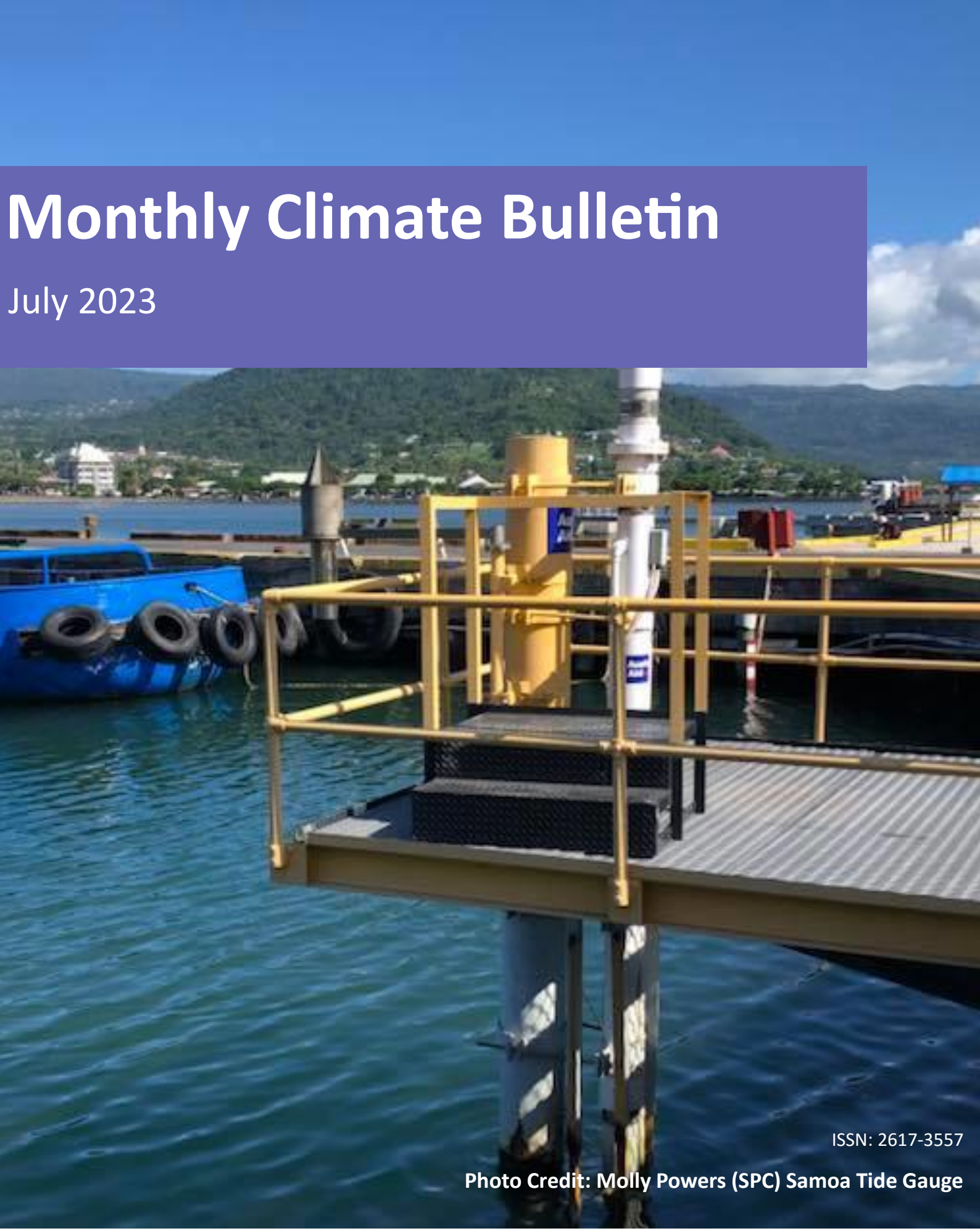
Monthly Climate Bulletin

July 2023



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

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Issued 15 August 2023

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- The Madden Julian Oscillation (MJO) is currently weak in the Western Pacific region and is likely to stay weak for the coming fortnight.
- The ITCZ and SPCZ were both active in July 2023.
- Sea surface temperatures (SST) for July 2023 were warmer than average over the entirety of the tropical Pacific Ocean.
- The Coral bleaching Outlook to 27 August shows patches of area of 'Alert Level 1' over Nauru and Kiribati (central Gilbert, northern Phoenix and northern Line Islands).
- For August-October 2023, the models agree on above normal rainfall being likely or very likely from northern Palau in the west, across southern Guam, FSM, central and southern RMI, Nauru, northern Solomon Islands, northern Tuvalu, to Kiribati (Gilbert Is., north of both Phoenix and Line Is.), and the south of PNG's EEZ. The models also agree on below normal rainfall being likely or very likely in CNMI, northern RMI, Kiribati (southern Line Islands), far southern New Caledonia, patches in each of south and east Fiji, northern Tonga, and Niue, plus central and northern Cook Islands, and central to northern French Polynesia.
- The ACCESS-S weekly tropical cyclone outlook shows a significantly increased risk in the northwest Pacific between 19 August and 1 September around China, Philippines, Japan, and CNMI.

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EL NIÑO–SOUTHERN OSCILLATION

El Niño development remains likely

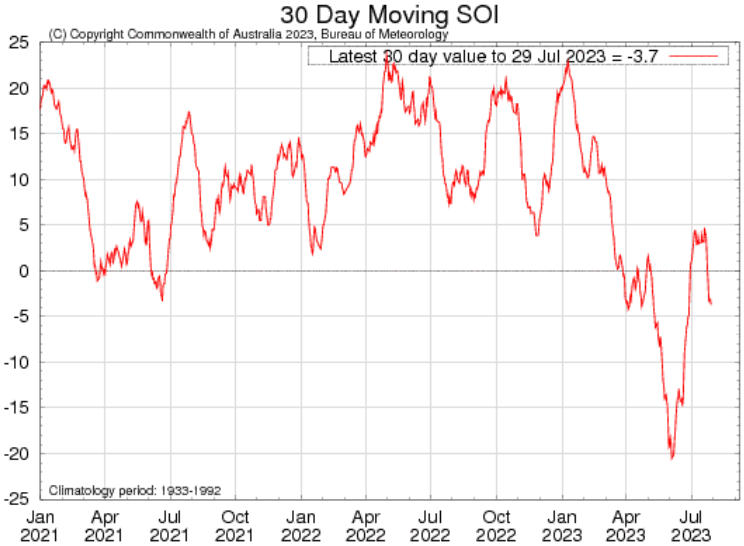
Click link to access Climate Driver Update issued on 1 August 2023

The Bureau's El Niño Alert continues, with El Niño development considered likely in the coming weeks, despite the current lack of atmospheric response. When El Niño Alert criteria have been met in the past, an El Niño event has developed around 70% of the time.

Sea surface temperatures (SSTs) in the tropical Pacific are exceeding El Niño thresholds, with climate models indicating this is likely to continue at least through to the end of the year. In the atmosphere, however, wind, cloud and broad-scale pressure patterns mostly continue to reflect neutral ENSO conditions. This means the Pacific Ocean and atmosphere have yet to become fully coupled, as occurs during El Niño events.

The Indian Ocean Dipole (IOD) is currently neutral. Climate model forecasts suggest a positive IOD is likely to develop in late winter or early spring. A positive IOD typically decreases winter-spring rainfall for much of Australia, and can exacerbate the drying influence from El Niño.

The 30-day Southern Oscillation Index (SOI) for the period ending 30 July was -4, with the value decreasing from +4 over the past fortnight. The 60-day SOI and the 90-day SOI were -3 and -8, respectively.

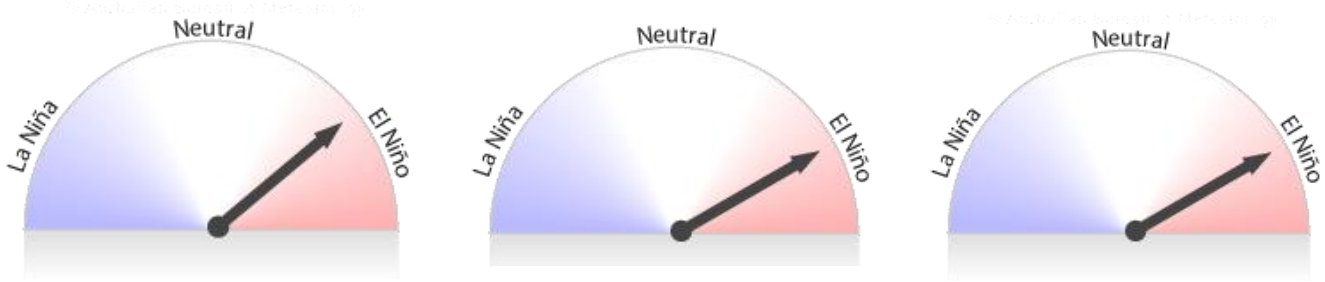


EL NIÑO–SOUTHERN OSCILLATION

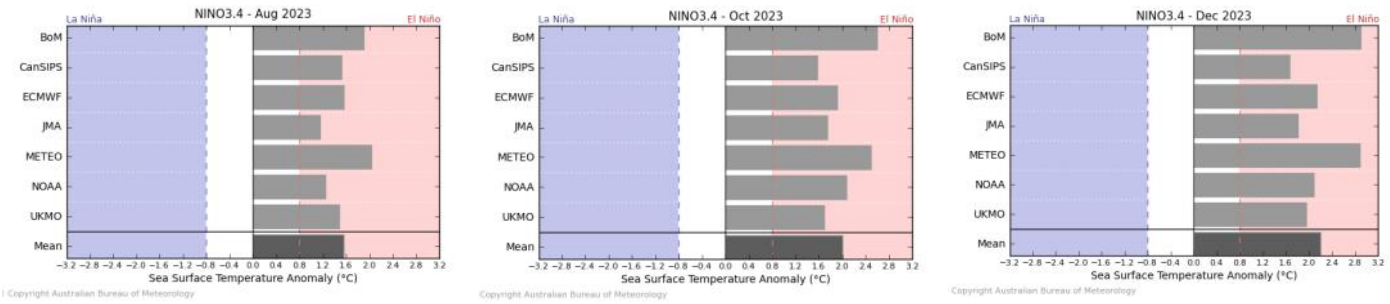
El Niño development remains likely

Click link to access Climate Driver Update issued on 1 August 2023

Bureau of Meteorology NINO3.4 ENSO Model Outlooks for August, October and December



