

Monthly Climate Bulletin

March 2022



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Photo Credit: Salesa Nihmei TMS Staff launching balloon and radiosondes



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- The 2021-2022 La Niña event has weakened slightly in the tropical Pacific over the past fortnight. Climate outlooks indicate a return to neutral El Niño-Southern Oscillation (ENSO) levels—neither La Niña nor El Niño—late in the southern hemisphere autumn (April to May 2022).
- The Madden-Julian Oscillation (MJO) has been weak and indiscernible during most of the last fortnight. Climate models are in agreement that it will remain weak for the coming 7 days, but may then strengthen marginally over the central Pacific region the following week.
- The Intertropical Convergence Zone (ITCZ) was active over the central and western equatorial Pacific, while the South Pacific Convergence Zone (SPCZ) was active shifted southwest in the western Pacific around Vanuatu, Fiji and Tonga.
- The SSTs for March 2022 show weak cool SST anomalies were present from 170°W towards the south American coast, while weak warm SST anomalies were largely present across the remainder of the basin west of 170°W. Warmer conditions were prevalent south-eastward from Palau to southern Cook Islands.
- Coral bleaching status for 04th April 2022 has warning 'Alert Level 2' for parts of southeast PNG, southern Solomon Islands, north-western Vanuatu, southern Fiji and Tonga.
- For April-June 2022, the dynamical models (including SCOPIC) agree on above normal rainfall for Palau, Guam, CNMI, northern RMI, New Caledonia, Vanuatu, Fiji, Tonga, Niue, southern Cook Islands and southern French Polynesia. The models also agree on below normal rainfall is very likely for PNG Islands, Nauru, Kiribati, Tuvalu, Tokelau, Wallis and Futuna, Samoa, American Samoa, northern and central Cook Islands, and the northern and central French Polynesia.
- The weekly tropical cyclone forecast from the ACCESS-S model shows reduced risk in the weeks beginning 12 April and ending 25 April 2022 for both the southwest and northwest Pacific.



EL NIÑO–SOUTHERN OSCILLATION

La Niña ease slightly over past fortnight

Click link to access [Climate Driver Update issued on 29 March 2022](#)

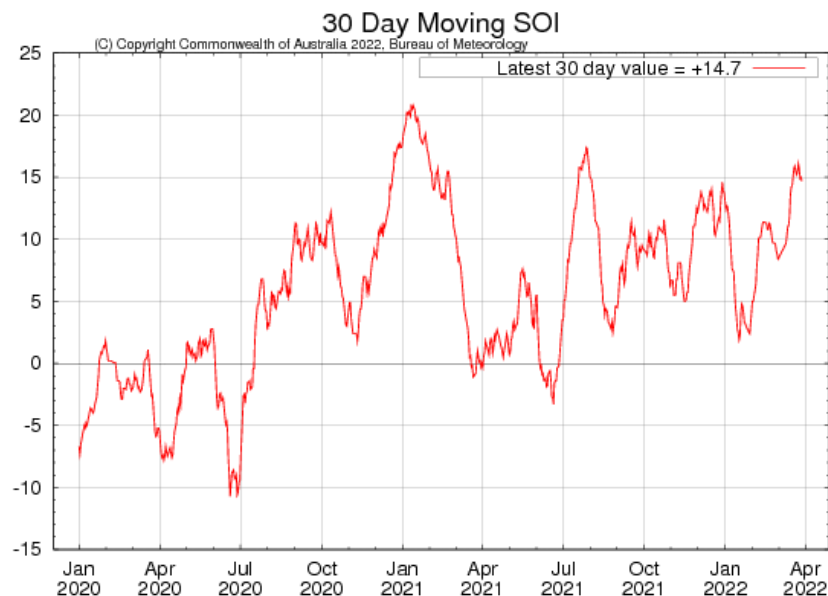
The 2021-2022 La Niña event has weakened slightly in the tropical Pacific over the past fortnight. Climate outlooks indicate a return to neutral El Niño-Southern Oscillation (ENSO) levels—neither La Niña nor El Niño—late in the southern hemisphere autumn (April to May 2022). Even as La Niña weakens, it may continue to influence global weather and climate. Atmospheric and oceanic indicators of ENSO persist at La Niña levels. Sea surface temperatures remain cooler than average along the equator, but have warmed slightly in the east as previously strong trade winds have eased in strength. Other indicators remain at La Niña levels, with decreased cloudiness persisting along the Date Line and a positive Southern Oscillation Index (SOI). La Niña events increase the likelihood of tropical cyclones within the Australian and southwest Pacific region, as well as increasing the chances of above average rainfall across large parts of eastern Australia during autumn.

Atmospheric and oceanic indicators over the Pacific remain at La Niña levels. Eastern tropical Pacific sea surface temperatures remain cooler than average despite a slow warming of deeper waters. Warming below the surface of the Pacific Ocean typically foreshadows a breakdown in La Niña, and typically occurs in the southern autumn. In the atmosphere, several indicators remain at La Niña levels, including decreased cloudiness along the Date Line, strengthened trade winds in the western Pacific, and a positive Southern Oscillation Index (SOI).

La Niña increases the likelihood of tropical cyclones within the Australian and southwest Pacific region, as well as increasing the chances of above average rainfall across large parts of eastern Australia and southwest Pacific countries during autumn.

The Indian Ocean Dipole (IOD) is neutral. It typically has little influence on global climate patterns from December to April due to the influence of the monsoon. Outlooks for the IOD indicate a neutral IOD is most likely for the remainder of autumn. Model outlooks have low accuracy beyond this time.

The 30-day Southern Oscillation Index (SOI) for the 30 days ending 27 March was +14.9. The 90-day SOI value was +8.9. The 30-day SOI has been persistently strong during March and remains firmly within La Niña thresholds. The 90-day value also continues to be typical of La Niña.



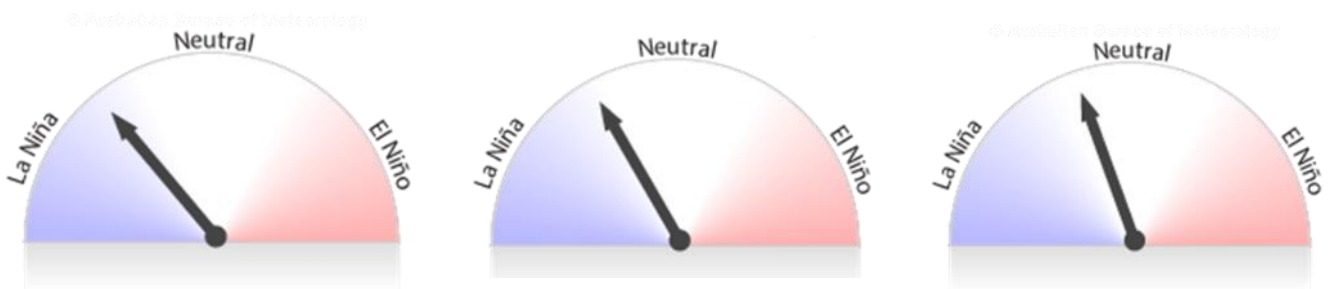


EL NIÑO–SOUTHERN OSCILLATION

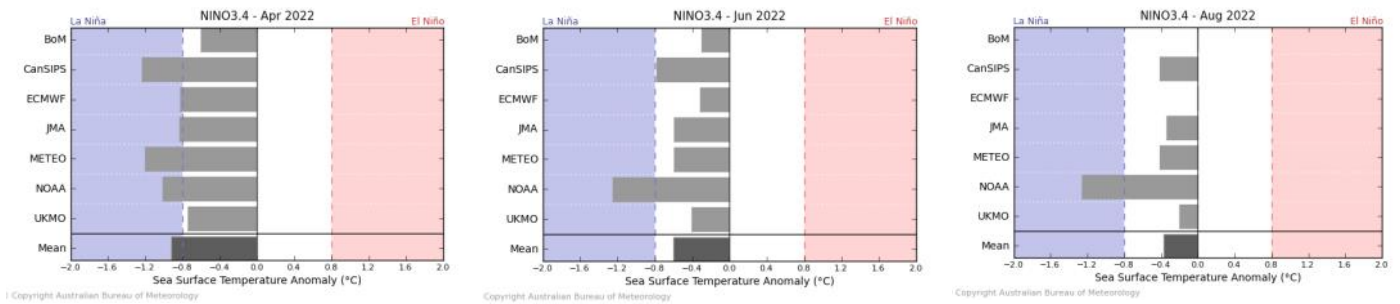
La Niña ease slightly over past fortnight

Click link to access [Climate Driver Update issued on 29 March 2022](#)

