Monthly Climate Bulletin

October 2023

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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

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Issued 14 November 2023

- El Niño and positive Indian Ocean Dipole (IOD) continues.
- The Madden Julian Oscillation (MJO) is currently weak with climate models suggest it will strengthen and move eastwards across the western Pacific later this week.
- The ITCZ was much stronger than normal in the far eastern Pacific in association with El Niño.
- Sea surface temperatures (SST) for October 2023 were above average over almost all of the equatorial Pacific Ocean.
- The Coral bleaching Outlook to 26 November shows patches of area of 'Alert 1 and 2' over Nauru, southern RMI, Kiribati (Gilbert Islands, northern Phoenix Islands and northern Line Islands) and northern Tuvalu.
- For November 2023-January 2024, the models agree on above normal rainfall being likely or very likely in near-equatorial regions from southeastern FSM, eastwards over northern Solomon Islands, Nauru, southern RMI, northern Tuvalu, Kiribati (Gilbert, parts of the Phoenix and far northern Line Islands), and Tokelau. They also agree on below normal rainfall being likely or very likely for Palau, central FSM, central RMI, southern PNG, much of Australia, New Caledonia, Vanuatu, Fiji, Tonga, American Samoa, Niue, American Samoa, southern Cook Island, northeastern French Polynesia and Pitcairn Islands.
- The ACCESS-S weekly tropical cyclone outlook shows a significantly increased risk in the northwest Pacific between 11 November and 24 November around, Palau, FSM, Guam, CNMI and Philippines.

EL NIÑO–SOUTHERN OSCILLATION

El Niño and positive Indian Dipole continue

Click link to access Climate Driver Update issued on 8 November 2023

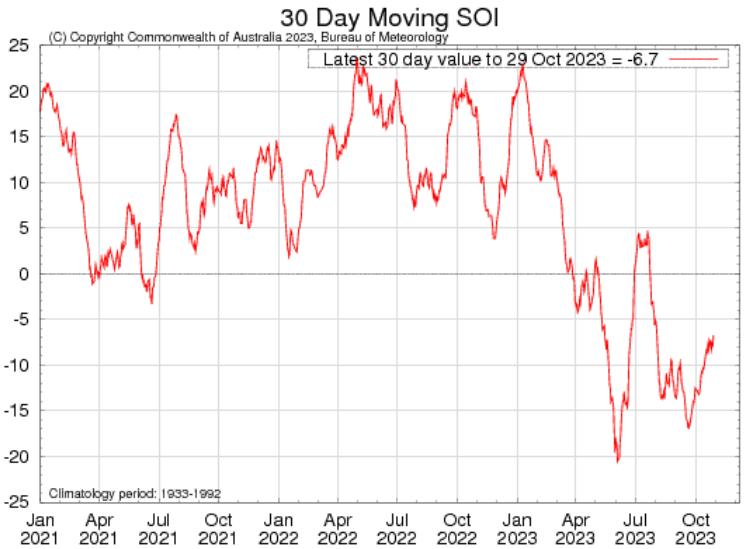
El Niño continues in the tropical Pacific. Higher than average sea surface temperatures (SSTs) in the tropical Pacific persist above El Niño thresholds, with warmer water beneath the surface to support that at the surface. In the atmosphere, cloud, wind and pressure patterns are consistent with El Niño.

The positive Indian Ocean Dipole (IOD) event continues. All models indicate that this positive IOD will likely persist into early December.

The Southern Annular Mode (SAM) index is currently positive with forecasts indicating it will return to neutral in the coming days.

Climate model forecasts indicate some further warming of the central to eastern Pacific is likely, with SSTs remaining above El Niño thresholds into the early southern hemisphere autumn 2024.

The 30-, 60- and 90-day Southern Oscillation Index (SOI) for the period ending 6 November were -8, -10 and -10, respectively.

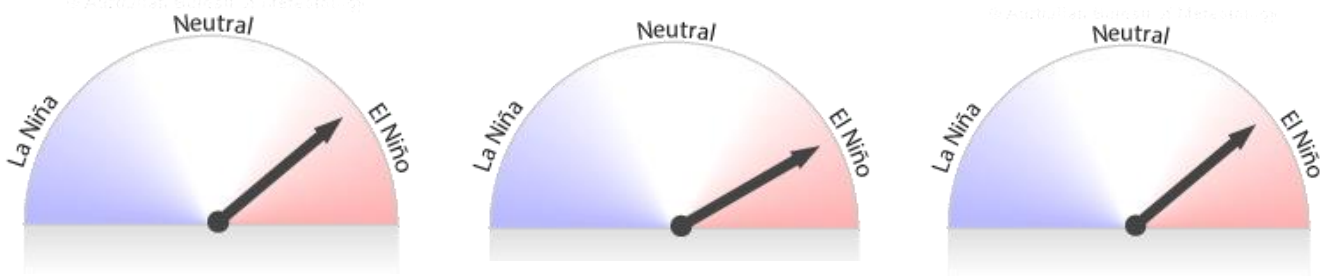


EL NIÑO–SOUTHERN OSCILLATION

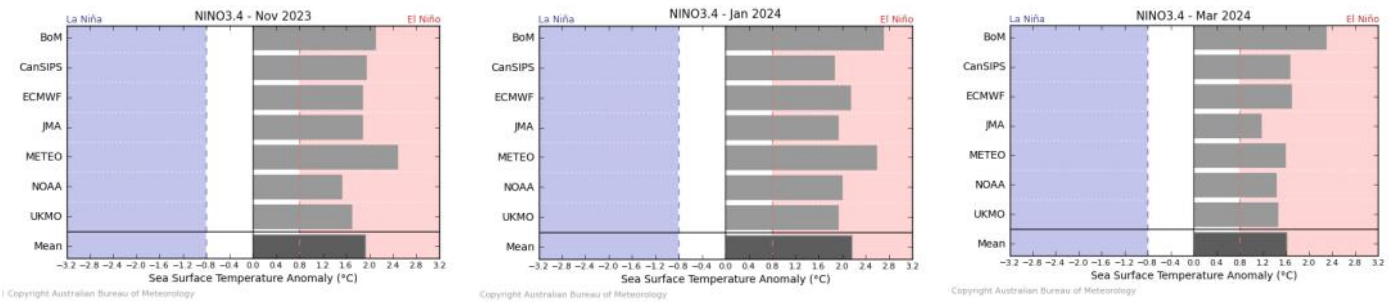
El Niño and positive Indian Dipole continue

Click link to access Climate Driver Update issued on 8 November 2023

Bureau of Meteorology NINO3.4 ENSO Model Outlooks for November, January and March



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

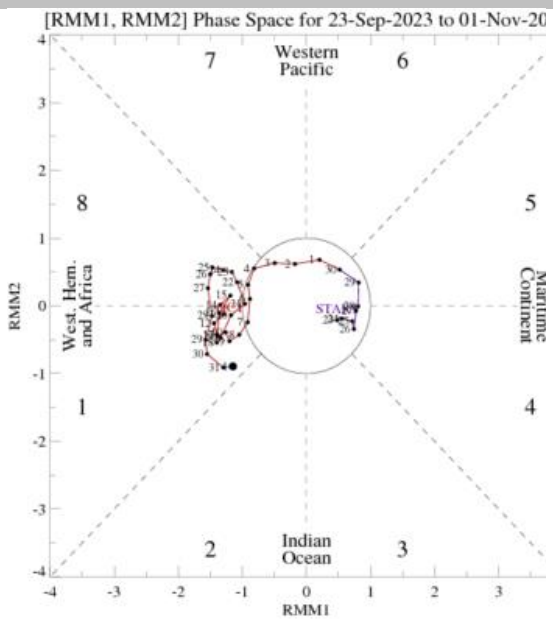
MADDEN–JULIAN OSCILLATION

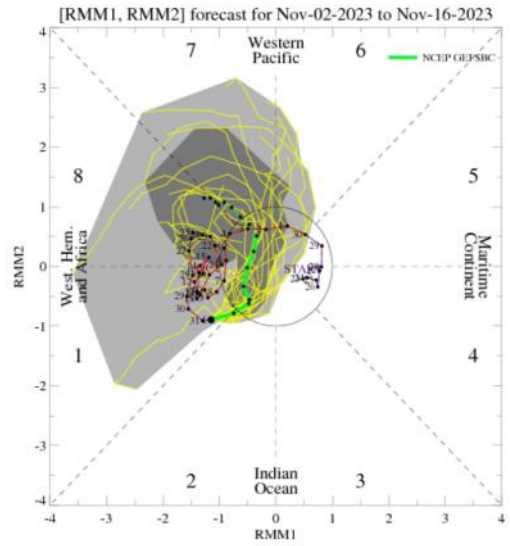
Click link to access *Tropical Climate Update* [Issued on Wednesday 8 November 2023]

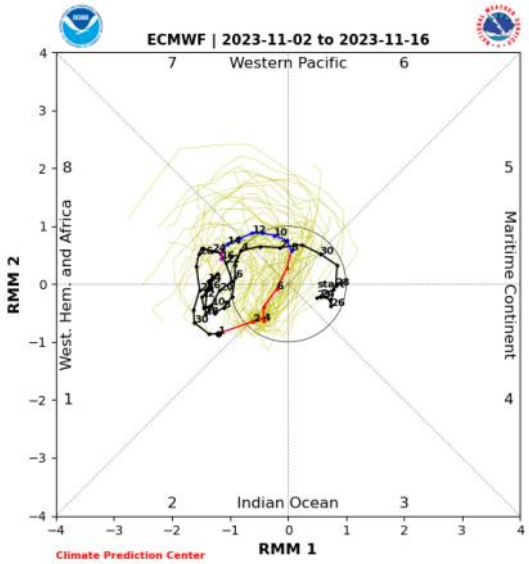
During October, the Madden Julian Oscillation (MJO) was mostly weak, with an active phase in the last week over the Western Pacific.