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

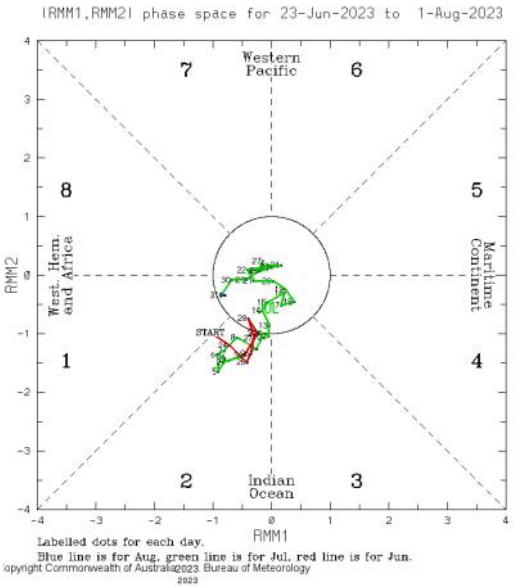
MADDEN–JULIAN OSCILLATION

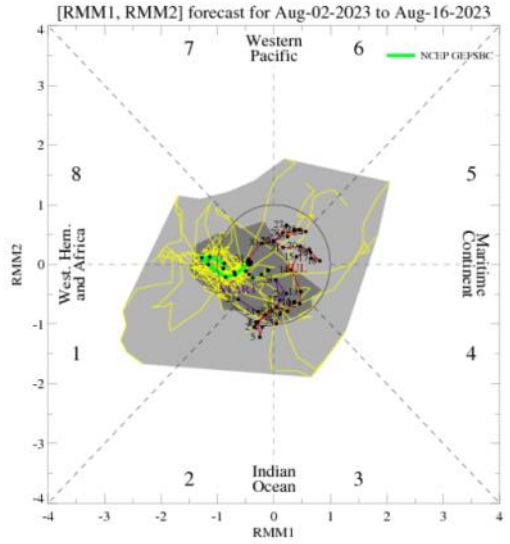
Click link to access *Tropical Climate Update* [Issued on Tuesday 08 August 2023]

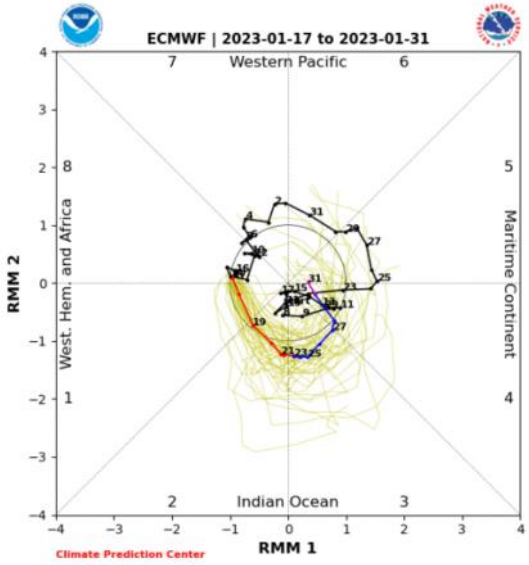
During July, the Madden Julian Oscillation (MJO) was active during the first week but remain weak through the rest of the month.

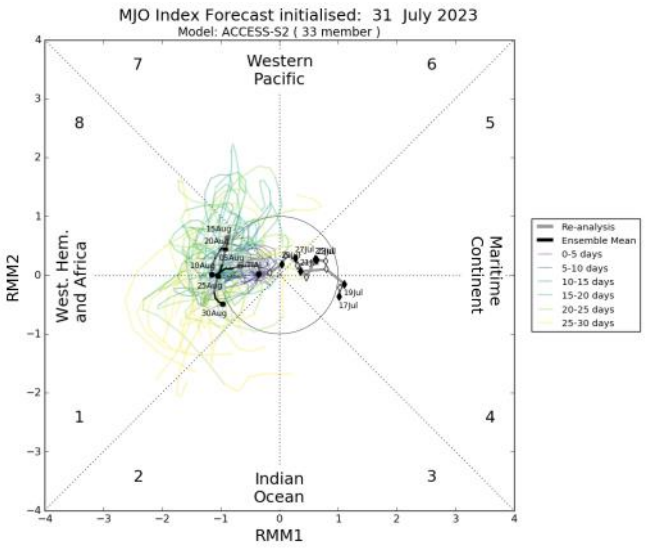
The Madden Julian Oscillation (MJO) is currently weak in the Western Pacific region and is likely to stay weak for the coming fortnight. It may appear in the Western Hemisphere region before becoming weak and indiscernible again next fortnight. The MJO may still contribute to potential El Niño development by weakening trade winds and increasing cloudiness in the western equatorial Pacific as it passes through the Western Pacific region.

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







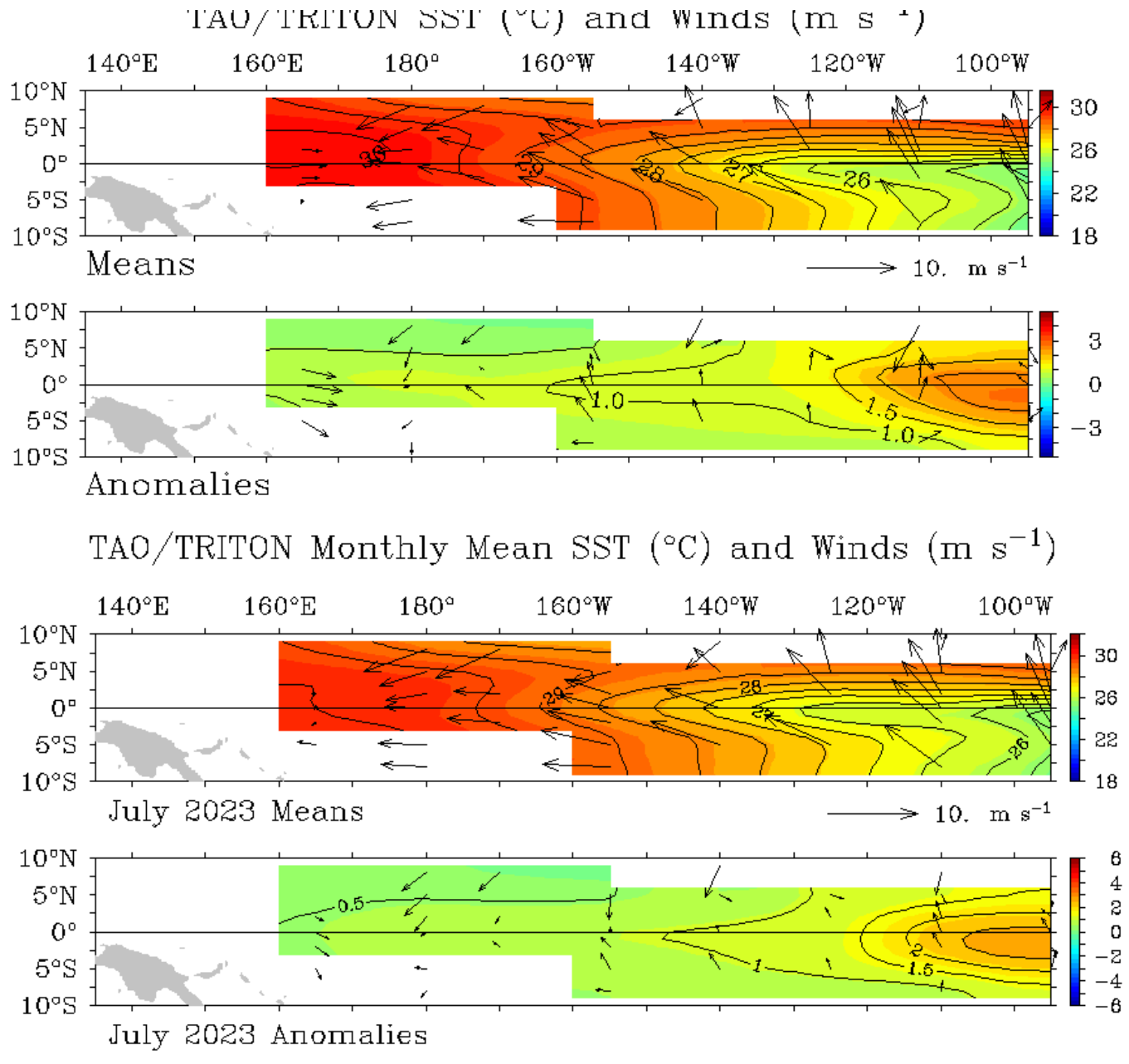


WIND

Click link to access Wind plots link

During July and for the five days ending 01 August 2023, the trade winds were generally close to normal across the 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