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



Bureau of Meteorology NINO3.4 International Model Outlooks



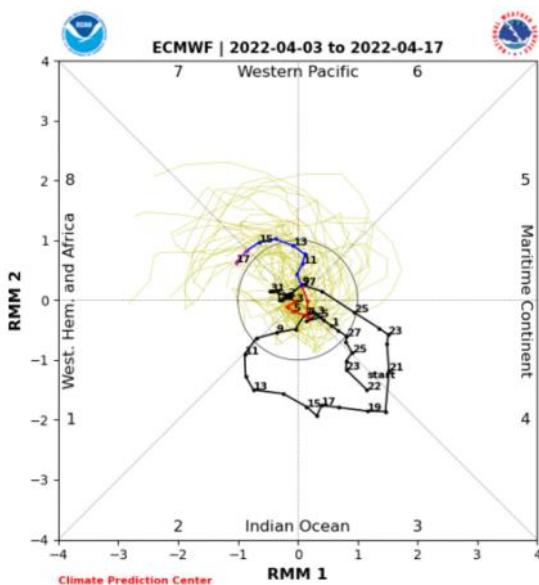
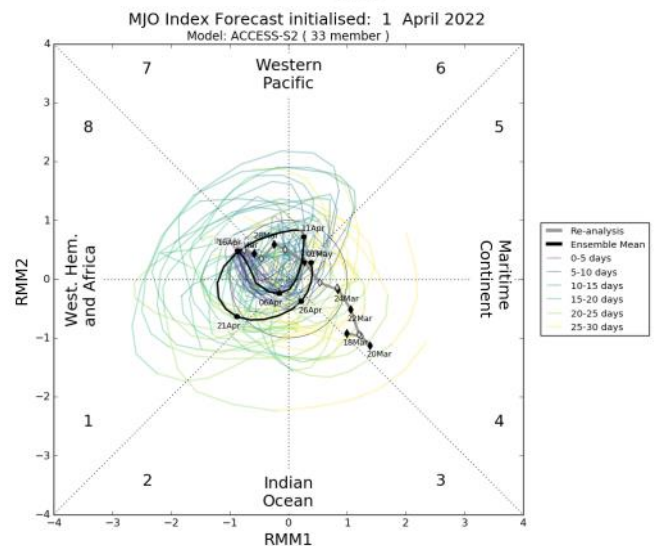
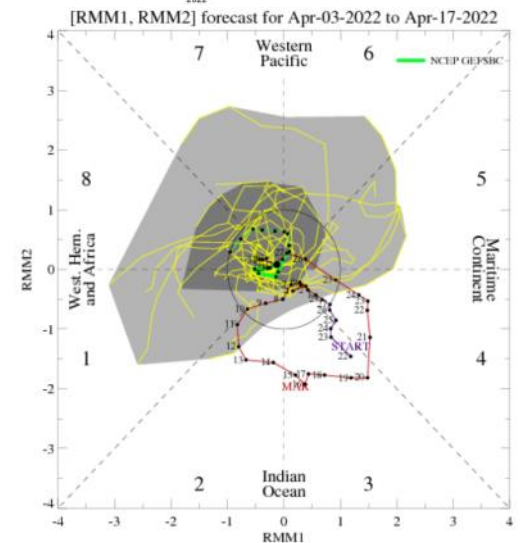
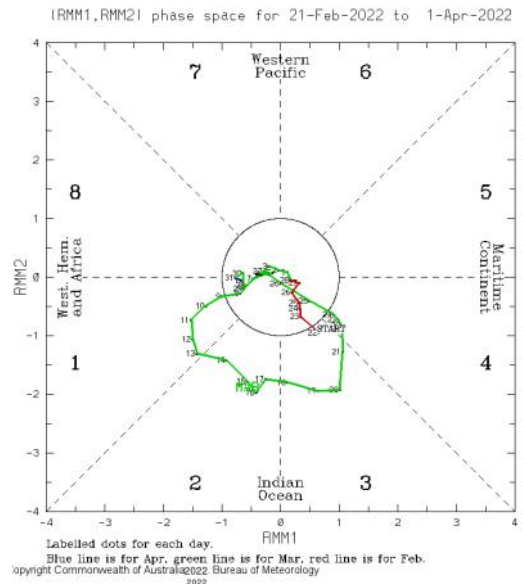
Bureau of Meteorology summary of international model outlooks for NINO3.4: <http://www.bom.gov.au/climate/model-summary/#tabs=Pacific-Ocean>

MADDEN–JULIAN OSCILLATION

Click link to access [Tropical Climate Update](#) [Issued on Tuesday 05 April 2022]

During the month of March, a strong pulse of Madden-Julian Oscillation (MJO) occurred during the second and third week tracked across the Indian Ocean towards the maritime Continent before becoming weak towards the last week. The Madden-Julian Oscillation (MJO) has been weak and indiscernible during most of the last fortnight. Climate models are in agreement that it will remain weak for the coming 7 days, but may then strengthen marginally over the central Pacific region the following week. Whether it remains weak, or strengthens slightly in the Pacific, the MJO is unlikely to exert a significant influence on rainfall patterns across the Australian region in the coming fortnight.

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



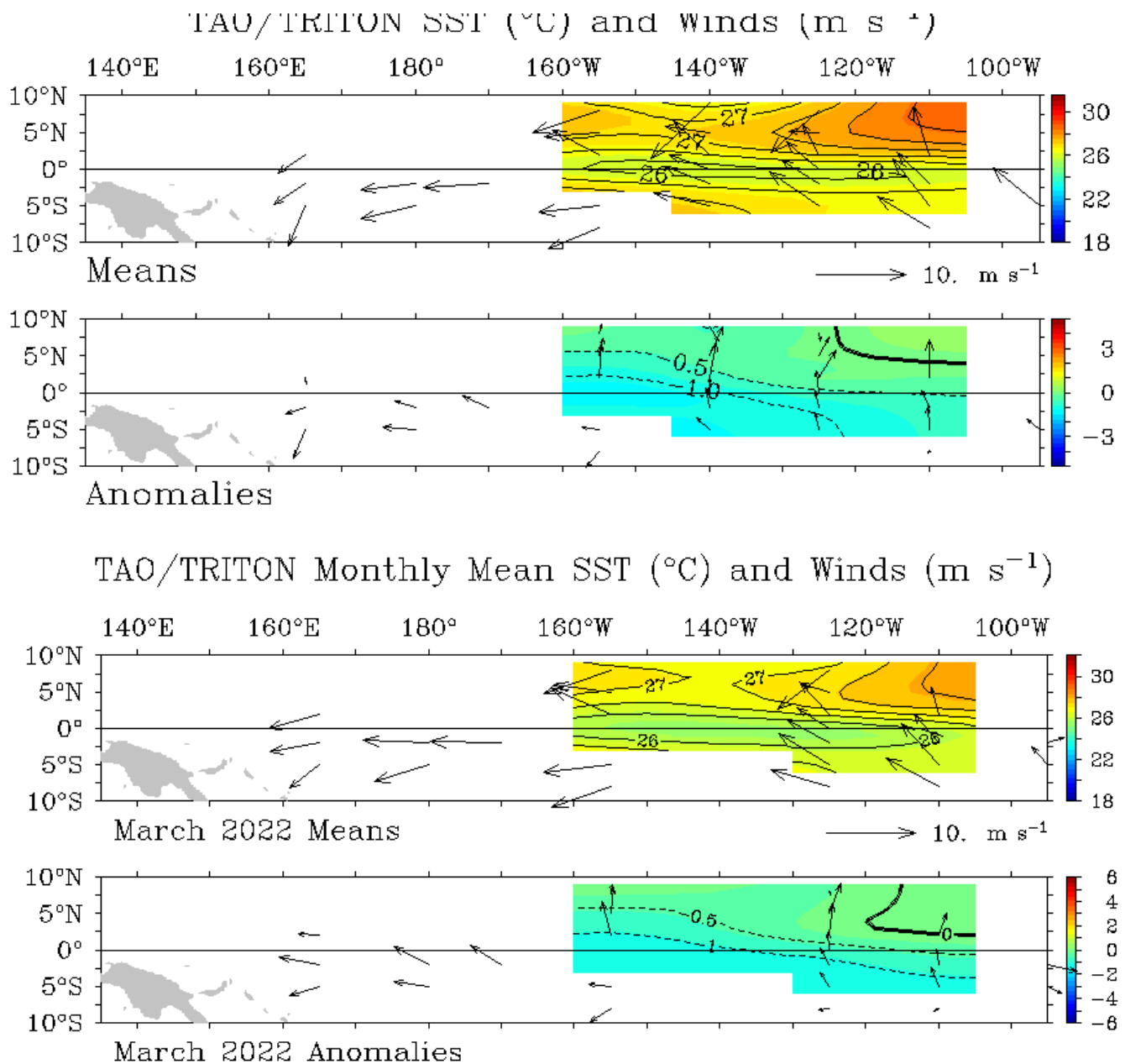


WIND

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

The trade winds in March were stronger over the equatorial Pacific especially over the central and western equatorial Pacific.

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

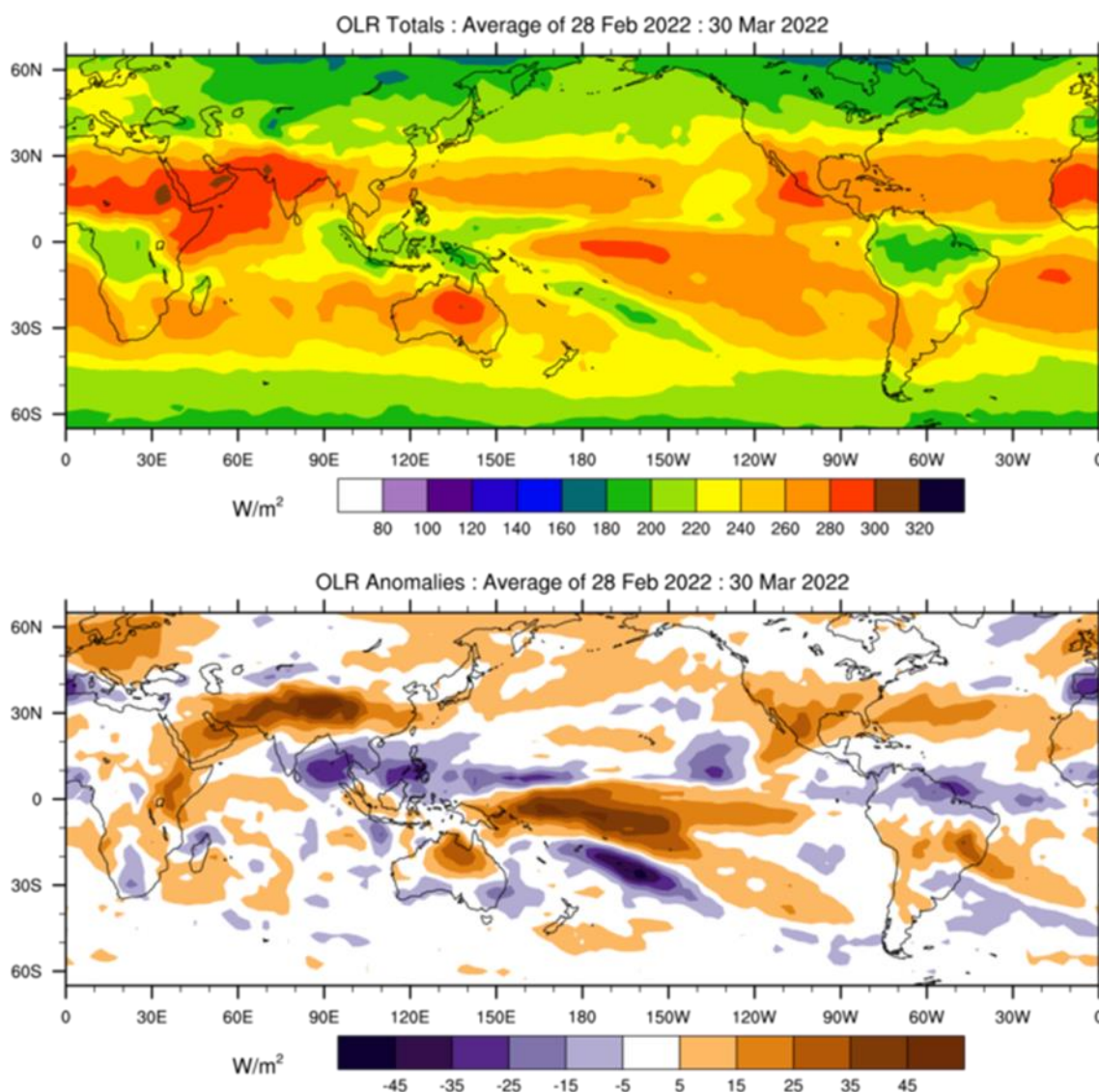
Click link to access [OLR](#)



