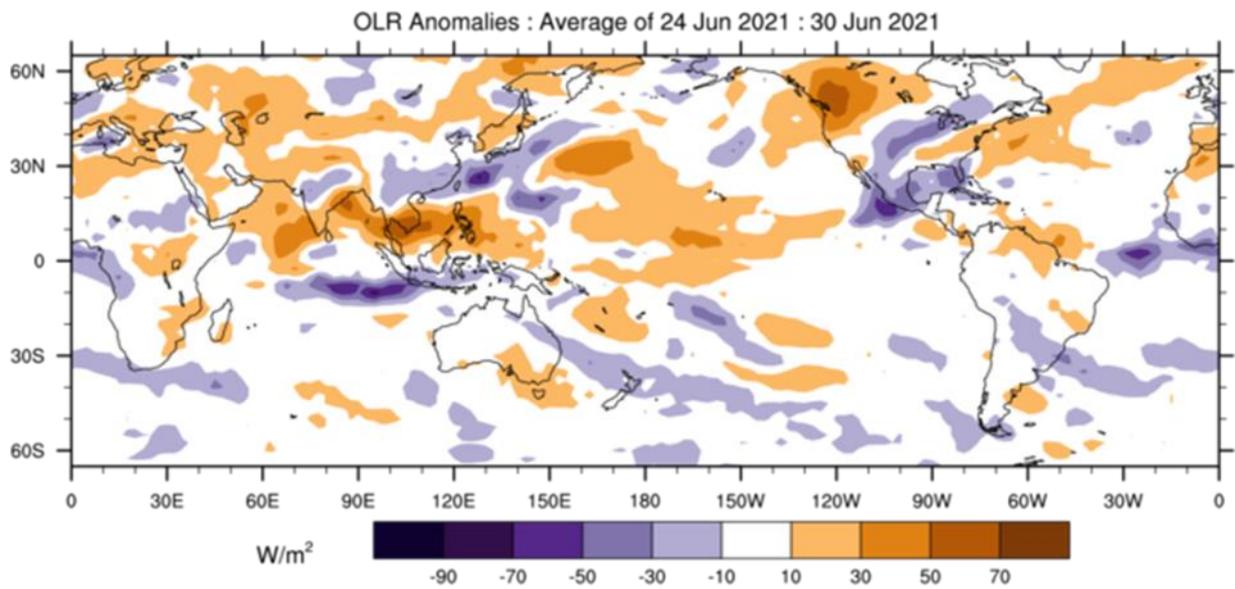
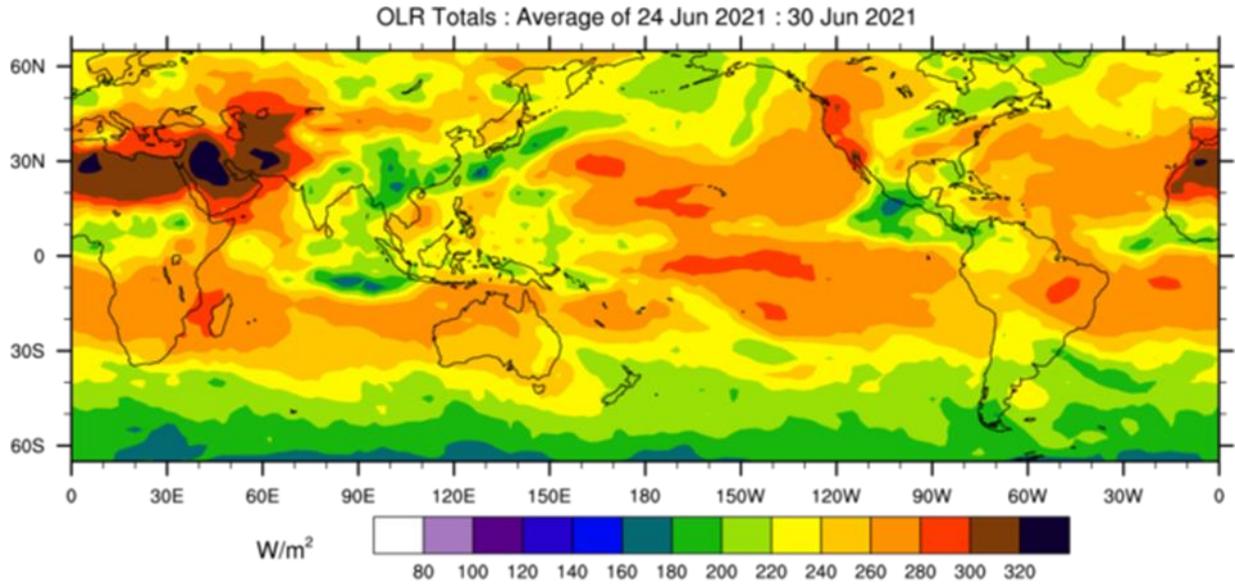
Note: Global maps of OLR below highlight regions experiencing increased or decreased cloudiness. The top panel is the total OLR in Watts per square metre (W/m^2) and the bottom panel is the anomaly (current minus the 1979-1998 climate average), in W/m^2 . In the bottom panel, negative values (blue shading)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

OLR Total and Anomalies, 30 Day OLR

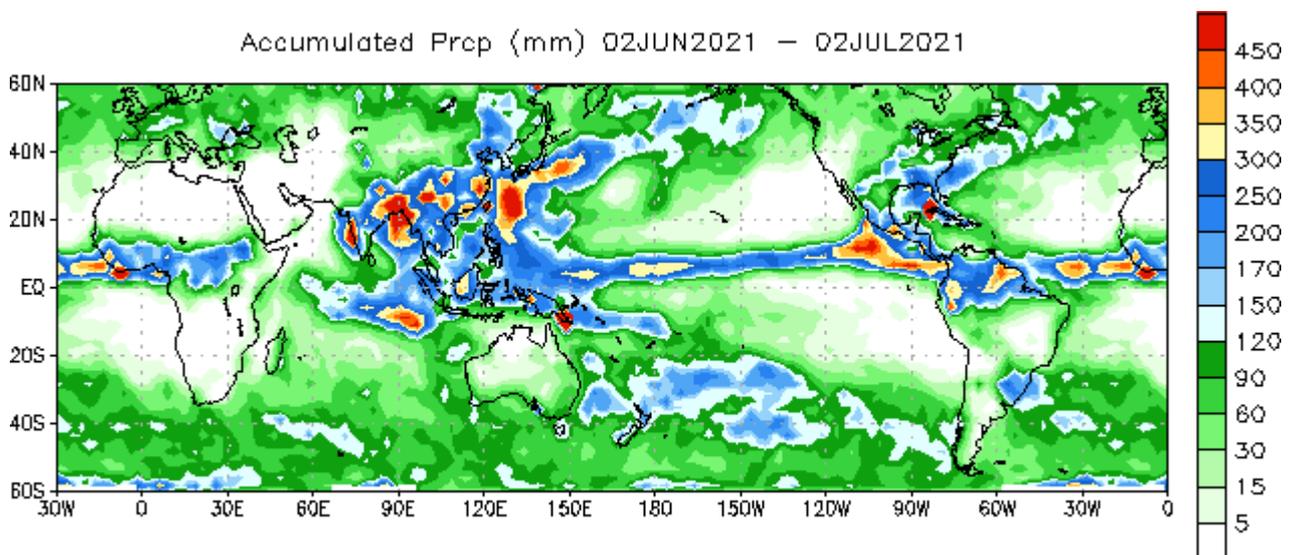


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OLR Total and Anomalies, 7 Day OLR

