Monthly Climate Bulletin

April 2024

ISSN: 2617-3557

Photo Credit: Molly Powers (SPC) Samoa Tide Gauge

Sustainable, transformative, and resilient for a Blue Pacific SPREP PROE

Australian Government
Department of Foreign Affairs and Trade
Bureau of Meteorology

Australian Aid

Climate and Oceans Support Program in the Pacific

Pacific Community
Communauté du Pacifique

CONTENTS

Issued 24 May 2024

- The El Niño Southern Oscillation is currently neutral with some early signs that an La Niña might form across the Pacific Ocean Basin in 2024.

- The Madden Julian Oscillation (MJO) is currently weak.

- The strong South Pacific Convergence Zone (SPCZ) was shifted northeast over PNG Islands, Solomon Islands, Tuvalu, Tokelau, northern American Samoa, northern Cook Islands, northern French Polynesia, and Pitcairn Islands.

- Sea surface temperatures (SSTs) for April 2024 were warmer than average across most of the tropical Pacific Ocean west of 120 °W.

- The Coral bleaching Outlook to 16 June shows 'Alert Level 2' over parts of northeastern PNG Islands, western Solomon Islands, Tuvalu, Kiribati (southern Phoenix), northern Tokelau, northern Wallis and Futuna, and northern Samoa.

- For May to July 2024, the models agree that above normal rainfall is likely or very likely for southern Palau, far northwest FSM, central RMI, northern Solomon Islands, Kiribati (southern Phoenix Islands), northern Fiji, Tuvalu, Tokelau, Wallis and Futuna, Samoa, American Samoa, and northern Cook Islands. In addition, the models agree that below normal rainfall is likely or very likely for northernmost RMI, Guam, CNMI, parts of New Caledonia, southern Fiji, Kiribati (far northern Phoenix and northern Line Islands), and patches in southern French Polynesia.

- The ACCESS-S weekly tropical cyclone outlook shows significantly increased risk over Palau, FSM, Guam, CNMI, Philippines and Japan for the week from 27 May to 2 June, and near-normal to reduced risk for the northwest Pacific for the week from 3 to 9 June.

EL NIÑO–SOUTHERN OSCILLATION

La Niña Watch-some signs of La Niña formation later in 2024

Click link to access Climate Driver Update issued on 14 May 2024

The El Niño Southern Oscillation is currently neutral. There are some early signs that a La Niña might form in the Pacific Ocean later in 2024. As a result, the Bureau's ENSO Outlook has shifted to La Niña Watch. When La Niña tch criteria have been met in the past, a La Niña event has subsequently developed around 50% of the time. There is about an equal chance of neutral ENSO conditions in the same outlook period.

Sea surface temperatures (SSTs) in the central Pacific have been steadily cooling since December 2023. This surface cooling is supported by a significant amount of sub-surface cooling in the central and eastern Pacific. Recent cloud and surface pressure patterns are ENSO-neutral.

The Bureau's modelling suggests that ENSO will likely remain neutral until at least July 2024. It is important to emphasise that early signs of La Niña are most relevant to the climate of the tropical Pacific, and that the long-range forecast for Australian rainfall and temperature provides better guidance for local climate.

Global sea surface temperatures (SSTs) have been the warmest on record for each month between April 2023 and April 2024, with April 2024 SSTs warmer than April 2023. The global pattern of warmth is affecting the typical historical global pattern of sea surface temperatures associated with ENSO and IOD variability. As the current global ocean conditions have not been observed before, inferences of how ENSO or IOD may develop in 2024 that are based on past events may not be reliable.

The Indian Ocean Dipole (IOD) is currently neutral. The most recent two weeks have seen the IOD index within neutral thresholds, and follow seven weeks of the index being above the positive IOD threshold (+0.40 °C). The current SST observations suggest that recent development of a positive IOD may have stalled. If a positive IOD eventually develops, it would be earlier in the calendar year than is typical historically.

The Southern Annular Mode (SAM) is currently neutral (as at 13 of May). Forecasts indicate the index is mostly likely to remain neutral or become positive in the coming fortnight.

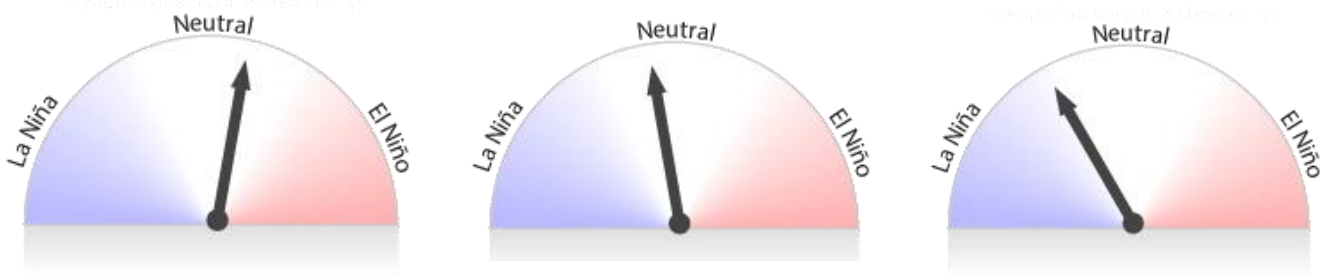
The 30-, 60- and 90-day Southern Oscillation Index (SOI) values for the period ending 12 May 2024 were -3.0, -3 and -1, respectively. The SOI reflects neutral ENSO conditions.

EL NIÑO–SOUTHERN OSCILLATION

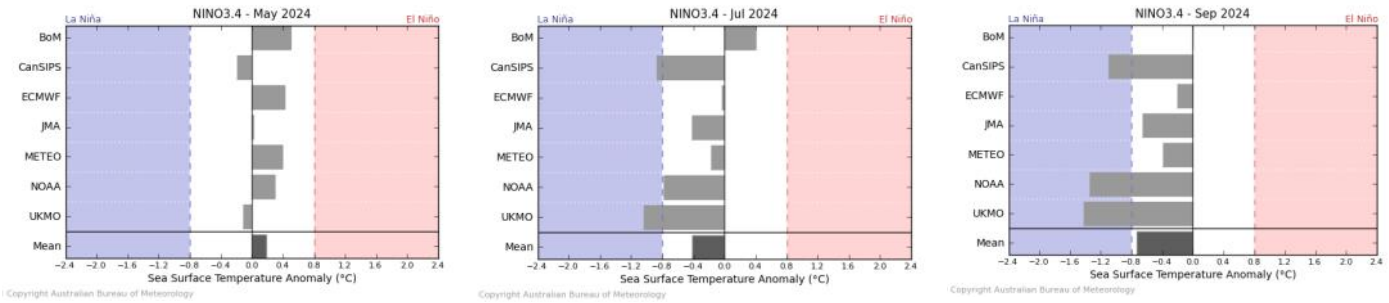
La Niña Watch-some signs of La Niña formation later in 2024

Click link to access Climate Driver Update issued on 14 May 2024

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



Bureau of Meteorology NINO3.4 International Model Outlooks



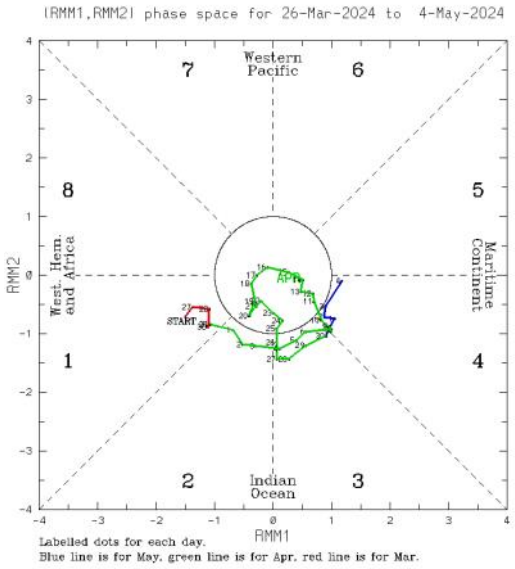
Bureau of Meteorology summary of international model outlooks for NINO3.4: http://www.bom.gov.au/climate/model-summary/#tabs=Pacific-Ocean

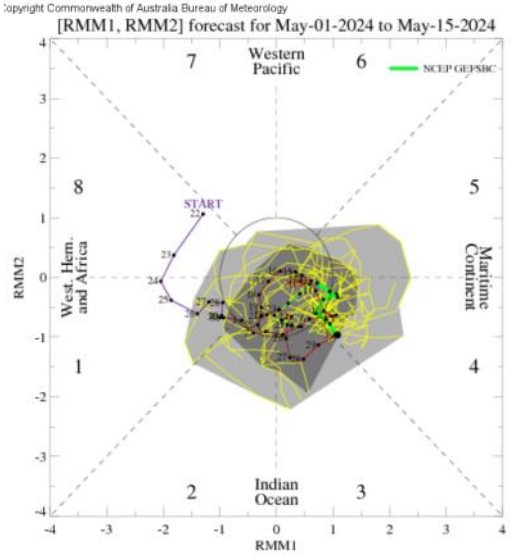
MADDEN–JULIAN OSCILLATION

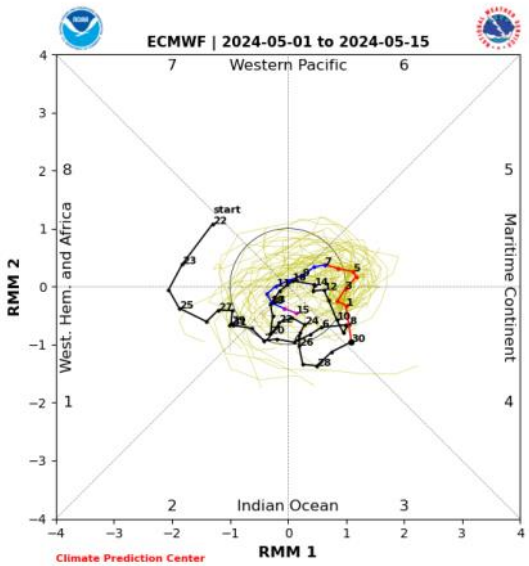
Click link to access *Tropical Climate Update* [Issued on Tuesday 14 May 2024]

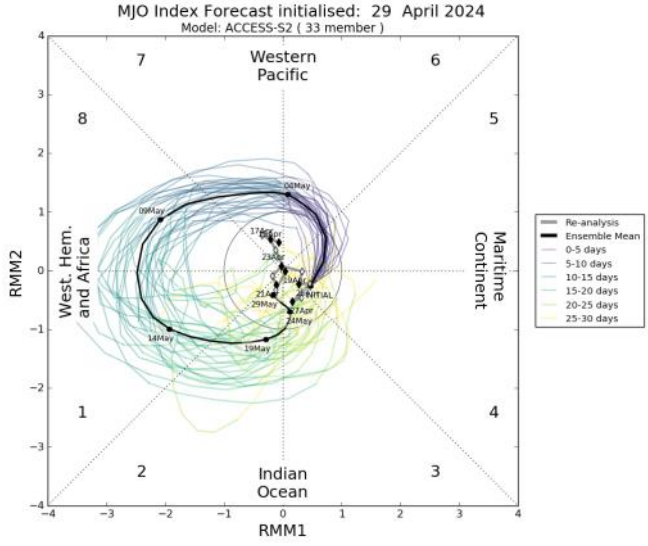
The Madden Julian Oscillation (MJO) is currently weak. Most models forecast indicate that the MJO will remain weak before re-strengthening over the eastern Indian Ocean or Maritime Continent region from mid to late May.