The March 30-day OLR total and anomaly maps suggest the Intertropical Convergence Zone (ITCZ) was active over the central and western equatorial Pacific, while the South Pacific Convergence Zone (SPCZ) was active shifted southwest in the western Pacific around Vanuatu, Fiji and Tonga.

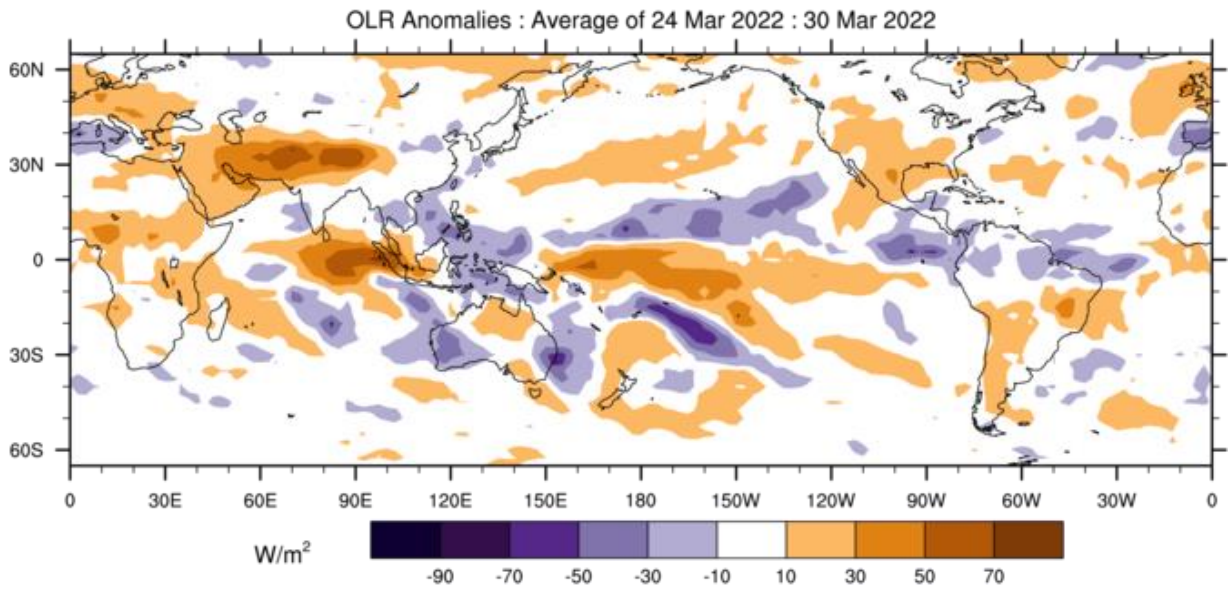
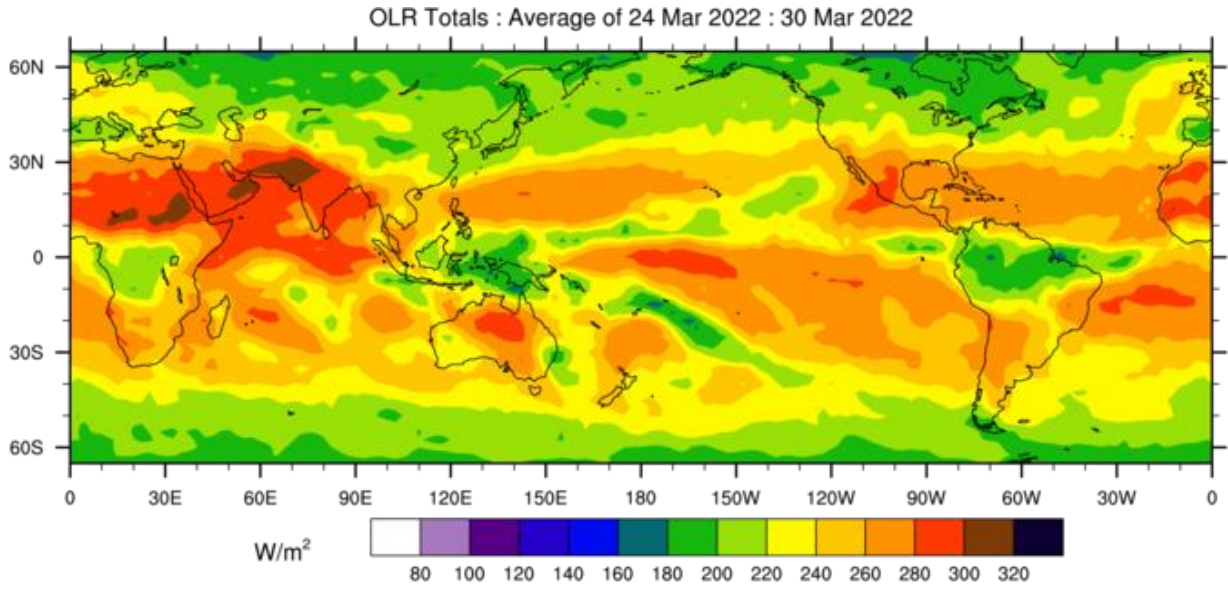
Note: Global maps of OLR below highlight regions experiencing increased or decreased cloudiness. The top panel is the total OLR in Watts per square metre (W/m^2) and the bottom panel is the anomaly (current minus the 1979-1998 climate average), in W/m^2 . In the bottom panel, negative values (blue shading)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