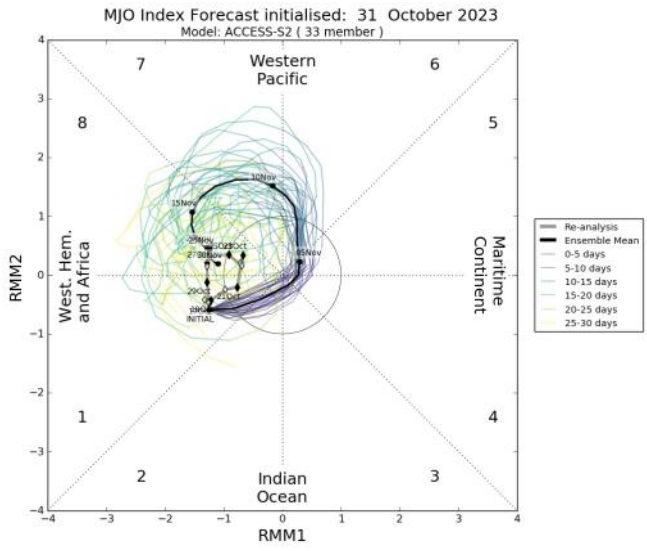
The Madden Julian Oscillation (MJO) is currently weak. Approximately half of international climate models suggest the MJO will strengthen and move eastwards across the western Pacific later this week.

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







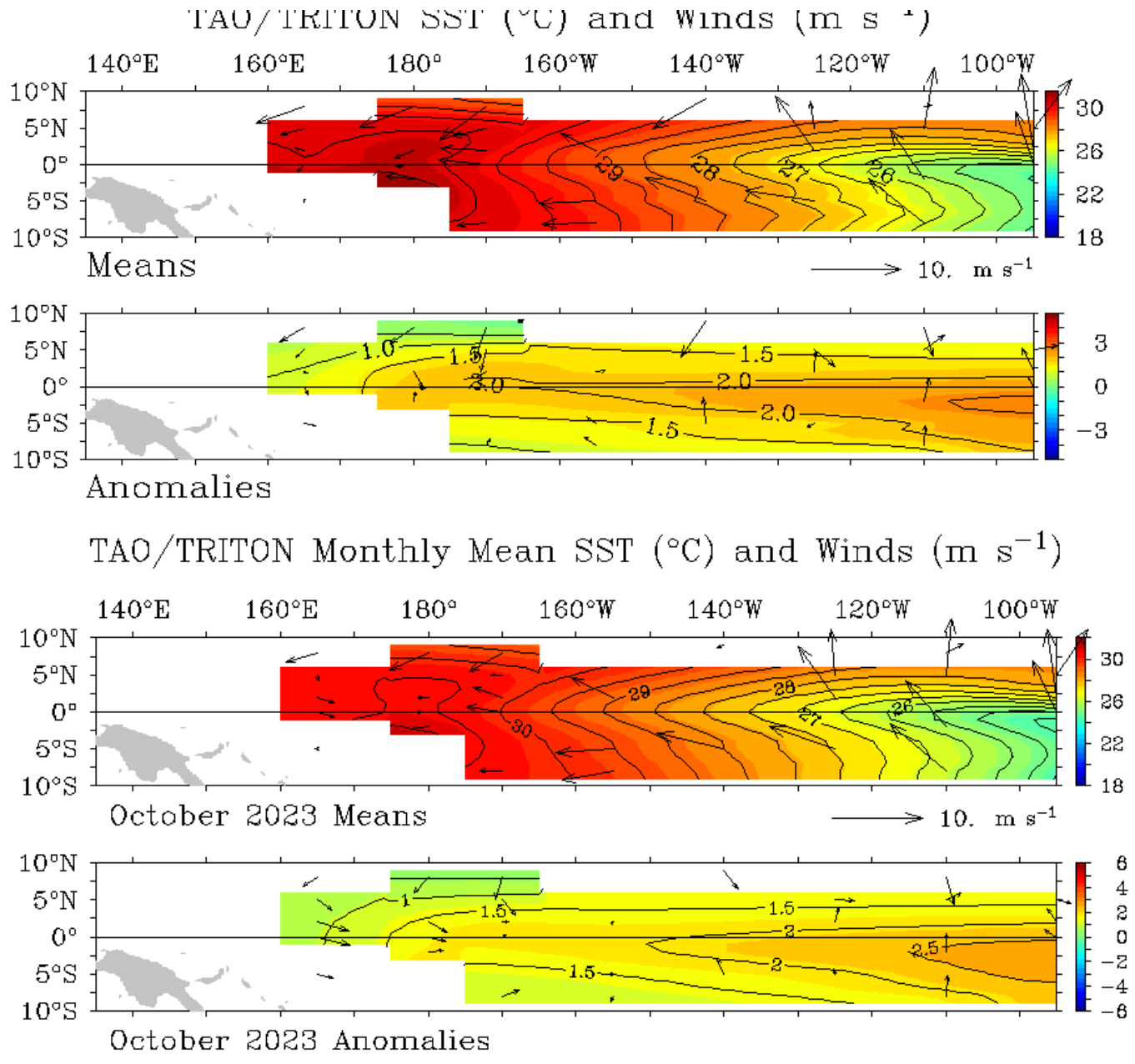


WIND

Click link to access Wind plots link

During October, the trade winds were generally weaker than normal across much of the western and central equatorial Pacific, with some westerly winds observed on the equator near the 160°E. For the five days ending 1 November 2023, the trade winds were close to normal across the 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.



