

Monthly Climate Bulletin

January 2024



ISSN: 2617-3557

Photo Credit: Molly Powers (SPC) Samoa Tide Gauge





CONTENTS

Summary	2
El Niño–Southern Oscillation	3
Madden–Julian Oscillation	4
Wind	5
Cloud and Rainfall	6
Oceanic Conditions	9
Mean Sea Level Pressure	13
Model Outlooks	14
Cyclones	17
Further Information	18

Issued 12 February 2024

- The El Niño continues in the tropical Pacific Ocean. Model forecasts and observations indicate sea surface temperatures in the central tropical Pacific have peaked and are now declining.
- The Madden Julian Oscillation (MJO) is currently over the central Pacific.
- The ITCZ and SPCZ were both active in January.
- Sea surface temperatures (SSTs) for January 2024 were warmer than average across the tropical Pacific Ocean.
- The Coral bleaching Outlook to 25 February shows 'Alert 2' over eastern Australia, western New Caledonia, eastern Solomon Islands, northern Fiji, eastern Tuvalu, Kiribati (eastern Gilbert Islands, and southern Phoenix Islands), and Tokelau.
- For February to April 2024, the models agree on below normal rainfall being likely or very likely for Palau, Guam, CNMI, FSM, RMI, southern PNG EEZ, southern Solomon Islands, New Caledonia, Vanuatu, much of Fiji, most part of Tonga and Niue, northeastern French Polynesia, and Pitcairn Islands. In addition, there's model agreement on above normal rainfall being likely or very likely in near-equatorial regions from PNG mainland plus Islands eastward to Solomon Islands, Nauru, Tuvalu, Kiribati (Gilbert, Phoenix, most of Line Islands), Tokelau, the far northern Cook Islands, and most of French Polynesia.
- The ACCESS-S weekly tropical cyclone outlook shows significant increased risk in the southwest Pacific between 10 and 23 February. The risk is near-normal in the northwest Pacific for the same period.

© SPREP 2024

This copyright statement protects our work from commercial exploitation, while ensuring that the information can be freely used for scientific, educational or research purposes, provided SPREP and the source document are acknowledged.



EL NIÑO–SOUTHERN OSCILLATION

El Niño ocean warmth past its peak as Indian Dipole returns to neutral

Click link to access [Climate Driver Update issued on 6 February 2024](#)

The El Niño continues in the tropical Pacific Ocean. Model forecasts and observations indicate sea surface temperatures in the central tropical Pacific have peaked and are now declining. Sea surface temperatures in the tropical Pacific are expected to return to neutral El Niño-Southern Oscillation (ENSO) levels in the southern hemisphere autumn 2024. Most atmospheric indicators are close to normal levels, although trade winds have temporarily weakened in line with the passage of the Madden-Julian Oscillation through the region.

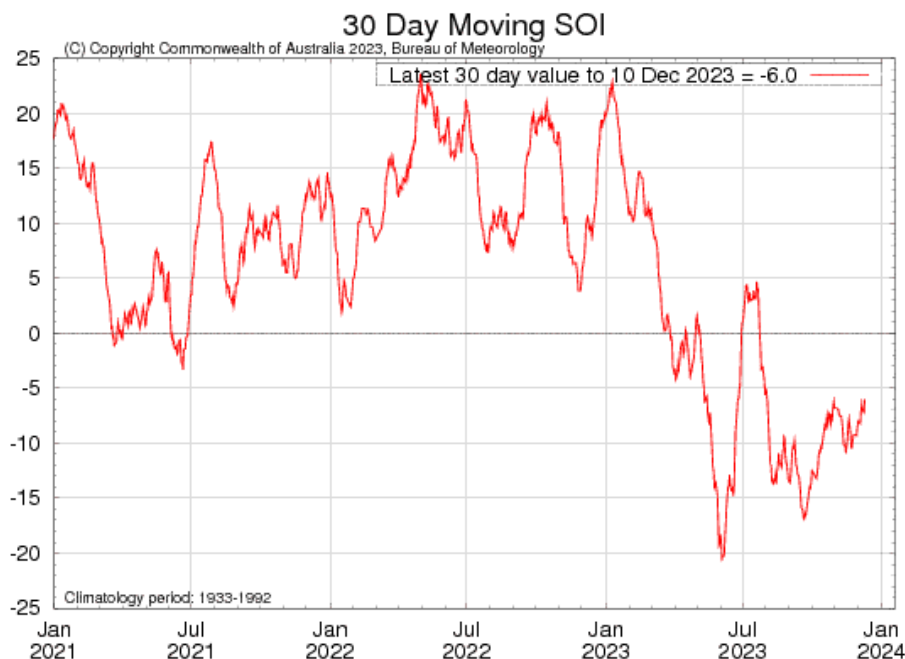
The positive Indian Ocean Dipole (IOD) has returned to neutral, with the latest weekly IOD index (to 4 February 2024) being below +0.4 °C (the positive IOD threshold) for the second consecutive week. IOD events typically break down as the monsoon trough shifts south into the southern hemisphere. Due to the strength of the positive IOD in 2023, the event decay has been later than usual. The majority of model forecasts indicate the IOD will be neutral until at least April, consistent with the annual cycle of the IOD.

The Southern Annular Mode (SAM) is currently neutral. Forecasts suggest it will remain mostly neutral over the coming fortnight.

The World Meteorological Organization (WMO) has confirmed that 2023 was the warmest year on record. The WMO estimated global temperatures in 2023 were $1.45 \pm 0.12^\circ\text{C}$ above the 1850-1900 average, exceeding the previous record warm years of 2016 and 2020, with $1.29 \pm 0.12^\circ\text{C}$ and $1.27 \pm 0.12^\circ\text{C}$ respectively.

Global sea surface temperatures (SSTs) were highest on record for all respective months between April 2023 and January 2024.

The 30-, 60- and 90-day Southern Oscillation Index (SOI) for the period ending 7 January 2024 were +1, -1 and -3, respectively.



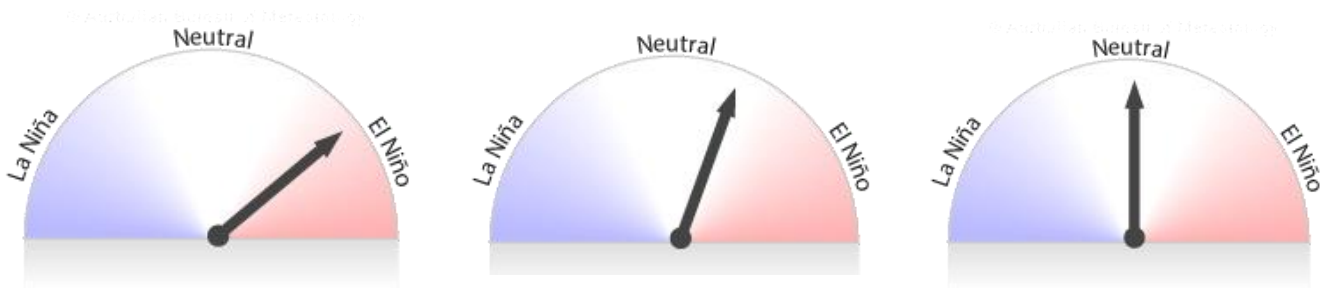


EL NIÑO–SOUTHERN OSCILLATION

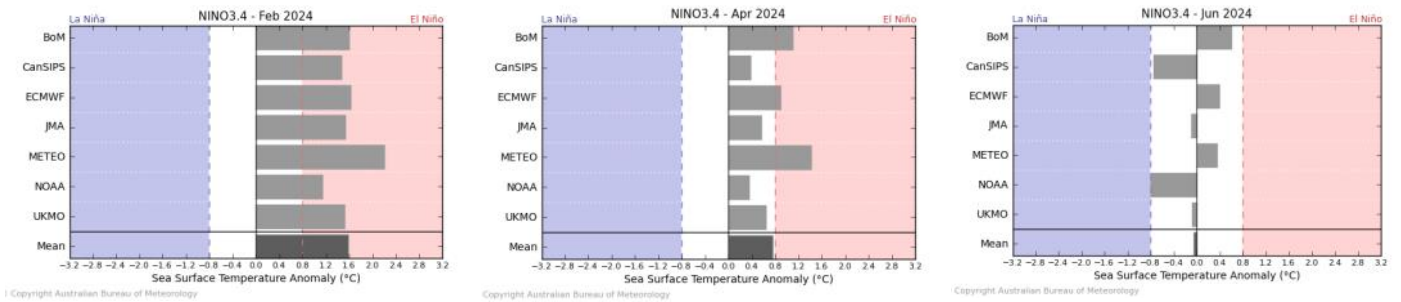
El Niño ocean warmth past its peak as Indian Dipole returns to neutral

Click link to access [Climate Driver Update issued on 6 February 2024](#)

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



Bureau of Meteorology NINO3.4 International Model Outlooks



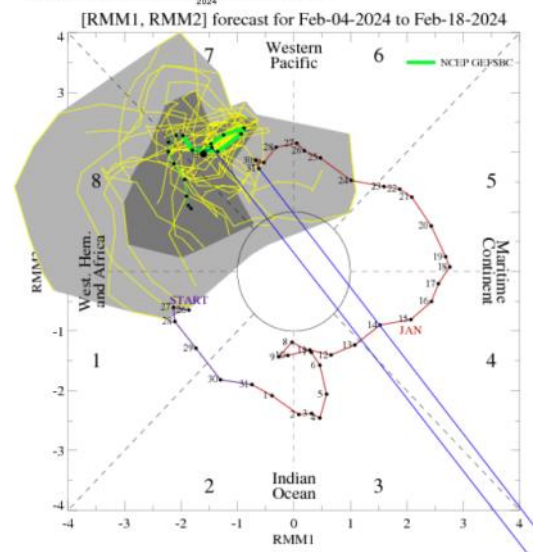
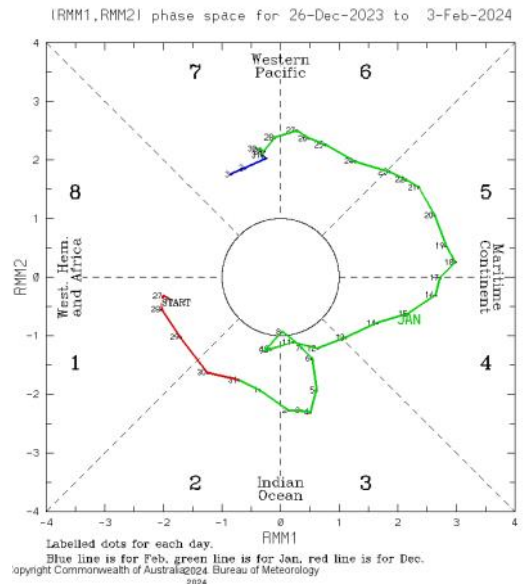
Bureau of Meteorology summary of international model outlooks for NINO3.4: <http://www.bom.gov.au/climate/model-summary/#tabs=Pacific-Ocean>