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







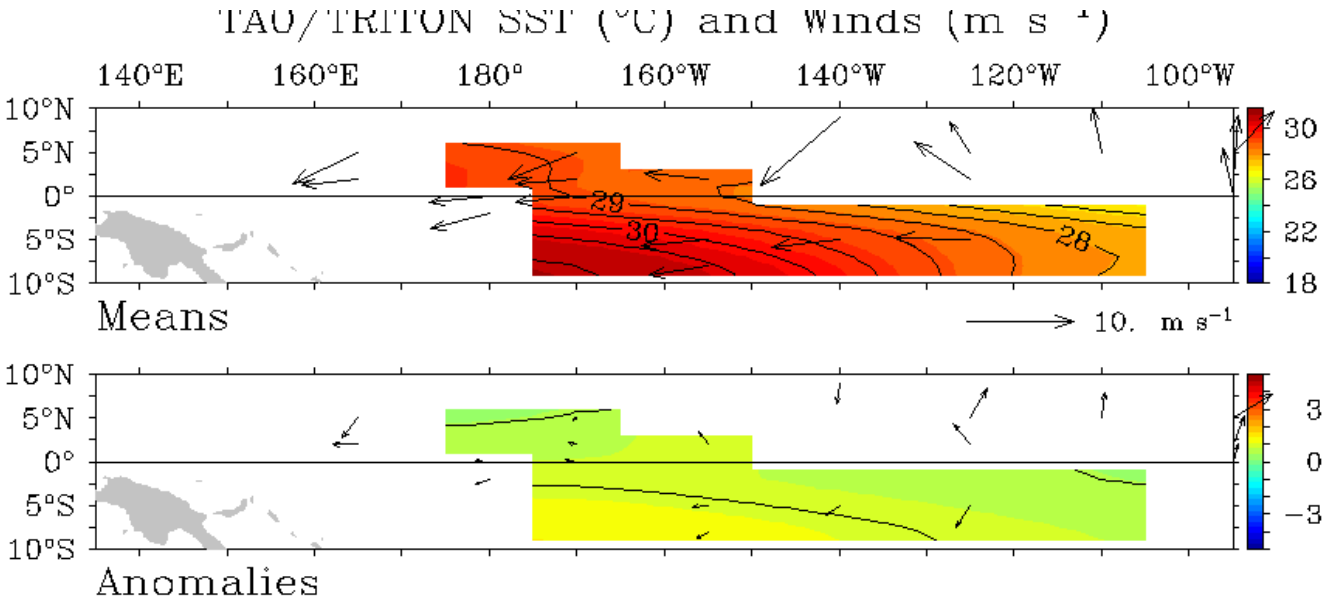


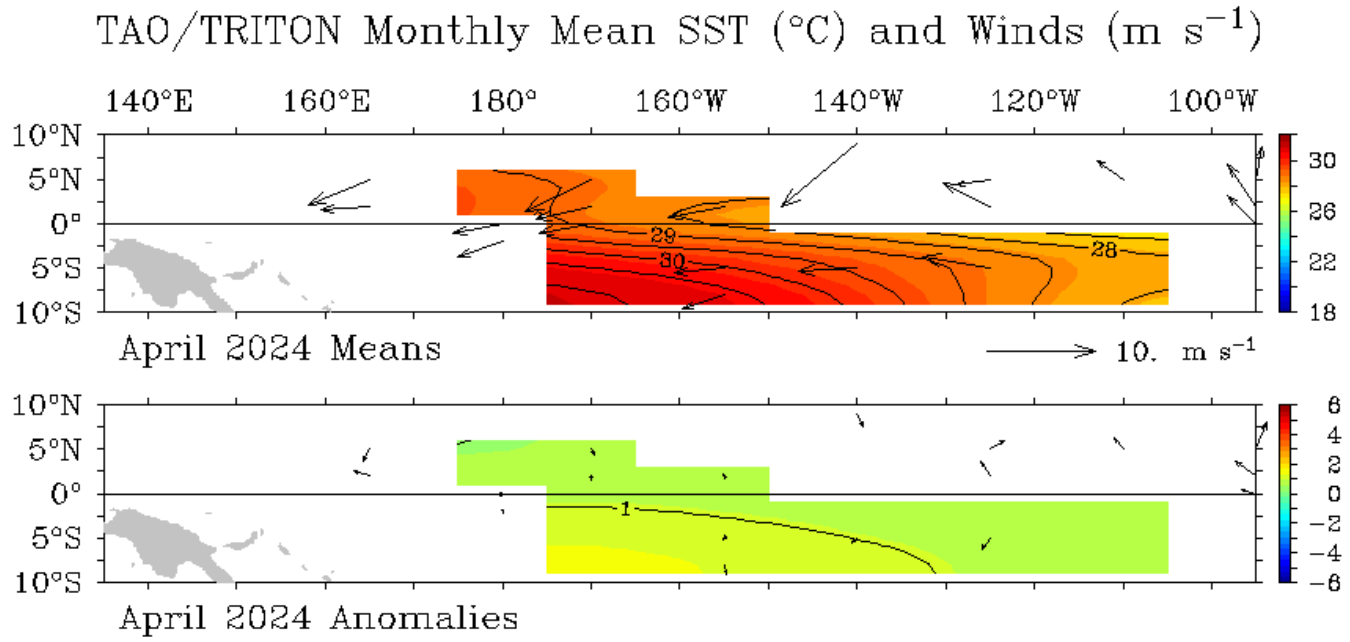
WIND

Click link to access Wind plots link

During April, the trade winds were generally close to normal over the equatorial Pacific. For the five days ending 30 April 2024, the trade winds were generally a little stronger than normal over most of the near-equatorial Pacific.