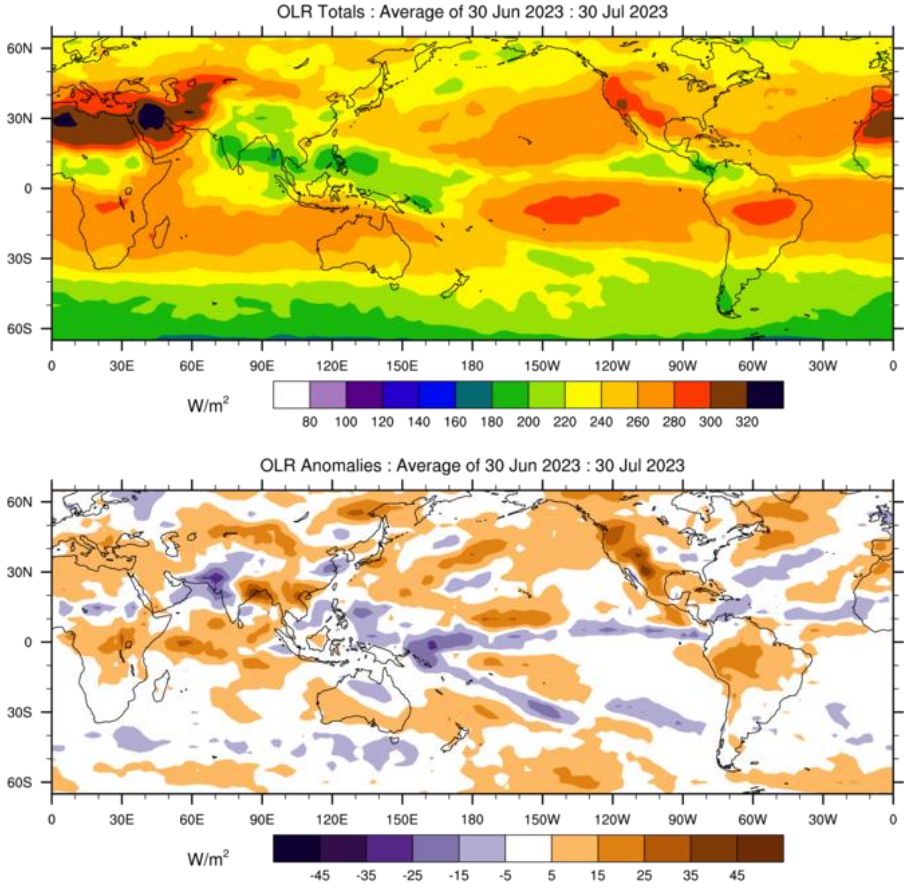
Click link to access OLR

The July 30-day OLR anomaly map shows a region of low OLR (increased convection) to the west of the Date Line over Palau, PNG Islands and Solomon Islands. There were also negative anomalies along the Intertropical Convergence Zone (ITCZ) and South Pacific Convergence Zone (SPCZ) region. In between the ITCZ and SPCZ, and north and south of these regions were regions of positive anomalies (reduced convection) from the New Caledonia and further south towards New Zealand and from CNMI to central Kiribati.

The atmospheric component of El Niño shown some signs of increasing with anomalous equatorial convection between 150° W and from Date Line to 120°W during the week ending 30 July.

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

OLR Total and Anomalies, 30 Day OLR



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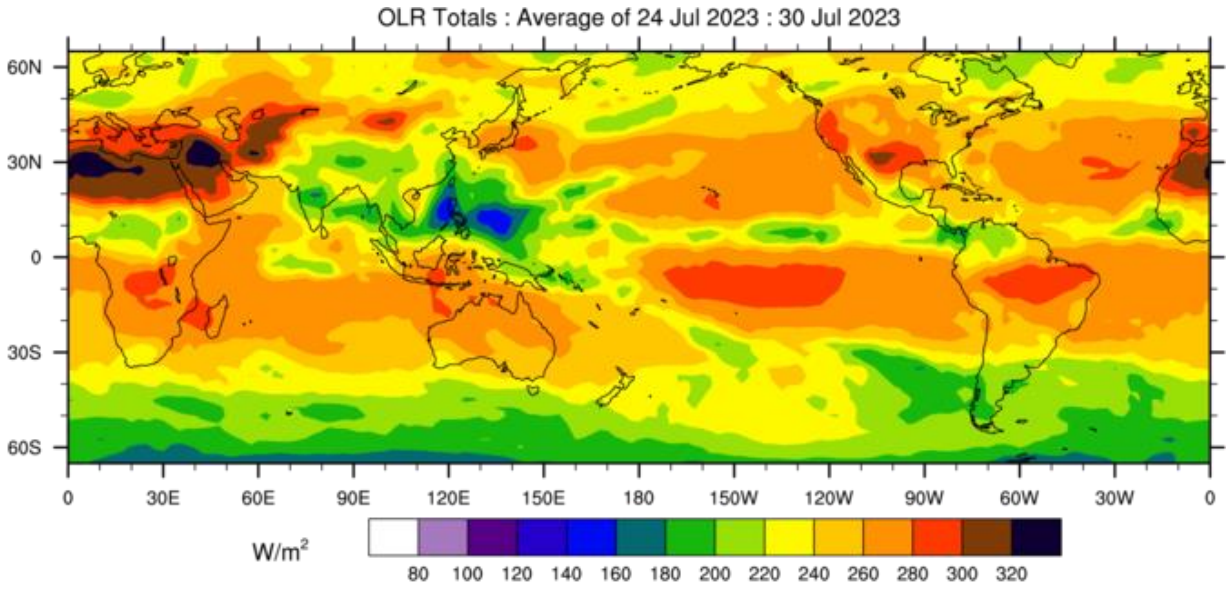
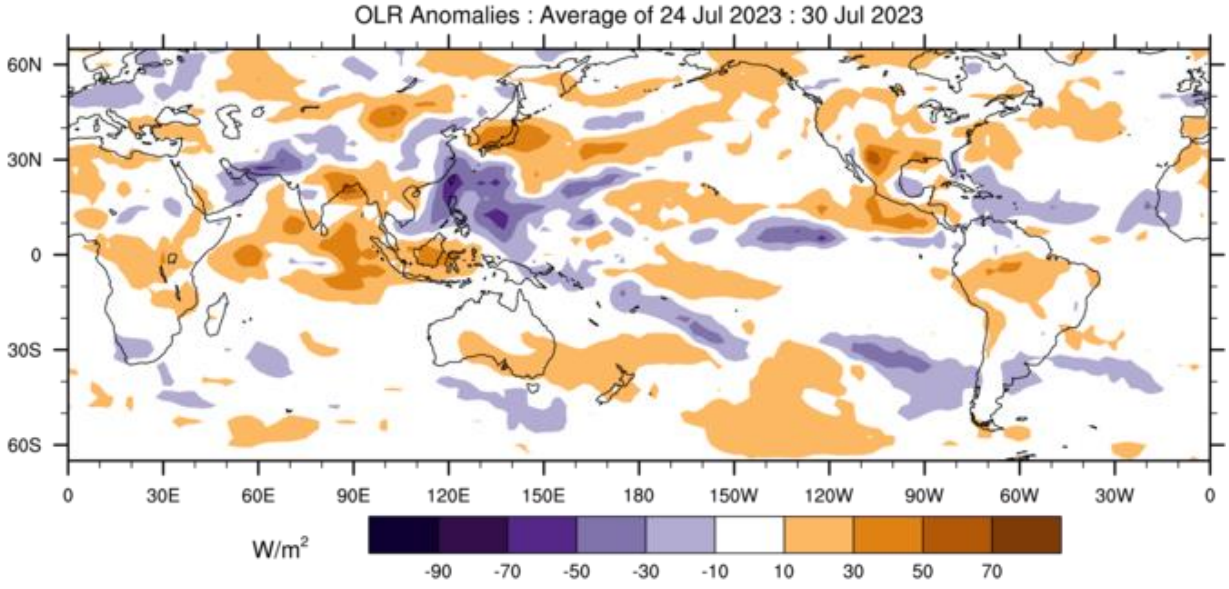
OLR Total and Anomalies, 7 Day OLR