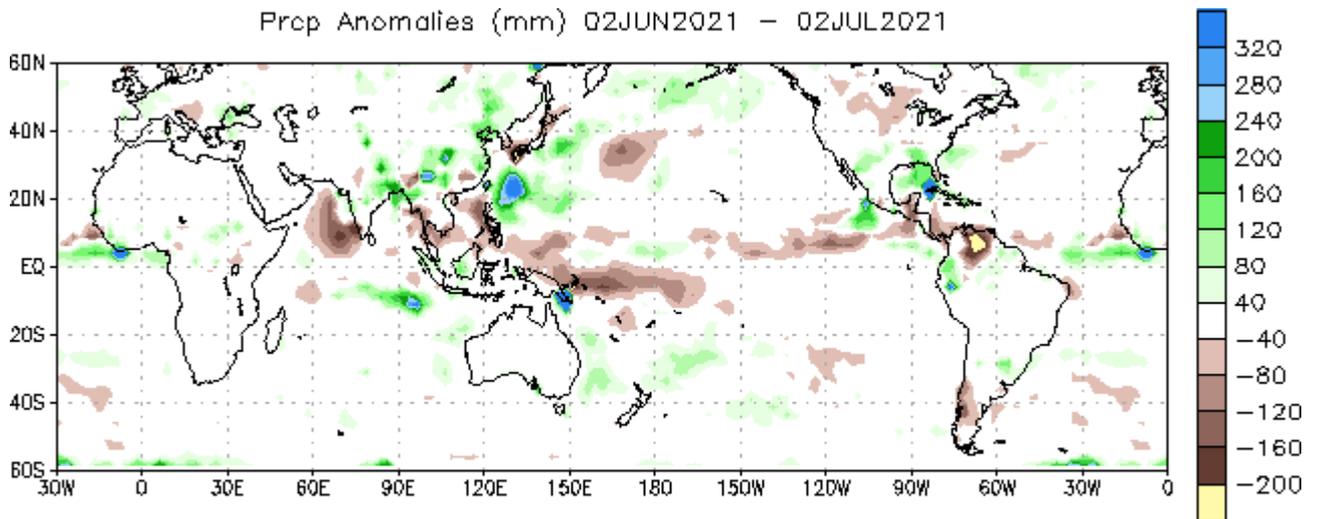


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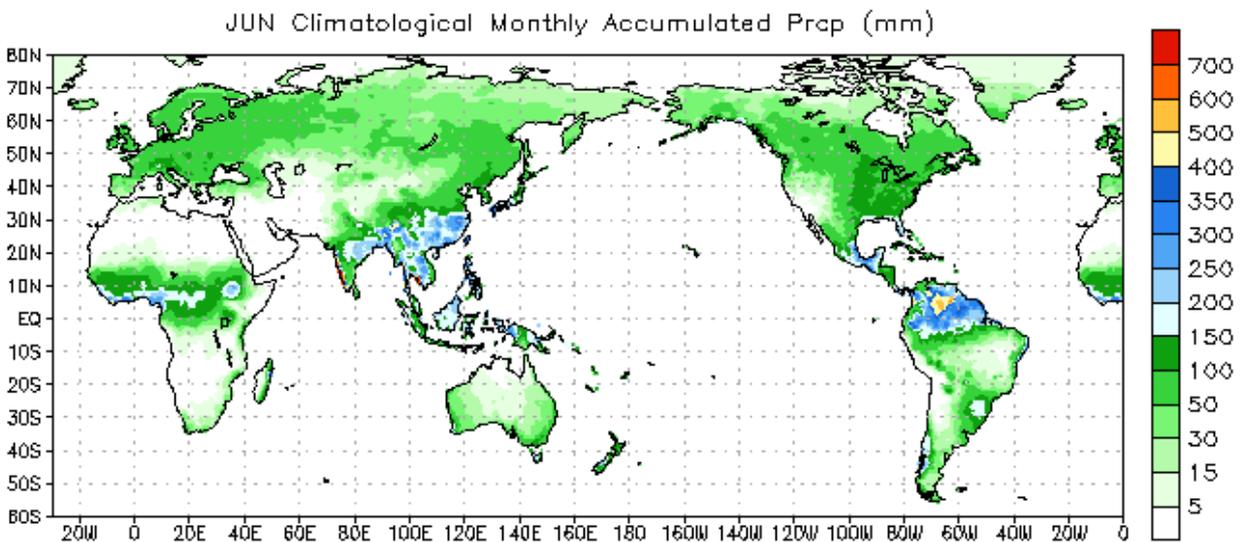


Data Source: NCEP CMAP Precipitation

30-Day Rainfall Anomalies



Data Source: NCEP CMAP Precipitation
Climatology (1991–2020)



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

OCEAN CONDITIONS

SEA SURFACE TEMPERATURE

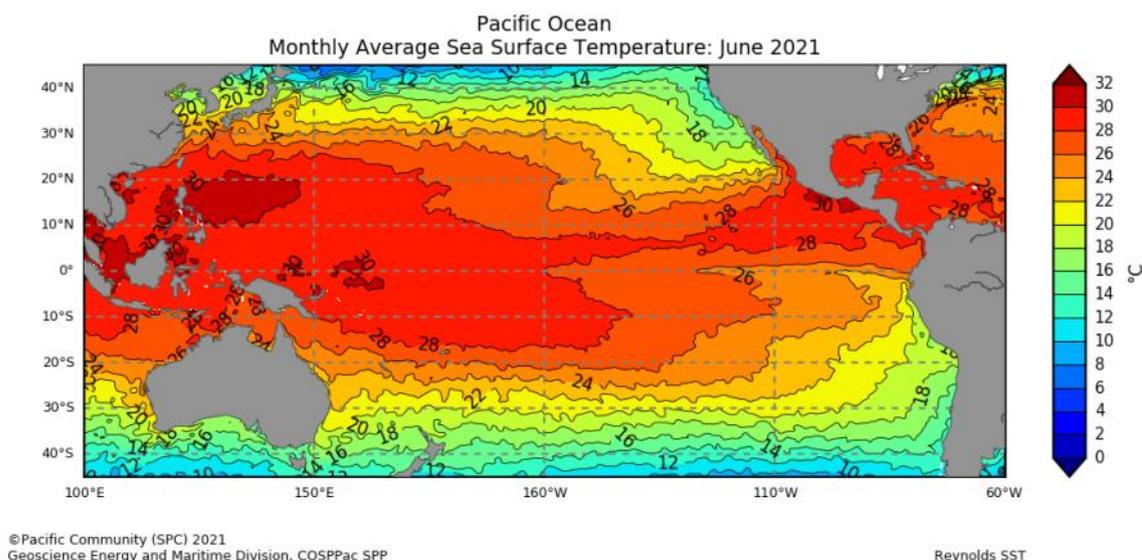


Click link to access [Pacific Community COSPPac Ocean Portal](#)

The SST map for June 2021 shows SSTs were close to average across most of the equatorial Pacific Ocean, although SSTs over the eastern Pacific Ocean warmed slightly resulting in a small region of warm anomalies off the coast of Ecuador and a reduction of cool anomalies present in May. SSTs were warmer than average in waters around the west, much of the south of Australia and the COSPPac countries.