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





TAO Project Office/PMEL/NOAA

May 1 2024

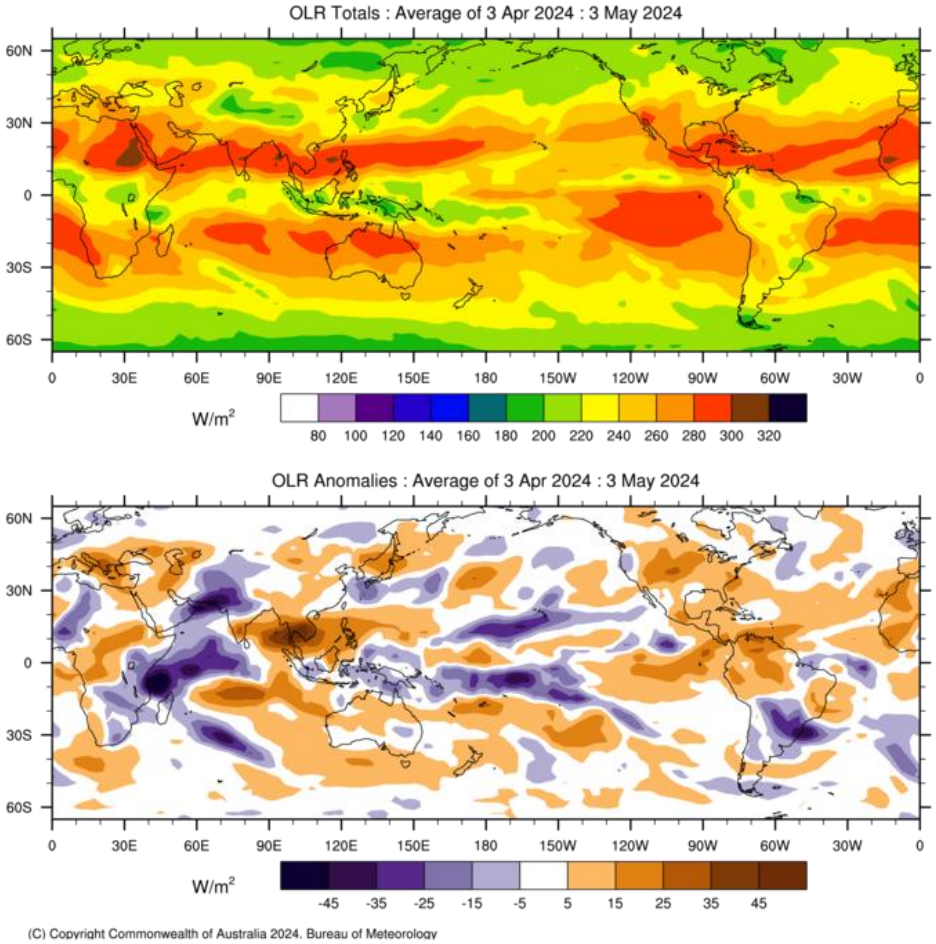
CLOUD AND RAINFALL

Click link to access OLR

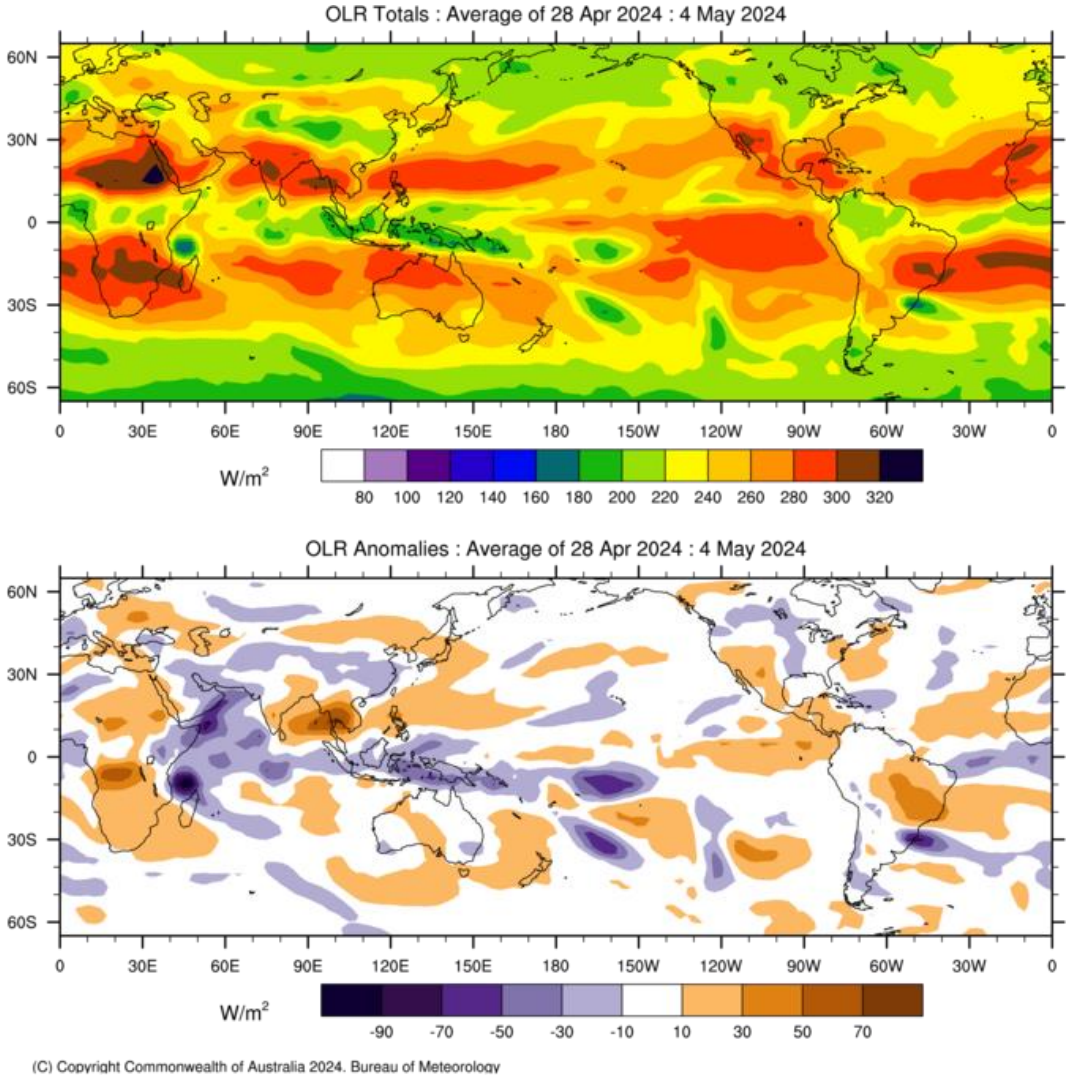
The April 30-day OLR anomaly map shows a large region of low OLR (increased convection) that stretched east-southeastwards from PNG's Islands in the west, to northern French Polynesia and Pitcairn Islands in the east. This line of convection and rain essentially formed the South Pacific Convergence Zone (SPCZ), which was shifted northeast over PNG Islands, Solomon Islands, Tuvalu, Tokelau, northern American Samoa, northern Cook Islands, northern French Polynesia, and Pitcairn Islands. Areas of high OLR (decreased convection) were evident over Palau, Guam, CNMI, and Kiribati in the northern hemisphere. In the southern hemisphere, anomalously high OLR stretched south-eastwards from northern Australia, across New Caledonia, Vanuatu, Fiji, Samoa, southern American Samoa, Niue, southern Cook Islands, and French Polynesia.

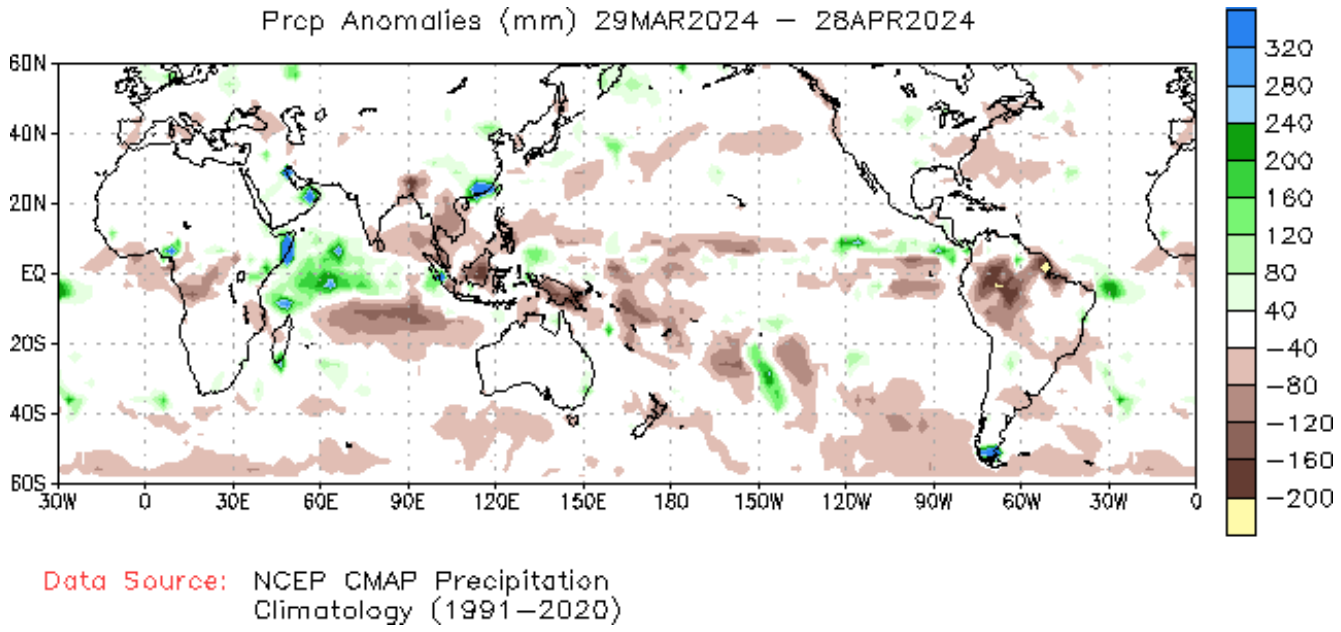
Note: Global maps of OLR below highlight regions experiencing increased or decreased cloudiness. The top panel is the total OLR in Watts per square metre (W/m^2) and the bottom panel is the anomaly (current minus the 1979-1998 climate average), in W/m^2. In the bottom panel, negative values (blue shading)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