MADDEN–JULIAN OSCILLATION

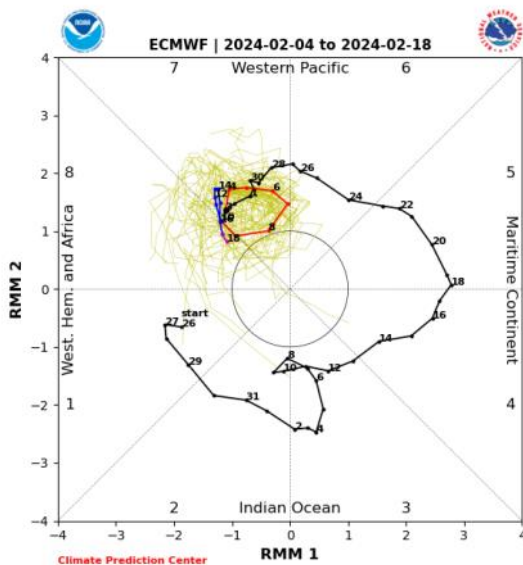
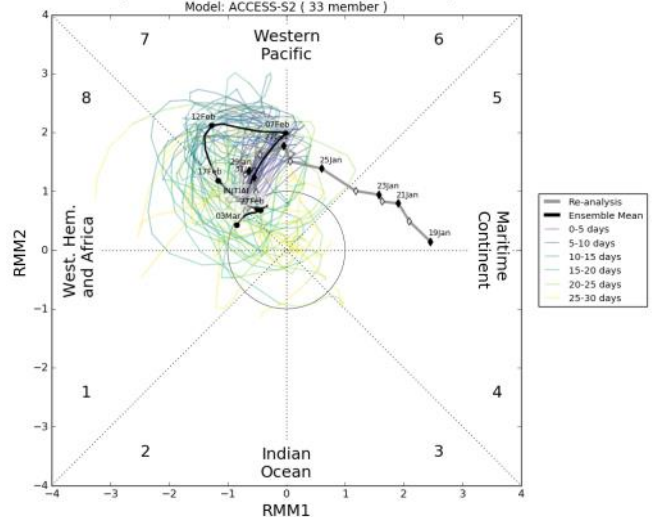
Click link to access [Tropical Climate Update](#) [Issued on Tuesday 6 February 2024]

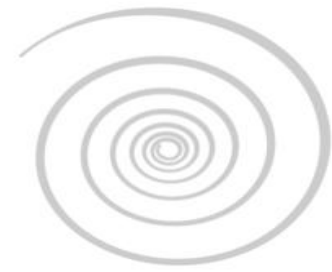
The Madden Julian Oscillation (MJO) is currently over the central Pacific. International climate models suggest the MJO is likely to remain in the central Pacific during the coming fortnight. When the MJO is in the central Pacific region, it may also weaken trade winds in the central to western Pacific, which is likely to temporarily stall cooling SSTs associated with El Niño decline; SSTs across parts of the Pacific have indeed increased slightly over the past week.

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



MJO Index Forecast initialised: 2 February 2024
Model: ACCESS-S2 (33 member)



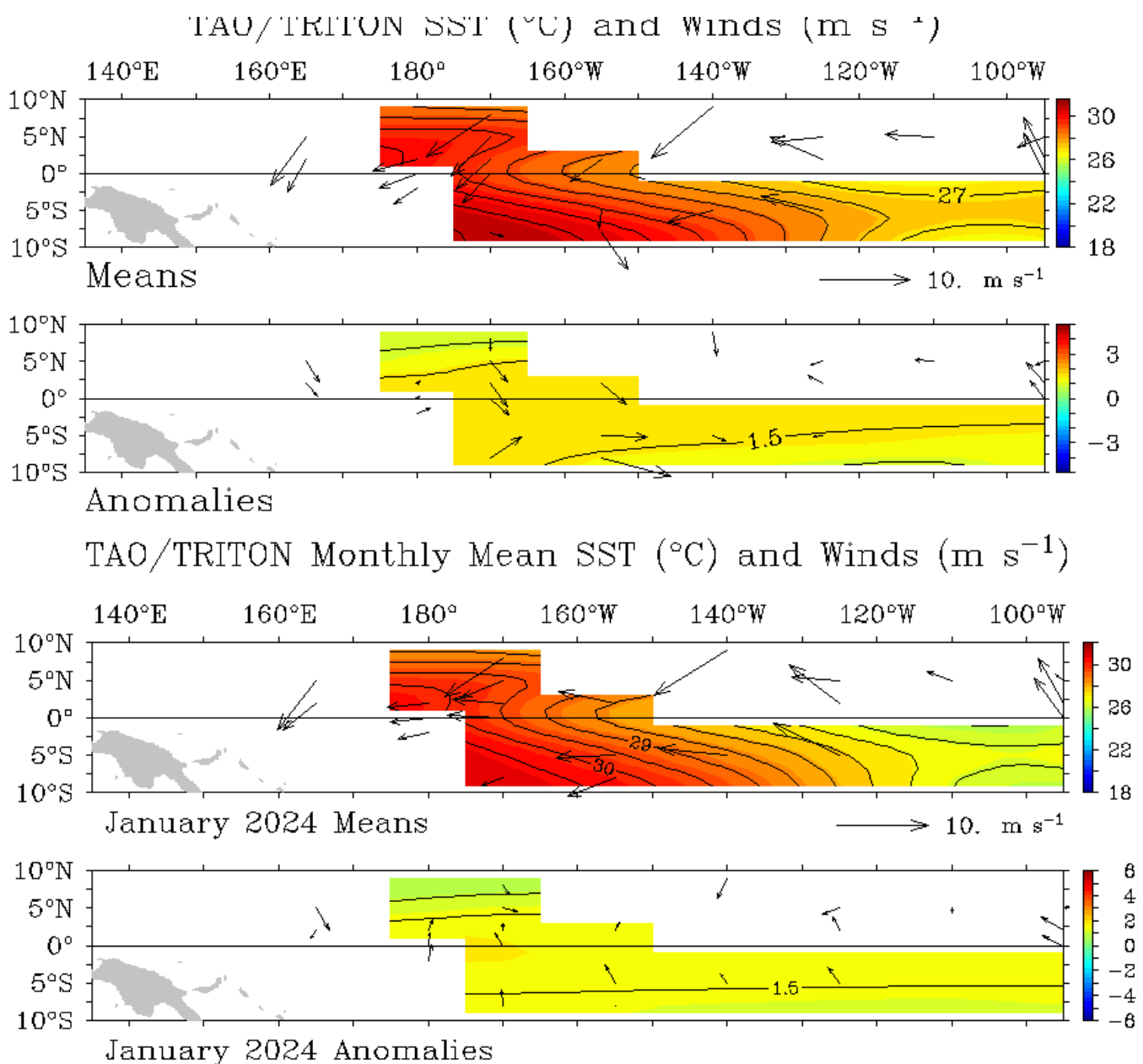


WIND

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

During January, the trade winds were generally close to normal near and east of the Date Line. Weak westerly anomalies (weaker trades) were analysed over the western Pacific. For the five days ending 3 February 2024, the trade winds were weaker or much weaker than normal west of 140°W due to the passage of an active MJO pulse.

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

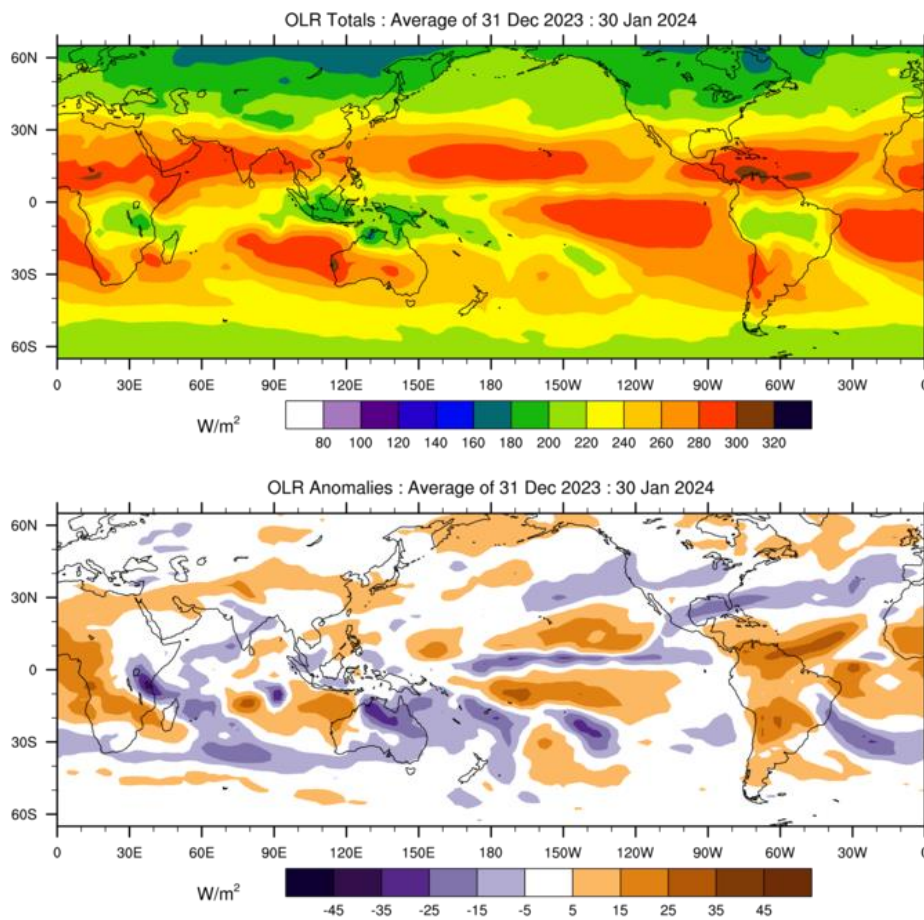
Click link to access [OLR](#)