In terms of the deciles, regions of above average (deciles 8-9) for June occurred across majority of the COSPPac countries from Palau to southern Cook Islands. Regions of very much above average (deciles 10) SSTs spanned across parts of north and south PNG, central and eastern Solomon Islands, Vanuatu, Fiji, Niue, southern Cook Islands, and southern French Polynesia. In contrast, below average (deciles 2-3) SSTs were observed central and eastern Kiribati (south of the equator).

Mean Sea Surface Temperature

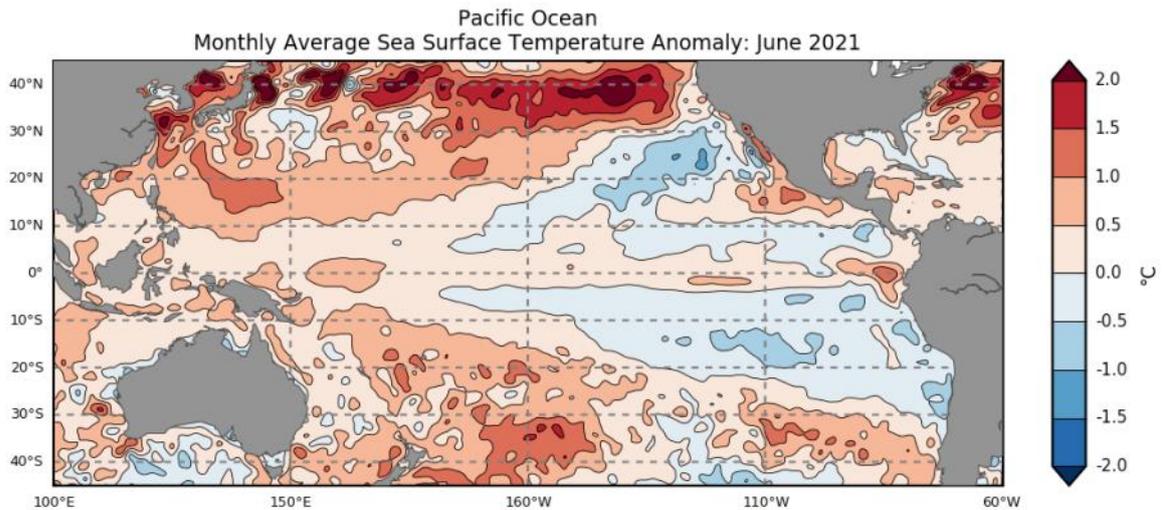


OCEAN CONDITIONS

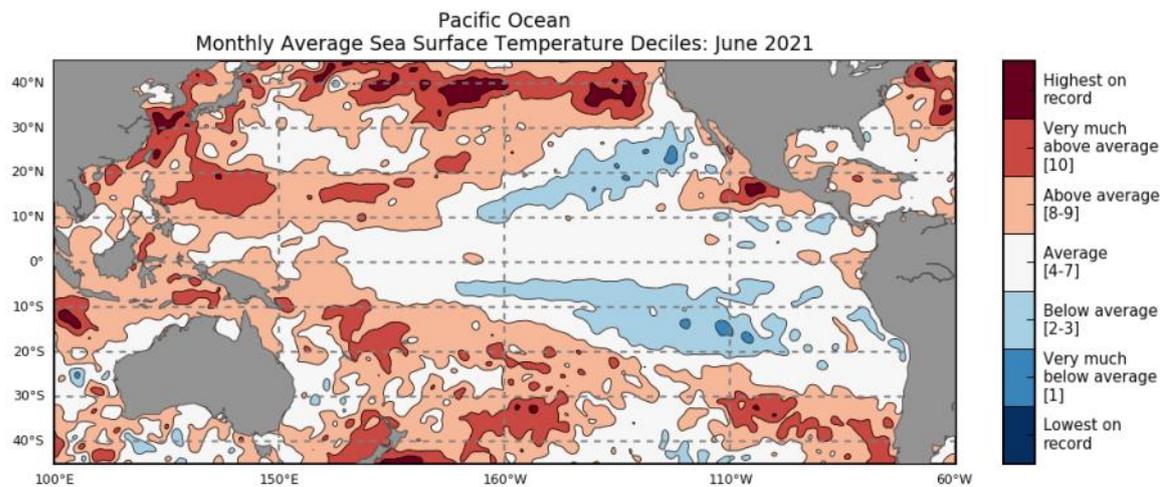
Click link to access [SEA SURFACE TEMPERATURE](#)