OLR Total and Anomalies, 30 Day OLR



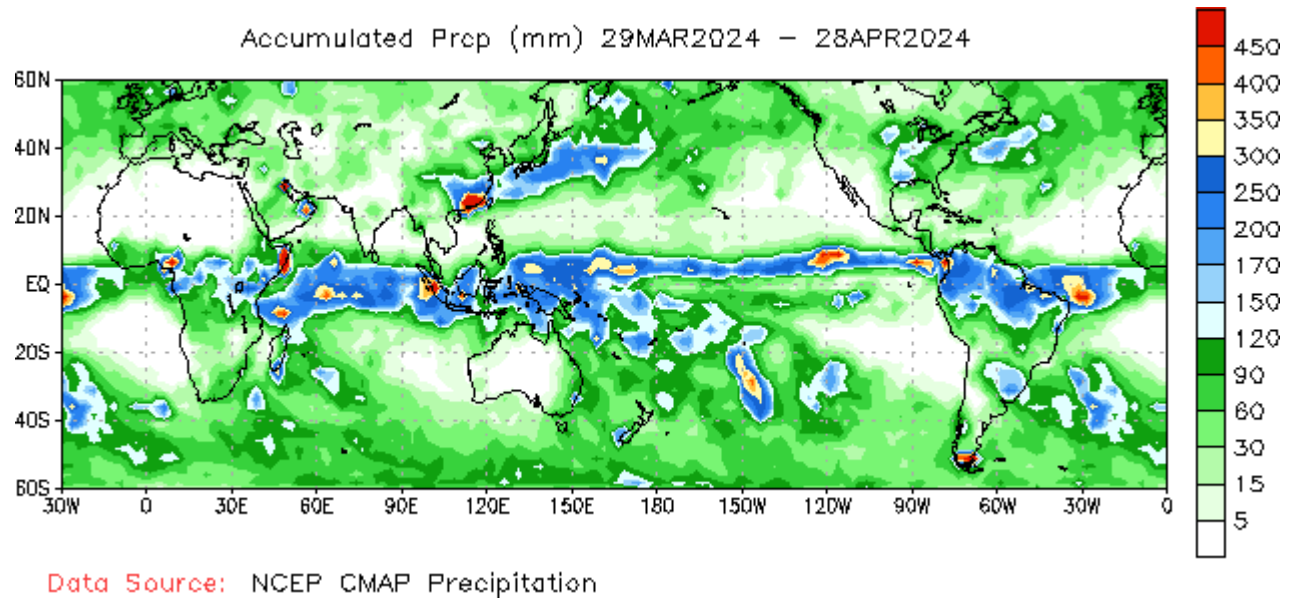
OLR Total and Anomalies, 7 Day OLR



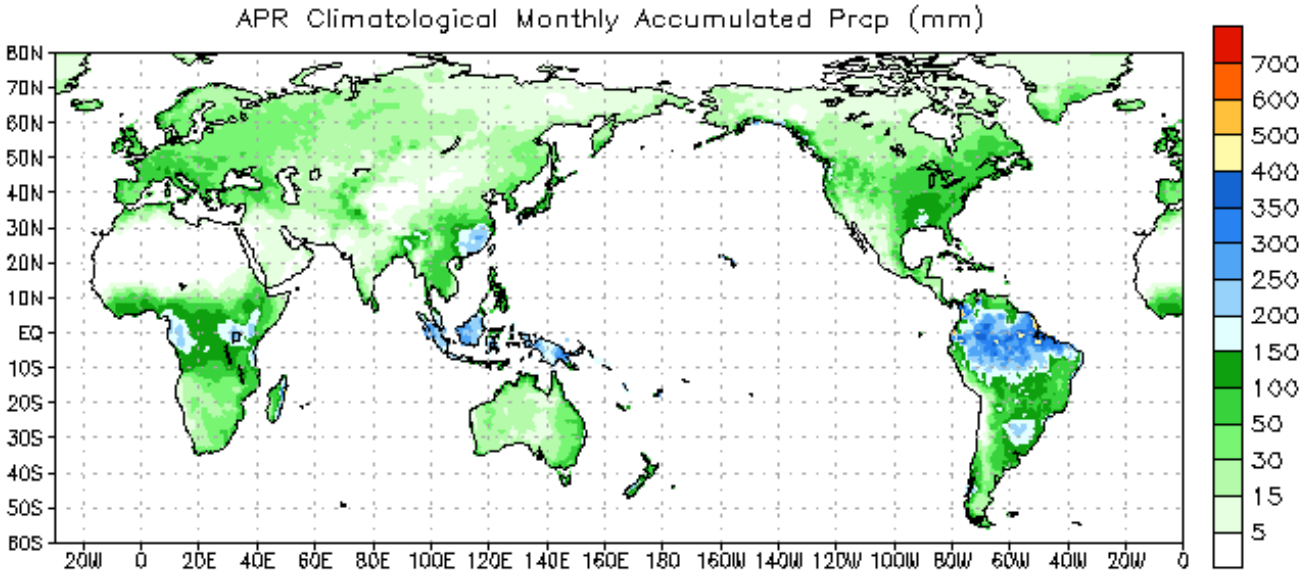


Data Source: NCEP CMAP Precipitation Climatology (1991–2020)

30-Day Rainfall Accumulated



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

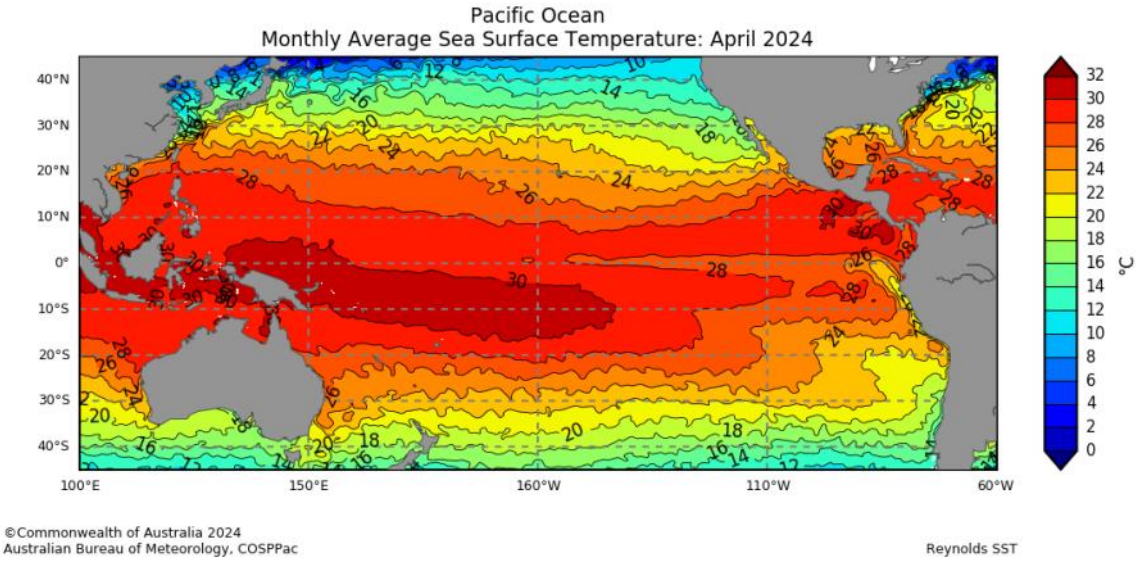
SEA SURFACE TEMPERATURE

Click link to access Pacific Community COSPPac Ocean Portal

Sea surface temperatures (SSTs) for April 2024 were warmer than average across most of the tropical Pacific Ocean west of 120 °W. Between 20°S and 10°N, SST anomalies were more than 0.8 °C warmer than the long term (1961-1990) average in most of the central and western Pacific Ocean. The extent and magnitude of warm anomalies across the equatorial Pacific has decreased compared to March 2024, reflecting the decay of El Niño to neutral El Niño-Southern Oscillation (ENSO) conditions.

Highest-on-record April SSTs occurred in northeast and southern PNG's EEZ, southern Nauru, parts of Kiribati (southern Gilbert, southern Phoenix, and southern Line Islands), northern Solomon Islands, northern Fiji, northern Tonga, Tuvalu, Tokelau, Wallis and Futuna, Samoa, American Samoa, northern Niue, central and northern Cook Islands and northern French Polynesia. The SSTs in decile 10 (very much above average) stretched east-southeastwards from PNG to northern half of Fiji, to northern French Polynesia, and from southern Nauru to Kiribati (central Gilbert, central Phoenix and southern Line Islands). Another band stretched from southern Palau, to southern FSM, to, central RMI. Above average (8-9) decile were observed for majority of the Pacific Island Countries, spanning east-south-eastward from eastern Palau, FSM, RMI, central Vanuatu to central French Polynesia. Average SSTs (4-7) for April were observed in central Palau, northern FSM, northern RMI, northern Nauru, eastern New Caledonia, southern Vanuatu, southern Fiji, southern Tonga, southern Niue, southern Cook Islands and southern French Polynesia. Patches of decile 2-3 (below average) were observed in southeastern New Caledonia, southeastern Fiji, southeastern Tonga, and southern French Polynesia.