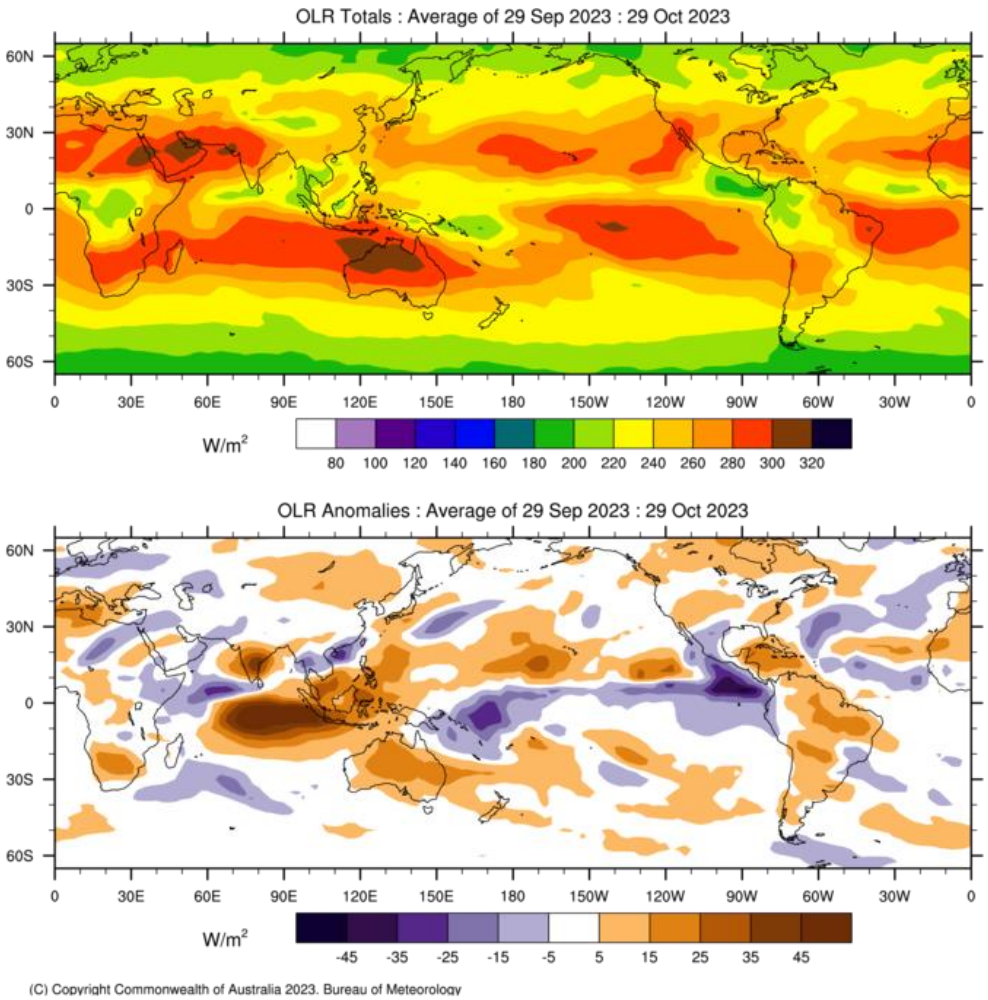
CLOUD AND RAINFALL

Click link to access OLR

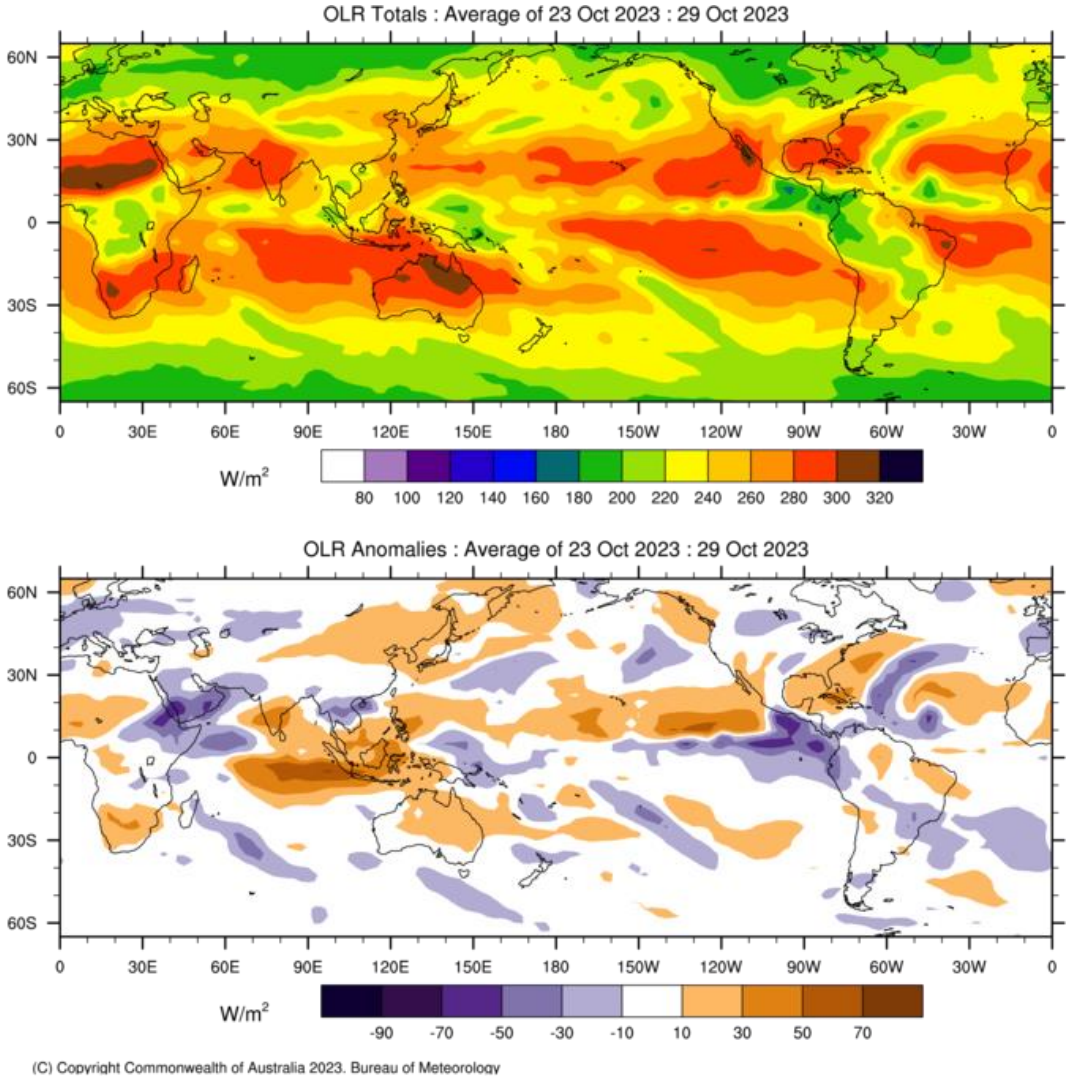
The October 30-day OLR anomaly map shows a region of low OLR (increased convection) along the Inter-tropical Convergence Zone (ITCZ) and around eastern PNG, Solomon Islands, Tuvalu, New Caledonia and Vanuatu. The most anomalous convection occurred off the west coast of South America, in association with the El Niño. Positive anomalies (reduced convection) were observed over Indonesia, Philippines, Guam, CNMI and RMI, with another band over Australia, Fiji, Samoa, Tonga, Niue and southern Cook Islands.

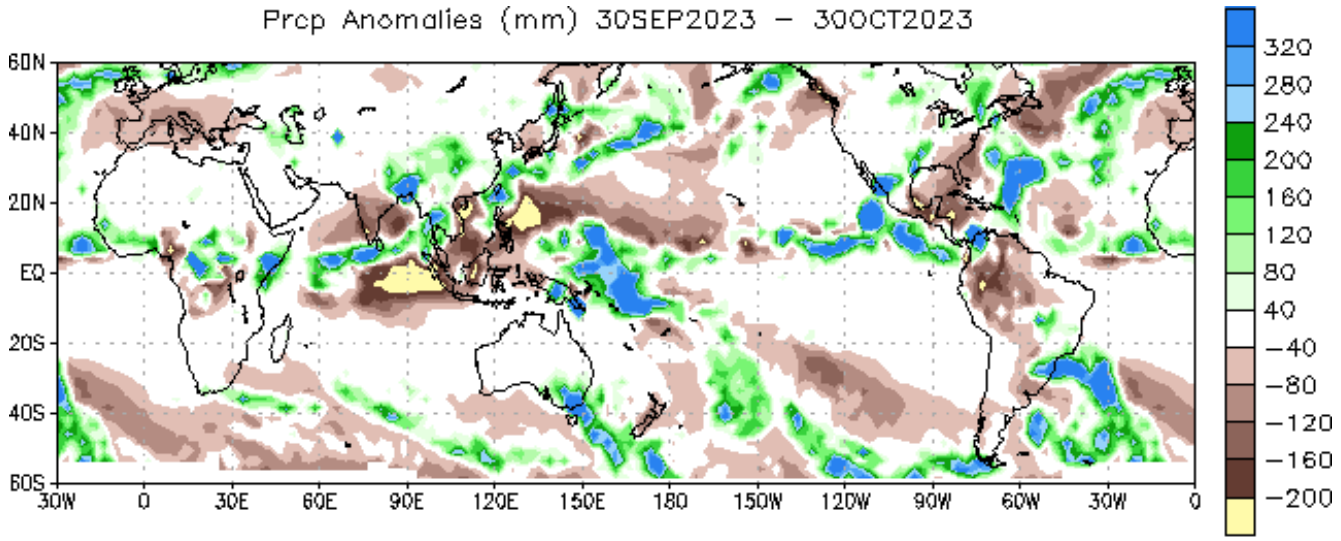
Note: Global maps of OLR below highlight regions experiencing increased or decreased cloudiness. The top panel is the total OLR in Watts per square metre (W/m^2) and the bottom panel is the anomaly (current minus the 1979-1998 climate average), in W/m^2. In the bottom panel, negative values (blue shading)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

OLR Total and Anomalies, 30 Day OLR



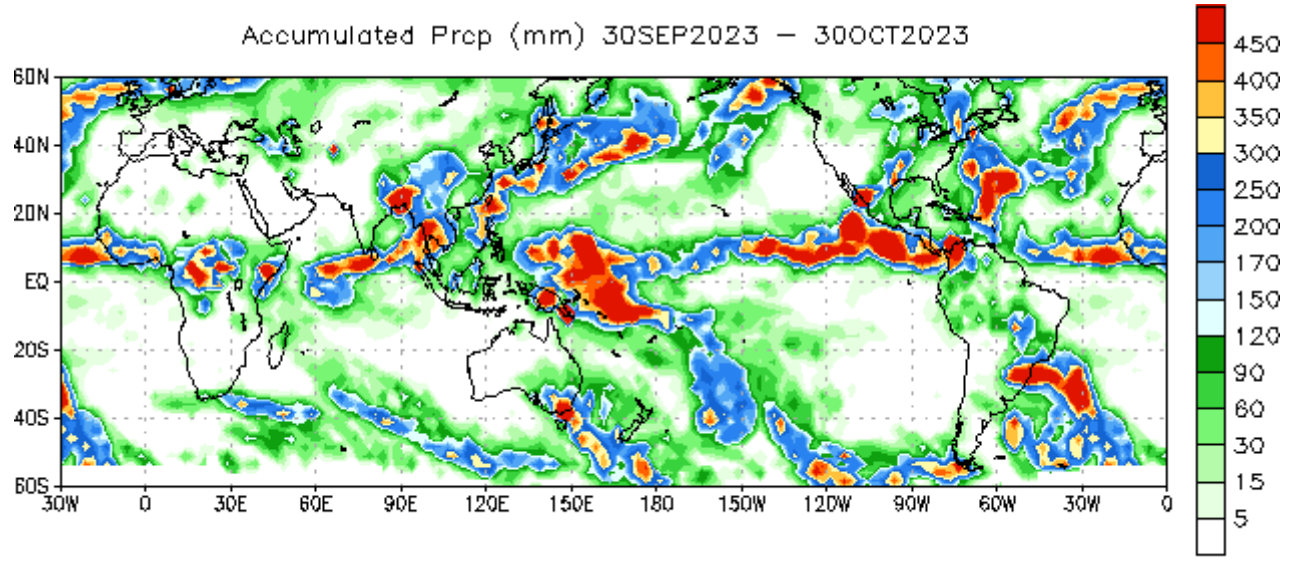
OLR Total and Anomalies, 7 Day OLR



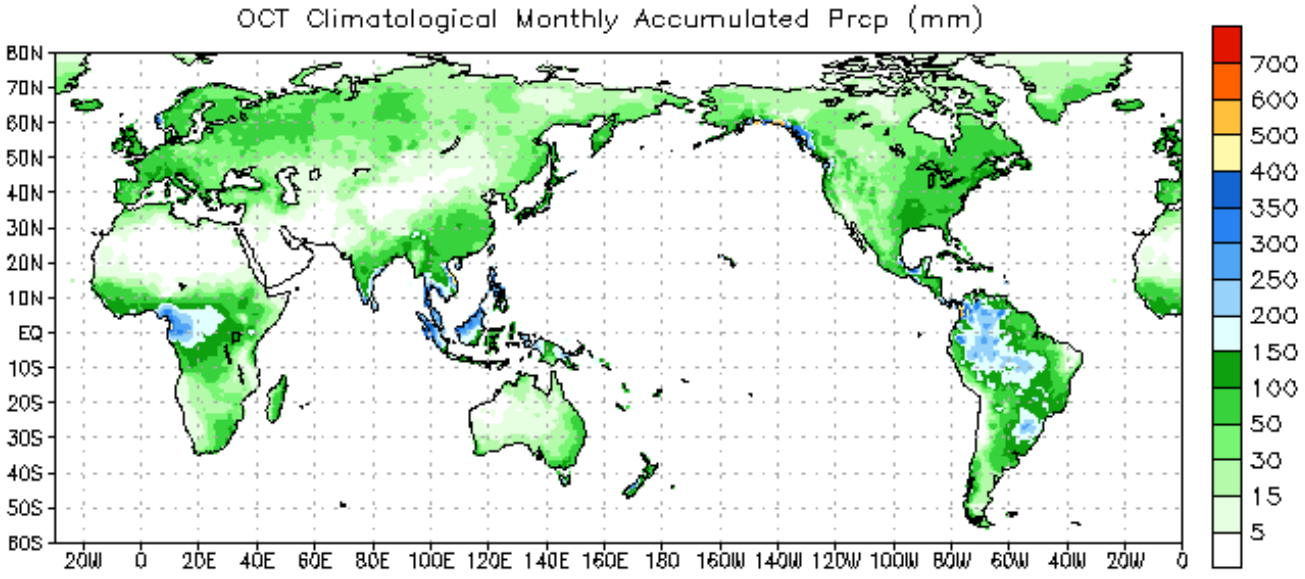


Data Source: NCEP CMAP Precipitation Climatology (1991–2020)