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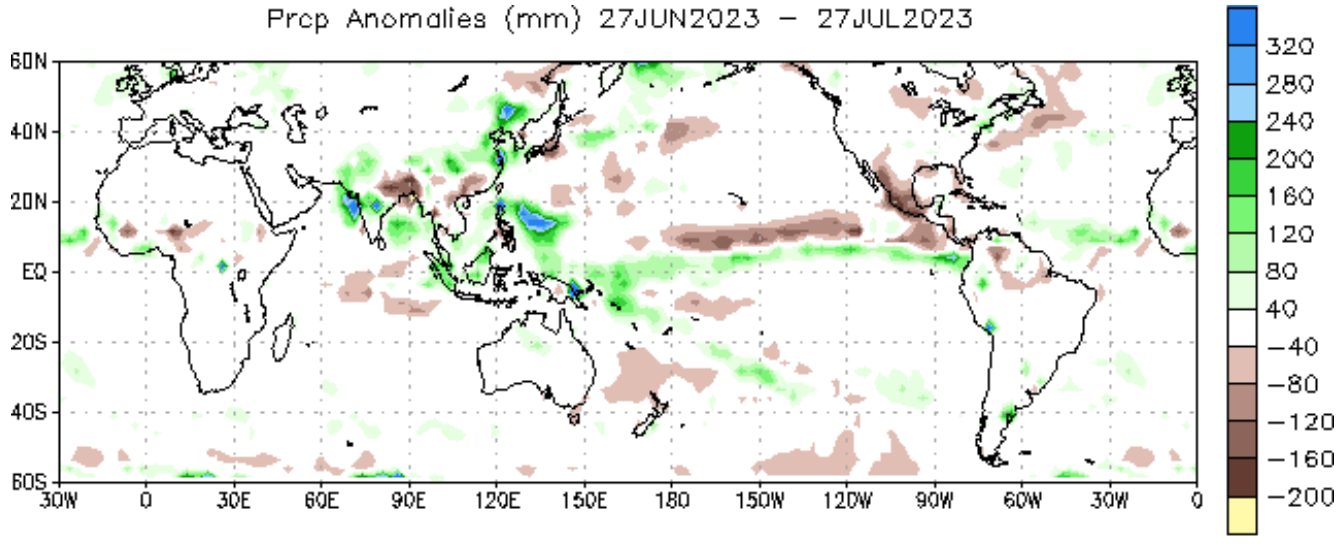
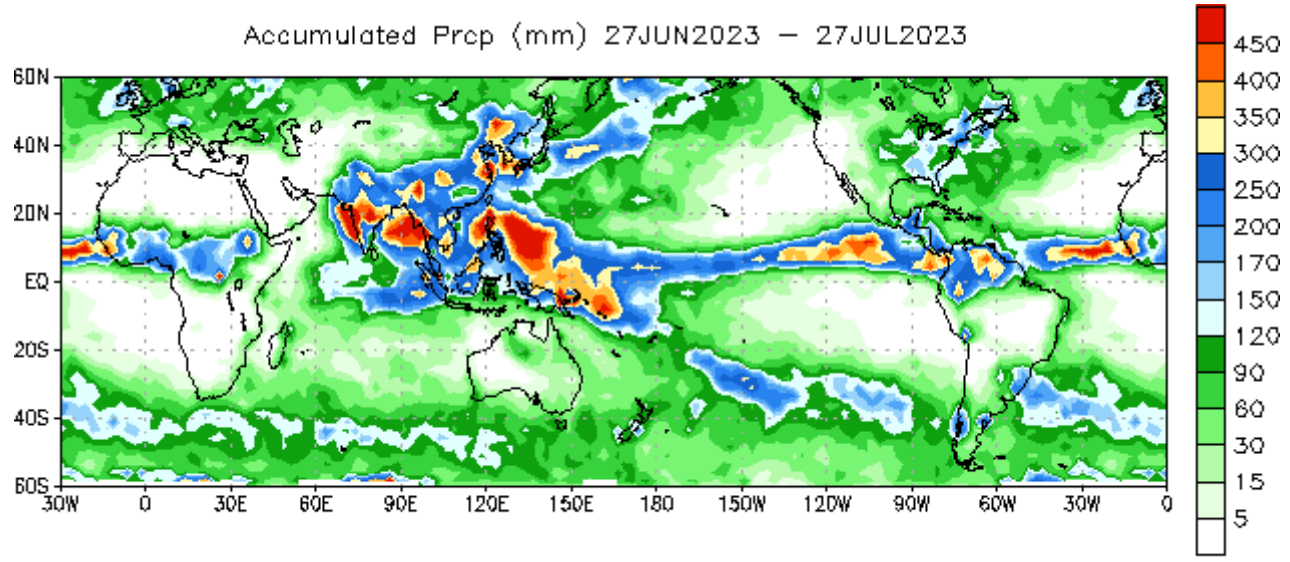
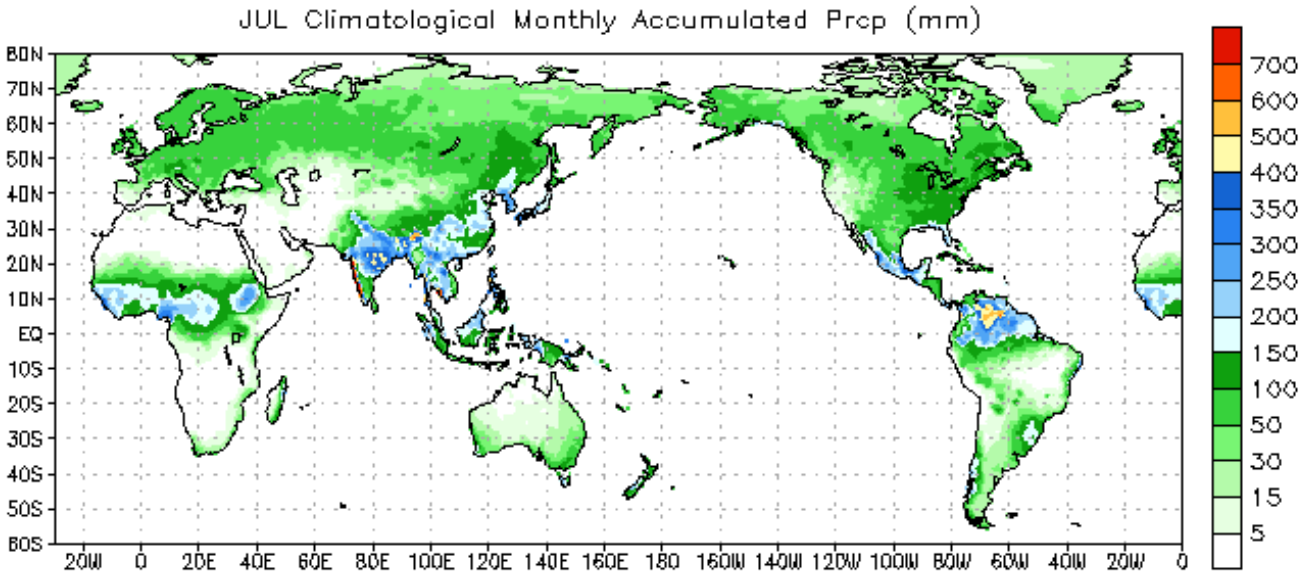


Data Source: NCEP CMAP Precipitation Climatology (1991–2020)

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

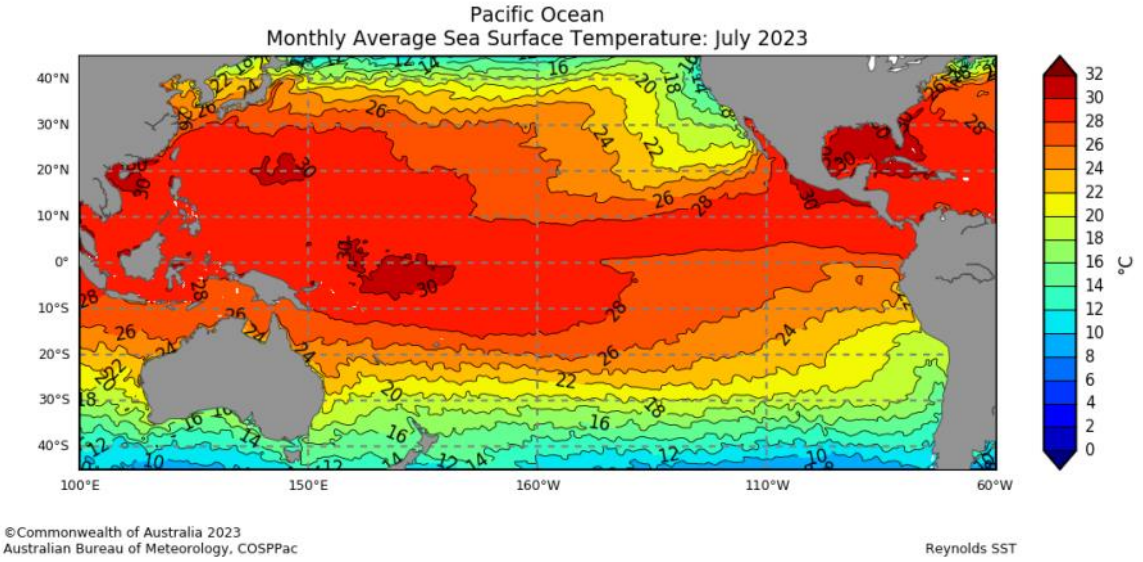
Sea surface temperatures (SST) for July 2023 were warmer than average over the entirety of the tropical Pacific Ocean and most of areas south of 10° S. Warm anomalies more than 1.0°C warmer than average were present over parts of these regions, increasing to more than 2°C warmer than average over small parts of the South American coast extending to 120° W.

Compared to June, warm anomalies at 1.5°C in the east equatorial tropical Pacific Ocean have extended further westwards to 170° E. A band of warm anomalies of 2.0 °C exist over the Queensland coast in Australia.

Warm SST anomalies also continued in the southern Tasman Sea, between south-east Australia and New Zealand, with patches of cold SST anomalies south-west and western Australia

Record-high July SSTs occurred in parts of eastern Solomon Islands, and northern Fiji. The SST in decile 10 (very much above average) and above average (8-9) are observed for majority of the Pacific Island Countries, spanning southeastward from Palau to Pitcairn Islands, and along the islands located near the equatorial region of the Pacific . Average SSTs (4-7) for July were observed in parts of Palau, northern PNG, and north of Line Islands, Kiribati. Patches were also observed in Vanuatu, Fiji, Tonga, Niue, Cook Islands, and south French Polynesia.