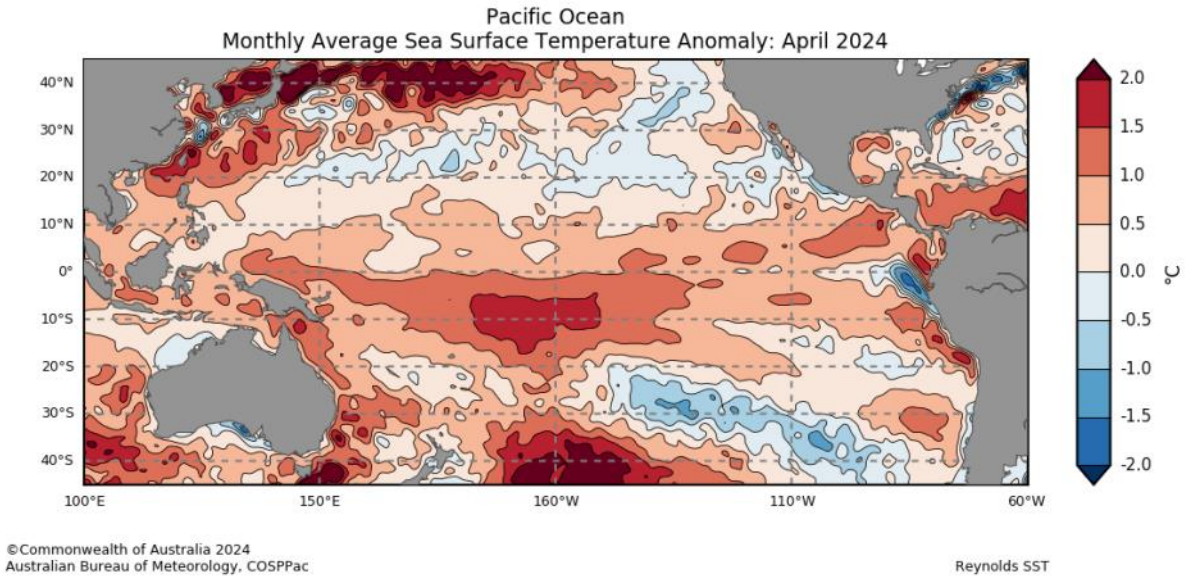
Mean Sea Surface Temperature



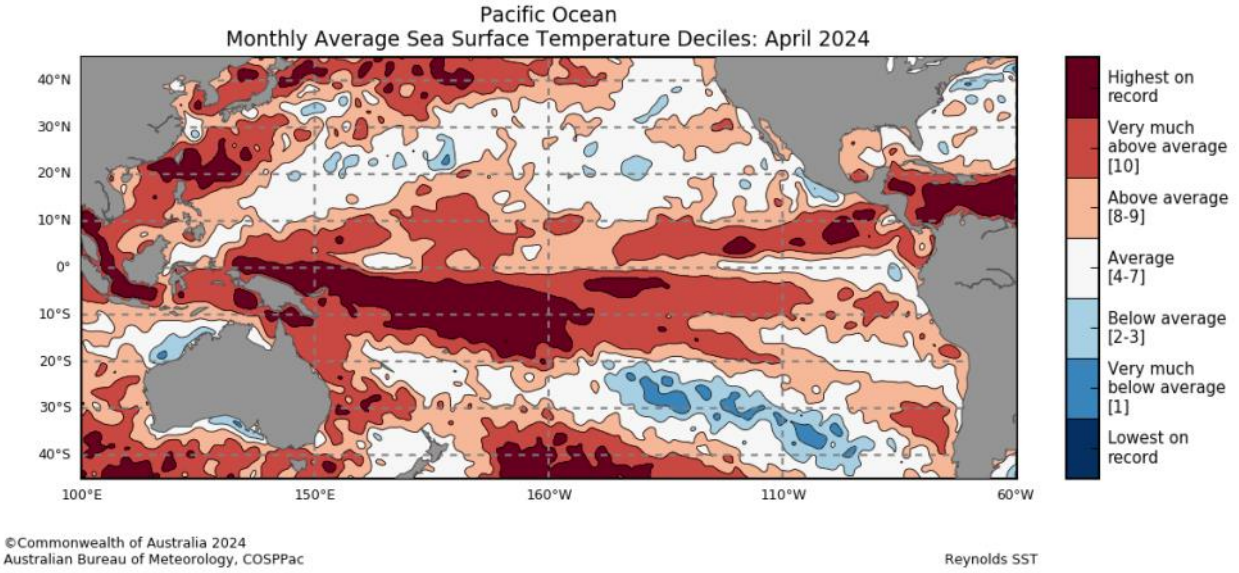
OCEAN CONDITIONS

Click link to access SEA SURFACE TEMPERATURE

Anomalous Sea Surface Temperature



Sea Surface Temperatures Deciles



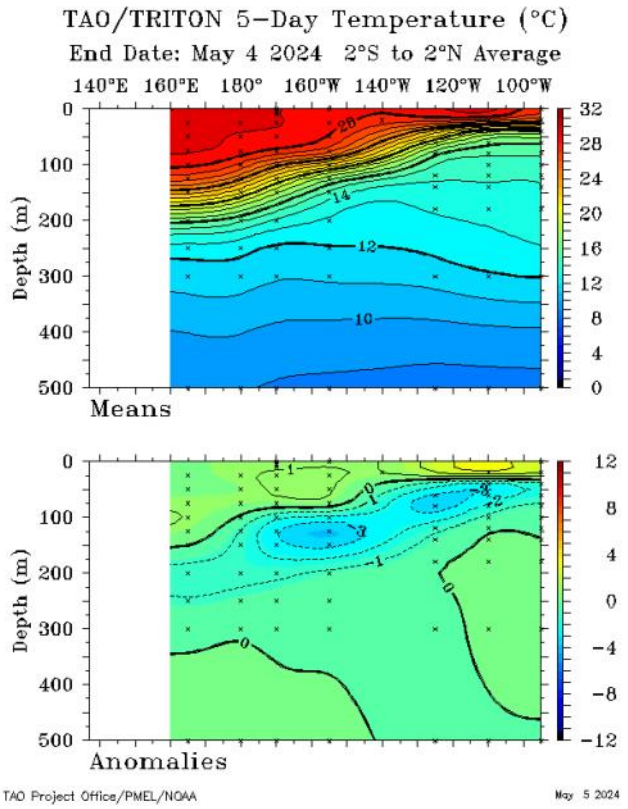
OCEAN CONDITIONS

SUB SURFACE

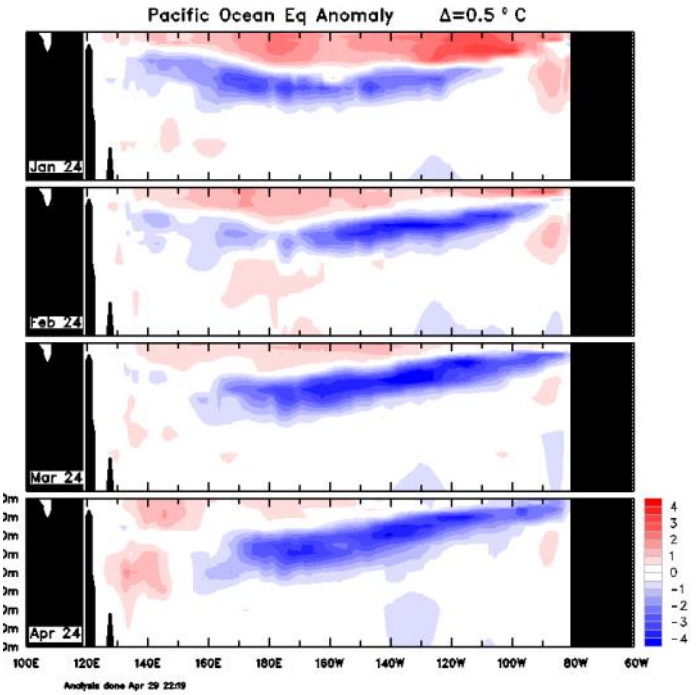
The four-month sequence of equatorial Pacific sub-surface temperature anomalies (to 30 April 2024) shows patches of weak warm anomalies of up to 1.5 °C warmer than average across the top 50 m of the central and western equatorial Pacific during April. Cool anomalies are present below this shallow layer and exceed more than 3.5 °C cooler than average eastwards of 160 °W and rise eastwards to the top 50 to 100m of the eastern Pacific where anomalies are up to 2 °C cooler than average.

The depth and magnitude of warm anomalies has significantly decreased over the December to April period. The magnitude and extent of cool anomalies has also increased and has spread eastwards over the December to March period. From March to April, the extent of cool anomalies remains similar, while the peak magnitude has decreased. The presence of a substantial layer of cooler than average waters near the surface suggests some cooling of the surface is likely over the next few months.

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/

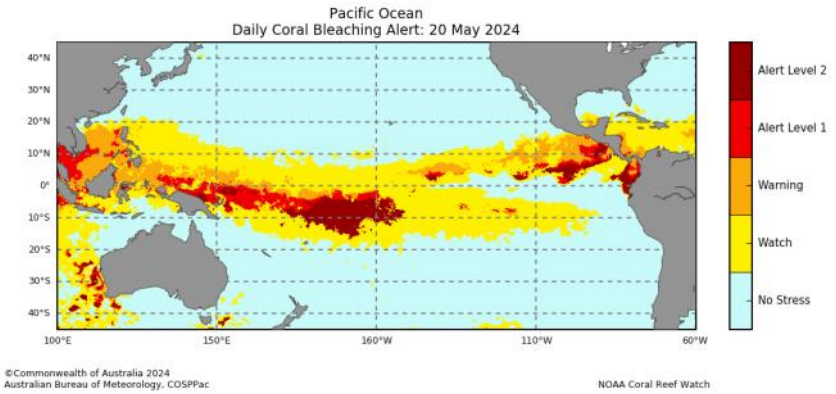
OCEAN CONDITIONS

CORAL BLEACHING

The daily Coral Bleaching Alert status for 20 May 2024 shows an area of 'Alert Level 2' over parts of southern Tuvalu, Tokelau, Kiribati (southern Phoenix, and southwest Line Islands), northern Wallis and Futuna, Samoa, American Samoa, and northern Cook Islands. 'Alert Level 1' over parts of northern PNG, northern Solomon Islands, southern Nauru, northern Tuvalu, and Kiribati (southernmost Gilbert and northern Phoenix Is.). 'Warning' status over southern Palau, southern FSM, Nauru, and Kiribati (southern Gilbert Is.). 'Watch' or 'No stress' for the rest of the countries. The four-week Coral Bleaching Outlook to 16 June shows 'Alert Level 2' over parts of northeastern PNG Islands, western Solomon Islands, Tuvalu, Kiribati (southern Phoenix), northern Tokelau, northern Wallis and Futuna, and northern Samoa. 'Alert Level 1' rating stretches southeastwards from southern Palau, northern PNG to eastern Tuvalu. 'Warning' extends from northern Palau, southern FSM, southern RMI, northern Nauru and Kiribati (northern Gilbert). 'Watch' or ' No Stress' over the rest of the countries.

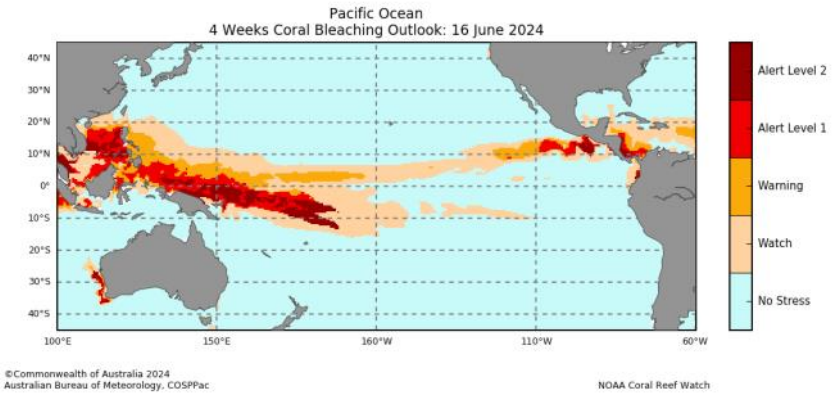
Daily Coral Bleaching Alert

(Source: Pacific Community COSPPac Ocean Porta Coral Bleaching)



4 Weeks Coral Bleaching Outlook

(Source: Pacific Community COSPPac Ocean Portal)