Anomalous Sea Surface Temperature



Sea Surface Temperatures Deciles



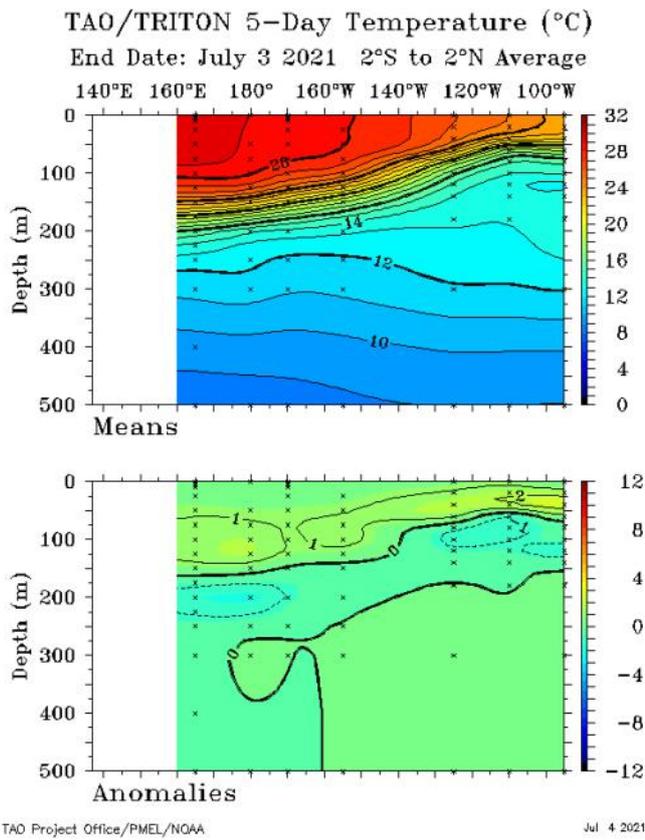
OCEAN CONDITIONS

SUB SURFACE

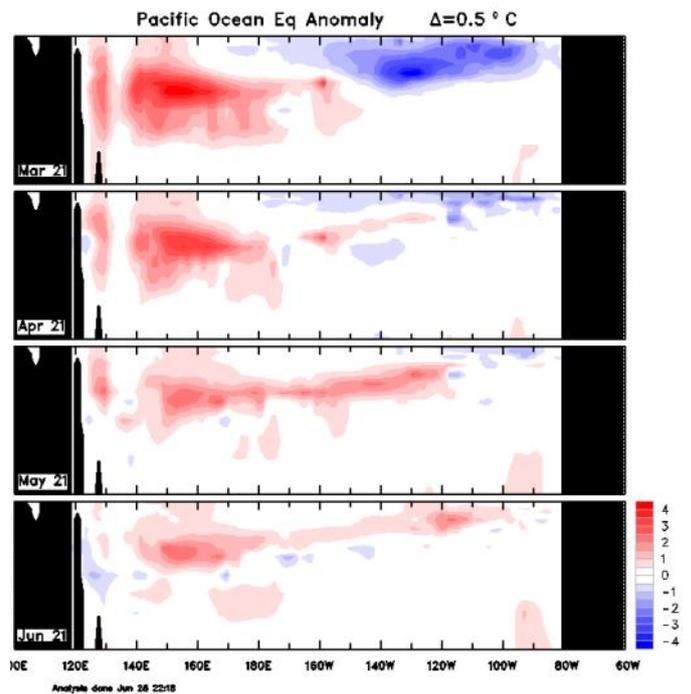


The four-month sequence of equatorial Pacific sub-surface temperature anomalies (to June) shows a pattern consistent with a neutral ENSO state. Weak warm anomalies were present across much of the column depth from the Date Line westwards, and also close to the surface in the top 100 m depth east of 140°W.

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

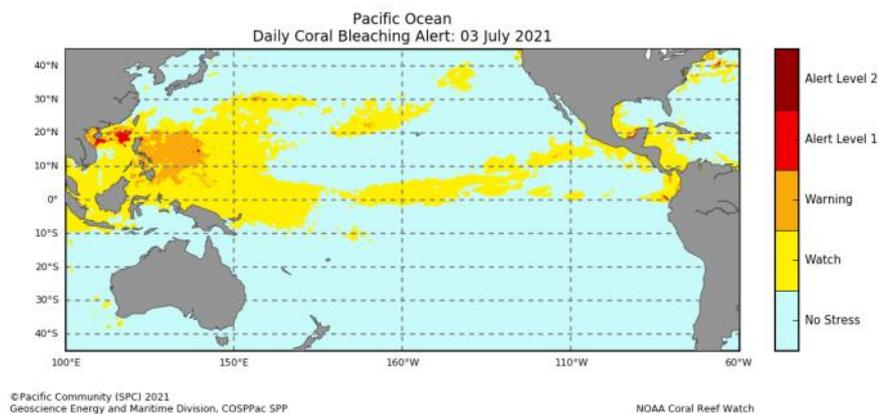
CORAL BLEACHING



The daily Coral Bleaching Alert for 03rd July 2021 shows 'No Stress or Watch' for much of the COSPPac partner countries, peaking at 'Warning' for Palau and western FSM. The four weeks Coral Bleaching Outlook to 25th July shows 'No Stress' for most of the countries with a 'Watch' and Alert level 1 for western FSM, northern PNG, Nauru, RMI and Kiribati.

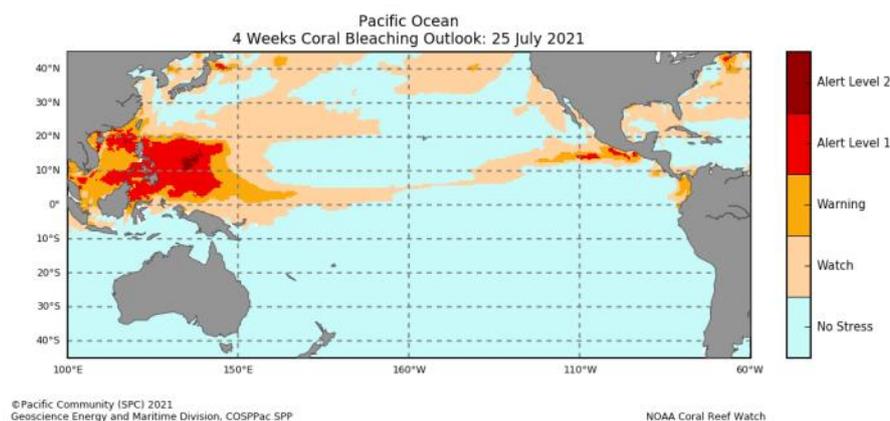
Daily Coral Bleaching Alert

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



4-Weeks Coral Bleaching Outlook

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



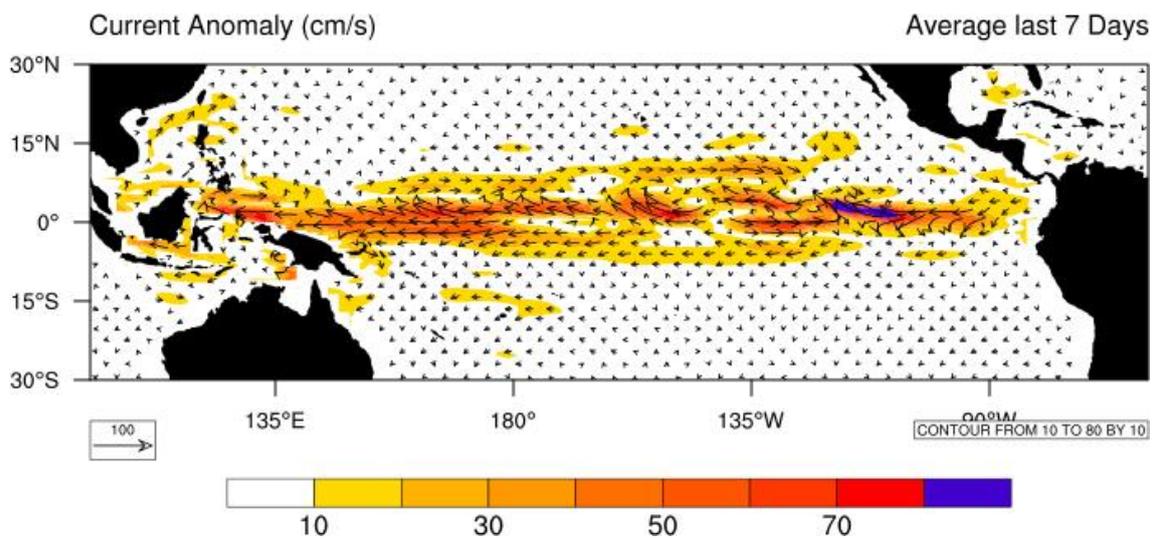
OCEAN CONDITIONS

OCEAN SURFACE CURRENTS AND SEA LEVEL



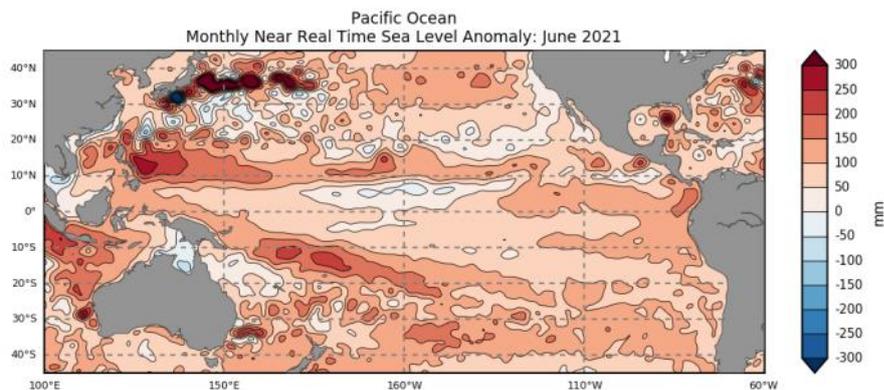
Sea level was above normal for most of the COSPPac countries. The highest anomalies above +250mm were in the eastern Solomon Islands and northern Fiji. Sea levels were near normal to below normal conditions in southern PNG and northern Kiribati.