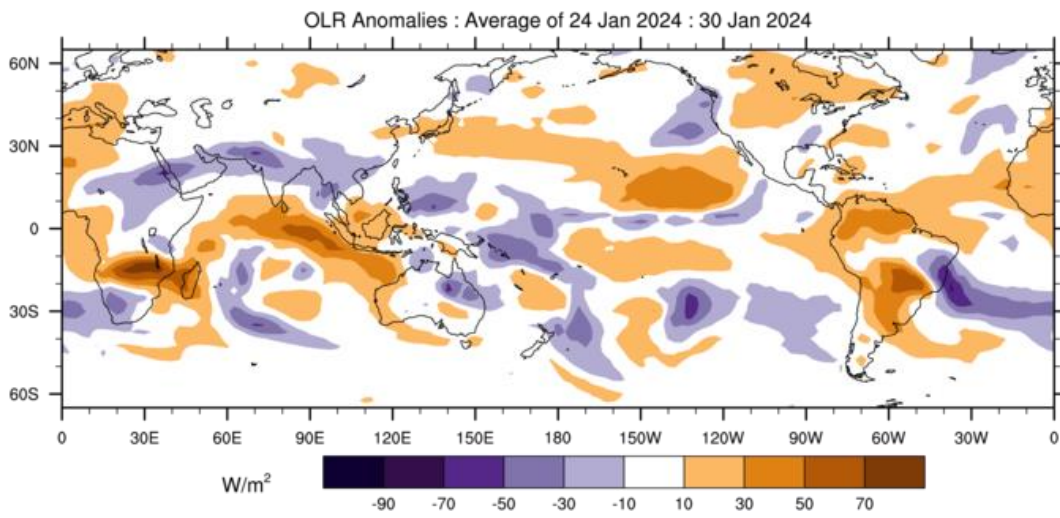
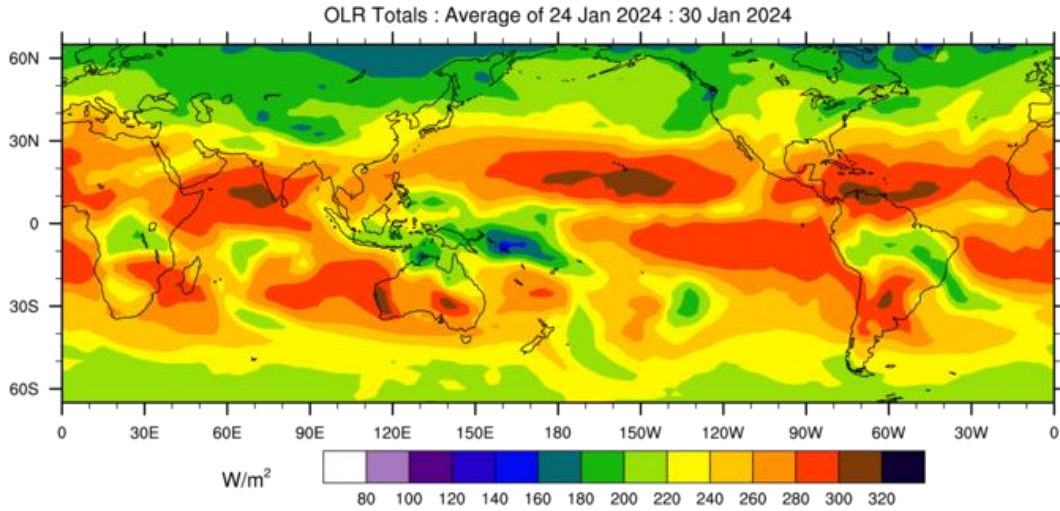
The January 30-day OLR anomaly map shows a region of low OLR (increased convection) along the equator east of 160 ° E. The ITCZ extended towards the central American coast. The South Pacific Convergence Zone (SPCZ) was evident over southern PNG, Solomon Islands, New Caledonia, Vanuatu, Fiji and Tonga, and with an extension to eastern Australia. Areas of high OLR (decreased convection) were evident over FSM and RMI in the northern hemisphere. In the southern hemisphere, high OLR stretches eastwards from eastern Solomon Islands to Wallis and Futuna, Samoa, American Samoa, northern 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.