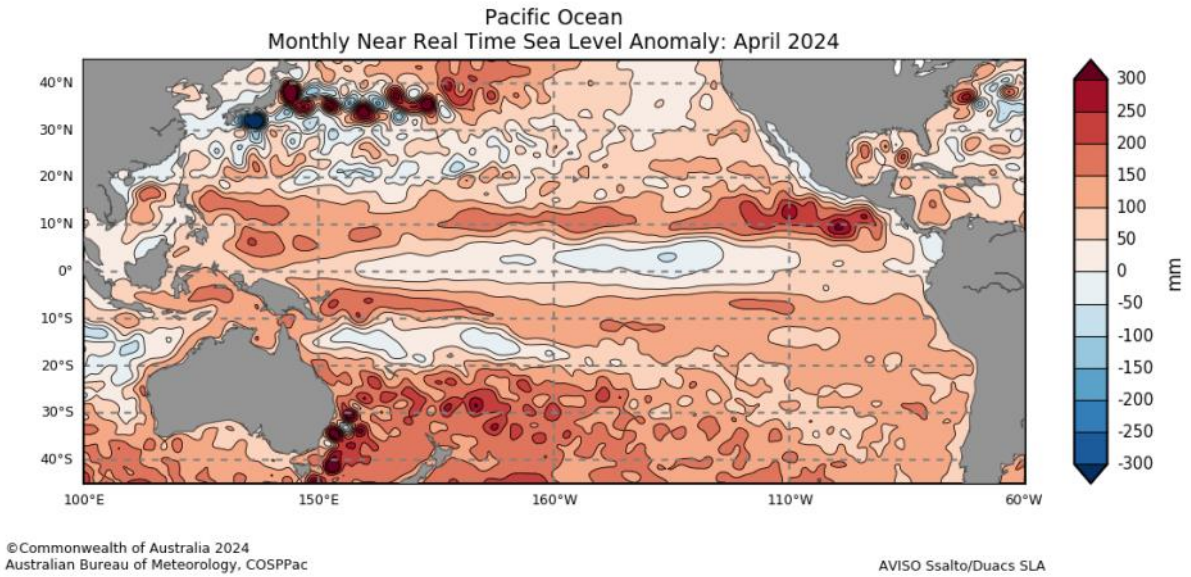
OCEAN CONDITIONS

OCEAN SURFACE CURRENTS AND SEA LEVEL

Sea levels observed in April were above normal over most COSPPac countries. Patches of anomalies from +200 to +250 mm were observed along the eastern Australia coast, and New Caledonia. Anomalies from +100 to +200 mm were observed in eastern PNG, Tuvalu, Tokelau, Kiribati (southern Phoenix, and southern Line Islands), southern Fiji, southern Tonga, southern Niue, northern and southern Cook Islands, and central French Polynesia. In the northern hemisphere, patches of +100 to +200 mm were observed in Palau, FSM and central RMI. Anomalies from +50 to +100 mm were observed for other COSPPac countries apart from patches of below normal sea level anomalies were observed in Kiribati (northern Line Is.), southeastern PNG, southern Solomon Islands, southern Vanuatu, northern Fiji, northern Tonga, southern Wallis and Futuna, Samoa, southern American Samoa, northern Niue and central Cook Islands.

Monthly Sea Level Anomalies

Source: Pacific Community COSPPac Ocean Portal

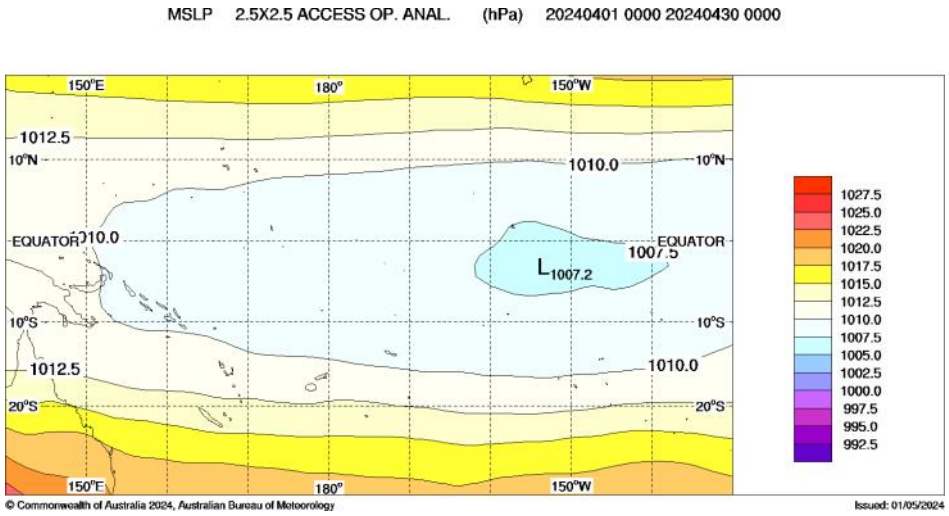


MEAN SEA LEVEL PRESSURE

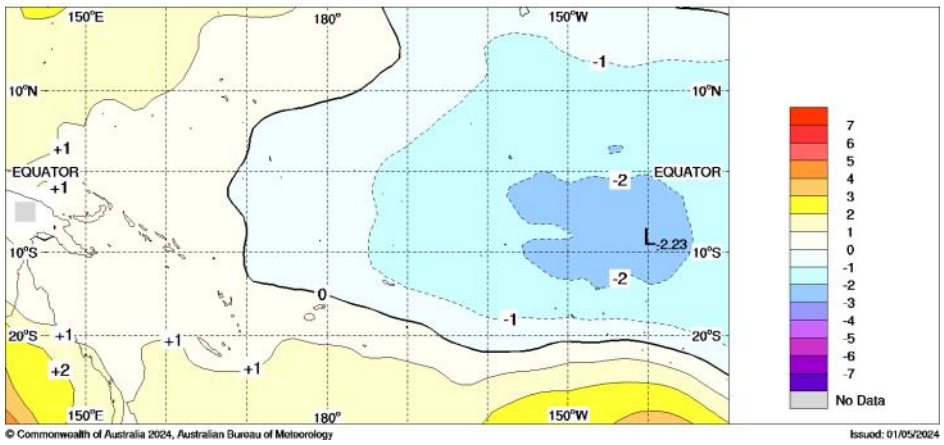
The April mean sea level pressure (MSLP) anomaly map still resembles a typical El Niño, with negative anomalies of 1 hPa or greater over the tropical Pacific east of 175 °W, and positive anomalies of 1 hPa or greater over Australia and across the southern tropical Pacific.

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

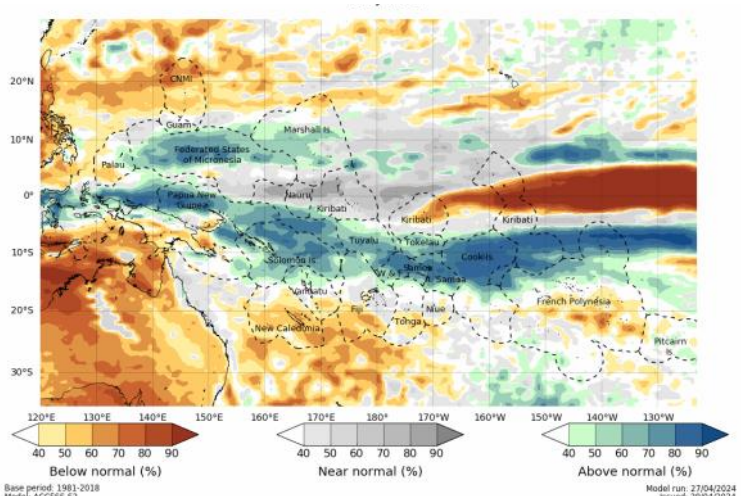
SEASONAL RAINFALL OUTLOOK

May—July 2024

The ACCESS-S model forecast for May 2024, shows above normal rainfall is likely or very likely for eastern Palau, northern FSM, central RMI, northern and eastern PNG, Solomon Islands, northern Vanuatu, southern Nauru, Kiribati (far southwest Gilbert, and southern Line Islands), northern Fiji, far northern Tonga, Tuvalu, Tokelau, Wallis and Futuna, Samoa, American Samoa, northern and central Cook Islands, north French Polynesia, and parts of Pitcairn Islands. Below normal rainfall is likely or very likely for southern Palau, northern most RMI, most of mainland PNG, New Caledonia, southern Vanuatu, southern Fiji, southern Tonga, patches in Niue, Kiribati (central Phoenix and central Line Islands), and central French Polynesia.

The ACCESS-S three-month rainfall outlook (May to July 2024) is very similar to the April outlook, but with the below normal rainfall region in the southern hemisphere extending to Niue and southern Cook Islands, while the above normal region cover most of Palau and is narrower and stronger from PNG Islands to northern French Polynesia.

Monthly ACCESS-S Maps



The Copernicus multi-model outlook for May to July 2024 is very similar to the ACCESS outlook, but with a stronger equatorial dry signal east of 130° E, and from Palau to RMI.

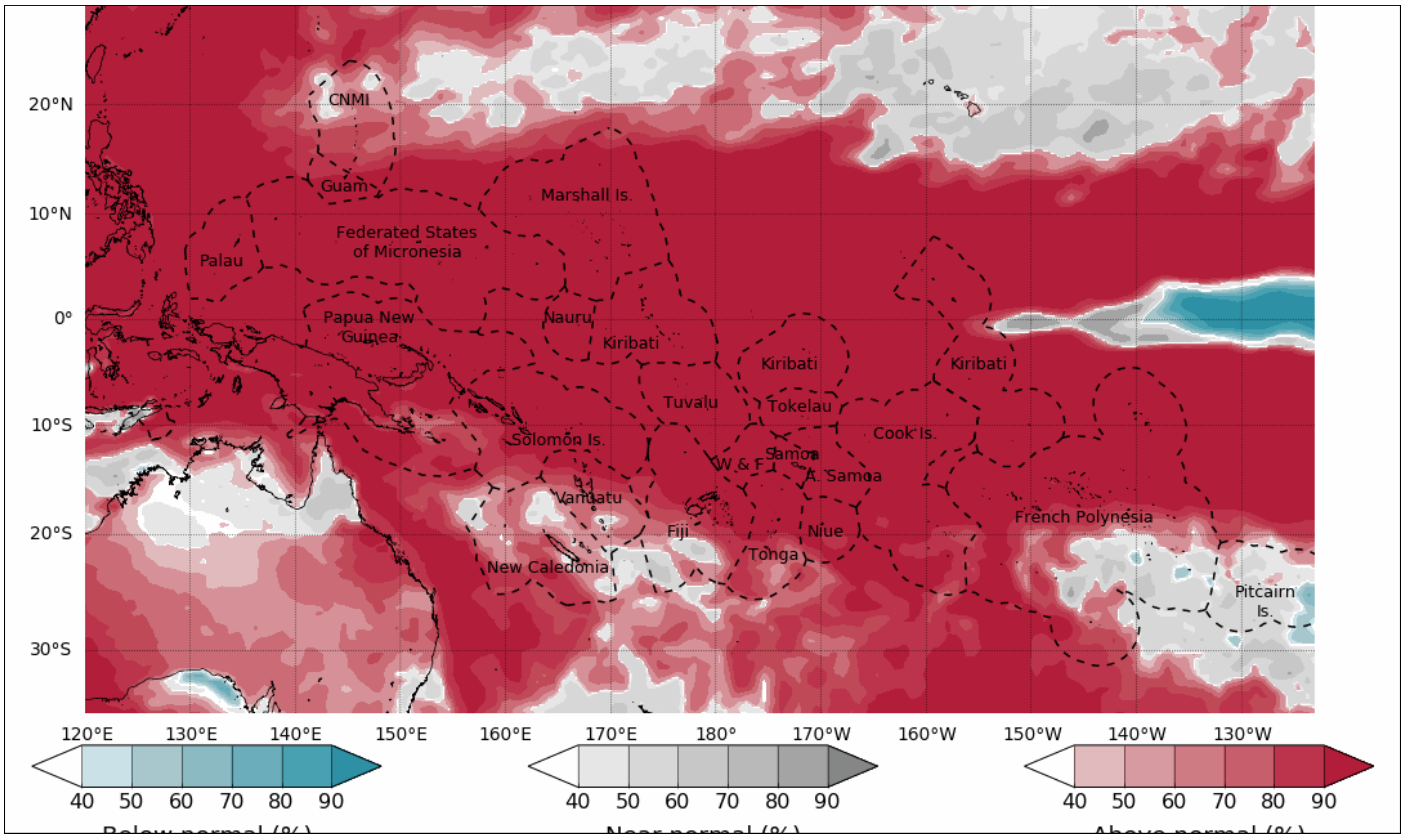
The APEC Climate Centre multi-model outlook (May to July 2024) is similar to the Copernicus model.