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

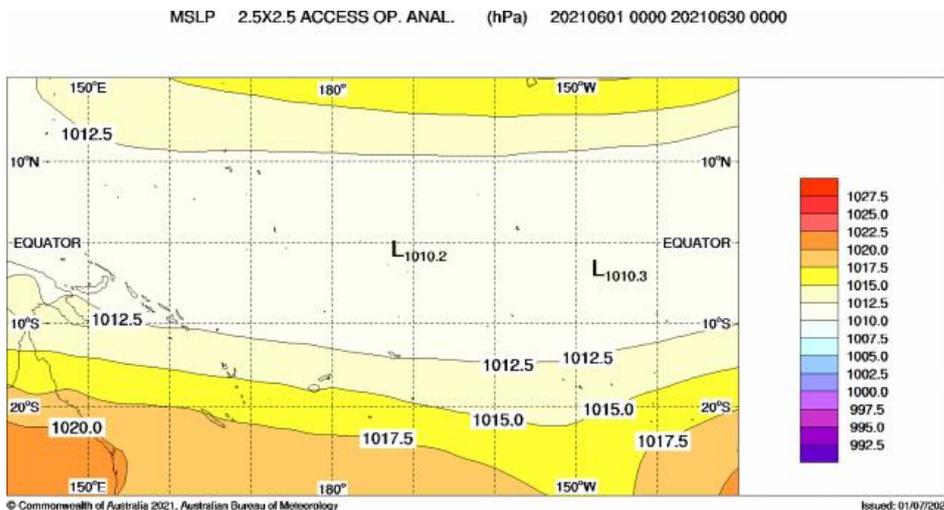
AVISO Ssalto/Duacs SLA

MEAN SEA LEVEL PRESSURE

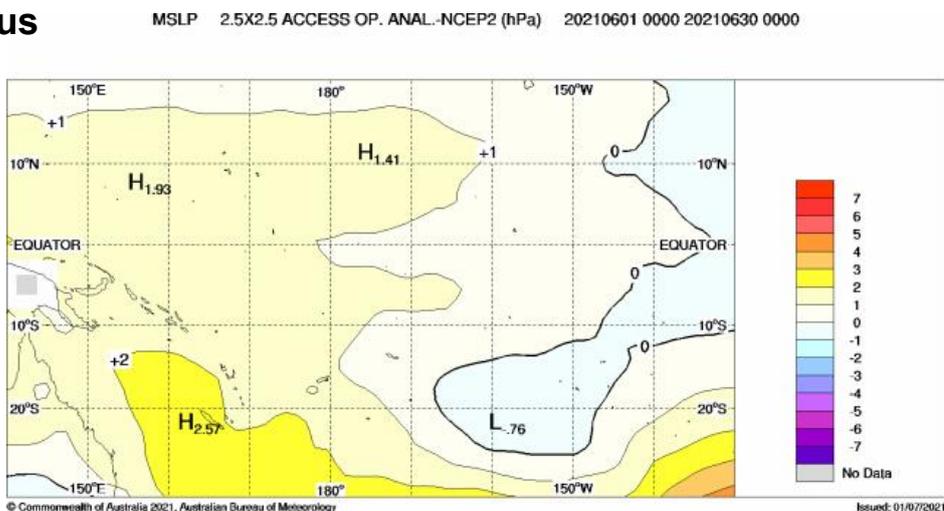
The June mean sea level pressure (MSLP) anomaly map shows negative anomalies over southern Cook Islands and French Polynesia. Positive anomalies were present over the New Caledonia and Coral Sea region towards New Zealand.

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

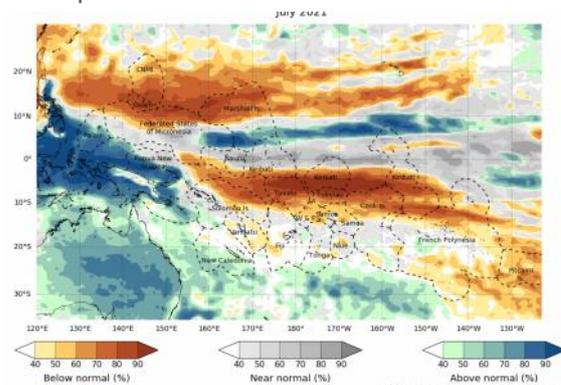
July—September 2021



The ACCESS-S model forecast for July 2021 strongly favours below normal rainfall for CNMI, Guam, the northern FSM, central and northern Marshall Islands, northern Solomon Islands, Rotuma, southern Nauru, much of Kiribati (especially south of the equator), Tuvalu, Tokelau, the northern Cook Islands, northern French Polynesia and Pitcairn Island. Above normal rainfall is favoured for Palau, most of PNG and southern Marshall Islands.

The three-month rainfall outlook (July-September) shows a strong dry signal affecting CNMI, Guam, FSM, central and northern Marshall Islands, Nauru, Kiribati, Tuvalu, Samoa, Tokelau, northern Cook Islands, northern French Polynesia and Pitcairn Island. In contrast, the models show an increased chance of wetter in Palau, PNG, southern Marshall Islands, most of Solomon Islands, New Caledonia, Vanuatu, most of Fiji, and southern Cook Islands. Above normal maximum and minimum temperatures are favoured for many COSPPac countries, except for some areas east of 160°E, namely Nauru, Kiribati, northern Tuvalu, northeastern Cook Islands, plus northern and central French Polynesia, where near-normal to below normal temperatures are favoured.

Monthly [ACCESS-S](#) Maps



The Copernicus multi-model outlook for July to September favours below normal rainfall for Palau, FSM, Guam, CNMI, central and northern Marshall Islands, the northeastern PNG Islands, western and northern Solomon Islands, Tuvalu, Tokelau, northern and central Cook Islands, northern and central French Polynesia, and Pitcairn Island. Above normal rainfall is favoured for southern Marshall Islands, Highlands, Western, Southern and parts of Momase regions of PNG, southern Solomon Islands, New Caledonia, Vanuatu, Fiji, Tonga, and Niue.

The SCOPIC statistical model for July to September favours below normal rainfall for parts of eastern FSM, Kiribati and Tuvalu. Above normal rainfall is favoured for parts of Southern and Momase regions of PNG, Vanuatu and most parts of Fiji.

The APEC Climate Centre multi-model for July to September favours below normal rainfall for northern FSM, northern Marshall Islands, northeastern PNG, western and northern regions of the Solomon Islands, Nauru, Tuvalu, southern Kiribati, Tokelau, northern Cook Islands, and central to northern French Polynesia. Above normal rainfall is favoured for Palau, the southern Marshall Islands, most of PNG, southern Solomon Islands, Vanuatu, Fiji, Tonga, Niue, and southern Cook Islands.