OLR Total and Anomalies, 30 Day OLR

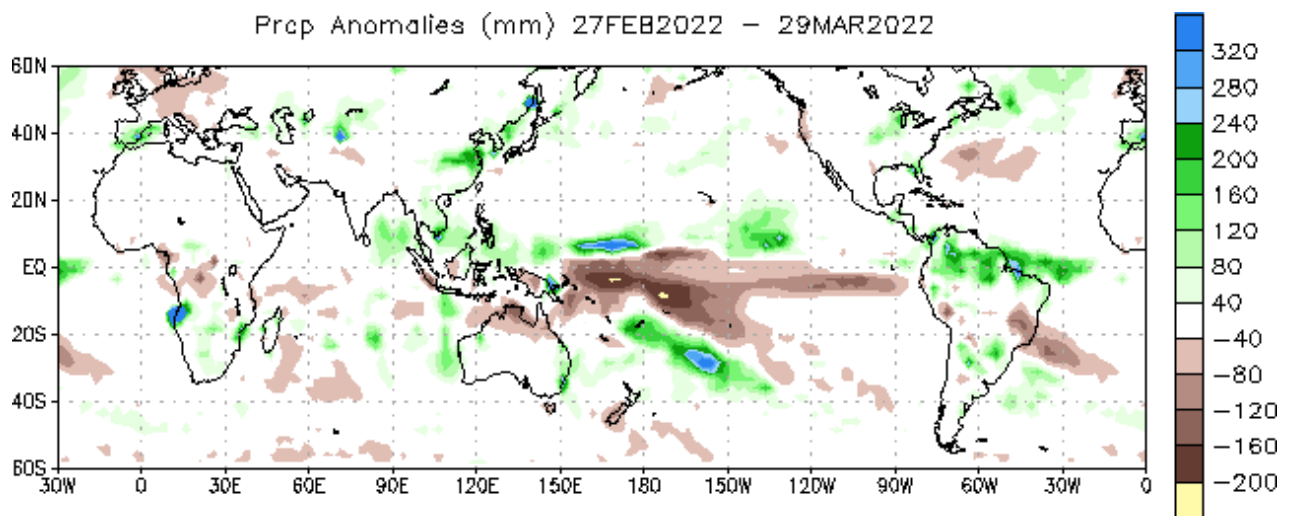


(C) Copyright Commonwealth of Australia 2022. Bureau of Meteorology

OLR Total and Anomalies, 7 Day OLR

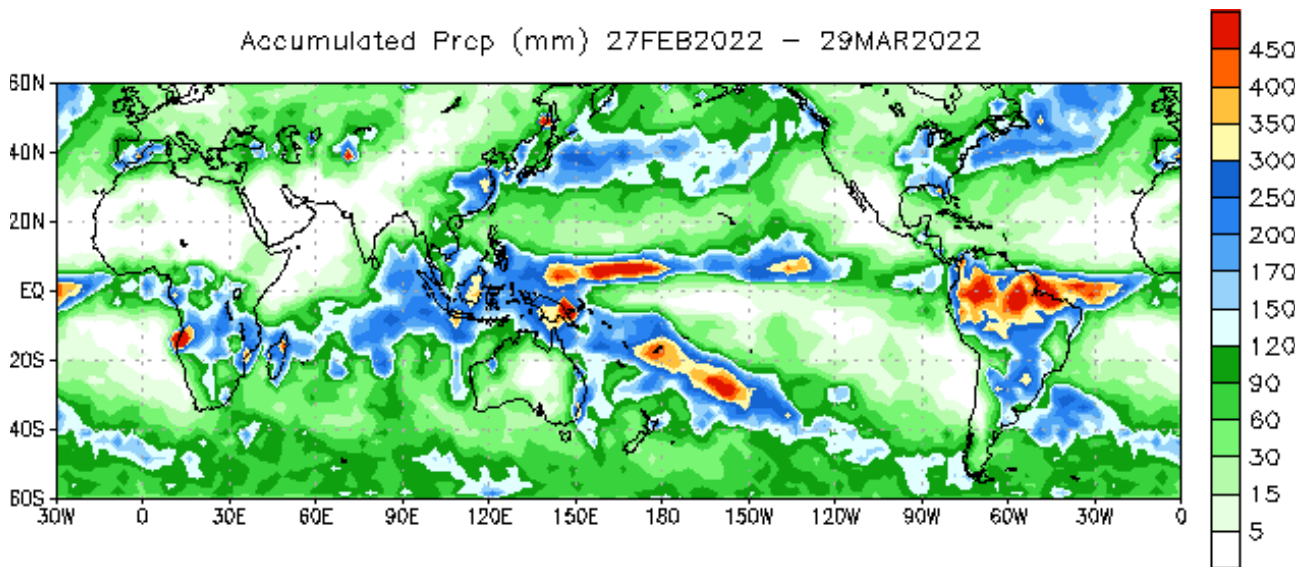


(C) Copyright Commonwealth of Australia 2022. Bureau of Meteorology

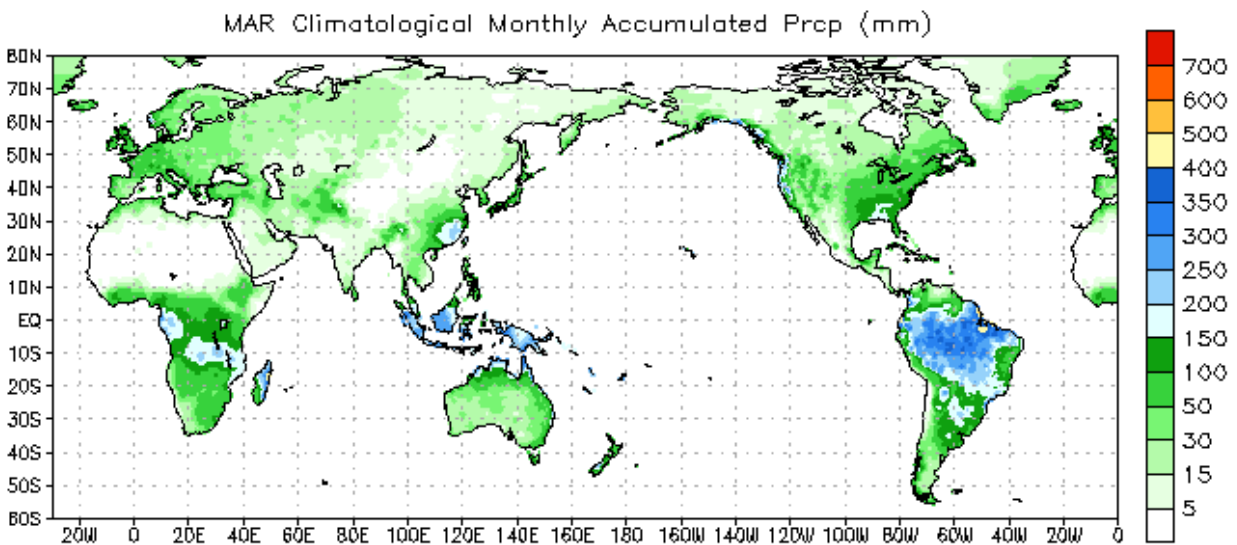


Data Source: NCEP CMAP Precipitation
Climatology (1991-2020)

30-Day Rainfall Anomalies



Data Source: NCEP CMAP Precipitation



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

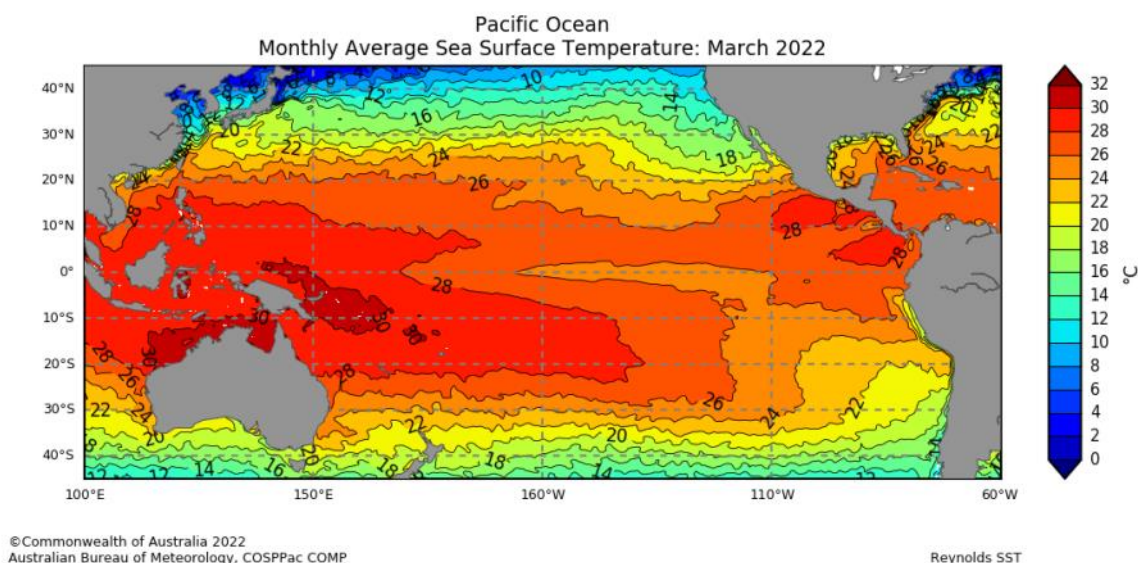


Click link to access [Pacific Community COSPPac Ocean Portal](#)

The SSTs for March 2022 show weak cool SST anomalies were present from 170°W towards the south American coast, while weak warm SST anomalies were largely present across the remainder of the basin west of 170°W. Warmer conditions were prevalent south-eastward from Palau to southern Cook Islands.

The highest on record deciles, occurred in central Palau, parts of Papua New Guinea Islands, north-western Solomon Islands, Coral sea region, New Caledonia, central and southern parts of Fiji and southern Tonga. Regions of very much above average (deciles 10) SSTs spanned across Palau and extend south-eastward towards southern Tonga. The regions of above average (deciles 8-9) for March occurred across majority of the COSPPac countries from Palau to southern Cook Islands. In contrast, average (4-7) SSTs were observed in south-eastern FSM, southern RMI, Nauru, northern Tuvalu, Samoa, central Cook Islands and southern French Polynesia. Below average (deciles 2-3) to very much below average (decile 1) occurred over Kiribati, northern Cook Islands and French Polynesia.

Mean Sea Surface Temperature

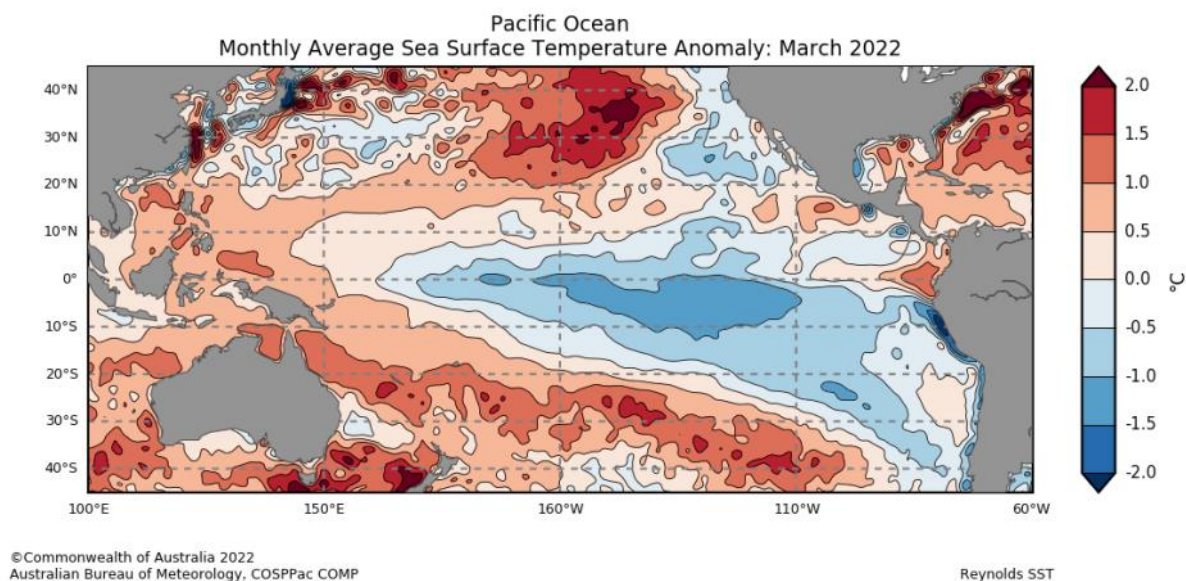


OCEAN CONDITIONS

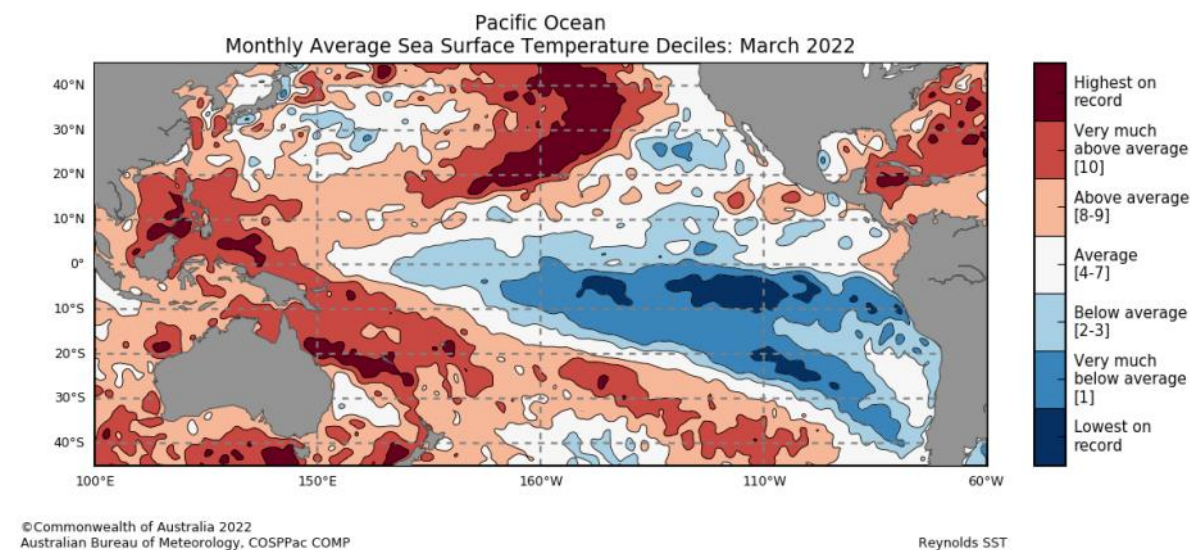
Click link to access [SEA SURFACE TEMPERATURE](#)