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

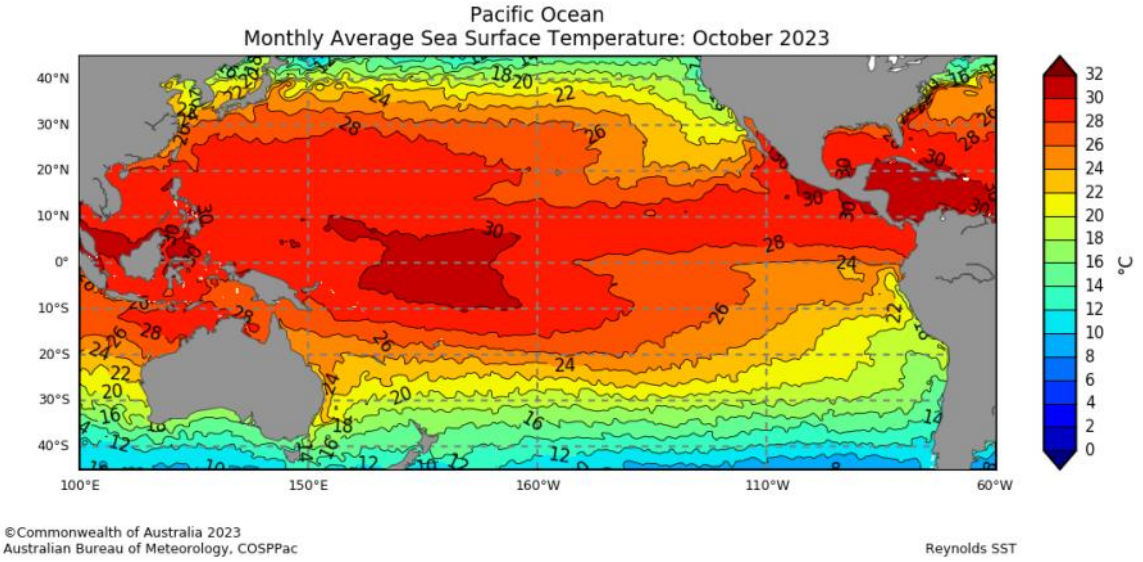
Sea surface temperatures (SST) for October 2023 were above average over almost all of the equatorial Pacific Ocean. SST anomalies more than +0.8 °C were present over much of the Pacific between 10°S and 10°N, increasing to up to +3 °C in parts of the western tropical Pacific and up to +4 °C in parts of the eastern tropical Pacific. Much of the central southern Pacific was also warmer than average for October.

Compared with September, warm anomalies intensified in the central tropical Pacific.

Warm SST anomalies also continued in the western Tasman Sea, including off most of the eastern coast of Australia, whilst weakening in eastern Tasman Sea. Warm anomalies to the west of Australia increased in extent with waters warmer than 2 °C above average off parts of the north-west coast of Western Australia.

Record-high October SSTs occurred in parts of northern and eastern Tuvalu, parts of Gilbert, Phoenix and Line Islands of Kiribati, Tokelau, northern American Samoa, and northern Cook Islands. The SST in decile 10 (very much above average) stretched from eastern Nauru to northern Samoa in the south and eastwards to Kiribati (Line Islands) and northern French Polynesia. Above average (8-9) decile are observed for majority of the Pacific Island Countries, spanning southeastward from Palau, FSM, RMI to eastern French Polynesia, and along the islands located near the equatorial region of the Pacific. Average SSTs (4-7) for October were observed in parts of Palau, western and southeastern FSM, PNG, western and southern Solomon Islands, Vanuatu Fiji, Tonga, Niue, southern Cook Islands and central French Polynesia. Patches of decile 2-3 (below average) were observed in parts of PNG Islands, New Caledonia, Vanuatu, Fiji, Tonga, Niue, southern Cook Islands, and central and south French Polynesia.