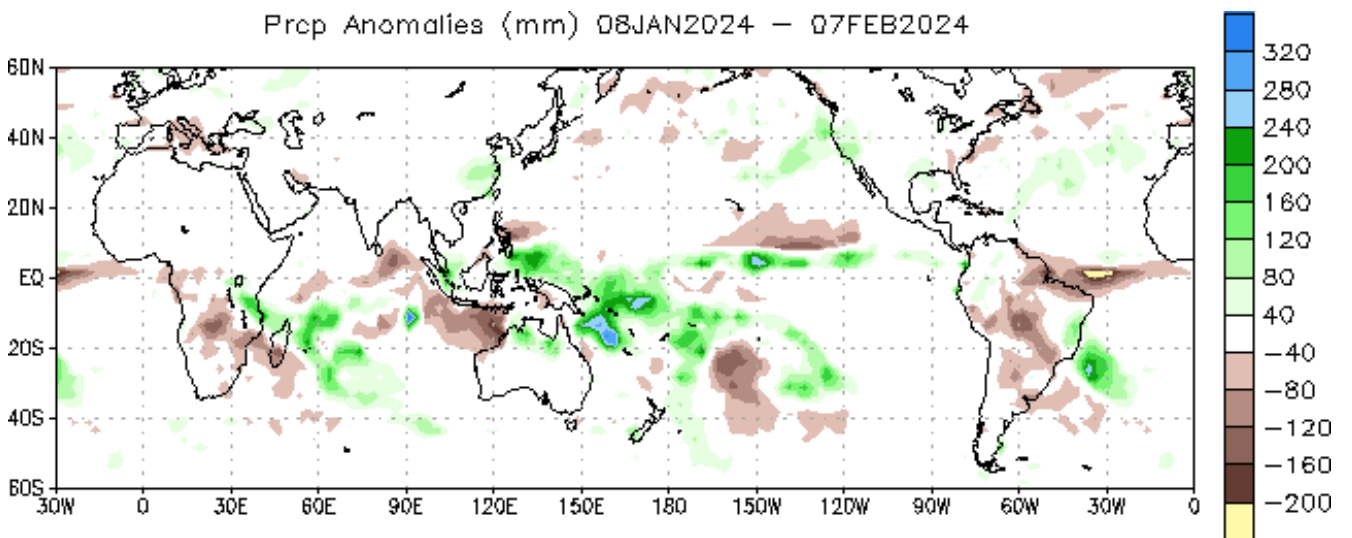
OLR Total and Anomalies, 30 Day OLR



OLR Total and Anomalies, 7 Day OLR

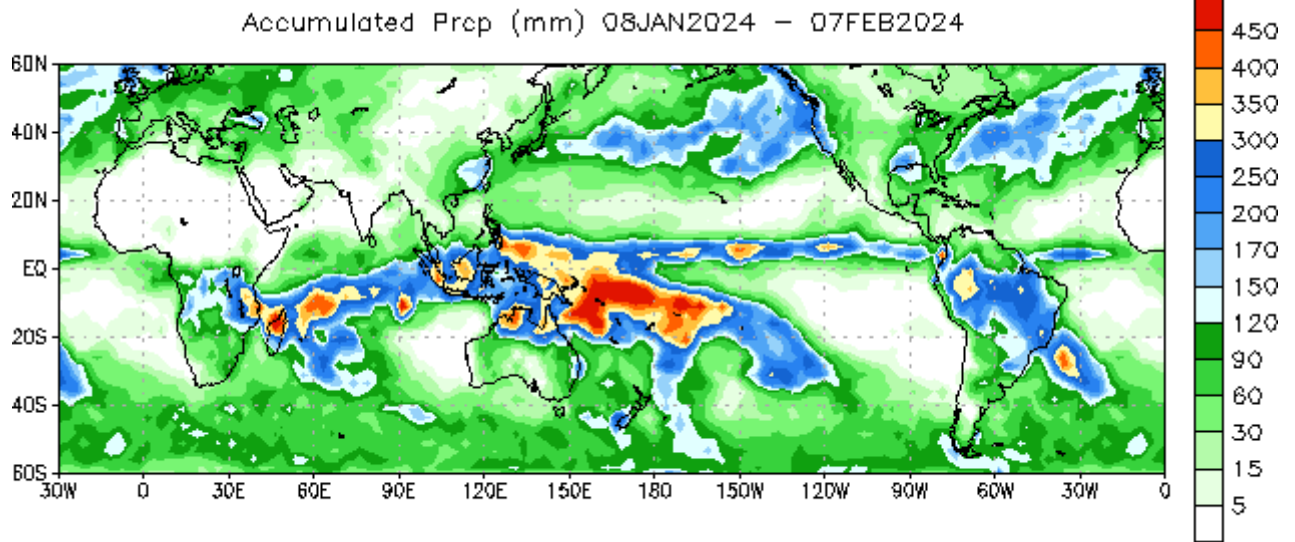


(C) Copyright Commonwealth of Australia 2024. Bureau of Meteorology

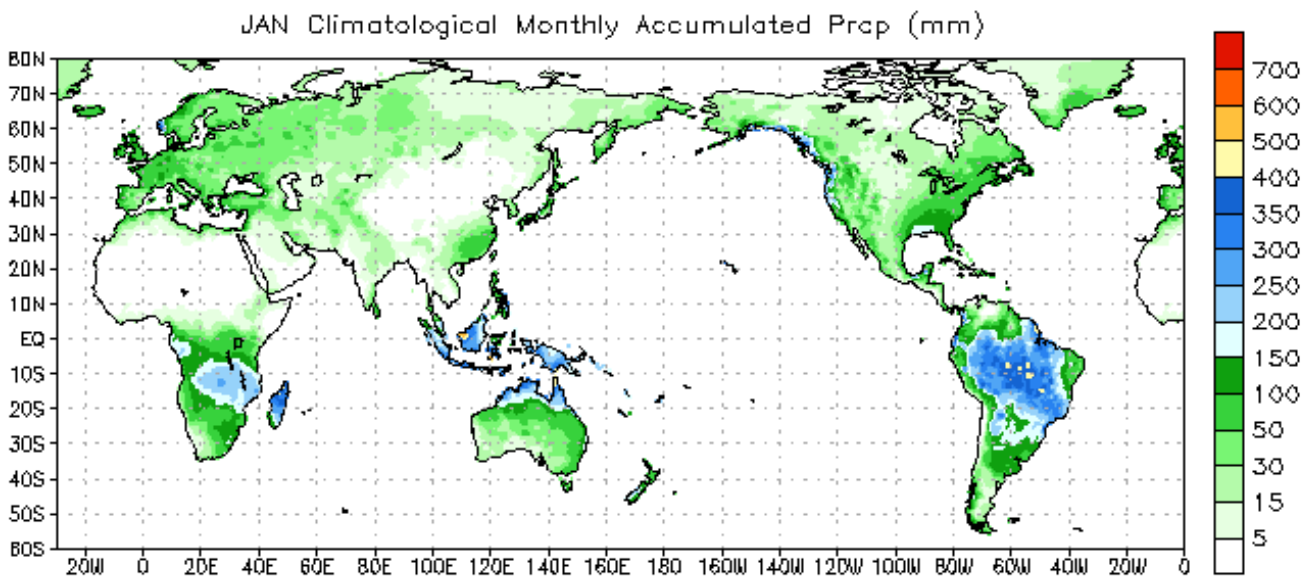


Data Source: NCEP CMAP Precipitation
Climatology (1991-2020)

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



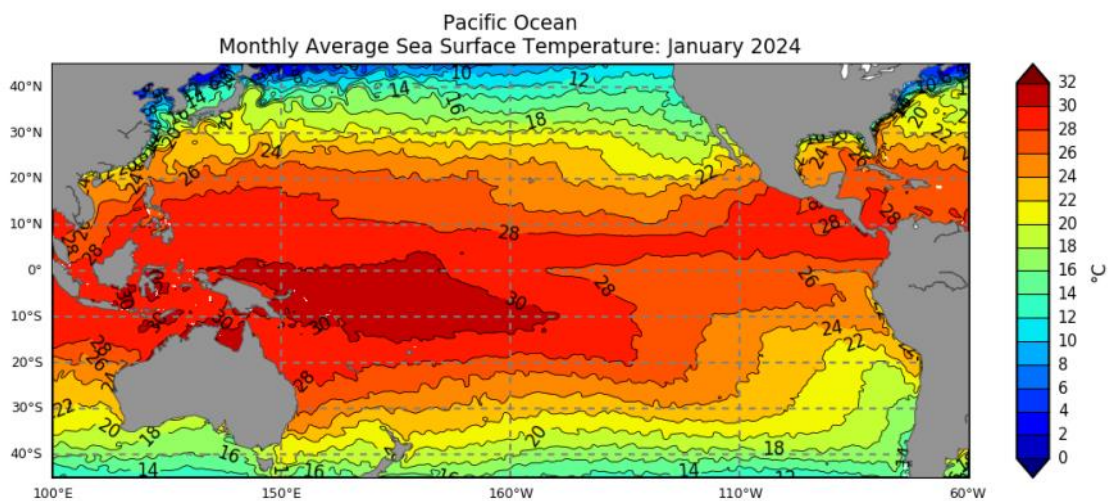
Click link to access [Pacific Community COSPPac Ocean Portal](#)

Sea surface temperatures (SSTs) for January 2024 were warmer than average across the tropical Pacific Ocean. Between 10°S and 10°N, SST anomalies were more than 1° warmer than the long-term (1961-1990) average in most areas along the equator.

The extent and magnitude of warm anomalies across the equatorial Pacific has decreased east of the Date Line compared to December 2023, while warm anomalies increased west of the Date Line.

Highest on record January SSTs occurred in eastern Solomon Islands, New Caledonia, northern Vanuatu, northern Fiji, northern Marshall Islands, parts of Kiribati (southeast Gilbert, western Phoenix and northern Line Islands), Tuvalu, Wallis and Futuna, Samoa, northern American Samoa, Tokelau, and northern Cook Islands. This decile category also occurred in part of FSM, PNG, and central French Polynesia. The SST in decile 10 (very much above average) stretched from PNG in the west and eastwards towards the south American coast. There were also areas of decile 10 over Palau, FSM and most of RMI. Above average (8-9) decile are observed for majority of the Pacific Island Countries, spanning southeastward from Palau, southeastern FSM, western RMI, parts of PNG, New Caledonia to eastern French Polynesia. Average SSTs (4-7) for January were observed in parts of southern Fiji, spanning eastwards to French Polynesia. Patches of decile 2-3 (below average) were observed in parts of southern Cook Islands and southern French Polynesia.

Mean Sea Surface Temperature



©Commonwealth of Australia 2024
Australian Bureau of Meteorology, COSPPac

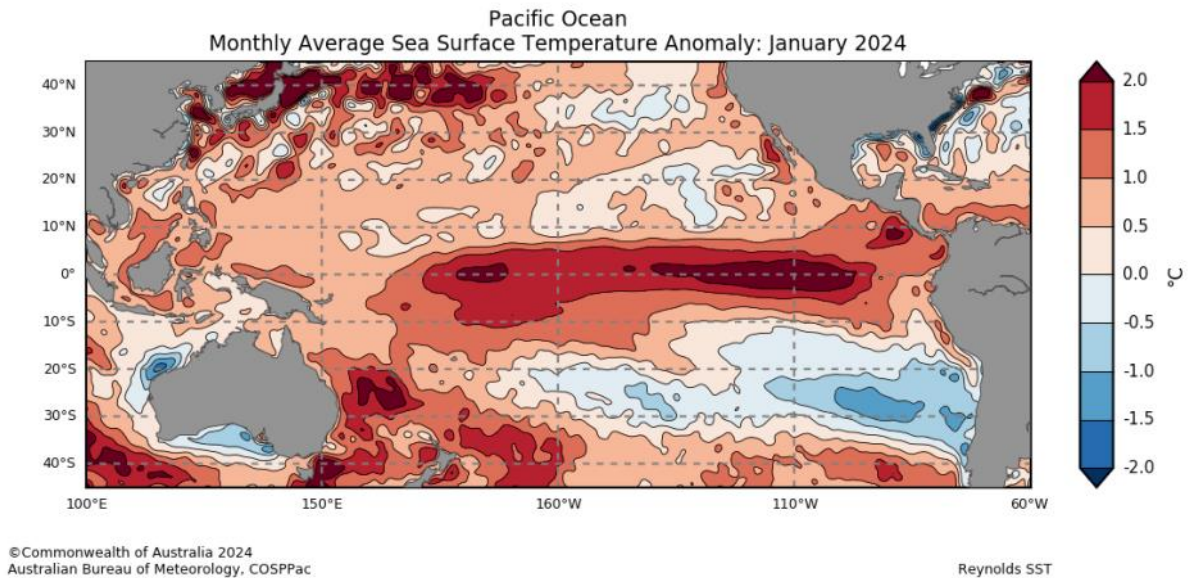
Reynolds SST

OCEAN CONDITIONS

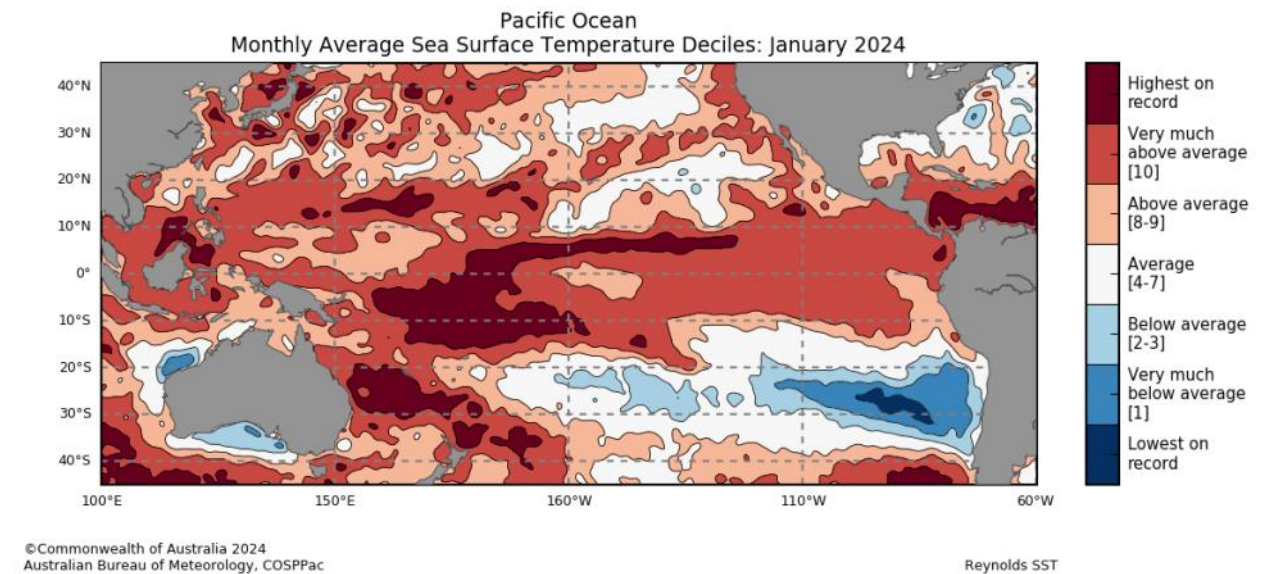
Click link to access [SEA SURFACE TEMPERATURE](#)