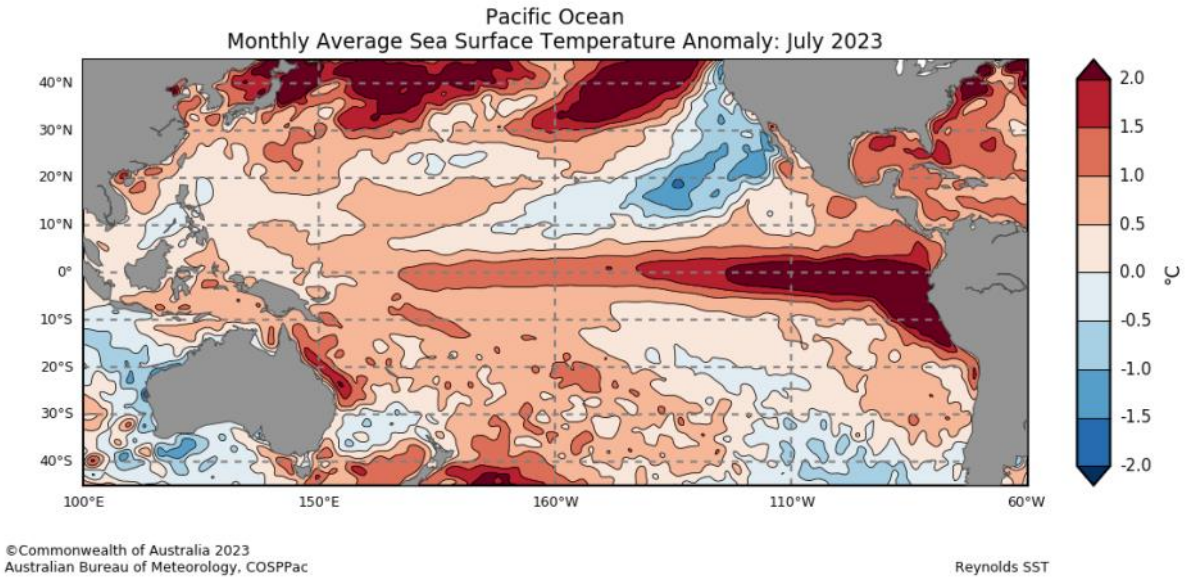
Mean Sea Surface Temperature



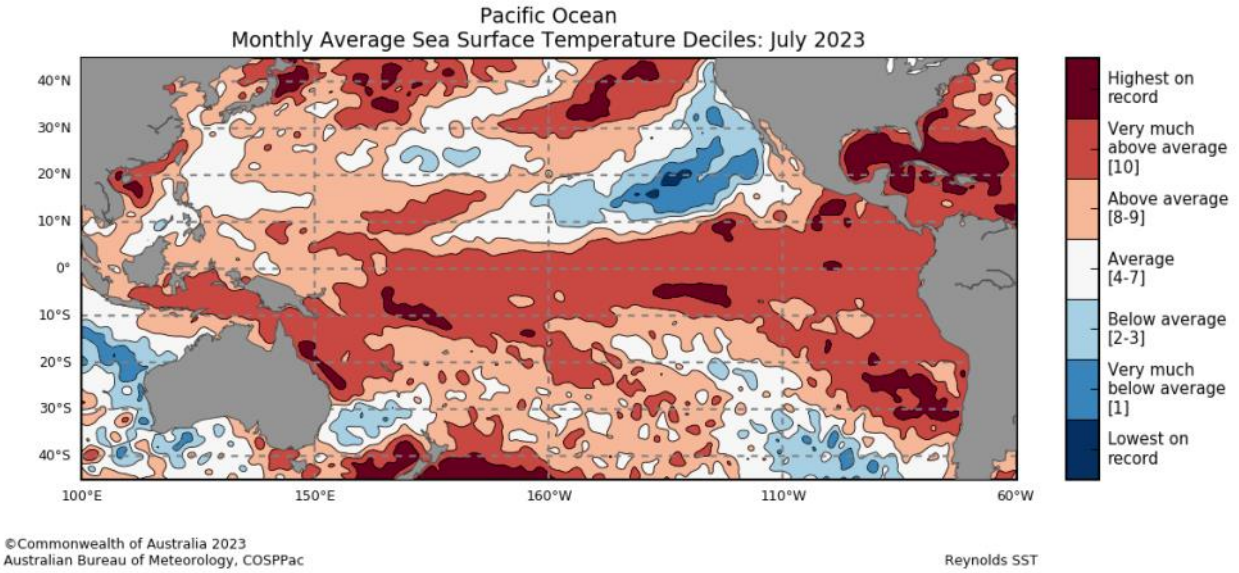
OCEAN CONDITIONS

Click link to access SEA SURFACE TEMPERATURE

Anomalous Sea Surface Temperature



Sea Surface Temperatures Deciles

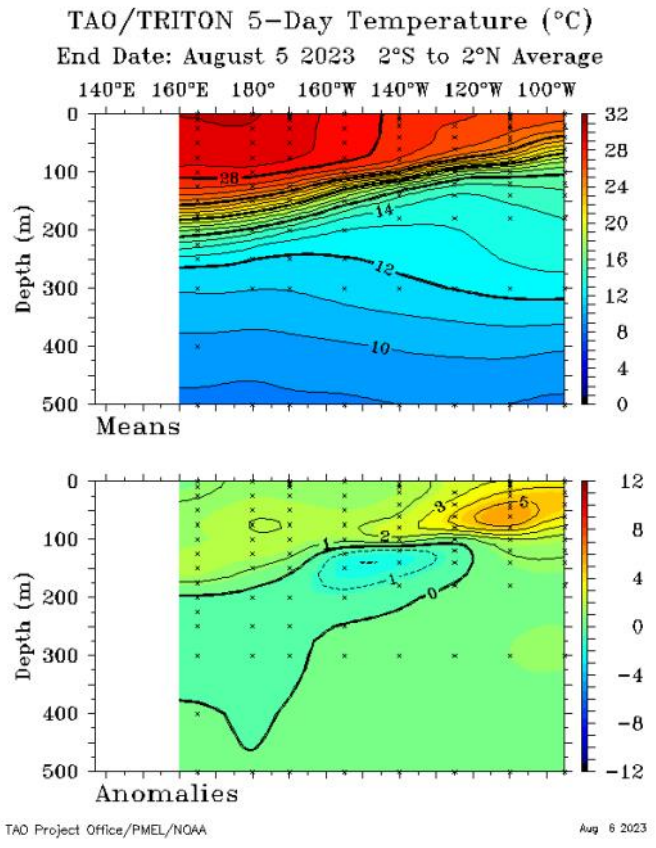


OCEAN CONDITIONS

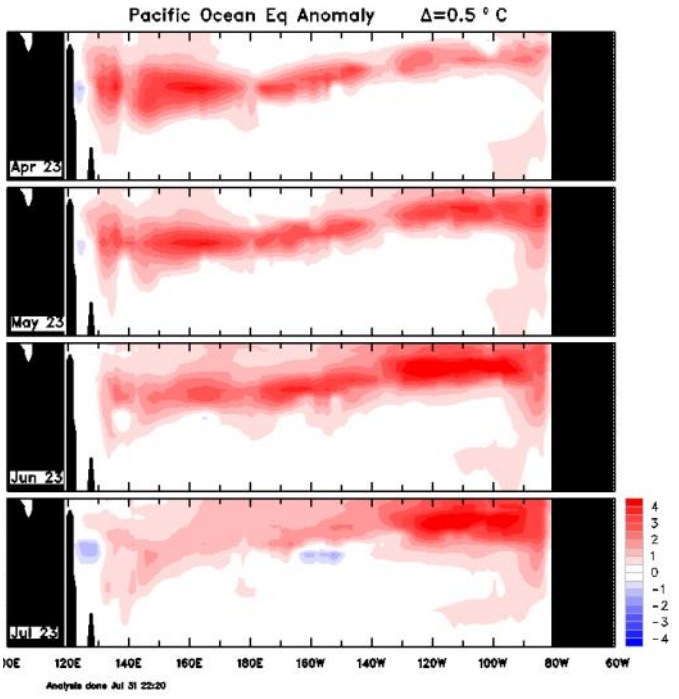
SUB SURFACE

The four-month sequence of equatorial Pacific sub-surface temperature anomalies (to 27 July 2023) shows warm anomalies were present for most of the top 150 m of the equatorial Pacific band. Anomalies reached more than 4 °C warmer than average across the eastern Pacific while only reaching up to 2 °C in the western and central Pacific. June and July have seen sub-surface heat concentrate towards the eastern Pacific, between the surface and 100 m depth. Heat has decreased in the western Pacific such that only weak warm anomalies remain.

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/

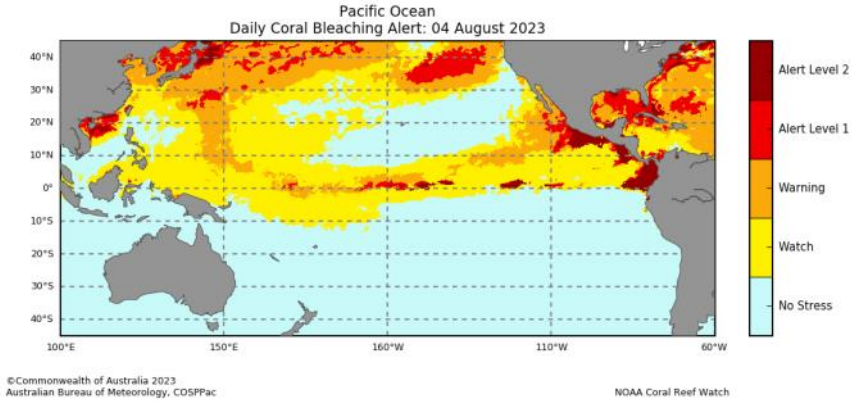
OCEAN CONDITIONS

CORAL BLEACHING

The daily Coral Bleaching Alert status for 04 August 2023 shows patches of 'Alert Level 1' for Kiribati (northern Gilbert Islands and central Line Islands). Patches of 'Warning' over northern FSM, Nauru, and Kiribati (Gilbert, northern Phoenix and northern Line Islands). The four-week Coral Bleaching Outlook to 27 August shows patches of area of 'Alert Level 1' over Nauru and Kiribati (central Gilbert, northern Phoenix and northern Line Islands). 'Watch to Warning' ratings extend east from FSM, RMI, northern PNG, northern Solomon Islands, and northern Tuvalu.

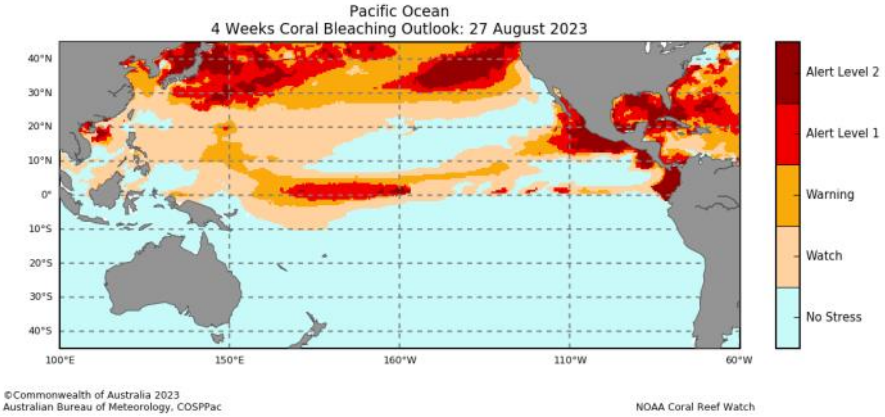
Daily Coral Bleaching Alert

(Source: Pacific Community COSPPac Ocean Porta Coral Bleaching)



4 Weeks Coral Bleaching Outlook

(Source: Pacific Community COSPPac Ocean Portal)



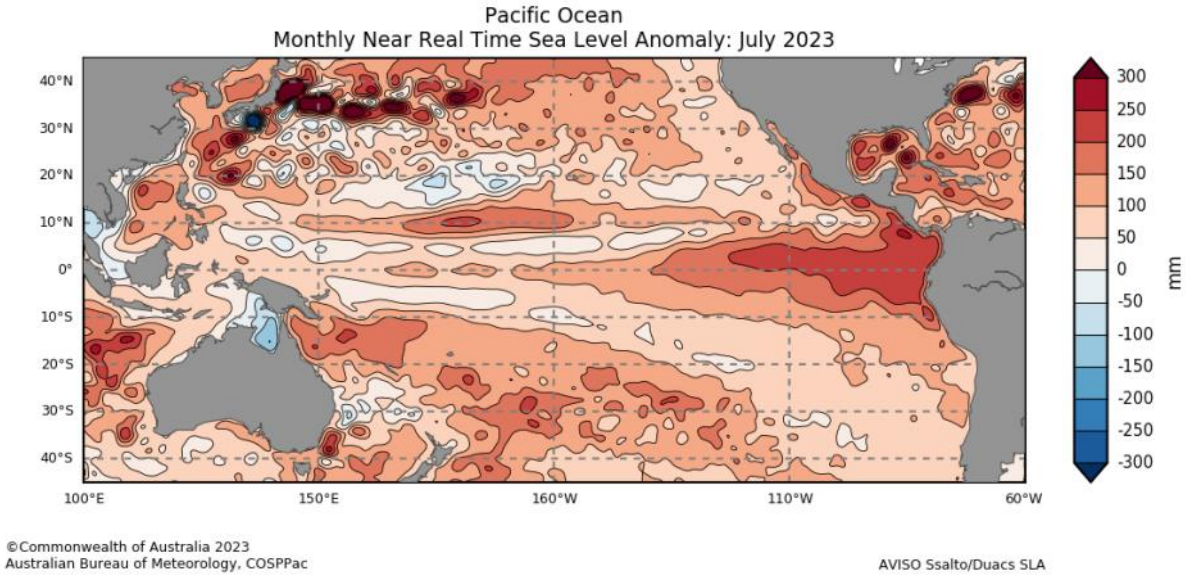
OCEAN CONDITIONS

OCEAN SURFACE CURRENTS AND SEA LEVEL

Sea level in July was above normal over COSPPac countries. Anomalies above +200 mm were observed in central RMI, southeastern PNG, southern Solomon Islands, northern Vanuatu and patches over southeast Fiji, southern Tonga and French Polynesia. Anomalies of +50 to +150 mm were observed in most of the COSPPac countries, apart from patches of below normal sea level anomalies observed in Palau, FSM, southwest New Caledonia and, northern and eastern Australia.