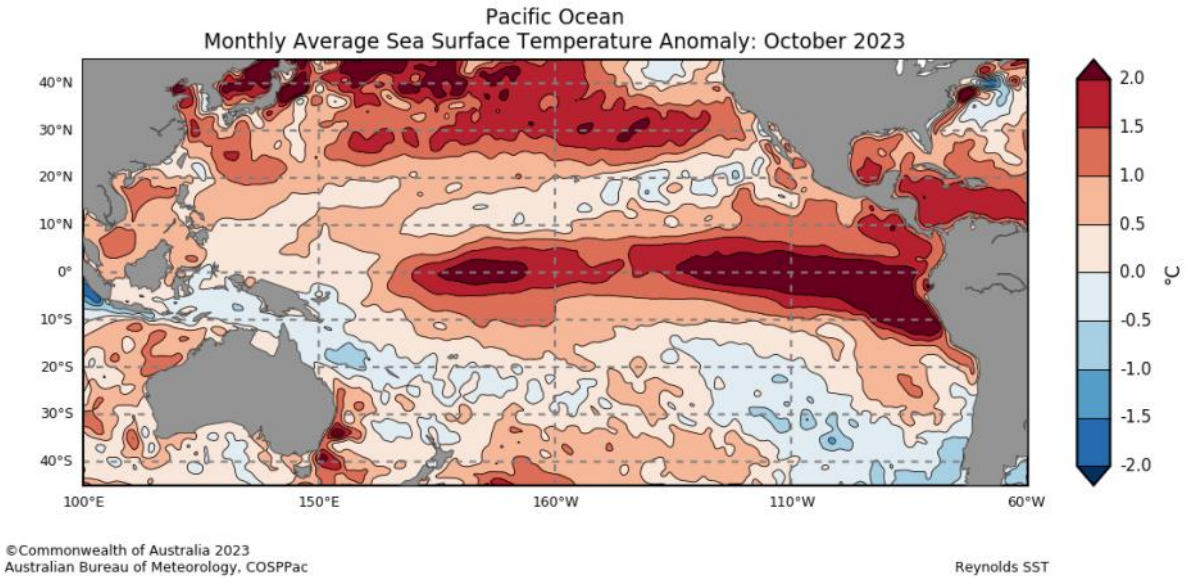
Mean Sea Surface Temperature



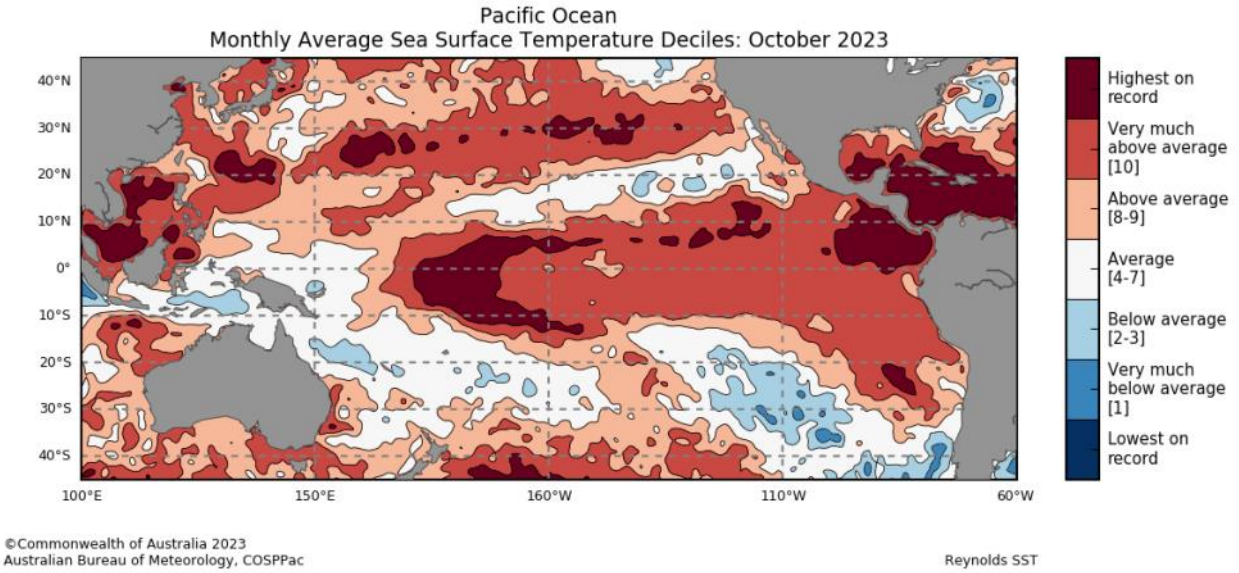
OCEAN CONDITIONS

Click link to access SEA SURFACE TEMPERATURE

Anomalous Sea Surface Temperature



Sea Surface Temperatures Deciles

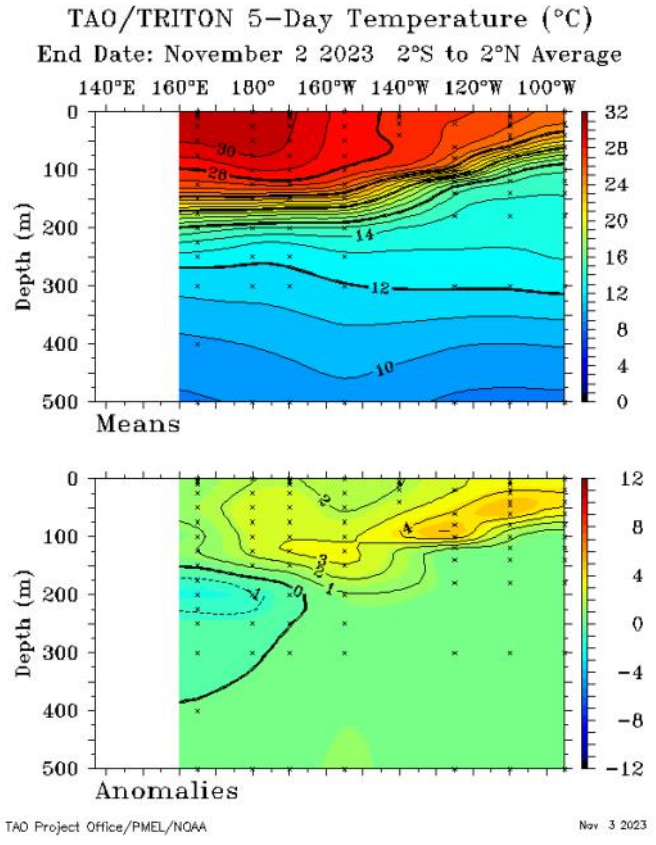


OCEAN CONDITIONS

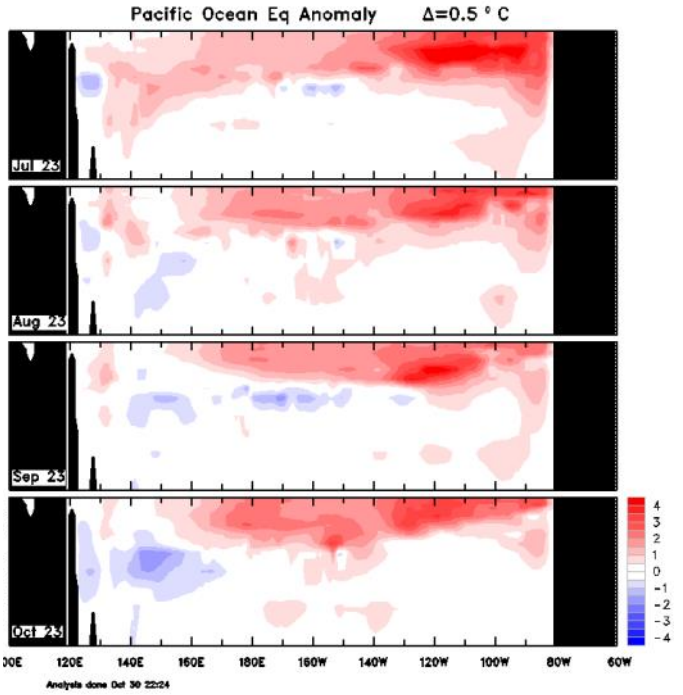
SUB SURFACE

The four-month sequence of equatorial Pacific sub-surface temperature anomalies (to 31 October 2023) shows warm anomalies across most of the top 100 m of the equatorial Pacific band, except in the far west. Anomalies increase in magnitude eastwards across the equatorial Pacific band, with the far west close to average, the central Pacific up to 2.5 °C warmer than average, and the eastern Pacific more than 2.5 °C warmer than average. The past 4 months have seen sub-surface heat shift towards the surface. Compared to July 2023. West of the Date Line, temperatures have decreased such that most of the water column is now close to average. Below average temperatures have started to appear between 100 m and 300 m depth west of 170°E.

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/

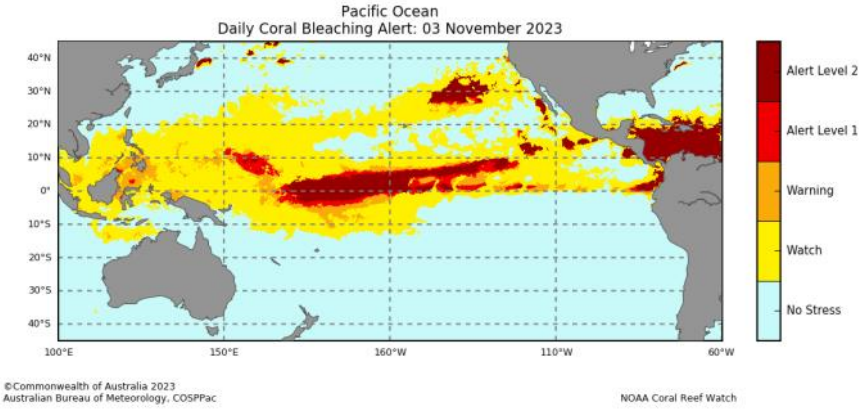
OCEAN CONDITIONS

CORAL BLEACHING

The daily Coral Bleaching Alert status for 07 November 2023 shows patches of 'Alert Level 1 and 2' for northeast FSM, far western RMI, Nauru, and Kiribati (Gilbert Islands, northern Phoenix Islands and northern Line Islands). Patches of 'Warning' over Palau, western FSM, northern Tuvalu and patches over northern PNG and Tokelau. The four-week Coral Bleaching Outlook to 26 November shows patches of area of 'Alert 1 and 2' over Nauru, southern RMI, Kiribati (Gilbert Islands, northern Phoenix Islands and northern Line Islands) and northern Tuvalu. 'Watch to Warning' ratings from southern Palau, FSM, western and southern RMI, northern PNG, northern Solomon Islands, northern Fiji, most of Tuvalu, Kiribati (southern Line Islands) Tokelau, Wallis and Futuna, northern Samoa, northern American Samoa, and northern Cook Islands.

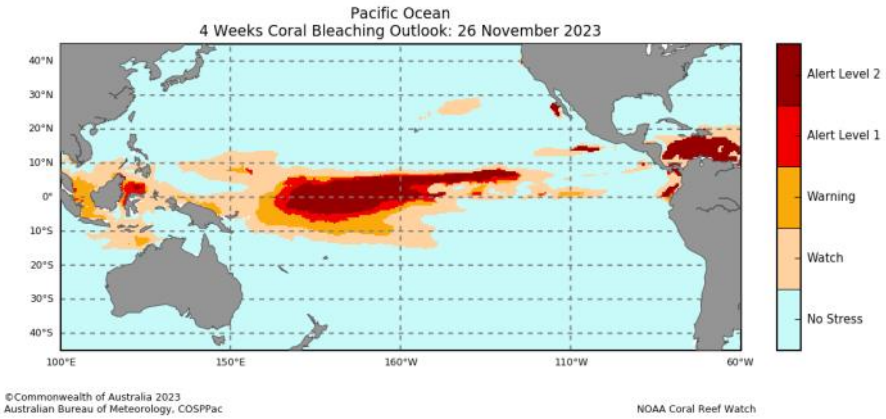
Daily Coral Bleaching Alert

(Source: Pacific Community COSPPac Ocean Porta Coral Bleaching)



4 Weeks Coral Bleaching Outlook

(Source: Pacific Community COSPPac Ocean Portal)



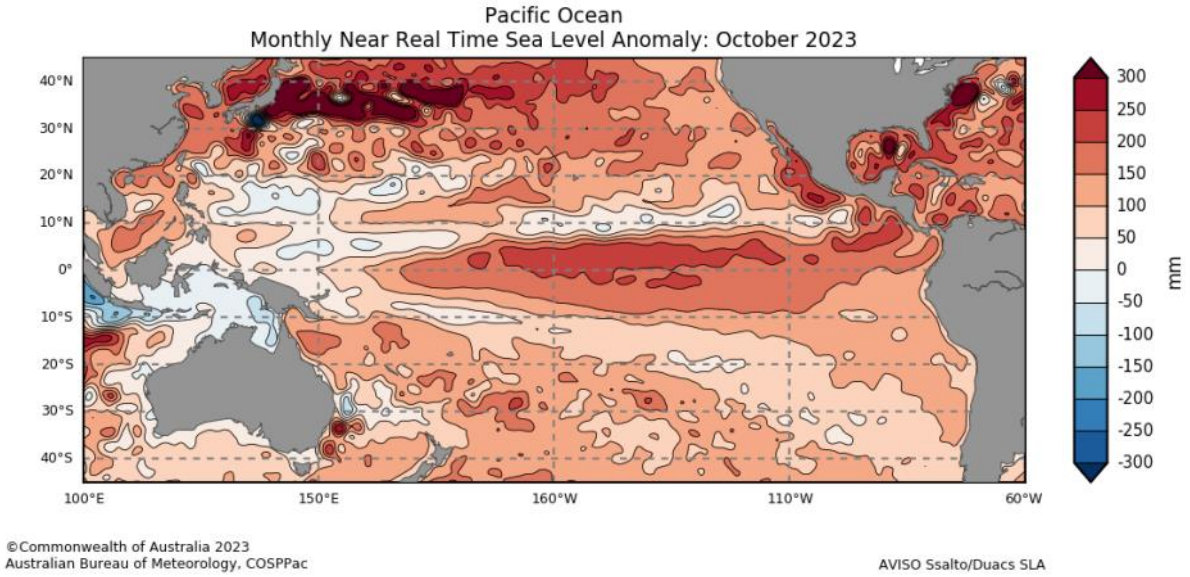
OCEAN CONDITIONS

OCEAN SURFACE CURRENTS AND SEA LEVEL

Sea level in October was above normal over COSPPac countries. Anomalies above +250 mm were observed in Kiribati (northern Line Islands) and patches over southern Fiji, southern Tonga. Areas of +150 to +200 were observed in Nauru, northern RMI, Kiribati and from southeastern PNG to southern French Polynesia. Anomalies of +50 to +100 mm were observed in most of the COSPPac countries, apart from patches of below normal sea level anomalies observed in central FSM, southern RMI, and, patches over eastern Australia and southern New Caledonia.