Anomalous Sea Surface Temperature



Sea Surface Temperatures Deciles



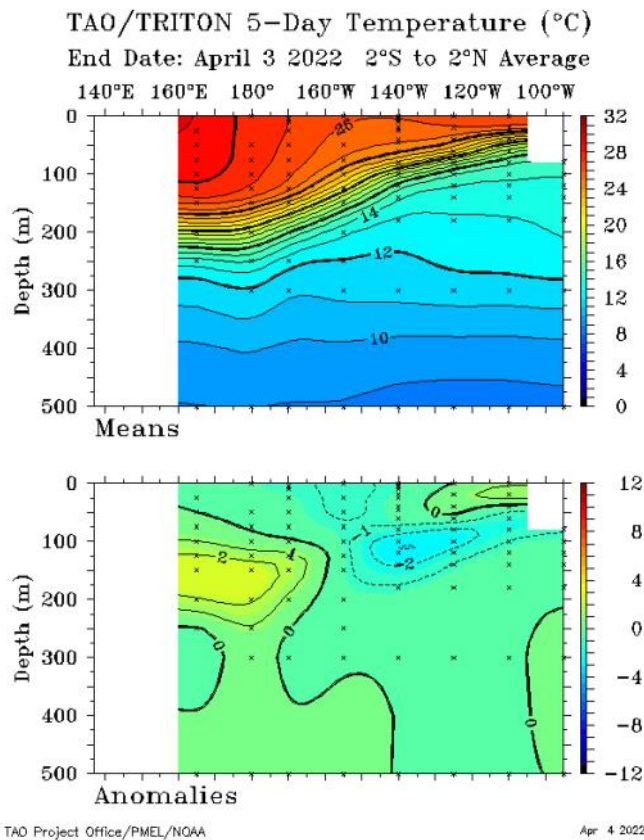
OCEAN CONDITIONS

SUB SURFACE

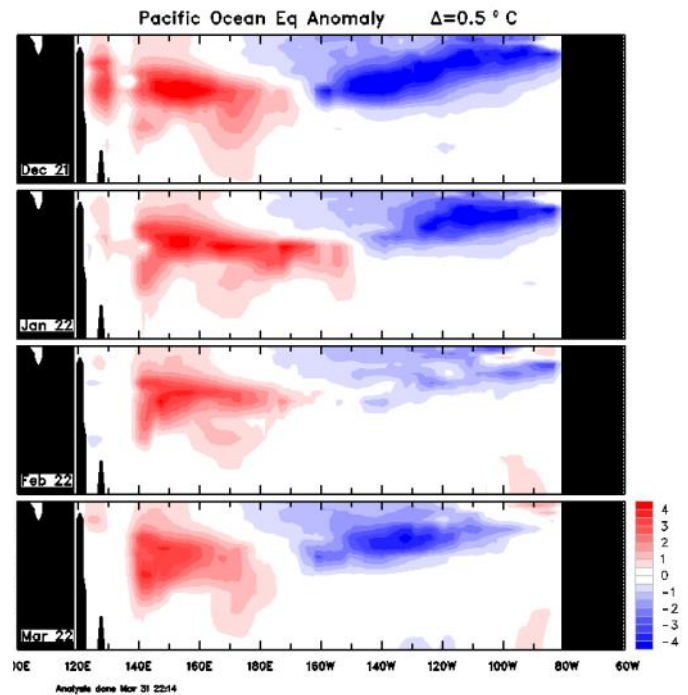


The four-month sequence of equatorial Pacific sub-surface temperature anomalies (to 28 March 2022) shows cool anomalies in the central and eastern tropical Pacific deepened during March as compared to February, although the strength and spatial extent is less than during December and January. For March, cooler water below the surface extends from the International Date Line eastwards with a peak in cool anomalies between 120-140°W. Warm anomalies continue to be present west of the International Date Line, reaching up to 3°C warmer than average down to 200m below the surface. Compared to February these anomalies are slightly smaller in eastward extent. Weak warm anomalies are also present near the surface in the far eastern Pacific.

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

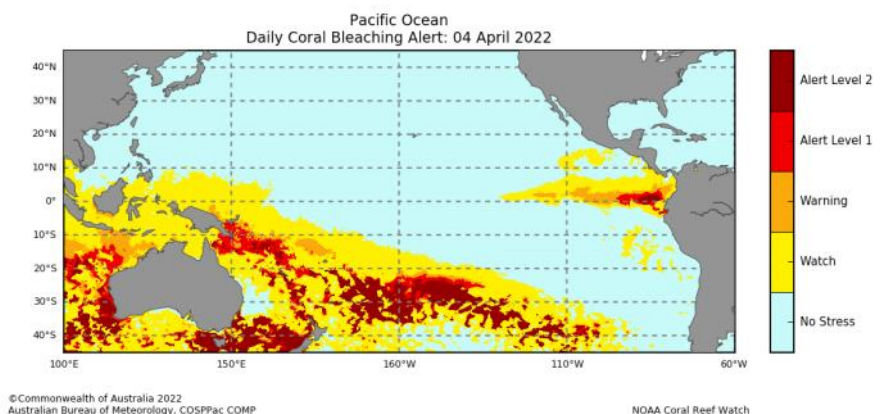
CORAL BLEACHING



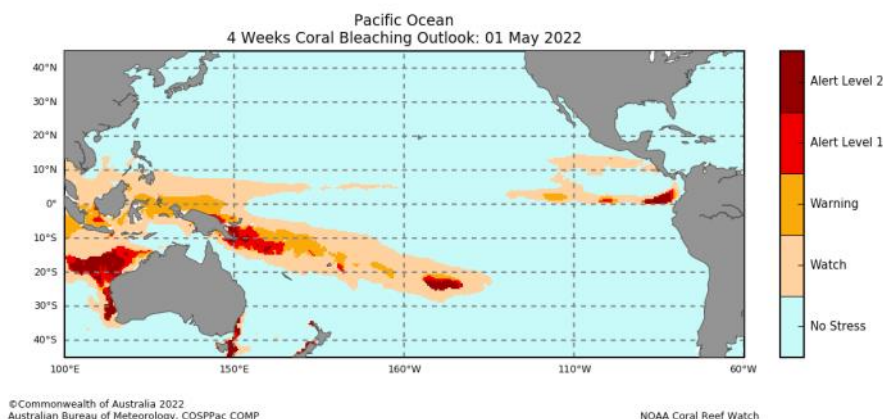
The daily Coral Bleaching Alert for 04th April 2022 shows 'Alert Level 2' for parts of southeast PNG, southern Solomon Islands, north-western Vanuatu, southern Fiji and Tonga. 'Alert 1' for parts of southeast PNG, southern Solomon Islands, parts of New Caledonia and Vanuatu, Fiji, Tonga, southern Cook Islands and French Polynesia. 'No Stress or Watch' for the rest of COSPPac partner countries. The four weeks Coral Bleaching Outlook to 01st May 2022 shows 'Alert Level 2' for southeastern PNG and parts of southern Solomon Islands. 'Alert Level 1' for parts of northern and southeastern PNG, southern Solomon Islands and parts of eastern Fiji. 'Warning' alert for northern PNG, most parts of Solomon Islands, northern Vanuatu, northeast Fiji, north-eastern Niue and southwest Cook Islands. 'No Stress or Watch' for the rest of COSPPac partner countries.