Monthly Sea Level Anomalies

Source: Pacific Community COSPPac Ocean Portal

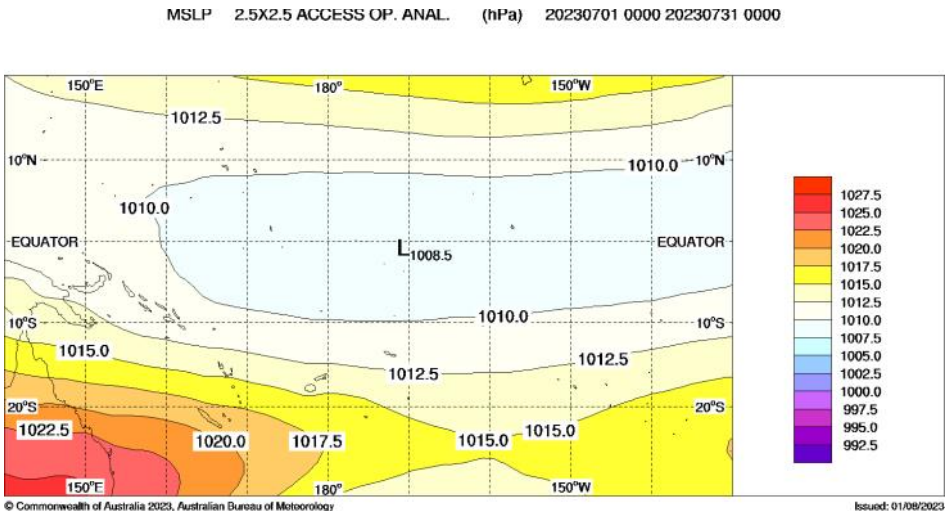


MEAN SEA LEVEL PRESSURE

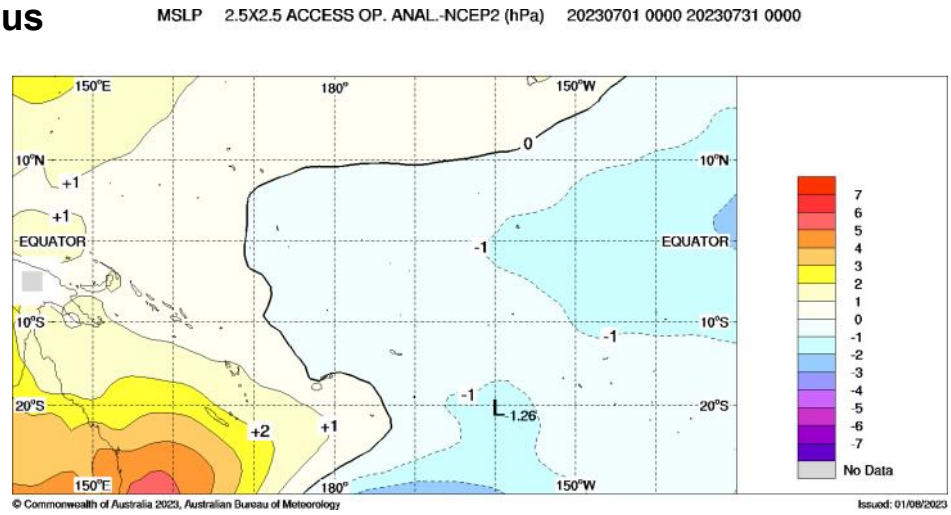
The July mean sea level pressure (MSLP) anomaly map shows mostly negative anomalies of 1 hPa or greater east of the Date Line. Positive anomalies of +1 hPa or greater were evident west of 170° E, especially over Australia.

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

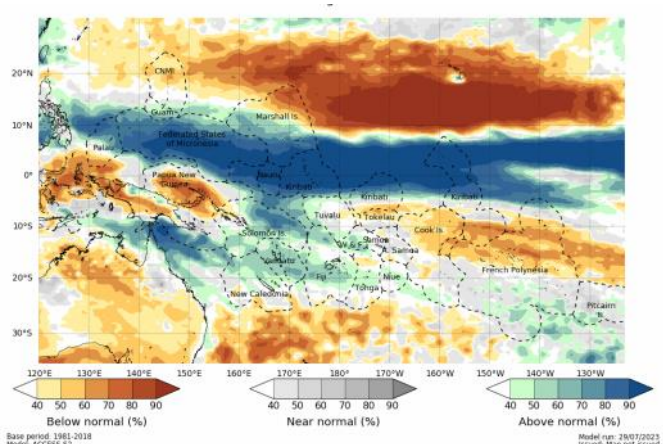
SEASONAL RAINFALL OUTLOOK

August—October 2023

The ACCESS-S model forecast for August 2023, shows below normal rainfall is likely or very likely for parts of PNG's Highlands and Islands regions, as well as CNMI, northern RMI, some small patches in each of western Solomon Islands, southwest Caledonia, northern and southern Tonga, American Samoa, and eastern Tuvalu, plus a larger area over Kiribati (southern Phoenix and southern Line Islands), northern Tokelau, central and northern Cook Islands and northern French Polynesia. Above normal rainfall is likely or very likely for Palau, FSM, central and southern RMI, Nauru, southern PNG, eastern and southern Solomon Islands, most of New Caledonia, Vanuatu, Fiji, most of Kiribati, western Tuvalu, Wallis and Futuna, central Tonga, Niue, far southern Cook Islands, south French Polynesia, and southern Pitcairn Islands EEZ.

The three-month rainfall outlook (August-October 2023) is very similar to the August outlook, with below normal rainfall likely or very likely in southern Palau, PNG's Islands and much of its southern mainland, CNMI, northern RMI, Kiribati (southern Line Islands), south New Caledonia, patches in each of east Fiji, Tonga, and Niue, plus Samoa, the central and northern Cook Islands, and central to northern French Polynesia. Above normal rainfall is likely or very likely from northern Palau in the west, across Guam, FSM, central and southern RMI, Nauru, northern Solomon Islands, most of Tuvalu, to Kiribati (Gilbert Is., north of both Phoenix and Line Is.). Similarly, above normal rainfall is likely or very likely in the south of PNG's EEZ, Vanuatu, plus patches in Fiji, the southern Cook Islands, and southern French Polynesia.

Monthly ACCESS-S Maps



The Copernicus multi-model outlook for August-October 2023 favours above normal rainfall for Palau, southern Guam, FSM, southern and central RMI, much of the PNG Islands, Solomon Islands, Nauru, northern Tuvalu, and Kiribati (Gilbert Islands and the north of both Phoenix and Line Islands). Below normal rainfall is likely or very likely for CNMI, northern RMI, New Caledonia, Vanuatu, Fiji, Wallis and Futuna, Samoa, Tokelau, American Samoa, central and northern Cook Island, French Polynesia and Pitcairn Islands.

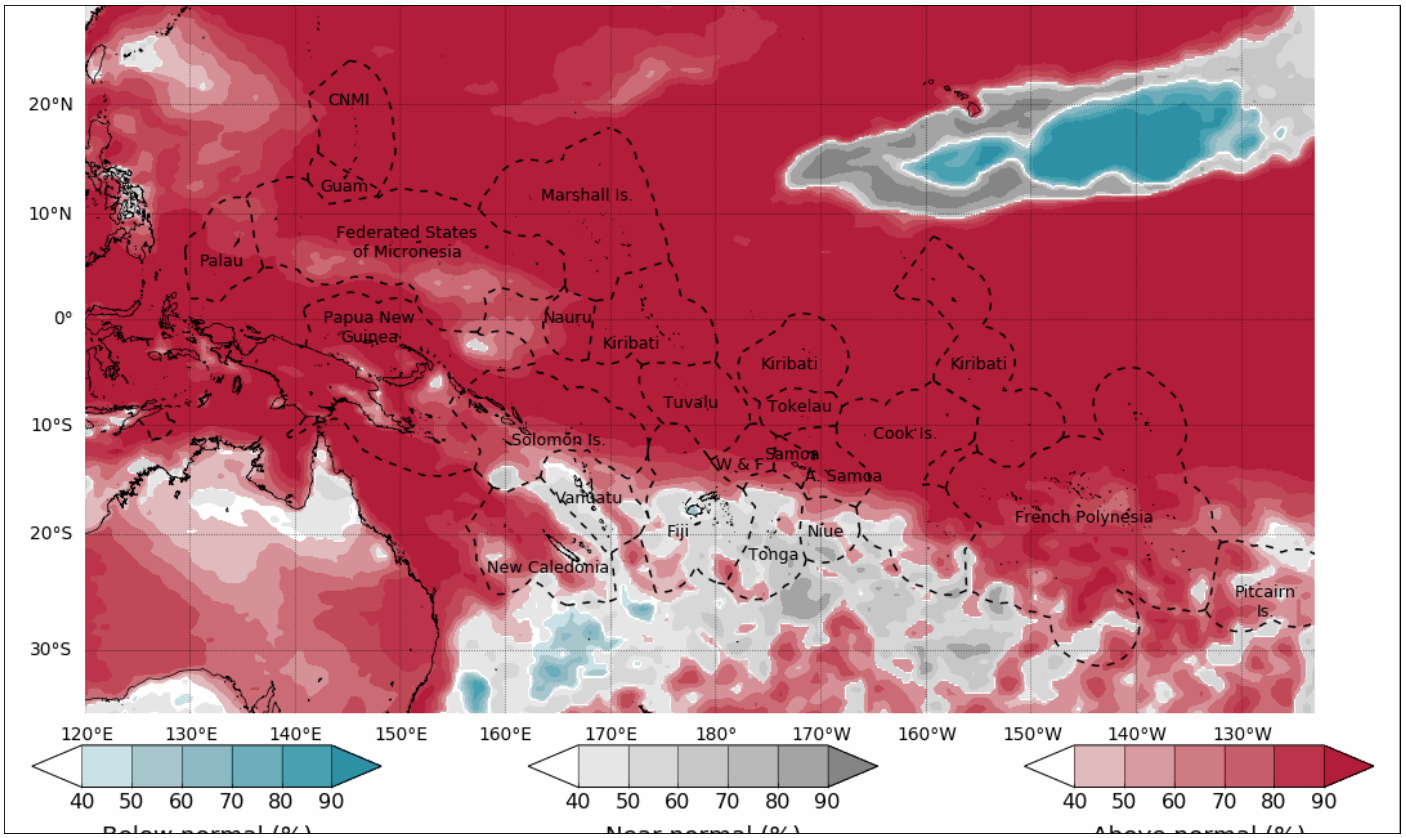
The APEC Climate Centre multi-model outlook for August-October 2023 is also very similar to the Copernicus model.