Monthly Sea Level Anomalies

Source: Pacific Community COSPPac Ocean Portal

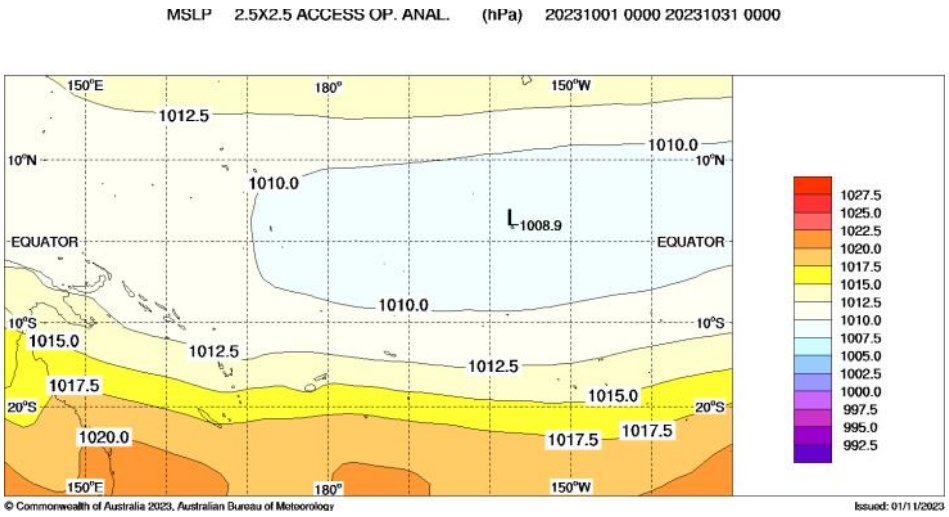


MEAN SEA LEVEL PRESSURE

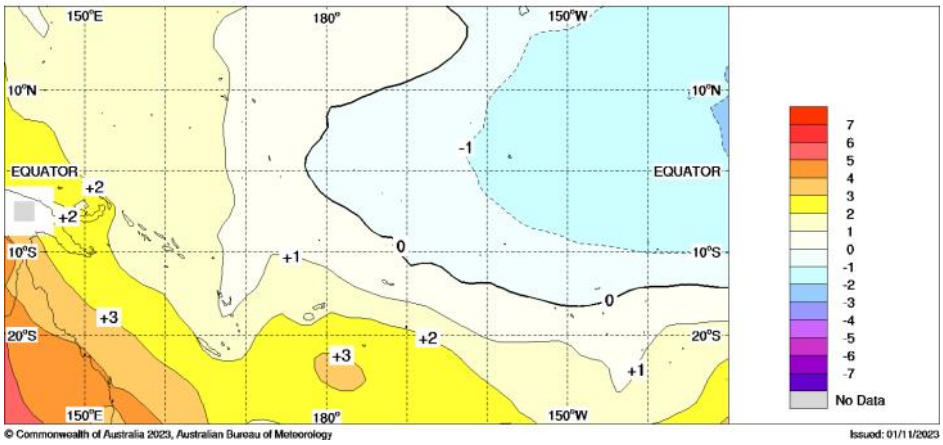
The October mean sea level pressure (MSLP) anomaly map shows mostly positive anomalies of 1 hPa or greater west of Vanuatu towards Australia, and over Fiji and Niue towards New Zealand. Negative anomalies of 1 hPa or greater were evident west of 163° W, especially over eastern Kiribati.

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

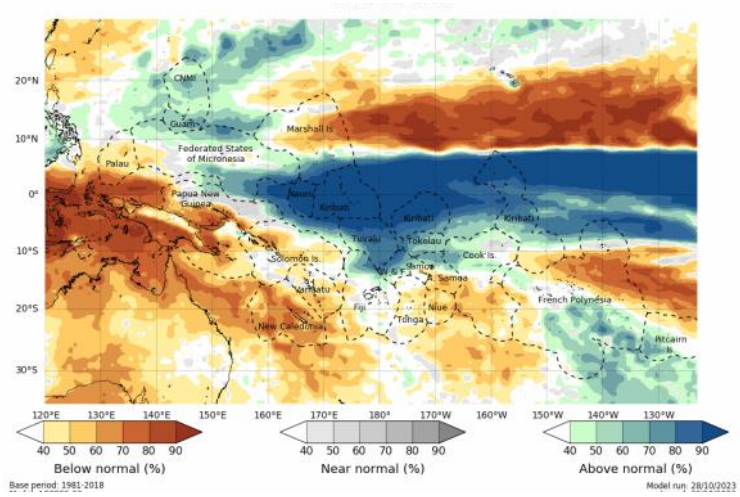
SEASONAL RAINFALL OUTLOOK

November 2023—January 2024

The ACCESS-S model forecast for November 2023, shows below normal rainfall is likely or very likely for Palau, PNG, Solomon Islands, central RMI, Australia, New Caledonia, Vanuatu, southwestern Fiji, Tonga, Niue, Samoa, southern American Samoa, southern Cook Islands, far southern Line Islands and much of northern French Polynesia. Above normal rainfall is likely or very likely for CNMI, Guam, most of FSM, southern RMI, northern Fiji, Nauru, the remainder of Kiribati, Tuvalu, Wallis and Futuna, Tokelau, northern American Samoa, northern Cook Islands, southern French Polynesia, and Pitcairn Islands.

The three-month rainfall outlook (November 2023-January 2024) is very similar to the November outlook, but with the below normal rainfall region being stronger over Palau to central FSM and northern RMI, and in the southern hemisphere from New Caledonia to southern Cook Islands. Above normal rainfall region also more intense from PNG's eastern EEZ to Kiribati and northern French Polynesia.

Monthly ACCESS-S Maps



The Copernicus multi-model outlook for November 2023-January 2024 favours above normal rainfall for PNG's Islands region, Solomon Islands, Nauru, southern RMI, Tuvalu, Kiribati (Gilbert, Phoenix and Line Islands), Tokelau, and far northern Coo Islands. Below normal rainfall is likely or very likely for Palau, CNMI, Guam, FSM, central and northern RMI, PNG's southern mainland, northern Australia, New Caledonia, Vanuatu, Fiji, Tonga, Niue, American Samoa, southern Cook Islands, French Polynesia and Pitcairn Islands.

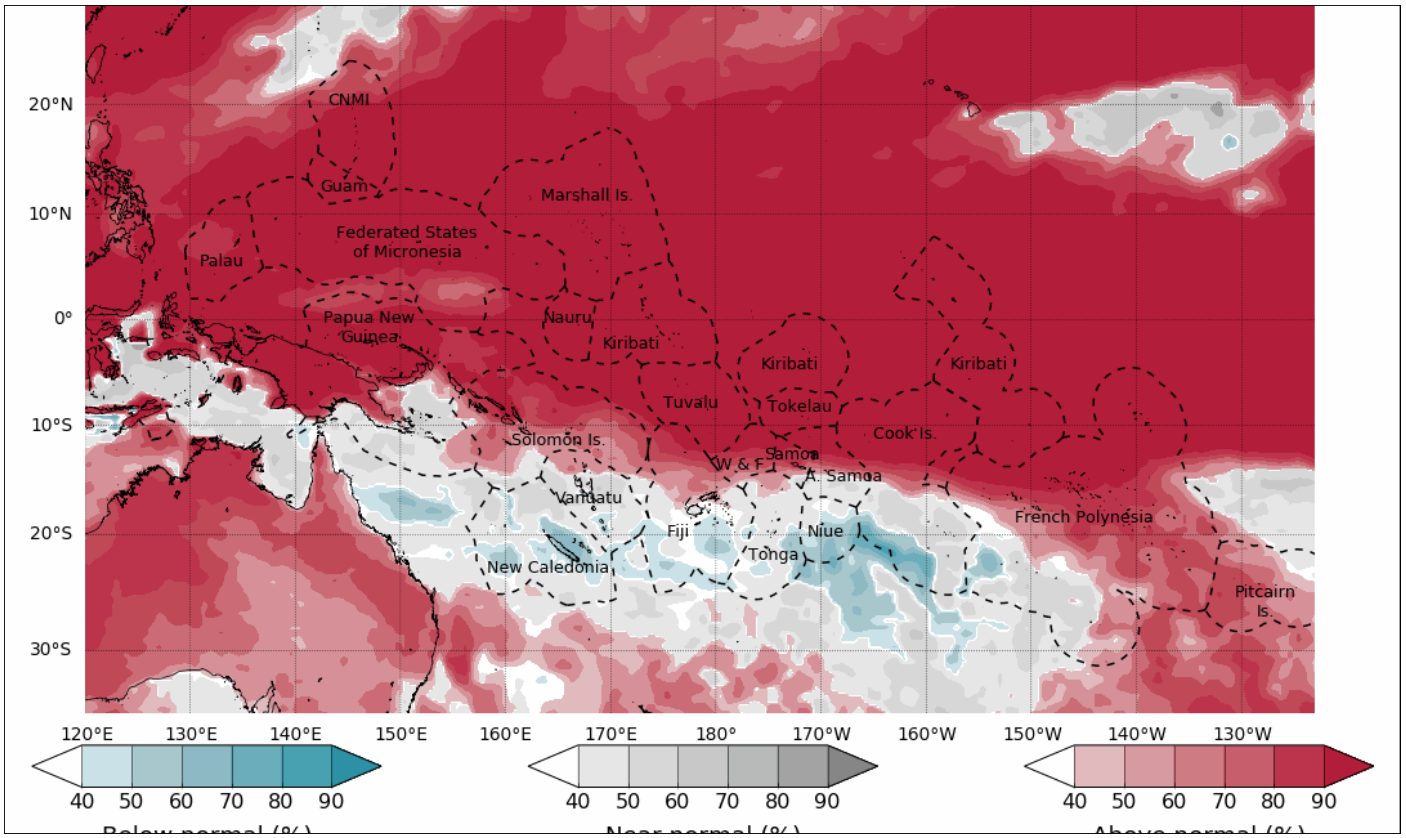
The APEC Climate Centre multi-model outlook (November 2023 - January 2024) shows above normal rainfall is likely or very likely from PNG's Islands region to southeastern FSM, Nauru, southern RMI, northern Solomon Islands, northern Tuvalu, Kiribati (Gilbert, some of the Phoenix and far northern Line Islands), and northern Tokelau. Below normal rainfall is likely or very likely for CNMI, Guam, eastern and northern FSM, central RMI, most of Australia, New Caledonia, Vanuatu, Fiji, Tonga, Wallis and Futuna, Samoa, Niue, American Samoa, central and northern Cook Islands, northeastern French Polynesia and Pitcairn Islands.