Daily Coral Bleaching Alert

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



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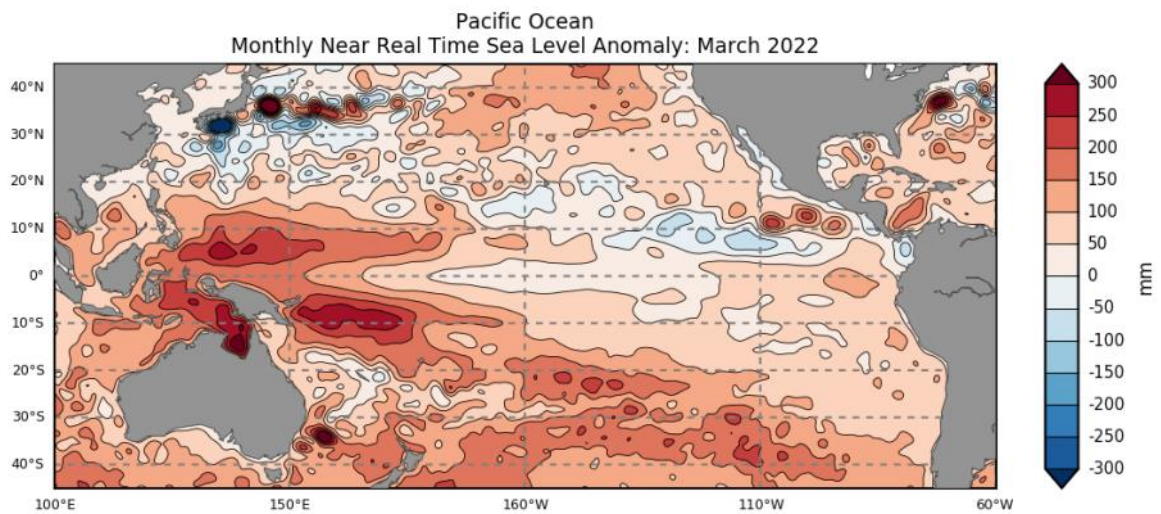
OCEAN CONDITIONS

OCEAN SURFACE CURRENTS AND SEA LEVEL

Sea level was above normal for most of the COSPPac countries. The highest anomalies above 250mm were observed in eastern Palau, central FSM, south-eastern PNG and Solomon Islands, 200mm for most parts of Palau, central FSM, eastern PNG, rest of Solomon Islands, while between 150mm and 200mm in remainder of Palau and FSM, central RMI, PNG, Vanuatu, central Tuvalu, Fiji, parts of Tonga, Niue and Cook Islands and southern French Polynesia. Sea level between 50mm and 150mm for the remaining CO-SPPac countries which includes Nauru, Tuvalu, Kiribati, Samoa, rest of Niue, Cook Islands, French Polynesia and Pitcairn Island. Patches of near normal to below normal sea levels were observed over parts of Kiribati and eastern New Caledonia.

Monthly Sea Level Anomalies

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



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Australian Bureau of Meteorology, COSPPac COMP

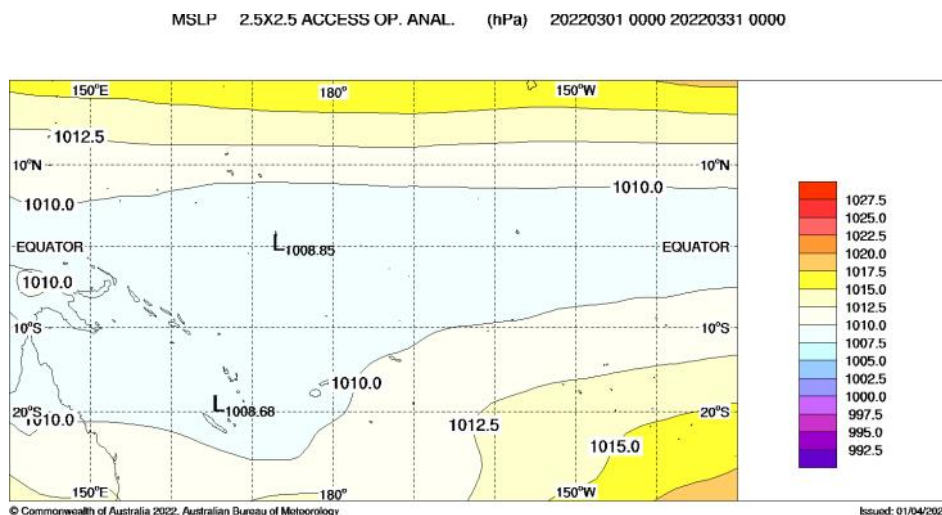
AVISO Ssalto/Duacs SLA

MEAN SEA LEVEL PRESSURE

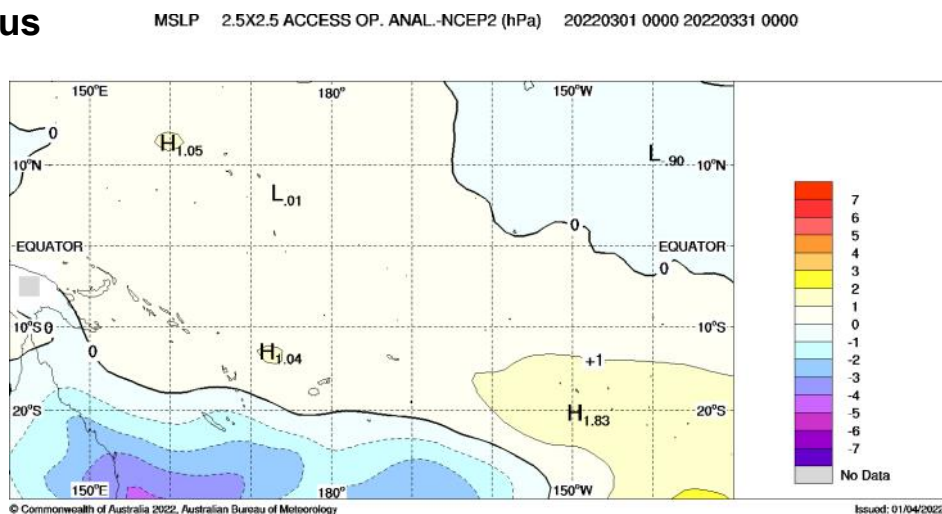
The March mean sea level pressure (MSLP) anomaly map shows mostly positive anomalies of -1 or greater over New Caledonia and extend further south and southwest towards Australia and New Zealand.

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

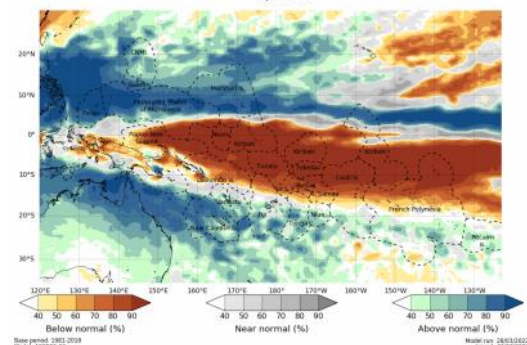
April—June 2022



The ACCESS-S model forecast for April 2022, the dry signal is weaker compared to last month's forecast but extend further west and is very likely to be below normal rainfall for southeastern FSM, southern RMI, PNG Islands, most of Solomon Islands, Nauru, Kiribati, Tuvalu, Tokelau, the northern and central Cook Islands and northern French Polynesia. The wetter than normal signal is also stronger compared to last month's forecast especially for the western Pacific Islands with above normal rainfall is very likely for CNMI, Guam, Palau, most of FSM, central and northern RMI, New Caledonia, parts of Vanuatu and Fiji, central Tonga, Niue, and parts of southern Cook Islands and southern French Polynesia.

The three-month rainfall outlook (April-June 2022) shows a smaller region of dry signal than the forecast issued last month very likely to affect PNG Islands, southern FSM, southern RMI, northern Solomon Islands, Nauru, Kiribati, Tuvalu, Tokelau, Samoa, American Samoa, northern and central Cook Islands, northern and central French Polynesia and northern Pitcairn Island. In contrast, the models show an increased chance of wetter very likely in Palau, western and eastern FSM, CNMI, Guam, central and northern RMI, western and southeast PNG, southern Solomon Islands, New Caledonia, Vanuatu, Fiji, Tonga, Niue, parts of southern Cook Islands and southern French Polynesia. Above normal maximum and minimum temperatures are very likely for most COSPPac countries, except for countries east of 155°E, namely Nauru, Kiribati, northern Tuvalu, Tokelau, northern Cook Islands, northern and central French Polynesia, where near-normal to below normal temperatures are favoured.

Monthly [ACCESS-S](#) Maps



The Copernicus multi-model outlook for April-June 2022 is very likely to be below normal rainfall for PNG Islands, western and northern Solomon Islands, Nauru, Kiribati, Tuvalu, Tokelau, Wallis and Futuna, Samoa, American Samoa, northern and central Cook Islands, and French Polynesia. Above normal rainfall is very likely for CNMI, Guam, Marshall Islands, southeastern PNG, New Caledonia, Vanuatu, Fiji, Tonga, Niue and southern Cook Islands.

The SCOPIC statistical model forecast for April-June 2022 is very likely to be above normal rainfall for most of the COSPPac countries except for Kiribati, Tuvalu and northern Cook Islands very likely to have below normal rainfall.

The APEC Climate Centre multi-model for April-June 2022 forecast is very likely to be below normal rainfall for northern PNG, Nauru, Kiribati, northern Tuvalu, Samoa, Tokelau, Wallis and Futuna, northern Cook Islands, and central to northern French Polynesia. Above normal rainfall is very likely for most of Palau, Guam, northern RMI, Vanuatu, Fiji, Tonga, Niue, southern Cook Islands and southern French Polynesia.