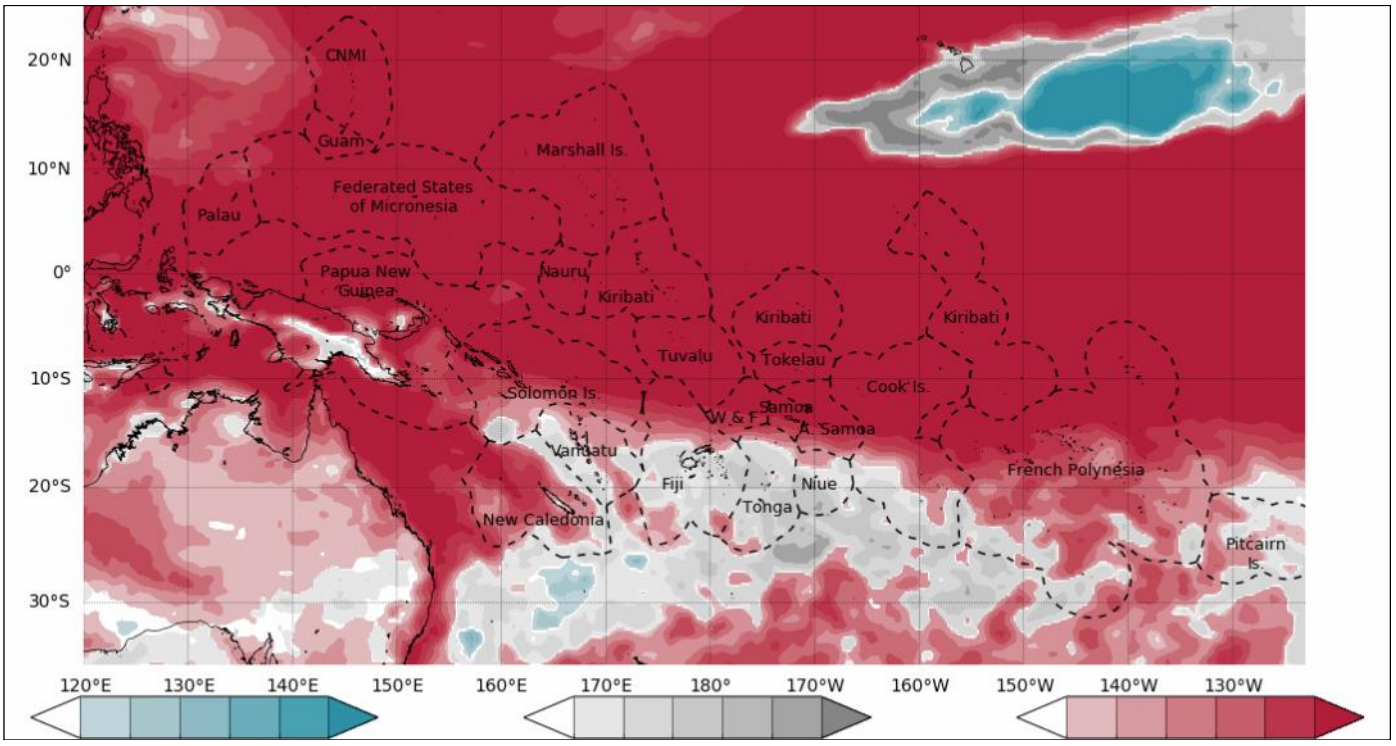
For August-October 2023, the models agree on above normal rainfall being likely or very likely from northern Palau in the west, across southern Guam, FSM, central and southern RMI, Nauru, northern Solomon Islands, north Tuvalu, to Kiribati (Gilbert Is., north of both Phoenix and Line Is.), and the south of PNG's EEZ. The models also agree on below normal rainfall being likely or very likely in CNMI, northern RMI, Kiribati (southern Line Islands), far southern New Caledonia, patches in each of south and east Fiji, northern Tonga, and Niue, plus central and northern Cook Islands, and central to northern French Polynesia.