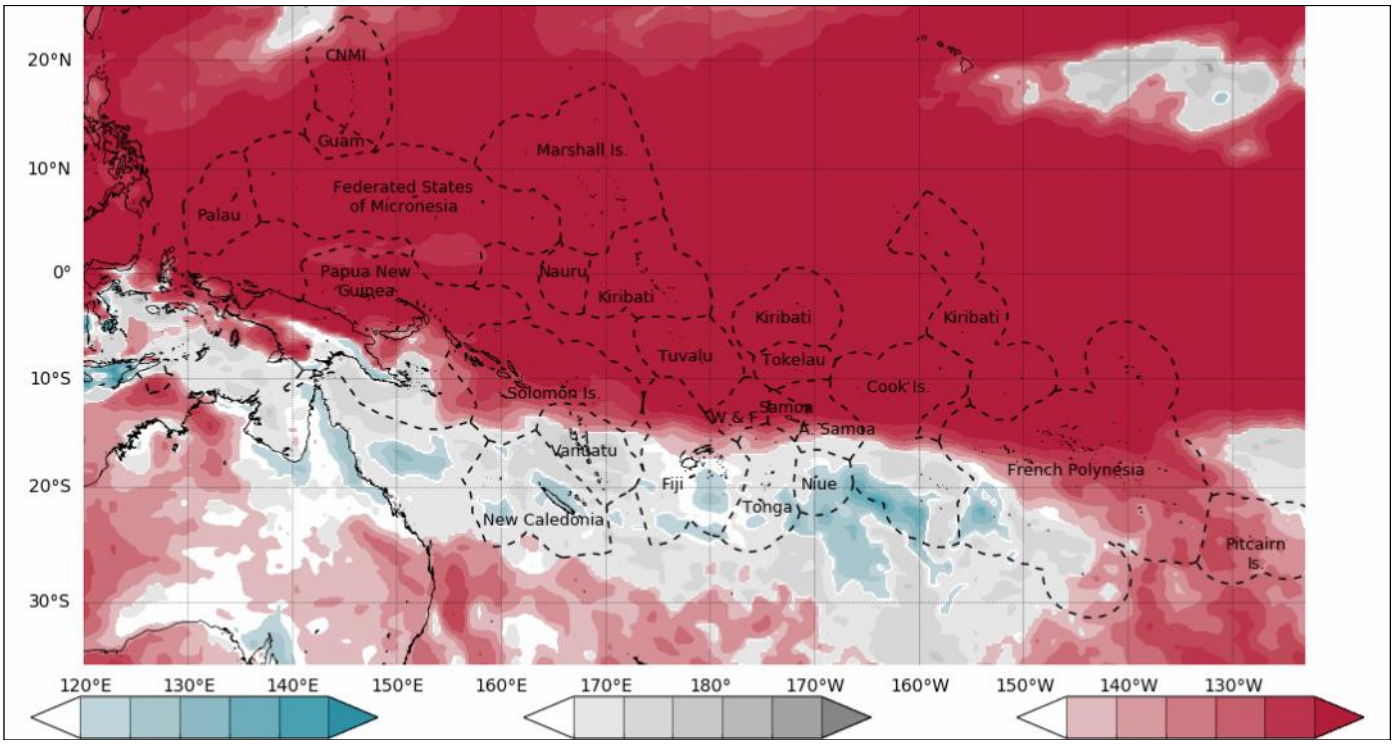
For November 2023-January 2024, the models agree on above normal rainfall being likely or very likely in near-equatorial regions from southeastern FSM, eastwards over northern Solomon Islands, Nauru, southern RMI, northern Tuvalu, Kiribati (Gilbert, parts of the Phoenix and far northern Line Islands), and Tokelau. They also agree on below normal rainfall being likely or very likely for Palau, central FSM, central RMI, southern PNG, much of Australia, New Caledonia, Vanuatu, Fiji, Tonga, American Samoa, Niue, American Samoa, southern Cook Island, northeastern French Polynesia and Pitcairn Islands.