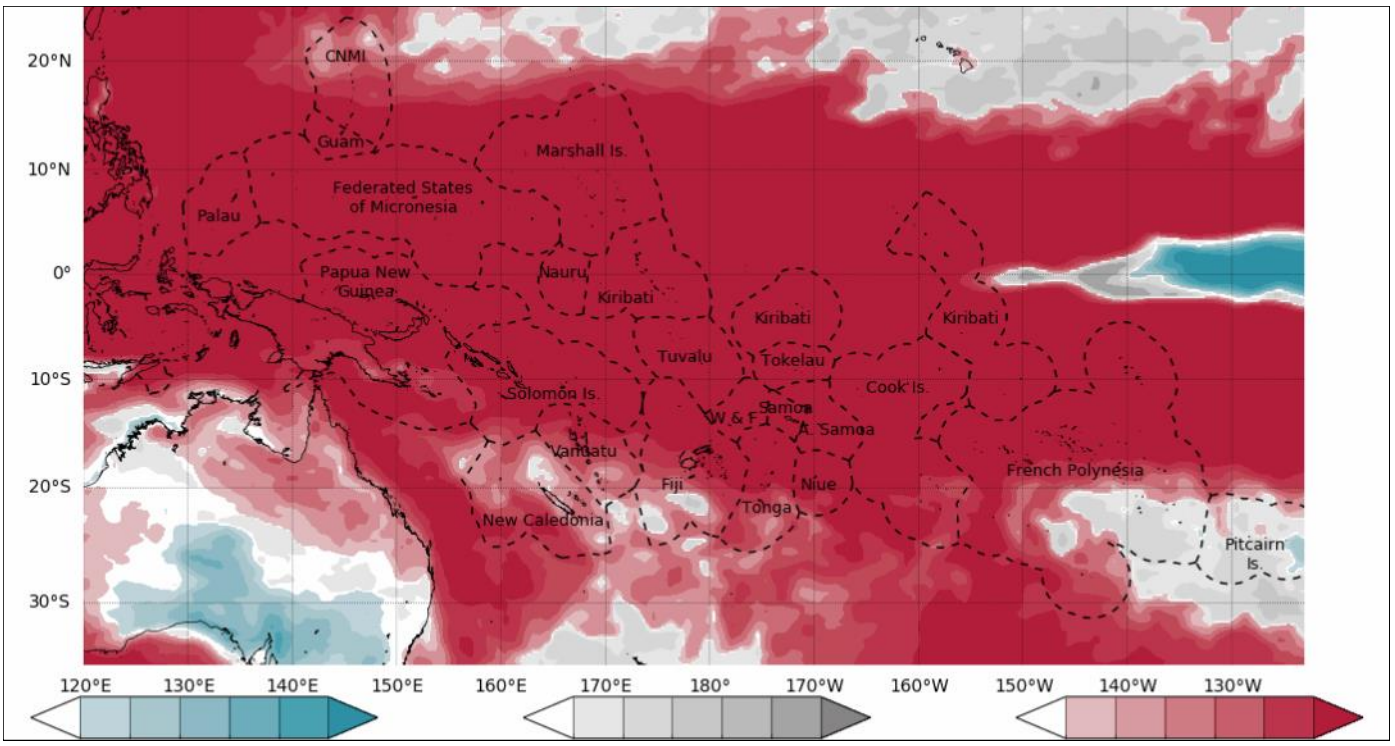
For May to July 2024, the models agree that above normal rainfall is likely or very likely for southern Palau, far northwest FSM, central RMI, northern Solomon Islands, Kiribati (southern Phoenix Islands), northern Fiji, Tuvalu, Tokelau, Wallis and Futuna, Samoa, American Samoa, and northern Cook Islands. In addition, the models agree that below normal rainfall is likely or very likely for northern most RMI, Guam, CNMI, parts of New Caledonia, southern Fiji, Kiribati (far northern Phoenix and northern Line Islands), and patches in southern French Polynesia.