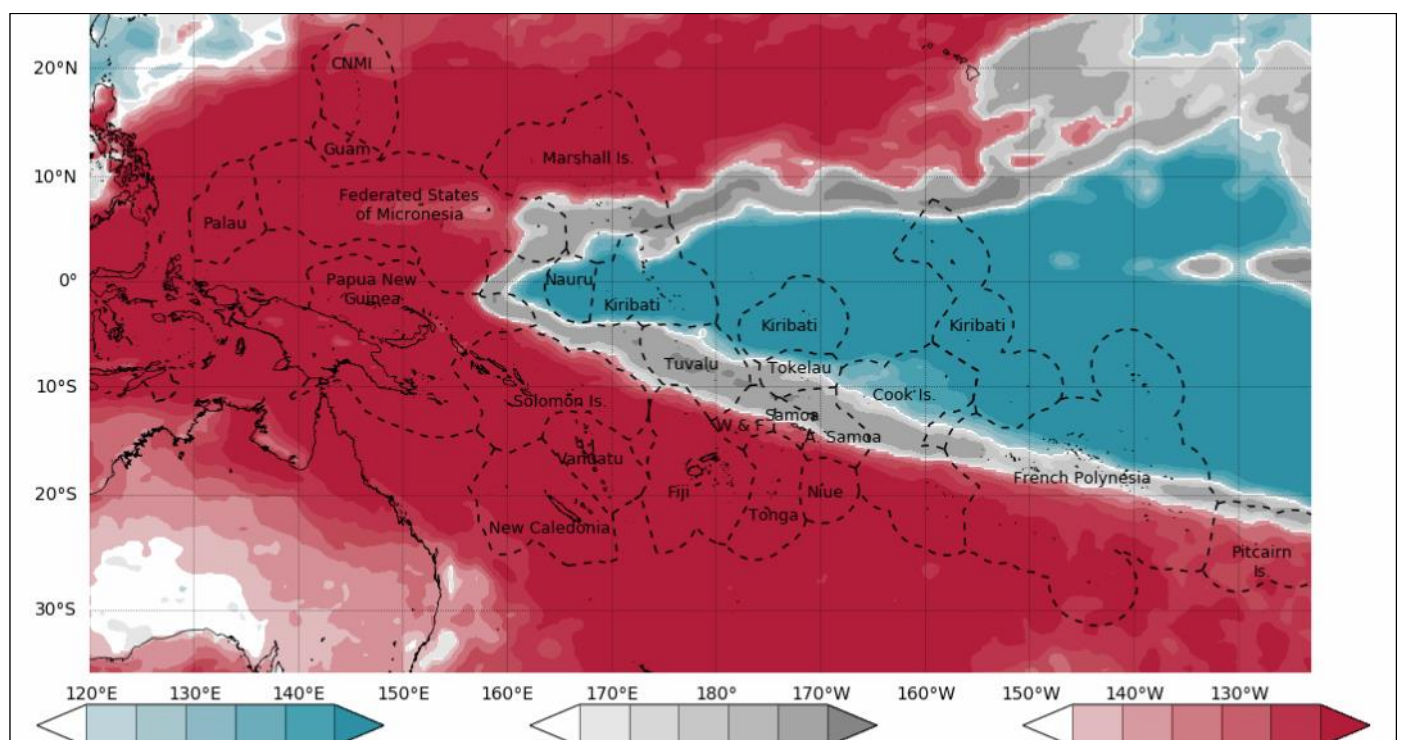
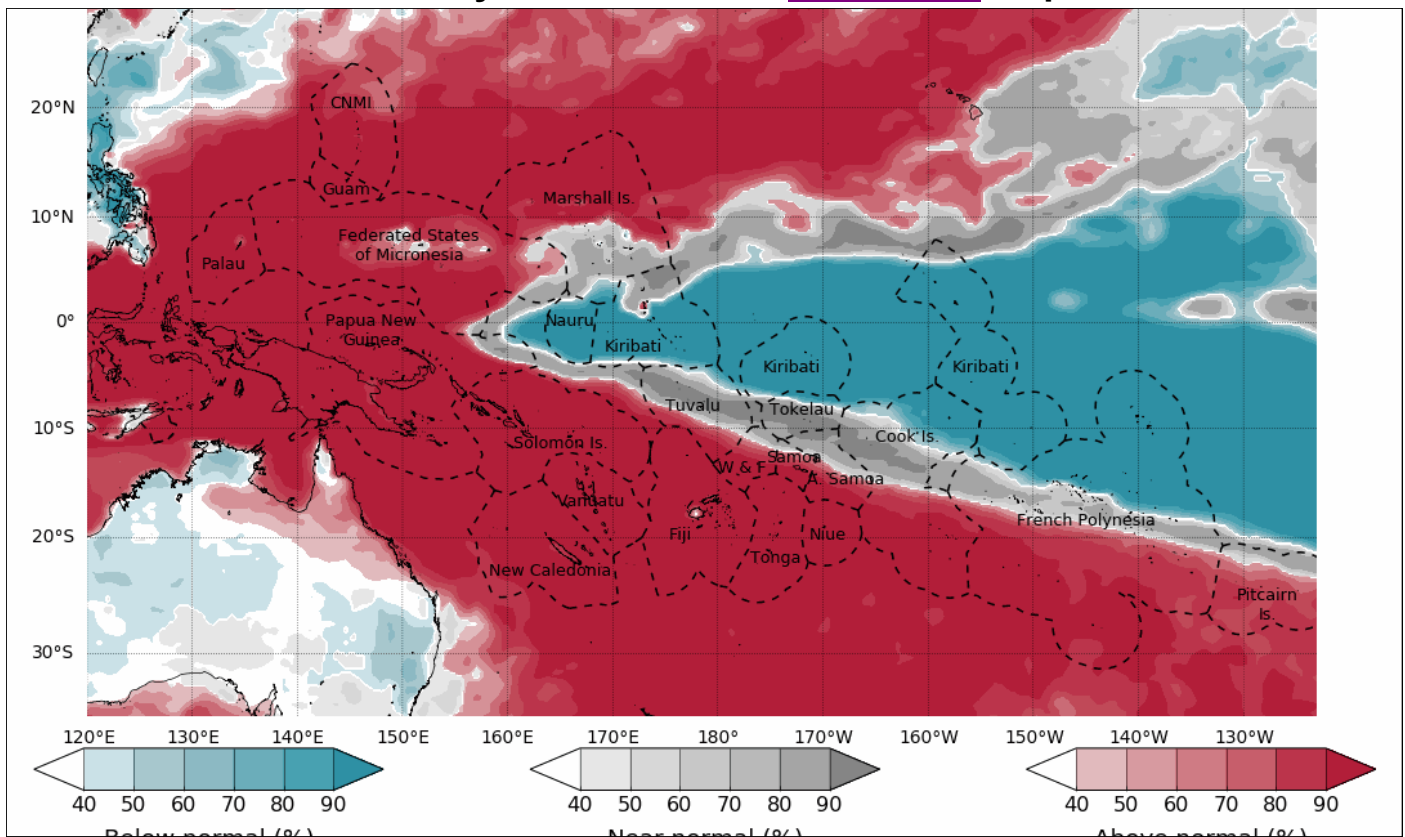
For April-June 2022, the dynamical models (including SCOPIC) agree on above normal rainfall for Palau, Guam, CNMI, northern RMI, New Caledonia, Vanuatu, Fiji, Tonga, Niue, southern Cook Islands and southern French Polynesia. The models also agree on below normal rainfall is very likely for PNG Islands, Nauru, Kiribati, Tuvalu, Tokelau, Wallis and Futuna, Samoa, American Samoa, northern and central Cook Islands, and the northern and central French Polynesia.

SEASONAL TEMPERATURE OUTLOOK

April—June 2022



Monthly Tmax and Tmin ACCESS-S Maps



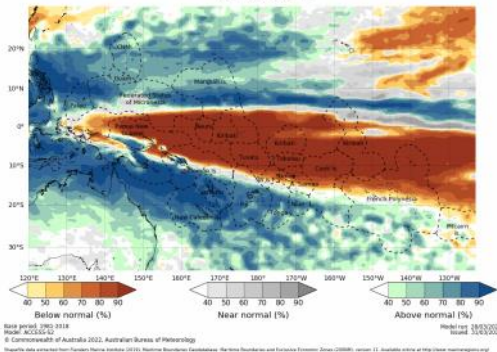
SEASONAL RAINFALL OUTLOOK

April—June 2022

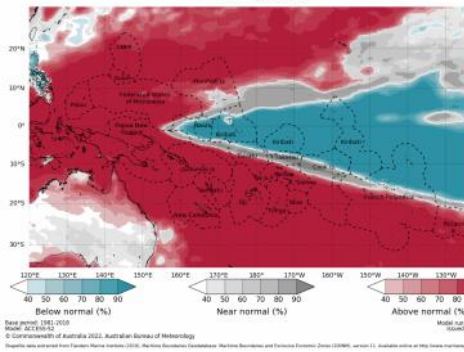


Seasonal ACCESS-S maps

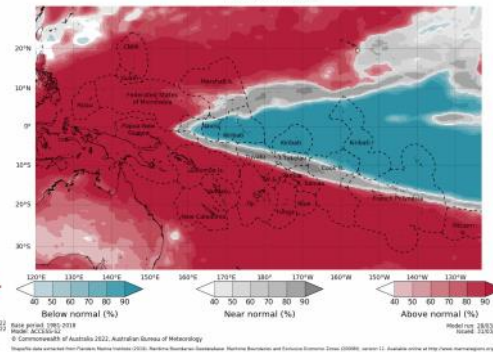
Tercile rainfall probabilities for April to June 2022



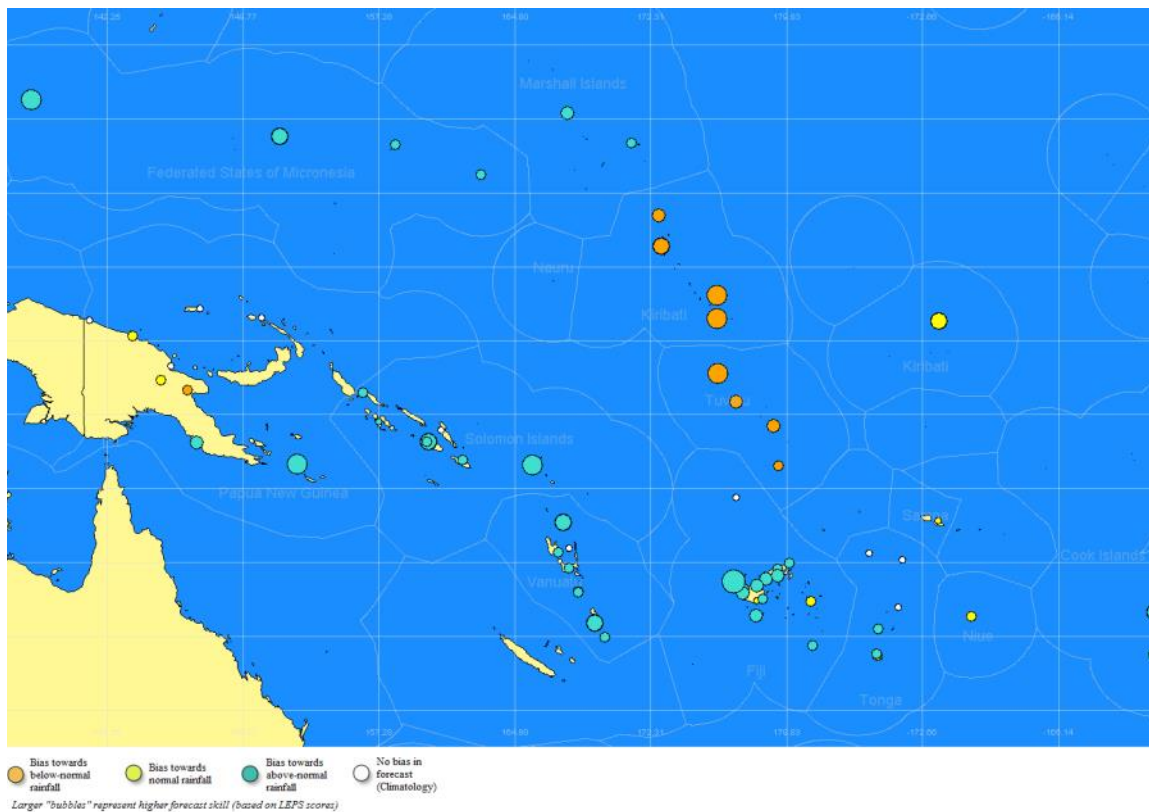
Tercile maximum temperature probabilities for April to June 2022