SEASONAL TEMPERATURE OUTLOOK

November 2023—January 2024

Monthly Tmax and Tmin ACCESS-S Maps

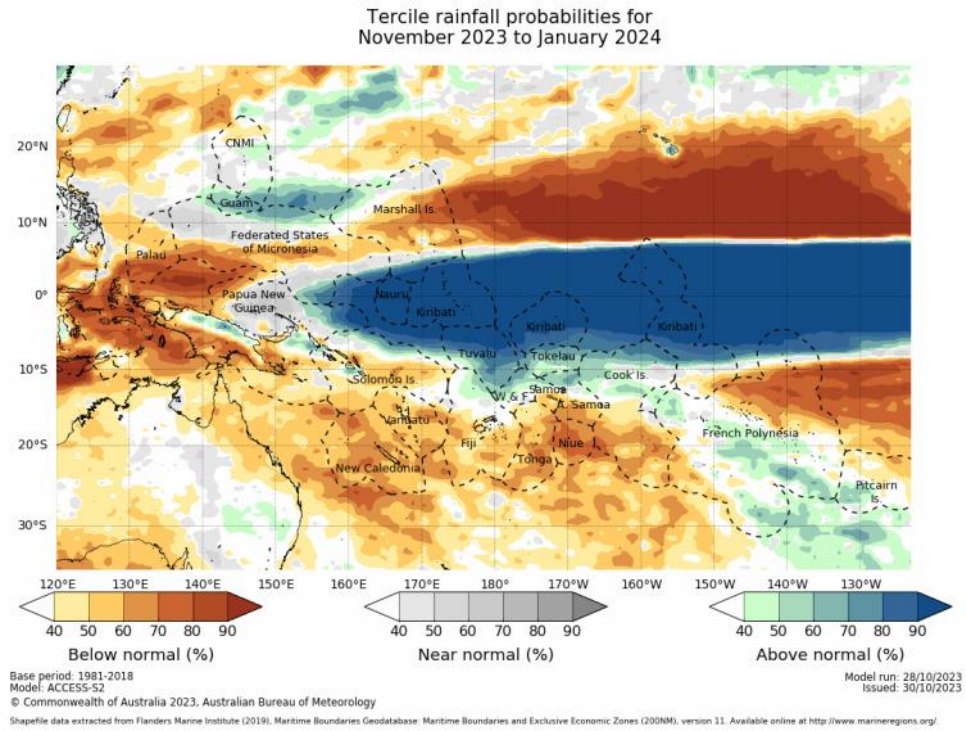


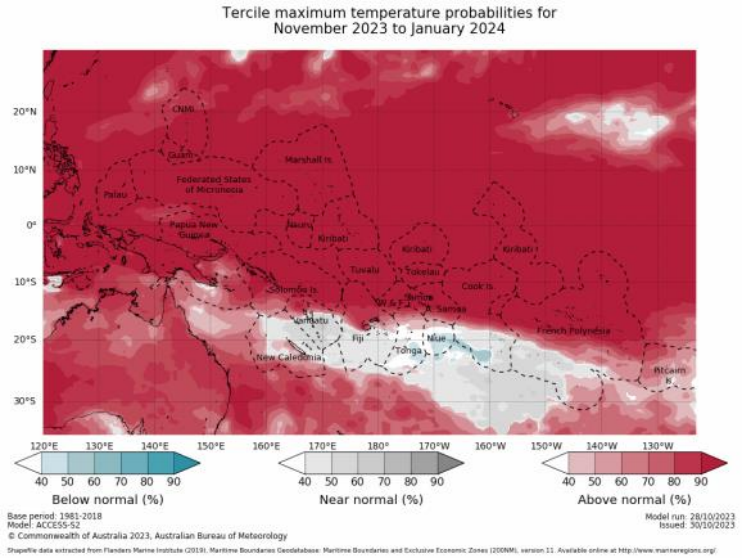


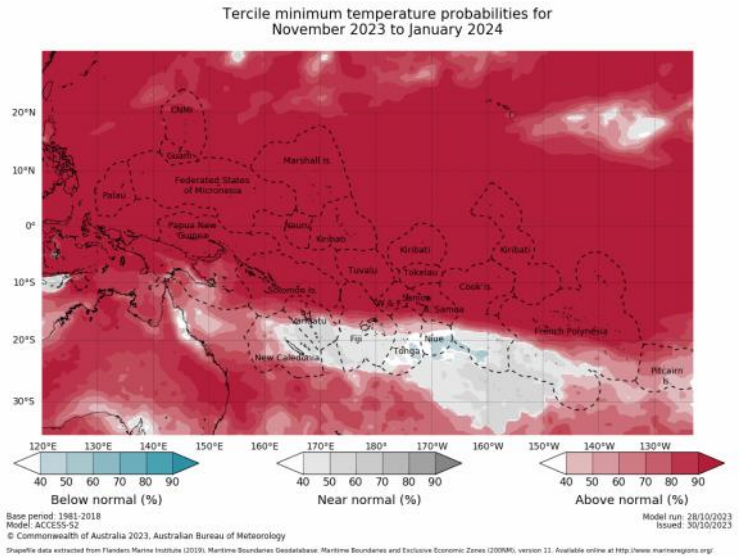
SEASONAL RAINFALL OUTLOOK

November 2023—January 2024

Seasonal ACCESS-S maps



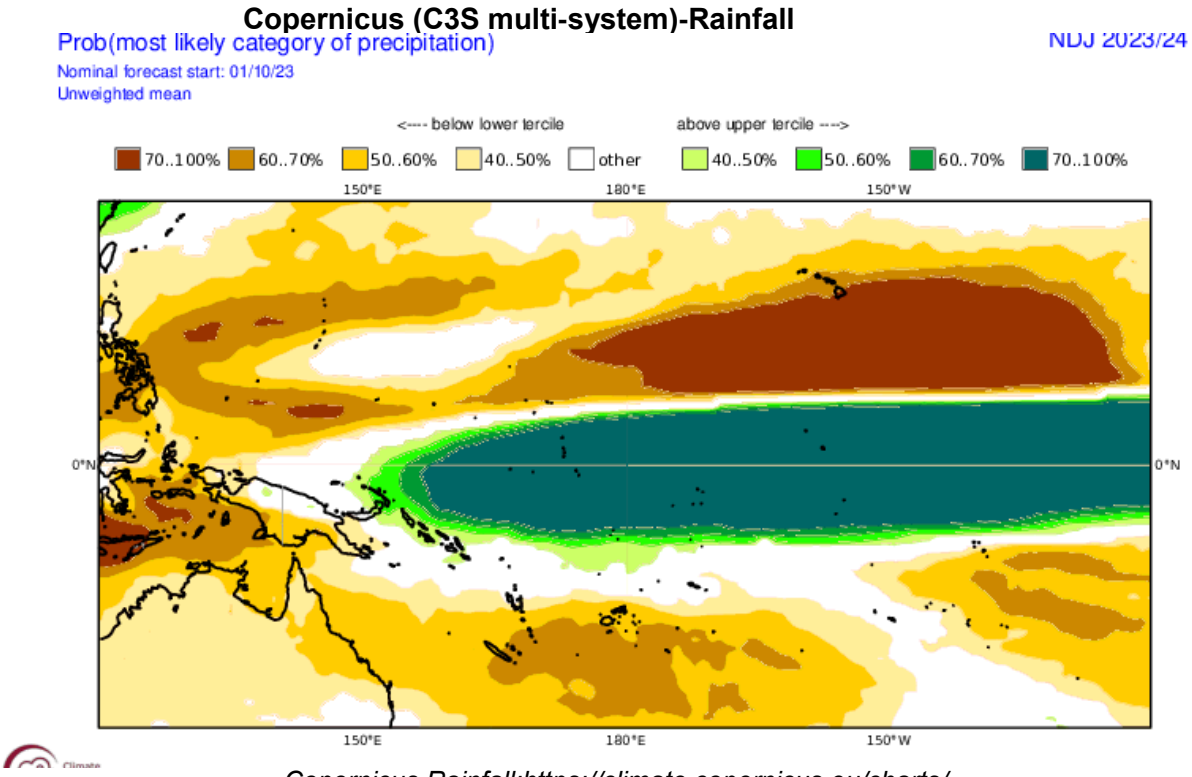




'About ACCESS-S http://access-s.clide.cloud/

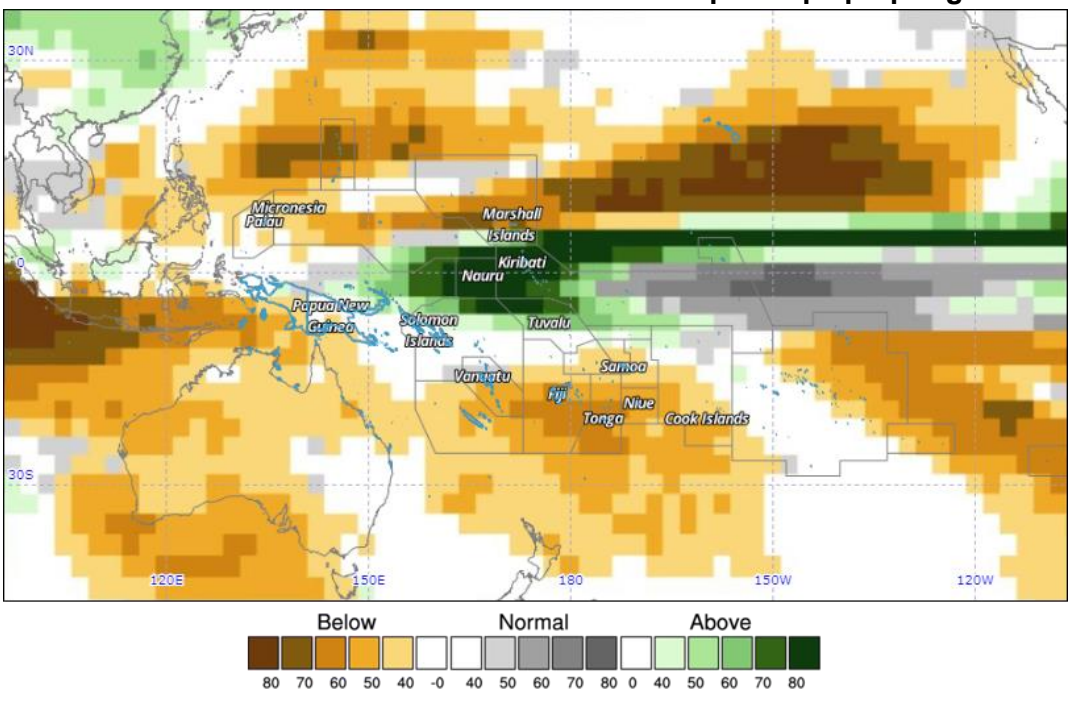
SEASONAL RAINFALL OUTLOOK

November 2023—January 2024



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

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



Year: 2023, Season: NDJ, Lead Month: 3, Method: GAUS
Model: APCC, BOM, CMCC, MSC, NASA, NCEP, PNU
Generated using CLIK® (2023-11-11)

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TROPICAL CYCLONE

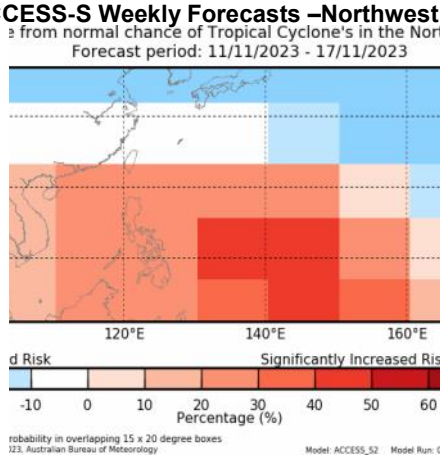
2023/2024 Season

The northwest Pacific tropical cyclone season is year round, with most cyclones occurring between May and October. Sixteen named TCs have occurred as of 20 October. In the southwest Pacific, the 2023-24 tropical cyclone season started on 1 November 2023. The outlook for the season favoured normal-to-enhanced risk for TC activity in the eastern part of the basin; normal-to-reduced TC activity is forecast in the western part of the basin. Several severe TCs are possible anywhere in the basin. Notably, the first TC of the South Pacific season (Lola) formed earlier than normal on 22 October in the eastern Solomon Islands. Lola intensified into a severe TC on 23 October, tracking toward northern Vanuatu.

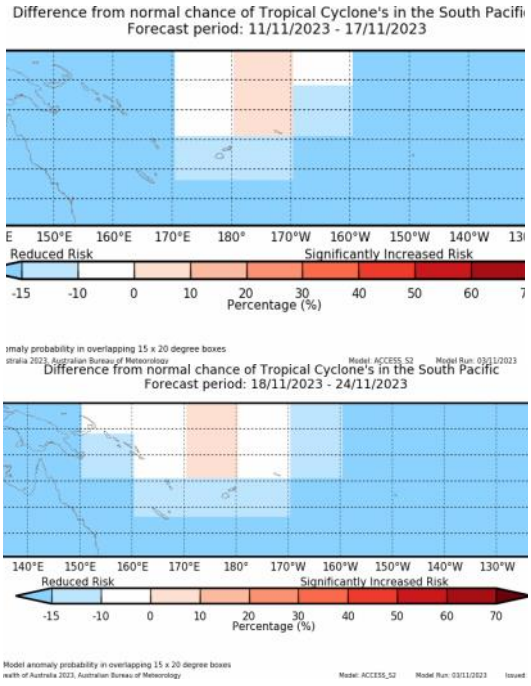
It's important to remember that history showed that TC can happen outside the normal cyclone season and it does not take a severe cyclone to produce severe impacts. Coastal and river flooding rainfall can occur with a distant, weak, or former cyclone, especially if the system is slow-moving. Communities should remain vigilant, and follow forecast information provided by their National Meteorological and Hydrological Service (NMHS).

The weekly tropical cyclone forecast from the ACCESS-S model shows a significantly increased risk in the northwest Pacific between 11 November and 24 November around, Palau, FSM, Guam, CNMI and Philippines.

ACCESS-S Weekly Forecasts –Northwest Pacific



ACCESS-S Weekly Forecasts –Southwest Pacific



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.

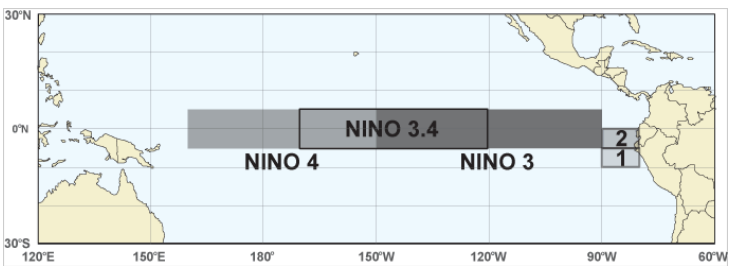
20 degrees Celsius Isotherm Depth

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