Anomalous Sea Surface Temperature



Sea Surface Temperatures Deciles



OCEAN CONDITIONS

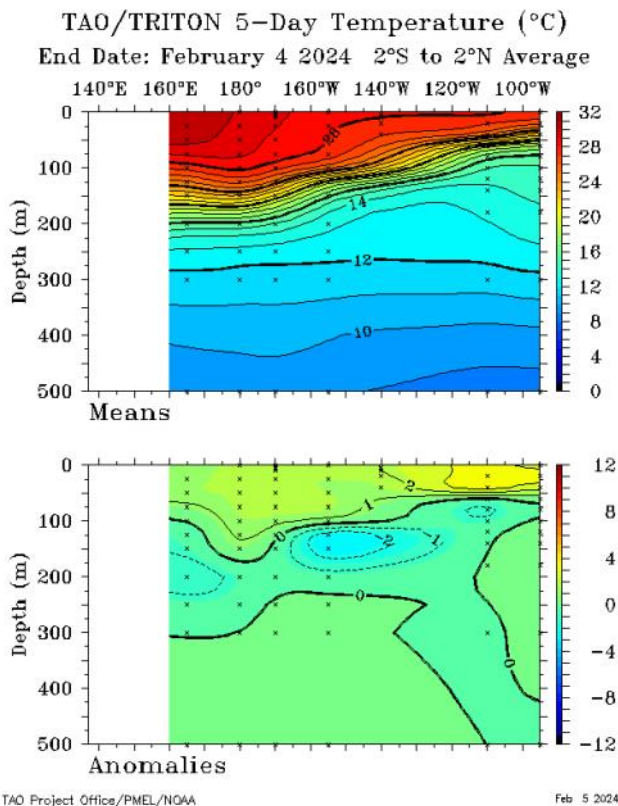
SUB SURFACE



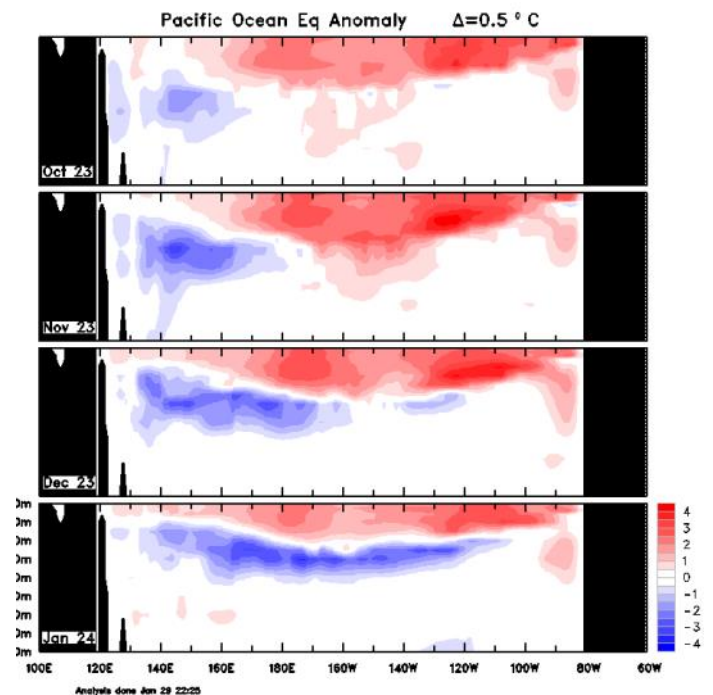
The four-month sequence of equatorial Pacific sub-surface temperature anomalies to 31 January 2024, shows warm anomalies across most of the top 50 m of the equatorial Pacific during January, with areas of cooler than average water between 100 and 200 m depth, extending across the basin to 100°W. Warm anomalies are greatest in magnitude, exceeding 3 °C warmer than average, in the far eastern Pacific between 130°W and 110°W. Cool anomalies reached more than 2 °C cooler than average across much of their extent.

Warm anomalies have persisted in the central and eastern Pacific between the surface and 200 m depth during October to December 2023, with patterns remaining similar. The depth of these warm anomalies has also slowly decreased over this period and extend to only around 100 m depth during January. The magnitude and extent of cool anomalies has increased across the past few months. This sub-surface pattern of a layer of warmer than average waters above a layer of cooler than average waters is typical of the declining phase of El Niño.

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

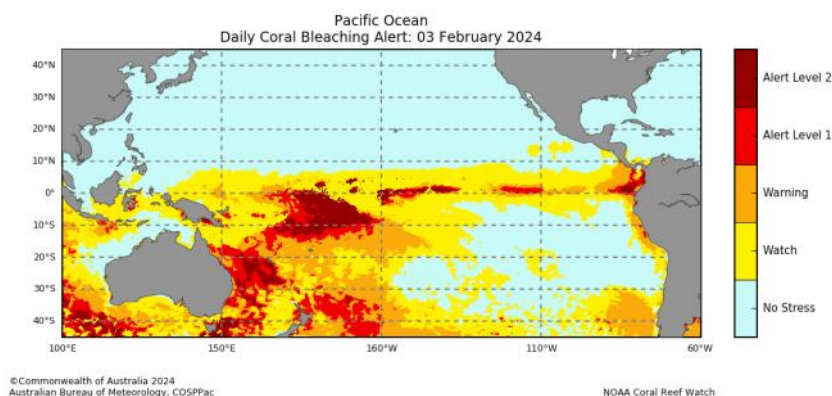
CORAL BLEACHING



The daily Coral Bleaching Alert status for 03 February 2024 shows an area of 'Alert Level 2' over parts of western New Caledonia, southern PNG mainland, eastern Solomon Islands, northern Fiji, most of Tuvalu, Kiribati (eastern Gilbert, southern Phoenix Islands and parts of central Line Islands), Tokelau, and parts of northern Cook Islands. 'Alert Level 1' over parts of southern PNG mainland, eastern Solomon Islands, western New Caledonia, northern Vanuatu, northern Fiji, Samoa, Nauru, rest of Tuvalu, and parts of northern Cook Islands. 'Warning' status stretches eastwards from Nauru to eastern New Caledonia in the south to western French Polynesia. 'Watch' or 'No stress' for the rest of the countries. The four-week Coral Bleaching Outlook to 25 February shows 'Alert 2' over eastern Australia, western New Caledonia, eastern Solomon Islands, northern Fiji, eastern Tuvalu, Kiribati (eastern Gilbert Islands, and southern Phoenix Islands), and Tokelau. Patches of 'Alert 2' over northern Vanuatu, northern Wallis and Futuna, northern Samoa, northern American Samoa, and northern Cook Islands. 'Alert Level 1' rating over similar areas to Alert Level 2 but extend to southeastern PNG, most of eastern Australia, Nauru, southern Solomon to western French Polynesia. 'Warning' similar to 'Alert 1' but extend further east to central French Polynesia. 'Watch' or 'No Stress' over the rest of the countries.

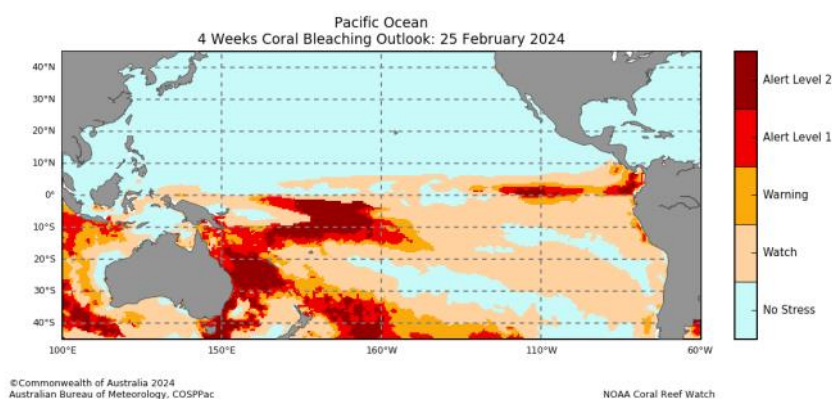
Daily Coral Bleaching Alert

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



4 Weeks Coral Bleaching Outlook

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



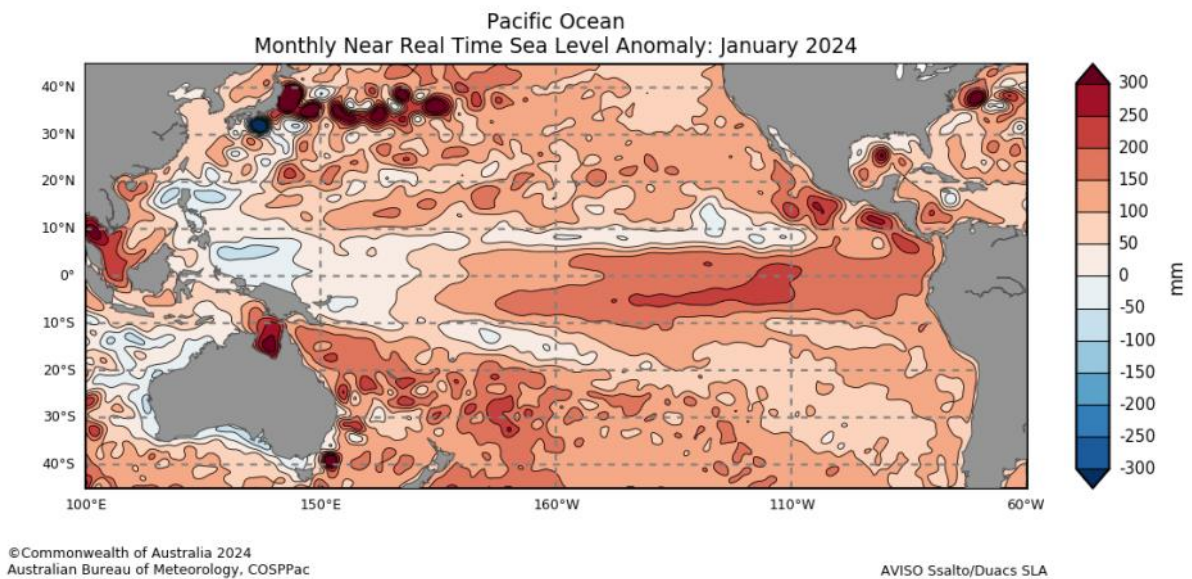
OCEAN CONDITIONS

OCEAN SURFACE CURRENTS AND SEA LEVEL

Sea level in January was above normal over most COSPPac countries. Anomalies from +100 to +200 mm were observed in Kiribati (far southern Gilbert, Phoenix, and Line Islands), Tuvalu and Tokelau. Patches of +150 to +200 mm were observed for other COSPPac countries apart from patches of below normal sea level anomalies were observed in Palau, western FSM, and patches over PNG, New Caledonia, far southern Fiji, Wallis and Futuna, Samoa, American Samoa and central Cook Islands.