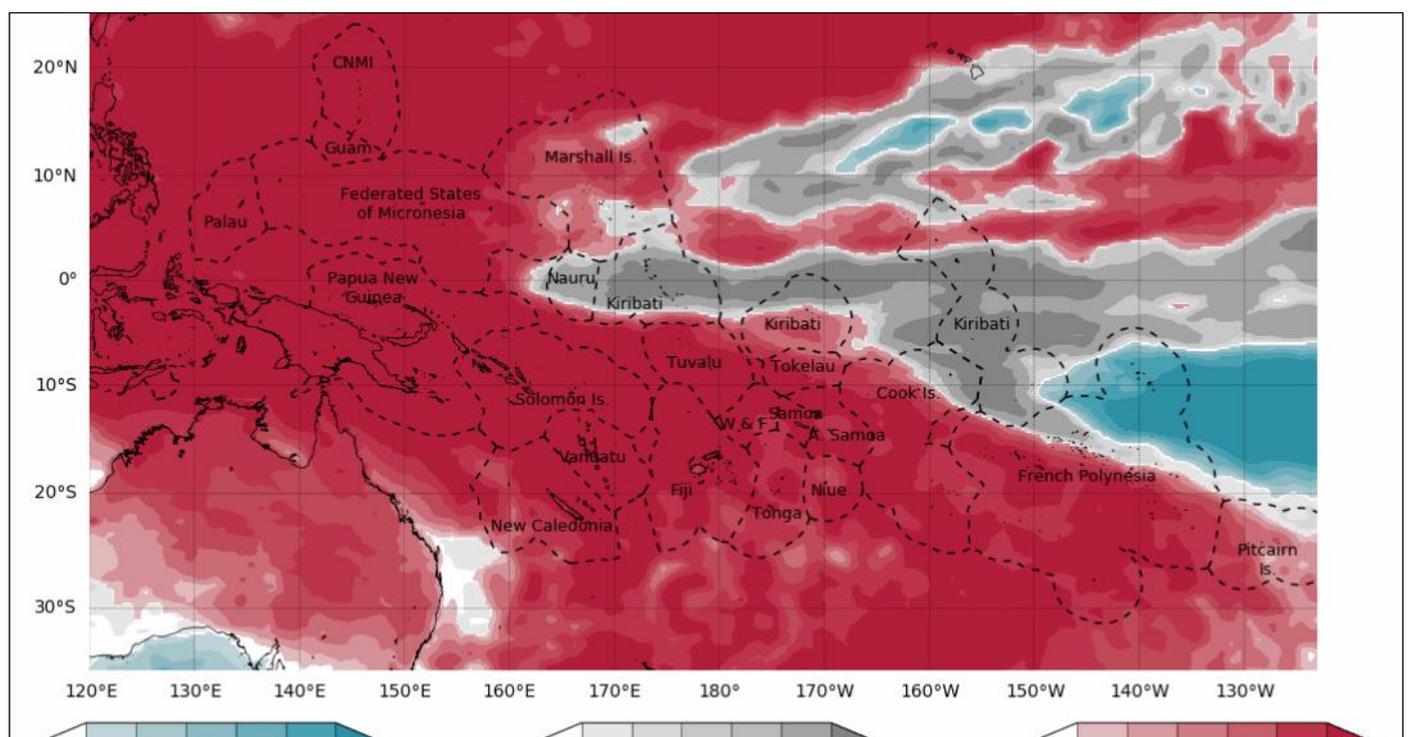
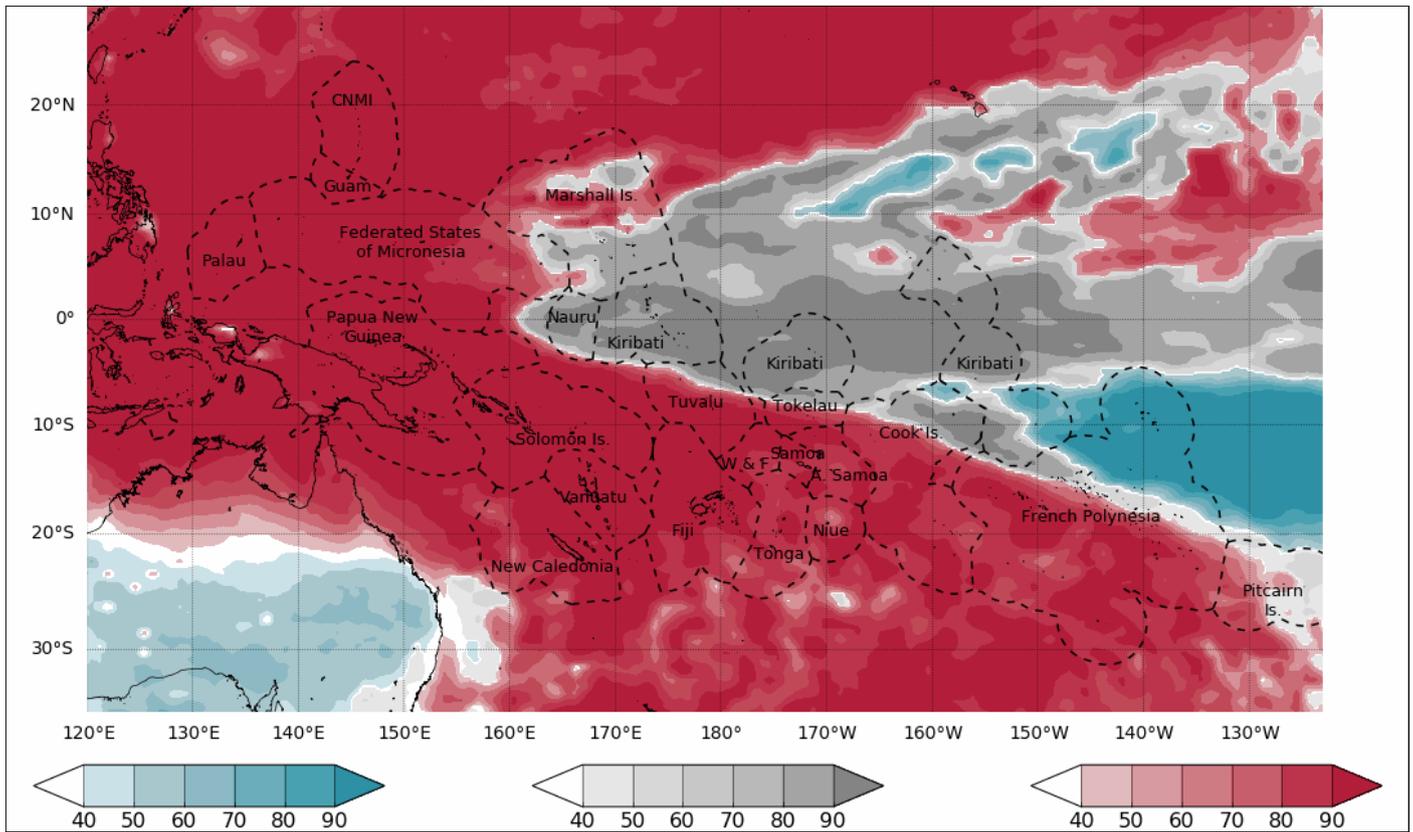
For July to September 2021, the dynamical models agree on above normal rainfall for southern Marshall Islands, most of PNG, New Caledonia, Vanuatu, Fiji, Tonga, Niue and southern Cook Islands. The models also agree on below normal rainfall for FSM, central and northern Marshall Islands, northern Solomon Islands, Kiribati (southern hemisphere), Tuvalu, Tokelau, northern and central Cook Islands, and the northern half of French Polynesia.