SEASONAL TEMPERATURE OUTLOOK

August—October 2023

Monthly Tmax and Tmin ACCESS-S Maps

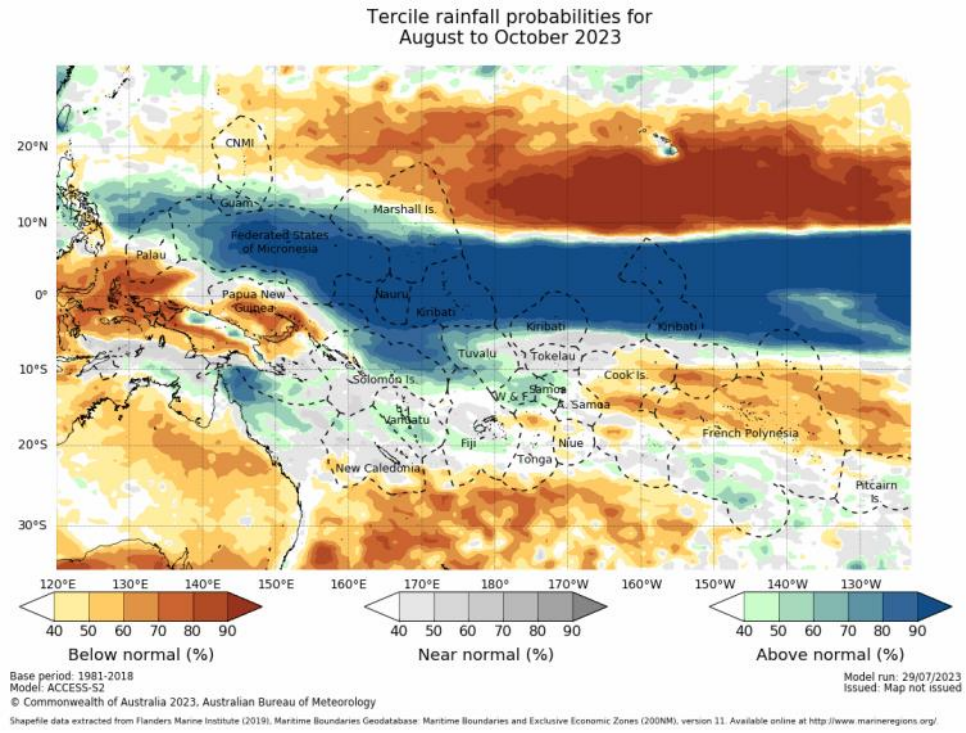


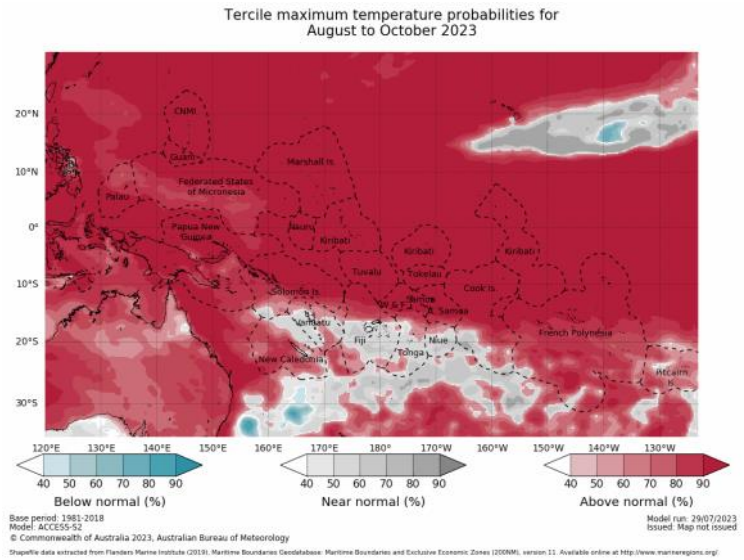


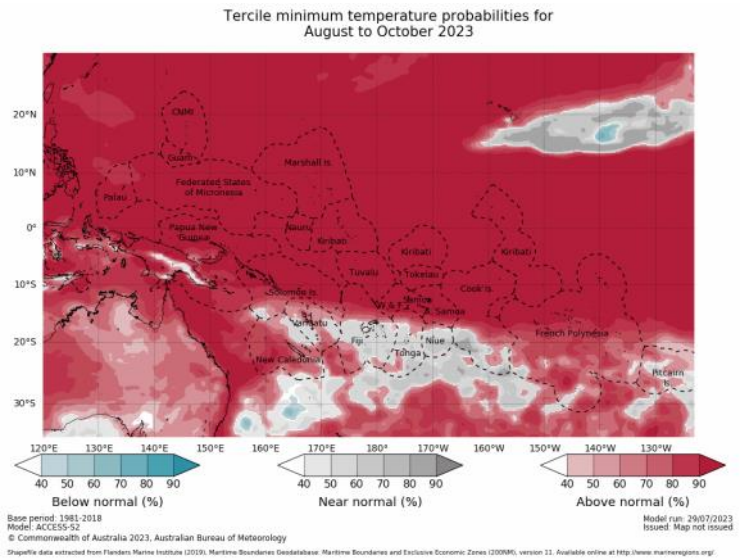
SEASONAL RAINFALL OUTLOOK

August—October 2023

Seasonal ACCESS-S maps





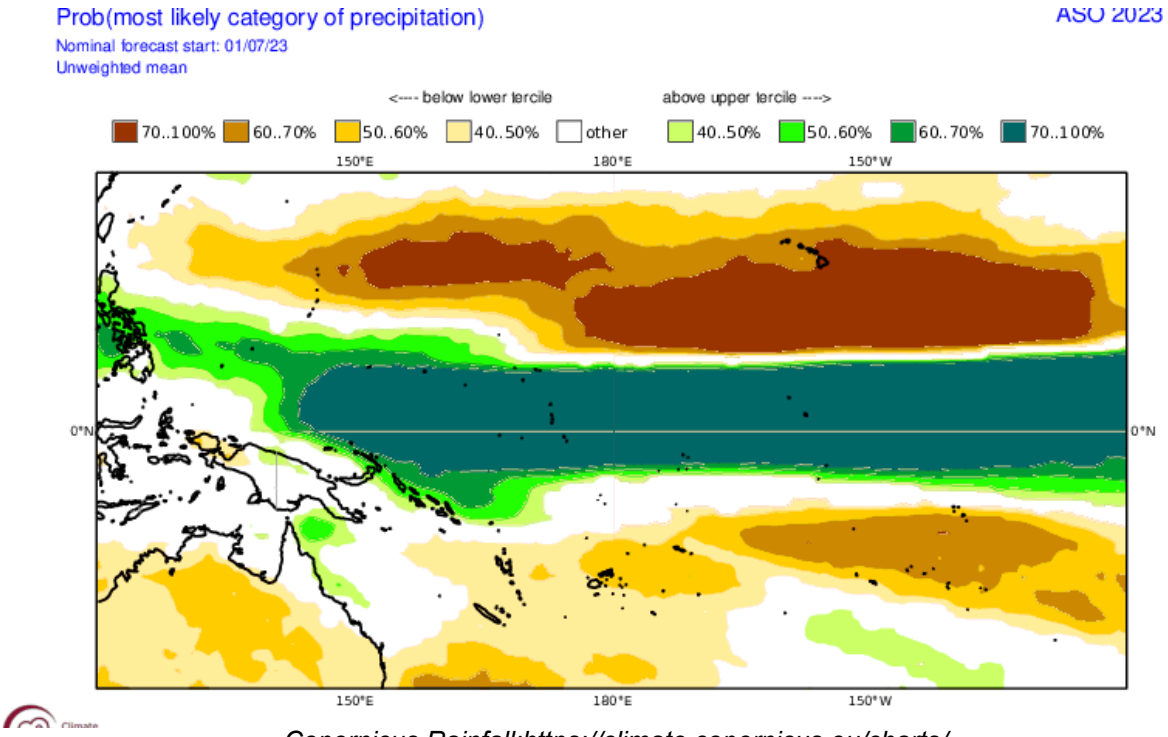


'About ACCESS-S http://access-s.clide.cloud/

SEASONAL RAINFALL OUTLOOK

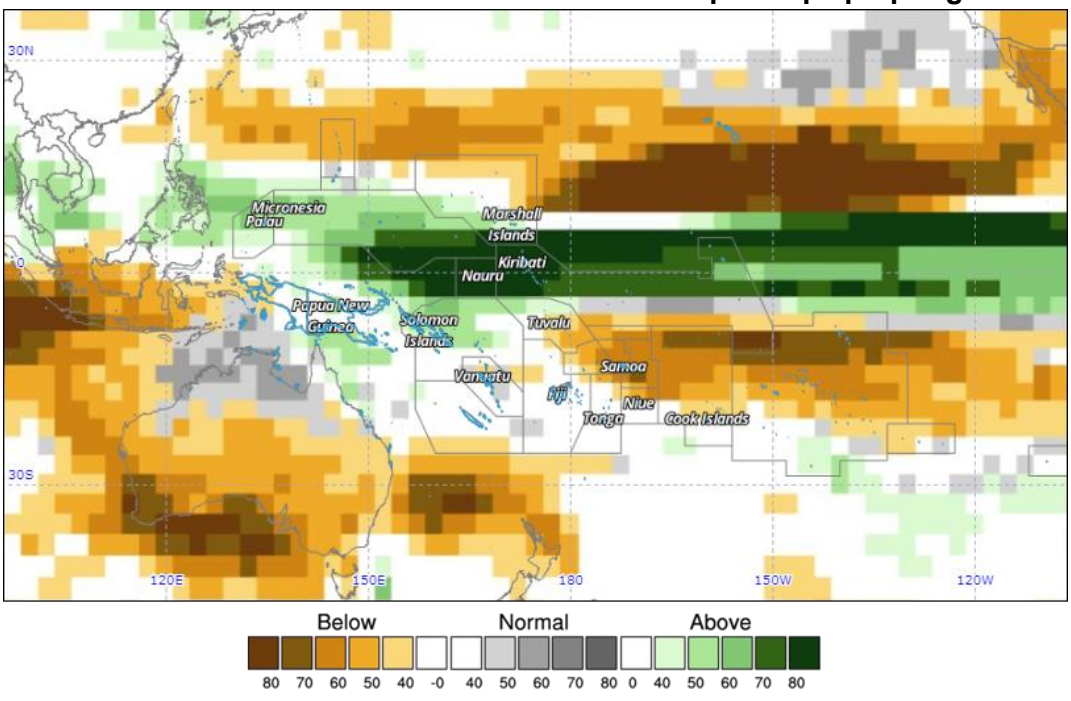
August—October 2023

Copernicus (C3S multi-system)-Rainfall



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

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



Year: 2023, Season: JAS, Lead Month: 3, Method: GAUS
Model: APCC, BOM, CMCC, MSC, NASA, NCEP
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TROPICAL CYCLONE

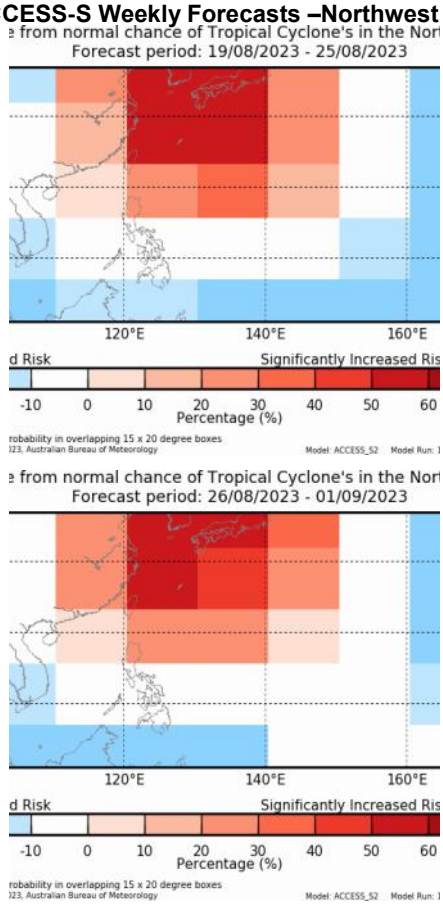
2022/2023 Season

In the southwest Pacific, the 2022-23 tropical cyclone ended on 30th April 2023. The outlook for the season favoured enhanced risk for tropical cyclone activity in the western part of the basin. In the central part of the region, cyclone risks were considered to be generally near-normal to below normal. There were five cyclones (Hale, Irene, Gabrielle, Judy, Kevin) over the southwest Pacific, with three (Gabrielle, Judy and Kevin) reaching severe status, affecting Australia, New Caledonia, Vanuatu, Fiji and New Zealand. TC activity in the western north Pacific occurs year around and with the possible development of El Niño, an increase in TC activity is supported, as stated in the PICOF 12 regional statement.

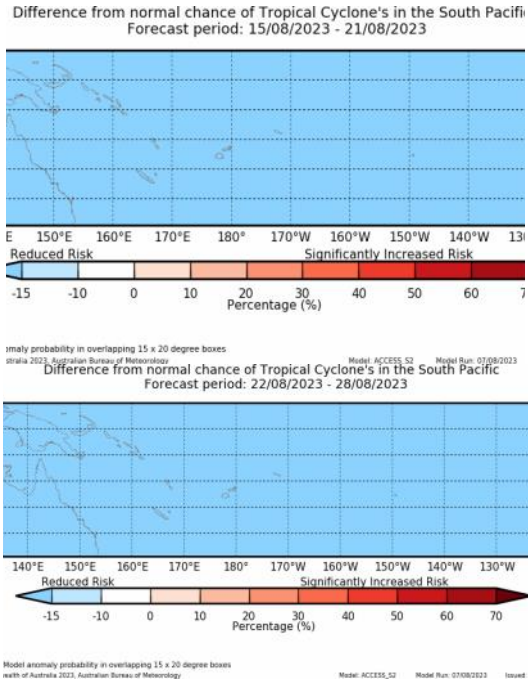
It's important to remember that history showed that TC can happen outside the normal cyclone season and it does not take a severe cyclone to produce severe impacts. Coastal and river flooding rainfall can occur with a distant, weak, or former cyclone, especially if the system is slow-moving. Communities 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 19 August and 1 September around China, Philippines, Japan and CNMI.

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.

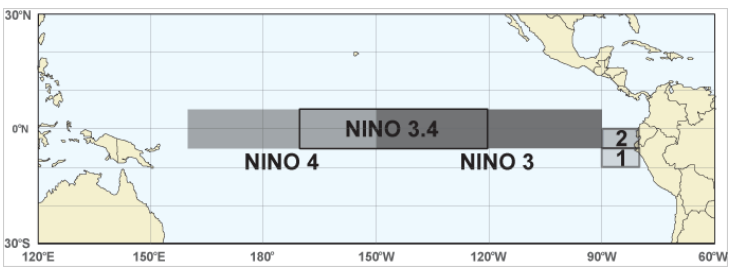
20 degrees Celsius Isotherm Depth

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