Monthly Sea Level Anomalies

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

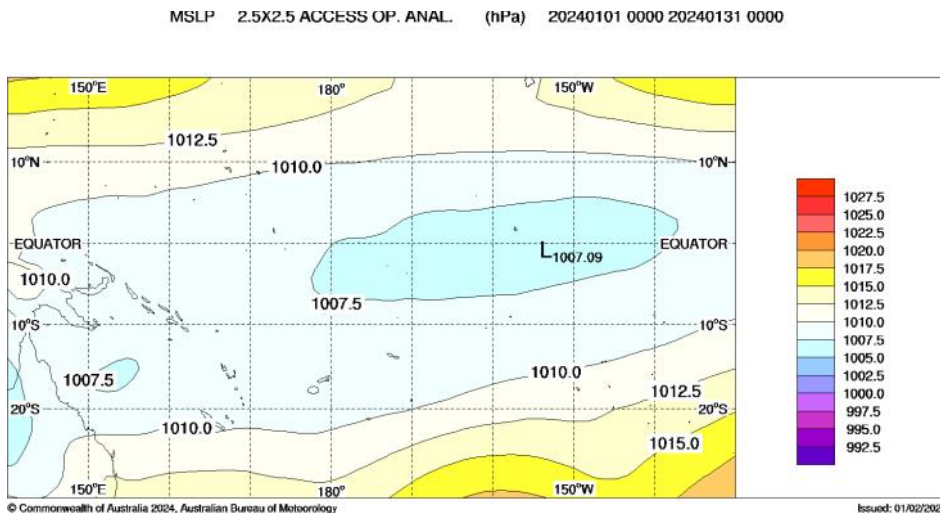


MEAN SEA LEVEL PRESSURE

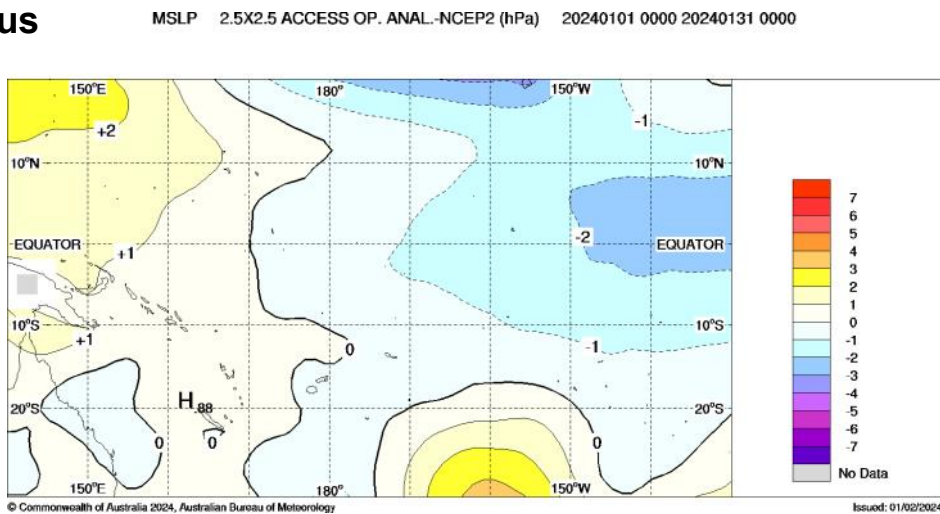
The January mean sea level pressure (MSLP) anomaly map shows negative anomalies of 1 hPa or greater east of 170 °W and within about 10° of latitude of the equator. Positive anomalies of 1 hPa or greater were evident in the western tropical Pacific.

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

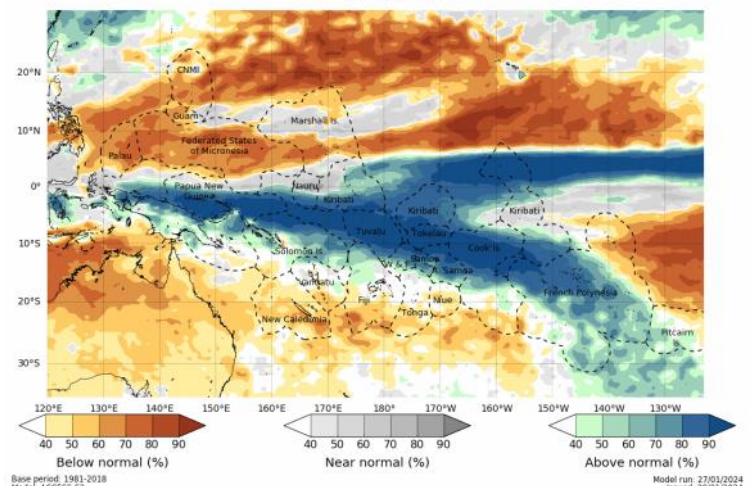
February — April 2024



The ACCESS-S model forecast for February 2024, shows below normal rainfall is likely or very likely for Palau, FSM, Guam, CNMI, parts of northern and central RMI, in patches of PNG's southern EEZ, southern Solomon Islands, New Caledonia, southern Vanuatu, southern Fiji, southern Tonga, Niue, southern Cook Islands, and eastern French Polynesia, and northern Pitcairn Islands. Above normal rainfall is likely or very likely for PNG, southern Nauru, Kiribati (Gilbert, Phoenix, much of the Line Islands), far northern Vanuatu, northern Fiji, Tuvalu, Wallis and Futuna, Tokelau, Samoa, American Samoa, northern and central Cook Islands, most of French Polynesia and Pitcairn Islands.

The three-month rainfall outlook (February to April 2024) is very similar to the February outlook, but with the below normal rainfall region being stronger and extending further to northern and central RMI. In the southern hemisphere, the below normal region was more intense and extensive over southern PNG, New Caledonia, and Vanuatu. The above normal rainfall region also extended to more of PNG's mainland and most of Kiribati's Line Islands, but the band from PNG to Pitcairn Islands is somewhat less intense.

Monthly [ACCESS-S](#) Maps



The Copernicus multi-model outlook for February to April 2024 is very similar to the ACCESS outlook, the main difference being a lack of dry signal over Fiji in C3S.

The APEC Climate Centre multi-model outlook (February to April 2024) has a much weaker and less extensive area where above normal rainfall is likely. The outlook for below normal rainfall, however, is similar to ACCESS-S and Copernicus, except over French Polynesia.