SEASONAL TEMPERATURE OUTLOOK

July—September 2021



Monthly Tmax and Tmin **ACCESS-S** Maps



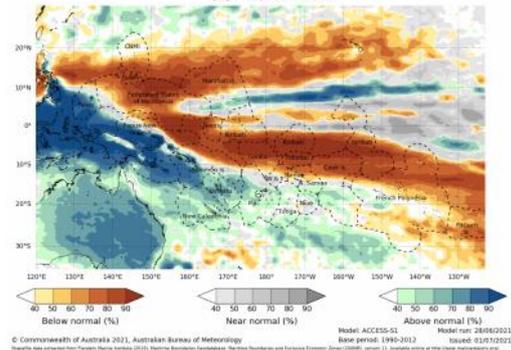
SEASONAL RAINFALL OUTLOOK

July—September 2021

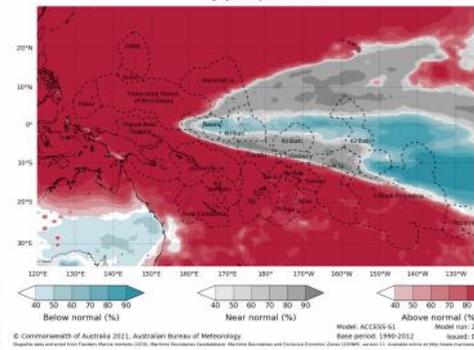


Seasonal ACCESS-S maps

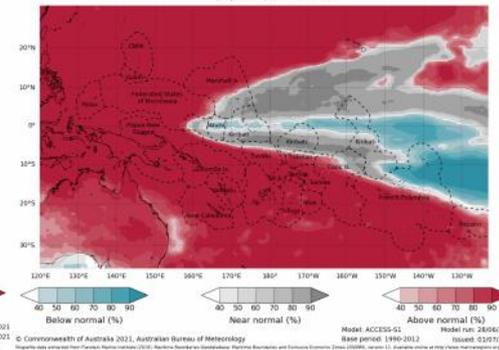
Tercile rainfall probabilities for July to September 2021



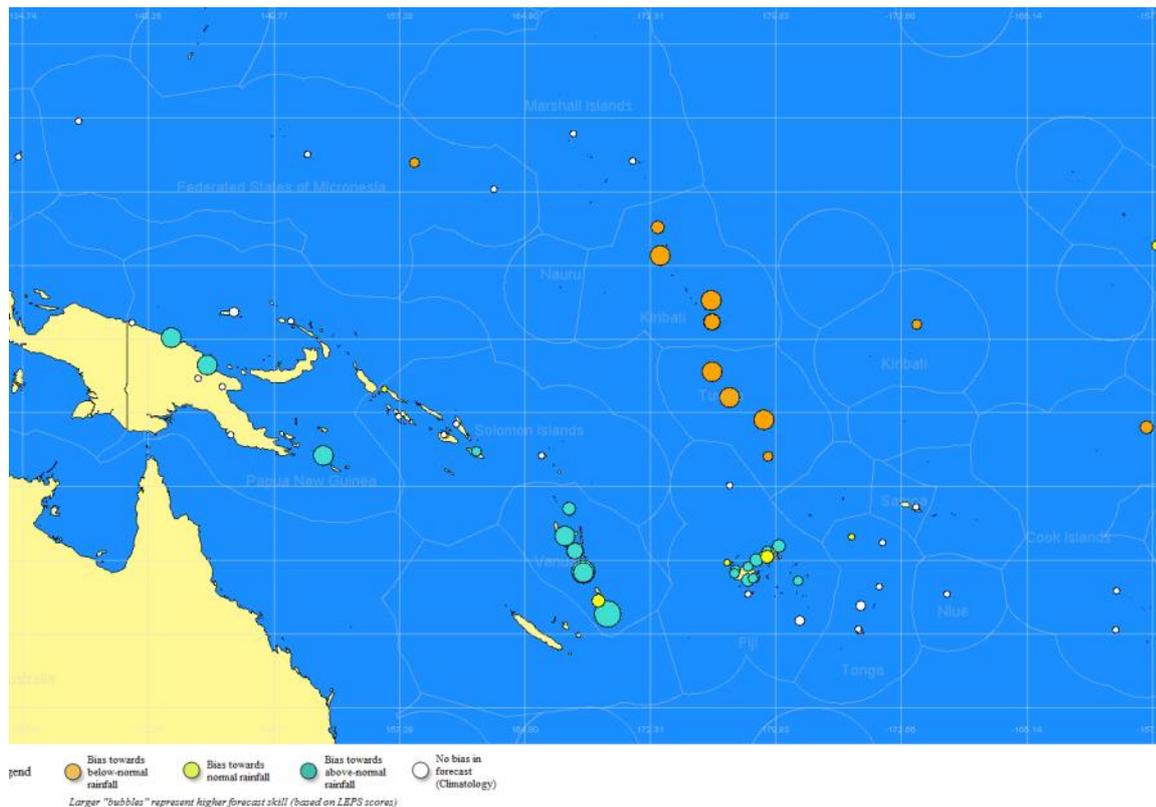
Tercile maximum temperature probabilities for July to September 2021



Tercile minimum temperature probabilities for July to September 2021



SCOPIC



'About SCOPIC' www.pacificmet.net/project/climate-and-ocean-support-program-pacific-cosppac

SEASONAL RAINFALL OUTLOOK

July—September 2021



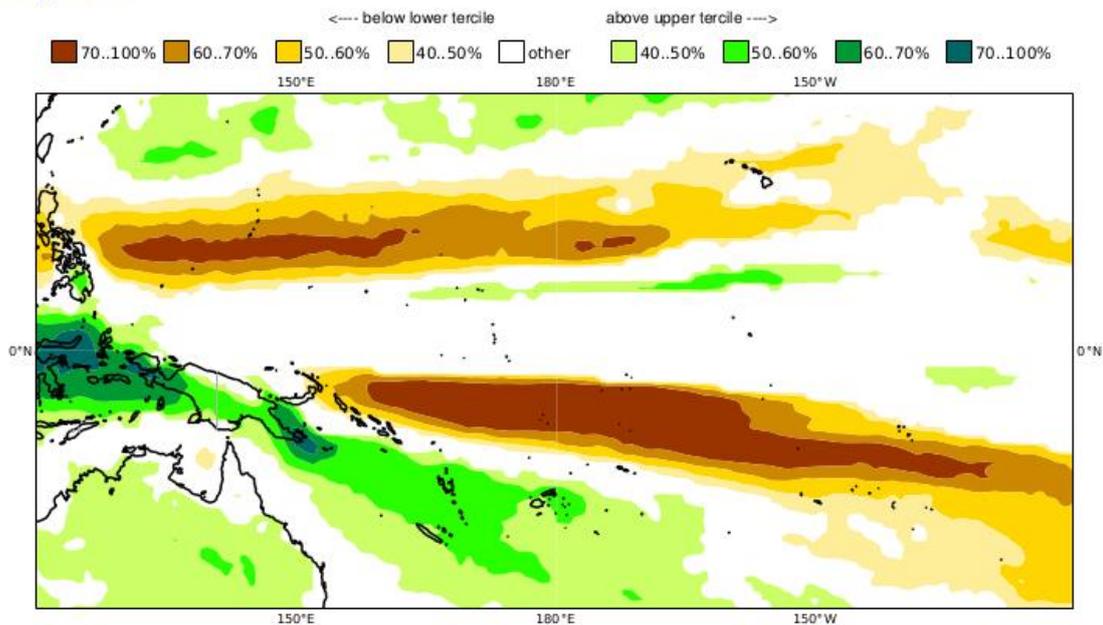
Copernicus (C3S multi-system)-Rainfall

Prob(most likely category of precipitation)