SEASONAL TEMPERATURE OUTLOOK

May—July 2024

Monthly Tmax and Tmin ACCESS-S Maps

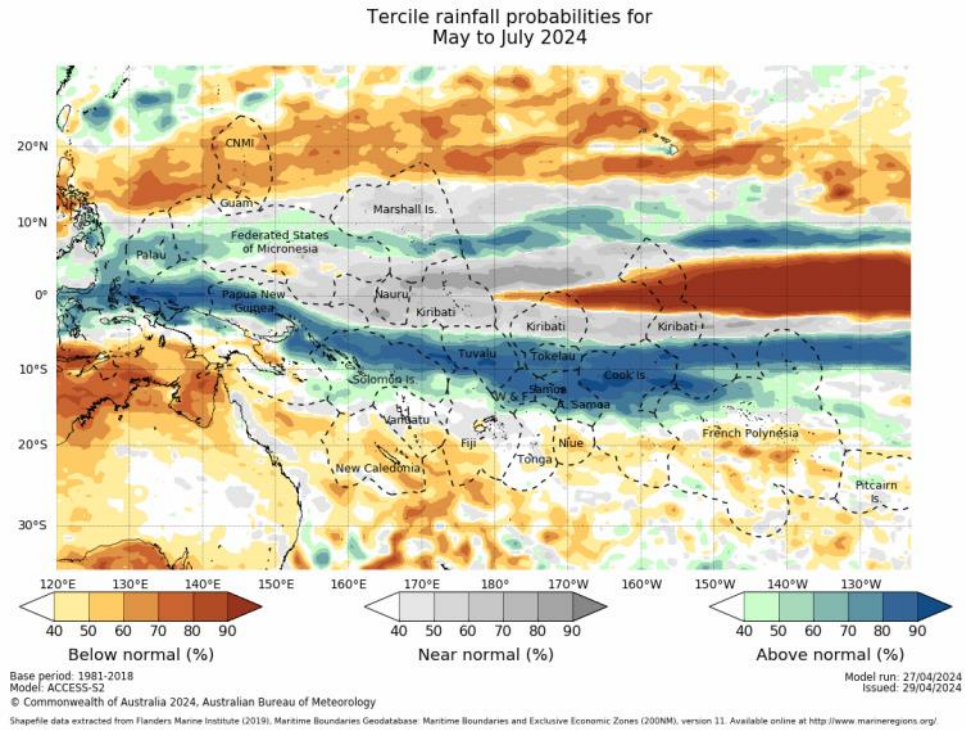


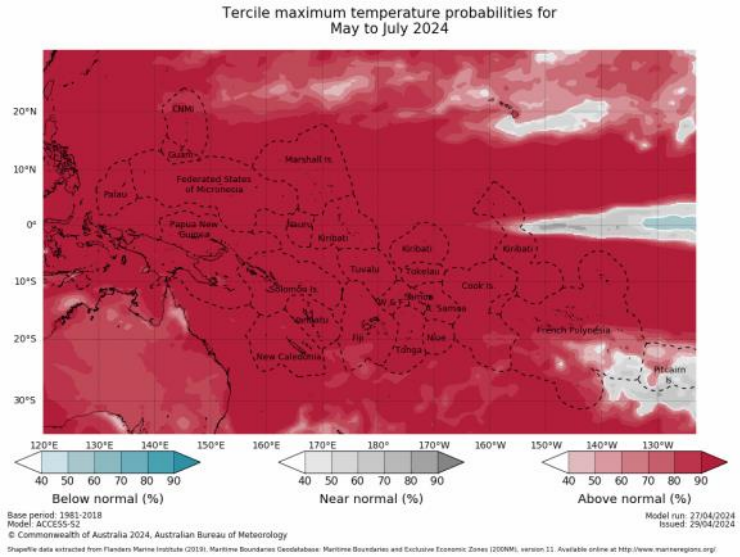


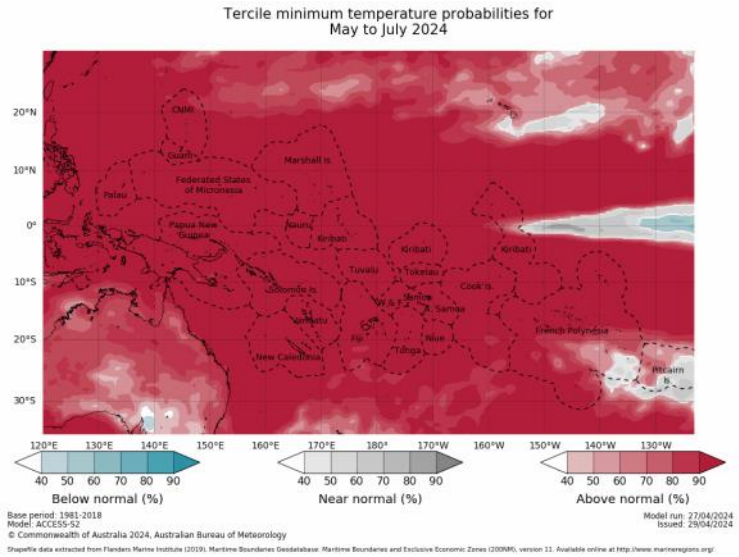
SEASONAL RAINFALL OUTLOOK

May—July 2024

Seasonal ACCESS-S maps



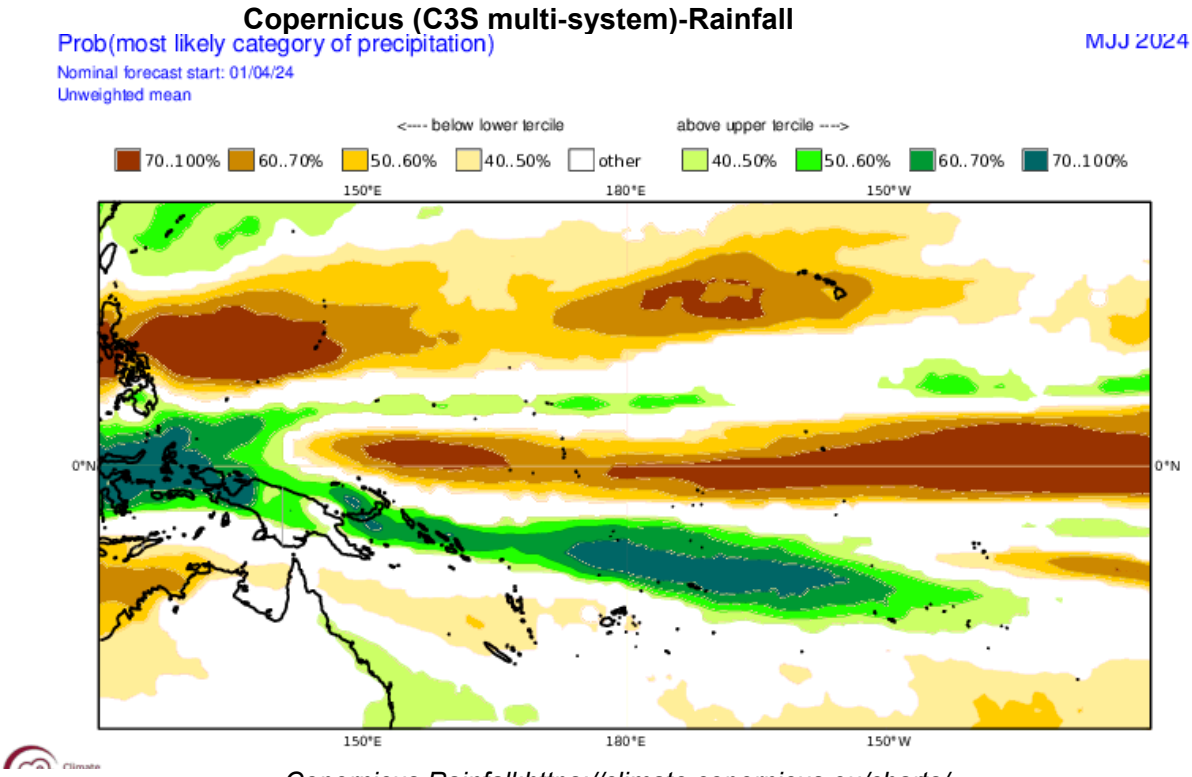




'About ACCESS-S http://access-s.clide.cloud/

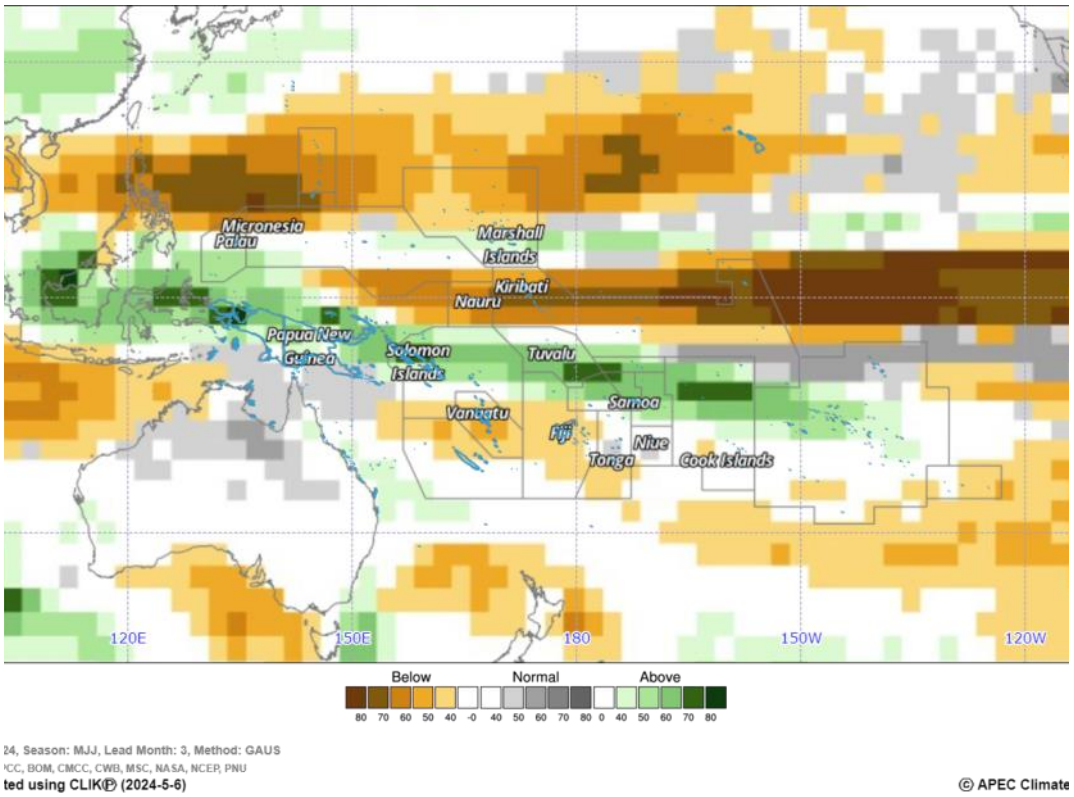
SEASONAL RAINFALL OUTLOOK

May—July 2024



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

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



TROPICAL CYCLONE

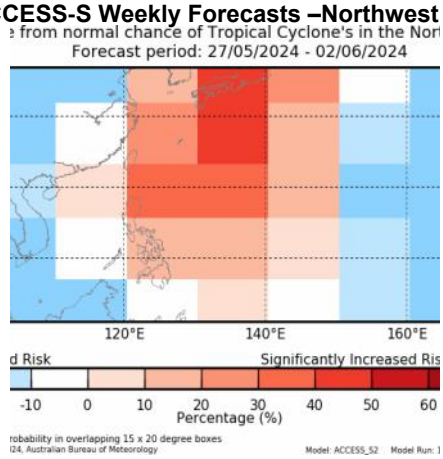
2023/2024 Season

The northwest Pacific tropical cyclone season is year-round, with most cyclones occurring between May and October. In the WNP, the genesis and track of TCs show a relationship with the ENSO cycle: activity typically shifts eastward during El Niño and westward during La Niña. In the southwest Pacific, the 2024-25 tropical cyclone season officially started on 1 November 2024. Seven TCs formed in the BOM forecast area (east of the tip of Cape York) to date (four severe) with one of the seven occurring in the pre-season month of October 2023. This is below the long term (1981/82-present) average of nine in terms of total numbers. The long term average for severe Category 3-5 events is four. Nine occurred in the NIWA forecast area (east of Darwin, five severe). The official season ended on 30 April 2024. There have been fewer TCs than forecast in the eastern SW Pacific basin (east of 165 °E) to date, while the western part of the basin experienced normal to reduced activity, as predicted. In the SW Pacific basin there has been a declining trend in the total number and severe TCs since 1981/82. The quieter than normal season contributes to this trend. In 2023, the TC pattern in the WNP was unconventional for an El Niño year. TC activity was well below normal with a distribution that did not follow expectations for an El Niño year.

It's important to remember that history shows that tropical cyclones can happen outside the normal cyclone season, and 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, especially if the system is slow-moving. Communities should remain vigilant, and follow forecast information provided by their National Meteorological and Hydrological Service (NMHS).

The weekly tropical cyclone forecasts from the ACCESS-S model show significantly increased risk over Palau, FSM, Guam, CNMI, Philippines and Japan for the week from 27 May to 2 June, and a near-normal (plus or minus 10%) to reduced risk for the northwest Pacific for the week from 3 to 9 June.

ACCESS-S Weekly Forecasts –Northwest Pacific



ACCESS-S Weekly Forecasts –Southwest Pacific

OUT OF SEASON

brated Tropical Cyclone outlc
are for November to April

OUT OF SEASON

alibrated Tropical Cyclone outlool
are for November to April

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/

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.

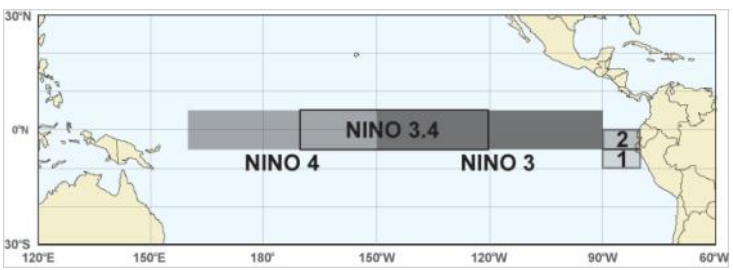
20 degrees Celsius Isotherm Depth

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