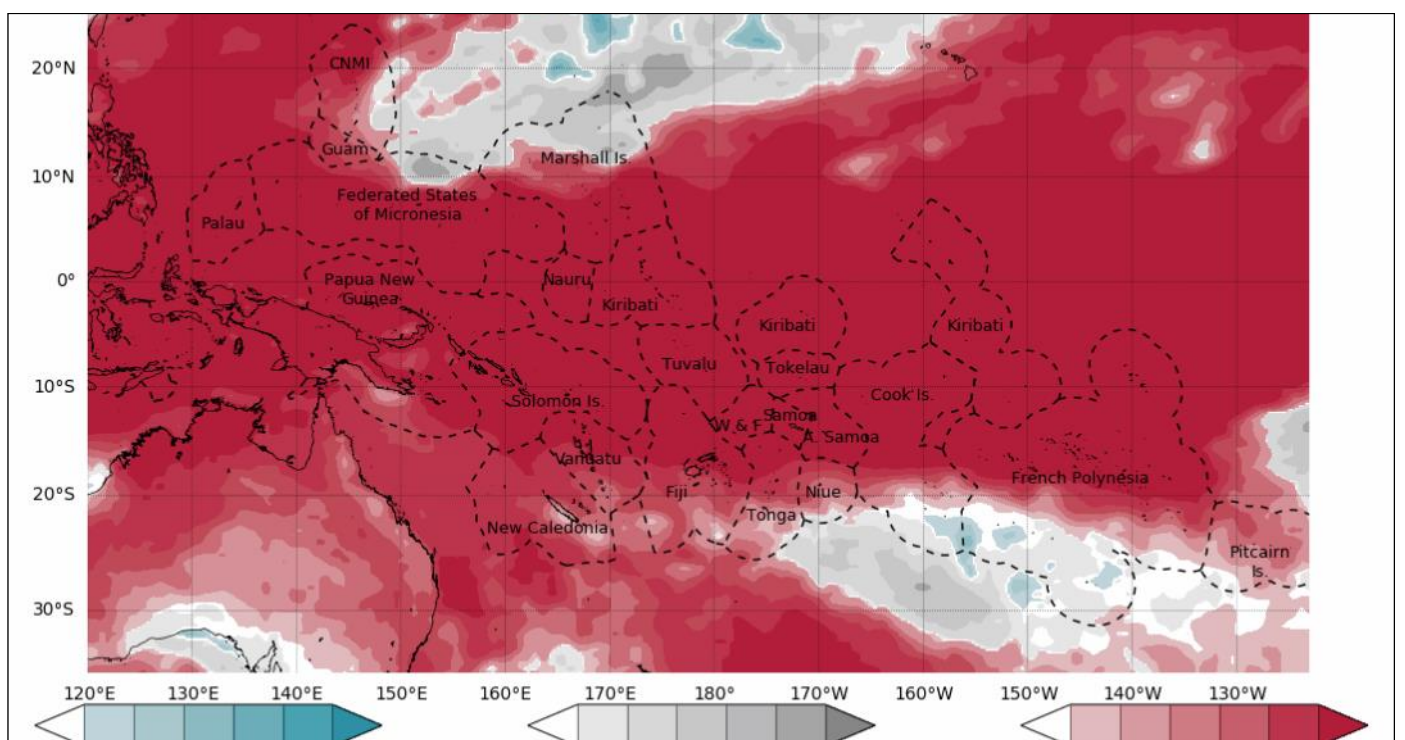
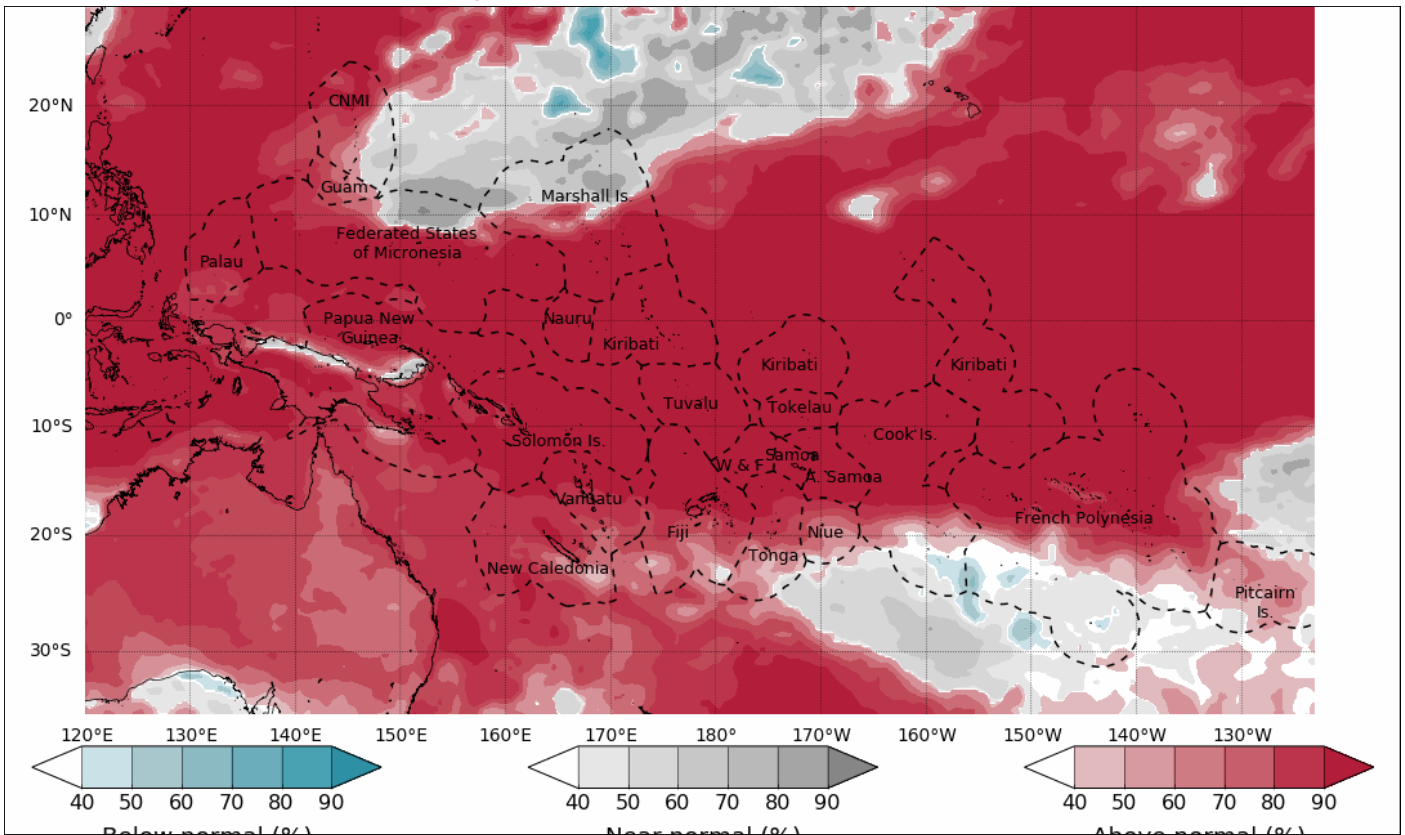
For February to April 2024, the models agree on below normal rainfall being likely or very likely for Palau, Guam, CNMI, FSM, RMI, PNG's southern EEZ, southern Solomon Islands, New Caledonia, Vanuatu, Niue, northeastern French Polynesia, and Pitcairn Islands. In addition, there's model agreement on above normal rainfall being likely or very likely in near-equatorial regions from the PNG Islands eastward to Solomon Islands, southern Nauru, Tuvalu, Tokelau, and the northern Cook Islands.

SEASONAL TEMPERATURE OUTLOOK

February—April 2024



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



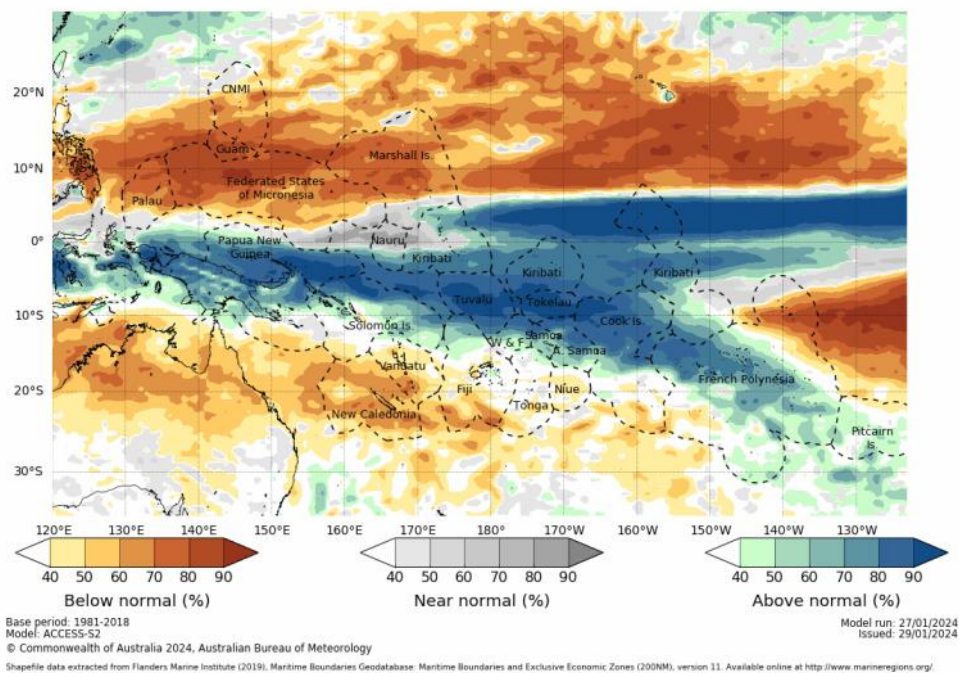
SEASONAL RAINFALL OUTLOOK

February—April 2024

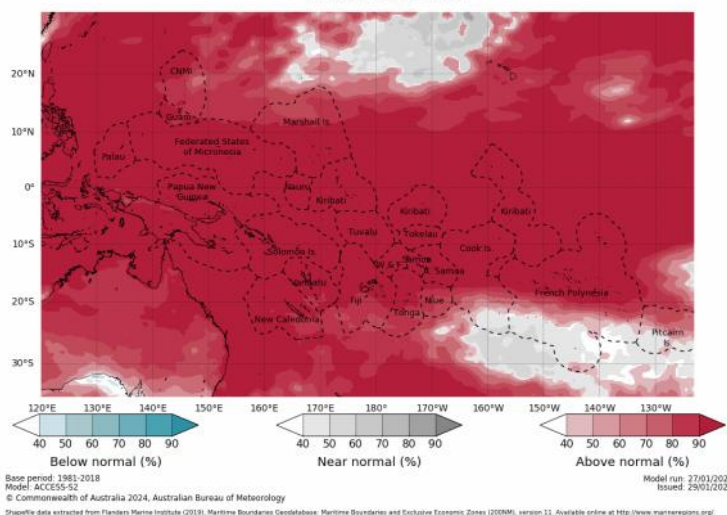


Seasonal ACCESS-S maps

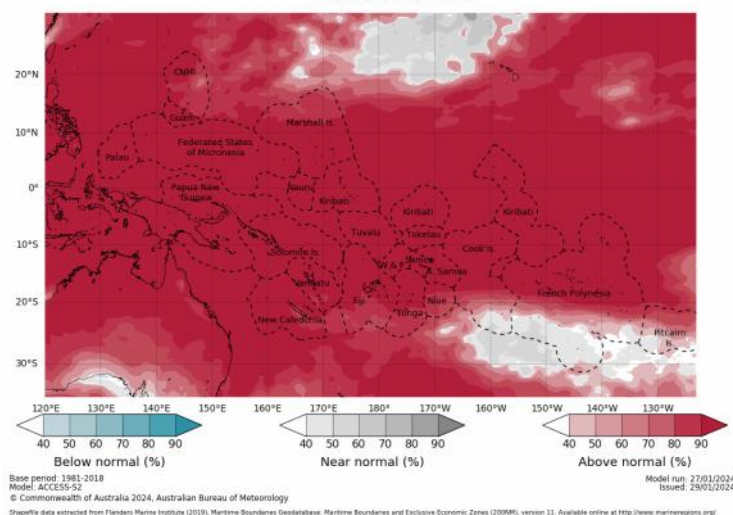
Tercile rainfall probabilities for February to April 2024