JAS 2021

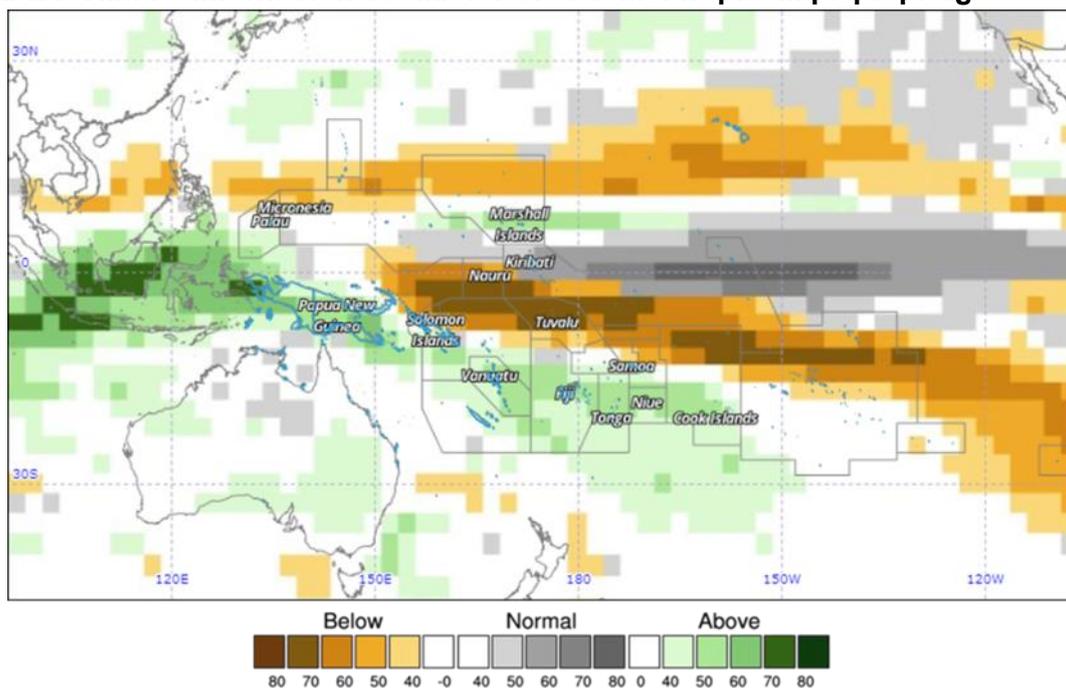
Nominal forecast start: 01/06/21

Unweighted mean



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

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



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

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

Generated using CLIK® (2021-7-5)

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TROPICAL CYCLONE

2020/2021 Season



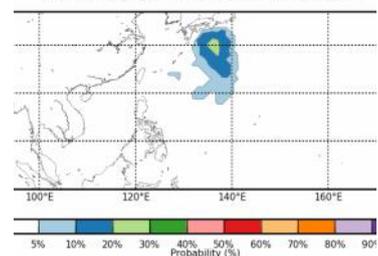
In the southwest Pacific, the tropical cyclone season 2020-21 ended on the 30th April, 2021. The outlook for the season was normal or slightly below normal Tropical Cyclone activity. Seven named TCs formed east of the longitude of the tip of Cape York, Australia. The long-term seasonal average for the southwest Pacific is nine. Three cyclones reached severe Category 3-5 status, including Yasa, one of the most intense TCs on record in the basin. TC activity in the Western North Pacific occurs year round. With ENSO-Neutral, near-normal to below normal numbers of TCs are anticipated.

The weekly tropical cyclone forecast from the ACCESS-S model shows increased risk in the weeks beginning 13 July and ending 26 July 2021 for the northwest Pacific, especially in areas around southeast Japan.

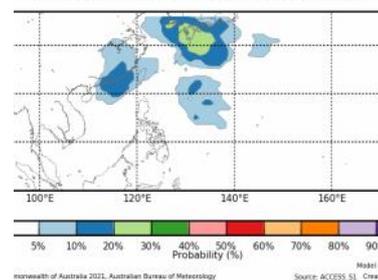
The tropical cyclone season outlook for 2020-21 is available via: <http://www.bom.gov.au/climate/cyclones/south-pacific/>

ACCESS-S Weekly Forecasts –Northwest Pacific

Tropical Cyclone probabilities in the Northern Pac
Forecast period: 13/07/2021 - 19/07/2021

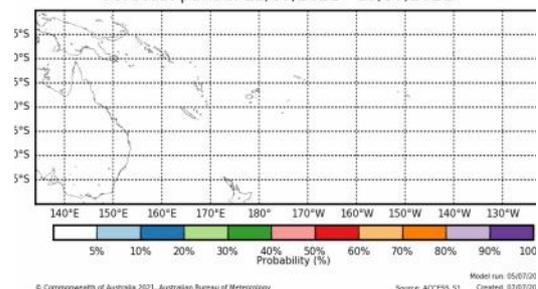


Tropical Cyclone probabilities in the Northern Pac
Forecast period: 20/07/2021 - 26/07/2021

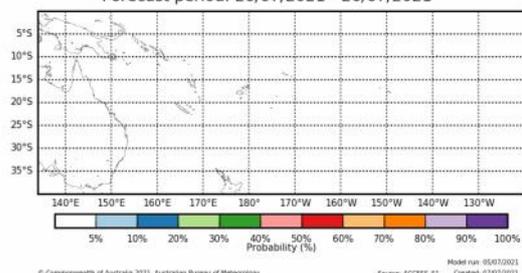


ACCESS-S Weekly Forecasts –Southwest Pacific

Tropical Cyclone probabilities in the South Pacific
Forecast period: 13/07/2021 - 19/07/2021



Tropical Cyclone probabilities in the South Pacific
Forecast period: 20/07/2021 - 26/07/2021



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.

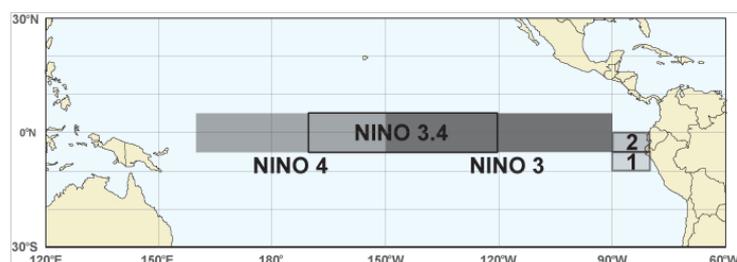
20 degrees Celsius Isotherm Depth

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 20°C isotherm that is deeper than normal (positive anomaly) implies a greater heat content in the upper ocean, while 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