Tercile minimum temperature probabilities for April to June 2022



SCOPIC



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

SEASONAL RAINFALL OUTLOOK

April—June 2022



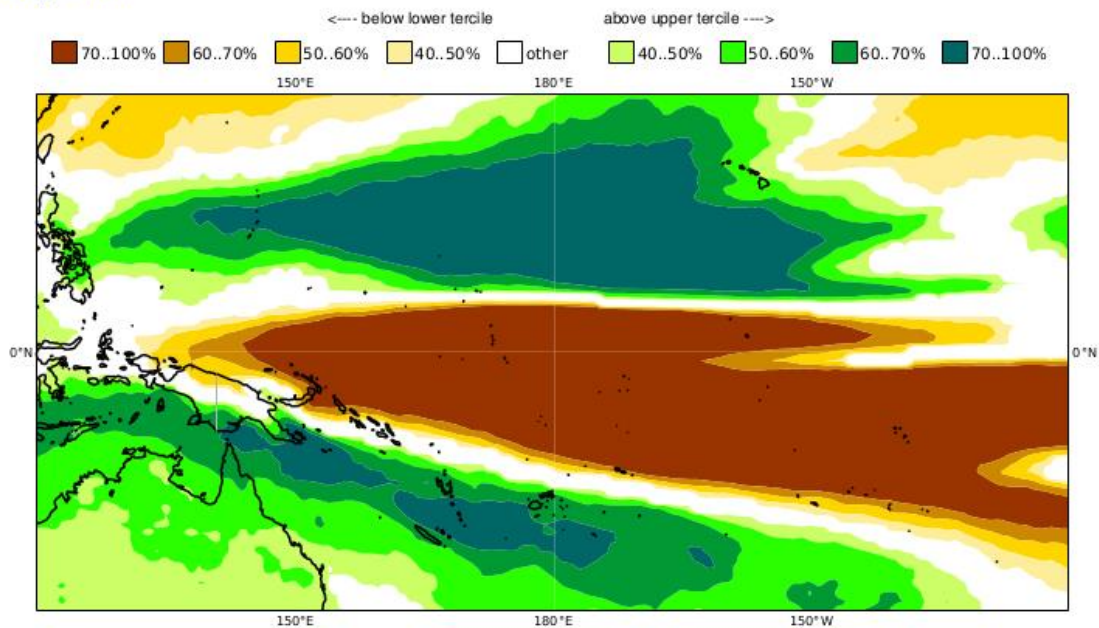
Copernicus (C3S multi-system)-Rainfall

Prob(most likely category of precipitation)

AMJ 2022

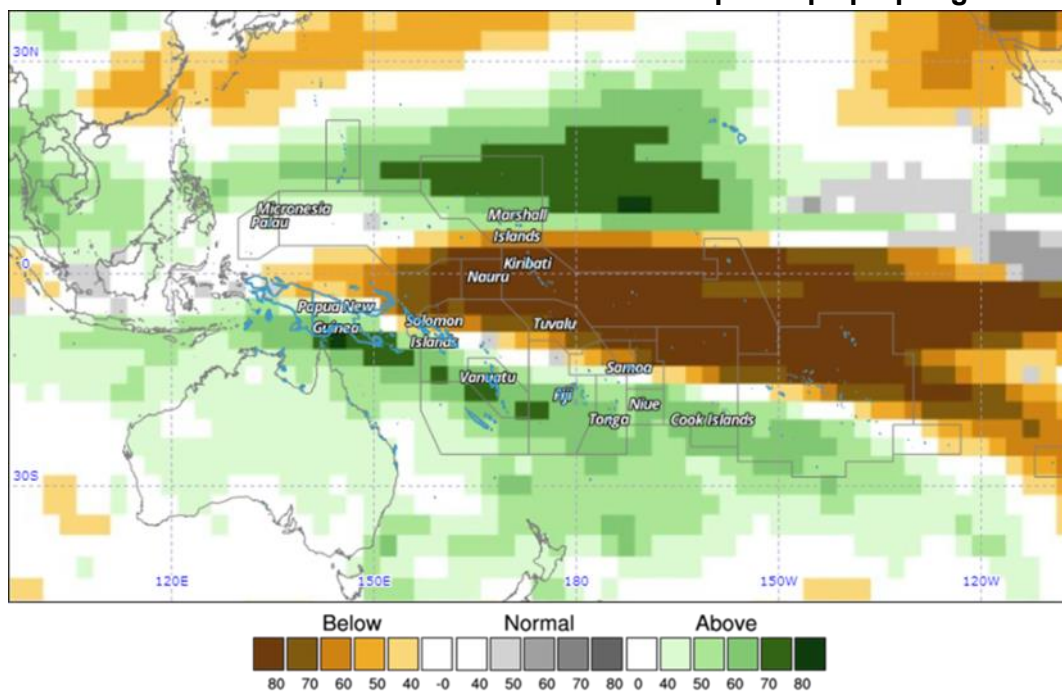
Nominal forecast start: 01/03/22

Unweighted mean



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

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



Year: 2022, Season: AMJ, Lead Month: 3, Method: GAUS

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

Generated using CLIK® (2022-4-4)

© APEC Climate Center

TROPICAL CYCLONE

2021/2022 Season

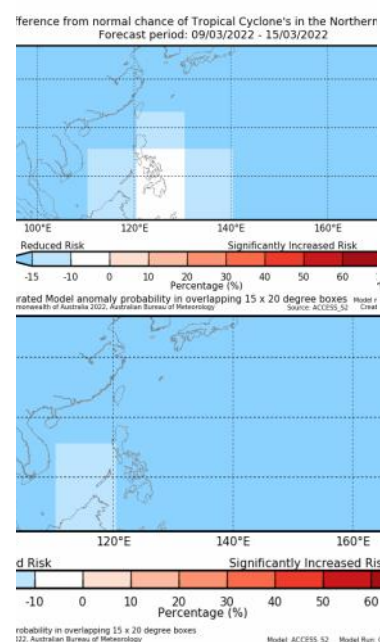


The cyclone activities in the western north Pacific occurs year around with near normal to below normal numbers of TCs anticipated. In the southwest Pacific, the tropical cyclone season 2021-22 started on the 01 November, 2021. The outlook for the season is enhanced risk for tropical cyclone activity in the western part of the basin over November to April. In the central part of the region, cyclone risks are generally near normal, with reduced chances farther east. So far, there were seven tropical cyclones (Ruby, Seth, Cody, Dovi, Tiffany, Eva and Fili) for the southwest Pacific region.

It's important to remember that it does not take a severe cyclone to produce severe impacts. Coastal and river flooding rainfall can occur with a distant, weak or former cyclone. Communities should remain vigilant, and follow forecast information provided by their National Meteorological and Hydrological Service (NMHS).

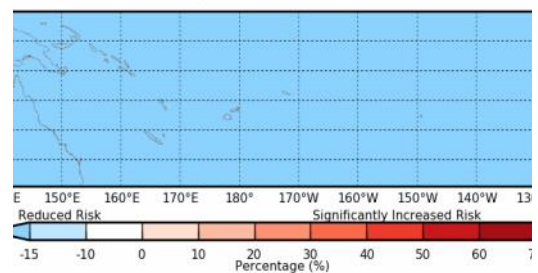
The weekly tropical cyclone forecast from the ACCESS-S model shows reduced risk in the weeks beginning 12 April and ending 25 April 2022 for both the southwest and northwest Pacific.

ACCESS-S Weekly Forecasts –Northwest Pacific

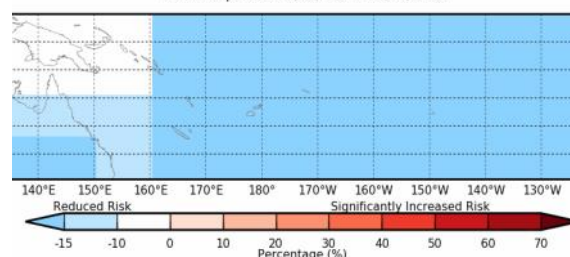


ACCESS-S Weekly Forecasts –Southwest Pacific

Difference from normal chance of Tropical Cyclone's in the South Pacific
Forecast period: 12/04/2022 - 18/04/2022



Difference from normal chance of Tropical Cyclone's in the South Pacific
Forecast period: 19/04/2022 - 25/04/2022



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.

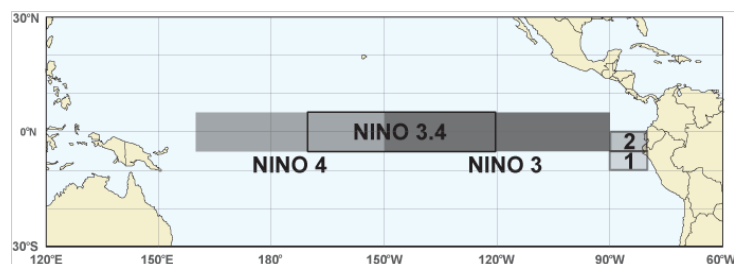
20 degrees Celsius Isotherm Depth

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