Tercile maximum temperature probabilities for February to April 2024



Tercile minimum temperature probabilities for February to April 2024



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

SEASONAL RAINFALL OUTLOOK

February—April 2024



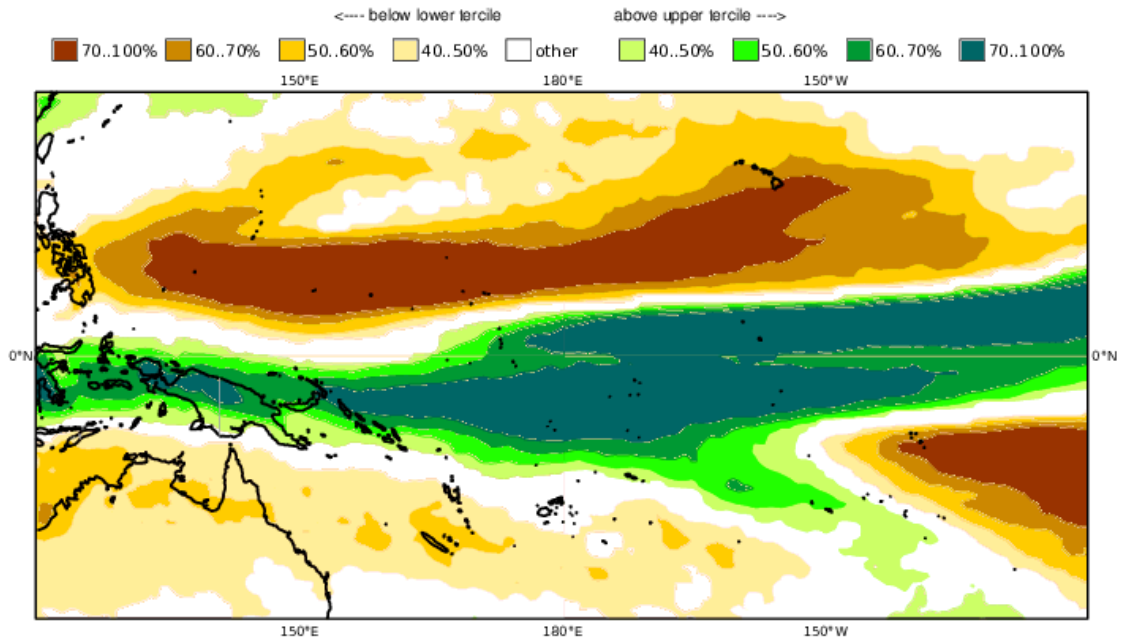
Copernicus (C3S multi-system)-Rainfall

Prob(most likely category of precipitation)

FMA 2024

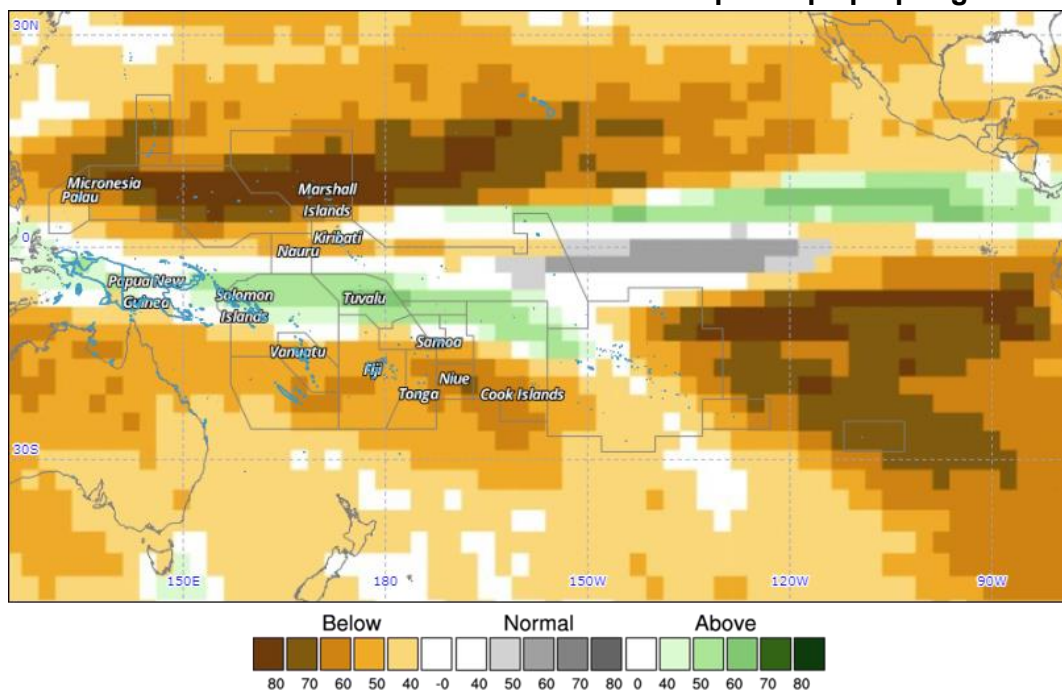
Nominal forecast start: 01/01/24

Unweighted mean



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

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



Year: 2024, Season: FMA, Lead Month: 3, Method: GAUS

Model: APCC, BOM, CMCC, MSC, NASA, NCEP, PNU

Generated using CLIK® (2024-2-5)

© APEC Climate Center

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 occurred as of 20 October 2023. In the southwest Pacific, the 2023-24 tropical cyclone season officially 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 and normal-to-reduced TC activity in the western part of the basin. Several severe TCs were considered possible anywhere in the basin. Six tropical cyclones have occurred in the south Pacific so far this season. TC Lola just formed before the start of the season on 22 October, followed by TC Mal which affected Fiji, and TC Jasper which affected the Solomon Islands before tracking slowly southwest to north Queensland, Australia, where devastating floods occurred in December. In January, TC Kirrily affected Australia, while TCs Nat and Osai have affected the Cook Islands and French Polynesia in February. 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 shows significant increased risk in the southwest and south-central Pacific between 10 and 23 February. The risk is near-normal in the northwest Pacific for the same period.

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>

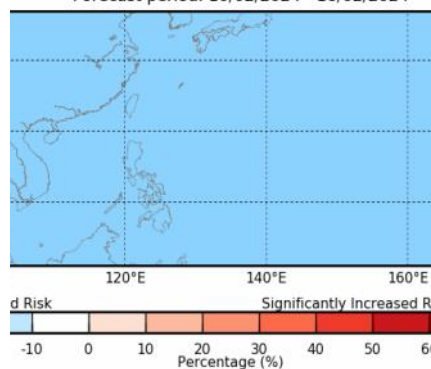
APEC Climate Center (APCC): <http://www.apcc21.org/eng/service/6mon/ps/japcc030703.jsp>

NASA GMAO GEOS-5: <http://gmao.gsfc.nasa.gov/research/ocean/>

NOAA CFSv2: <http://www.cpc.ncep.noaa.gov/products/CFSv2/CFSv2seasonal.shtml>

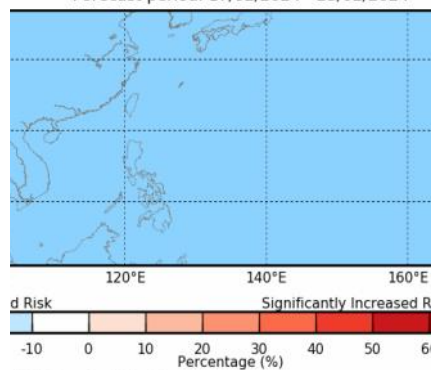
IRI for Climate and Society: <http://iri.columbia.edu/our-expertise/climate/forecasts/seasonal-climate-forecasts/>

ACCESS-S Weekly Forecasts –Northwest Pacific
Difference from normal chance of Tropical Cyclone's in the Northwest Pacific
Forecast period: 10/02/2024 - 16/02/2024



Probability in overlapping 15 x 20 degree boxes
124, Australian Bureau of Meteorology Model: ACCESS_S2 Model Run: (

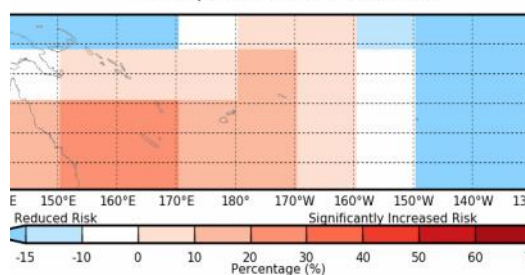
ACCESS-S Weekly Forecasts –Southwest Pacific
Difference from normal chance of Tropical Cyclone's in the Southwest Pacific
Forecast period: 17/02/2024 - 23/02/2024



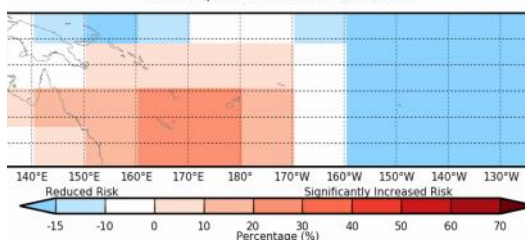
Probability in overlapping 15 x 20 degree boxes
124, Australian Bureau of Meteorology Model: ACCESS_S2 Model Run: (

ACCESS-S Weekly Forecasts –Southwest Pacific

Difference from normal chance of Tropical Cyclone's in the South Pacific
Forecast period: 10/02/2024 - 16/02/2024



Probability in overlapping 15 x 20 degree boxes
124, Australian Bureau of Meteorology Model: ACCESS_S2 Model Run: 05/02/2024



Model anomaly probability in overlapping 15 x 20 degree boxes
north of Australia 2024, Australian Bureau of Meteorology Model: ACCESS_S2 Model Run: 02/02/2024 Issue:

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.

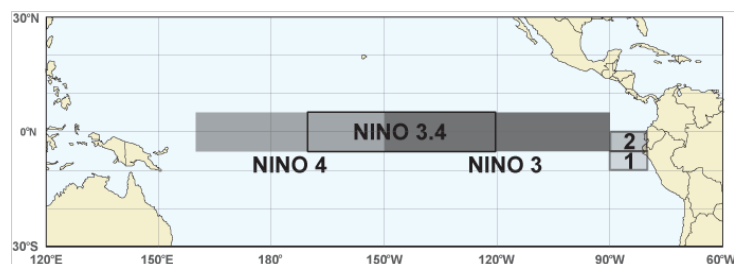
20 degrees Celsius Isotherm Depth

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