Monthly Climate Bulletin

September 2020

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Bureau of Meteorology

Australian Aid

Climate and Oceans Support Program in the Pacific

Pacific Community
Communauté du Pacifique

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SUMMARY

Issued 09 October 2020

- The Bureau's ENSO Outlook has moved to La Niña, indicating La Niña is established in the tropical Pacific. All surveyed international climate models indicate this La Niña will persist until at least January 2021.
- The Intertropical Convergence Zone (ITCZ) was weaker than normal and displaced north of its normal position in the western Pacific. However, the South Pacific Convergence Zone (SPCZ) was displaced southwest of normal with some enhancement over PNG and Solomon Islands.
- The Madden-Julian Oscillation (MJO) is currently weak or indiscernible, but may increase in strength as it moves from the Maritime Continent into the Western Pacific Ocean.
- Sea level in September was higher than normal for most countries in the region, with positive anomalies (15-25cm) situated around Palau, FSM, RMI and far north of eastern Kiribati, while smaller patches of +15 to +20cm anomalies occurred around the Solomon Islands, Vanuatu, Fiji, Tonga and Niue. Sea level in the central to eastern equatorial Pacific was lower in September than August, although anomalies remained positive.
- Coral bleaching is on Alert Level 2 in the western part of FSM, while areas of Alert Level 1 exists around FSM and eastern Palau. The Coral Bleaching Outlook shows the region of Alert Level 2 expanding over much of FSM, with Alert 1 in remainder of FSM, Palau and northern PNG. The rest of northern PNG, the Solomon Islands, RMI, Nauru, southern Tuvalu, northern Fiji and Samoa are on Warning or Watch alert, while remaining south west Pacific countries are rated as 'no stress'.
- For October to December, the dynamical models (as well as SCOPIC) agree on above normal rainfall for Palau, southern Marshall Islands, most parts of PNG, Solomon Islands, New Caledonia, Vanuatu, Fiji, Tonga and southern Cook Islands. The models also agree on below normal rainfall eastern FSM, northern Marshall Islands, Nauru, Kiribati, northern Tuvalu and northern Cook Islands.

EL NIÑO–SOUTHERN OSCILLATION

La Niña underway in the tropical Pacific

Climate Driver Update issued on 29 September 2020

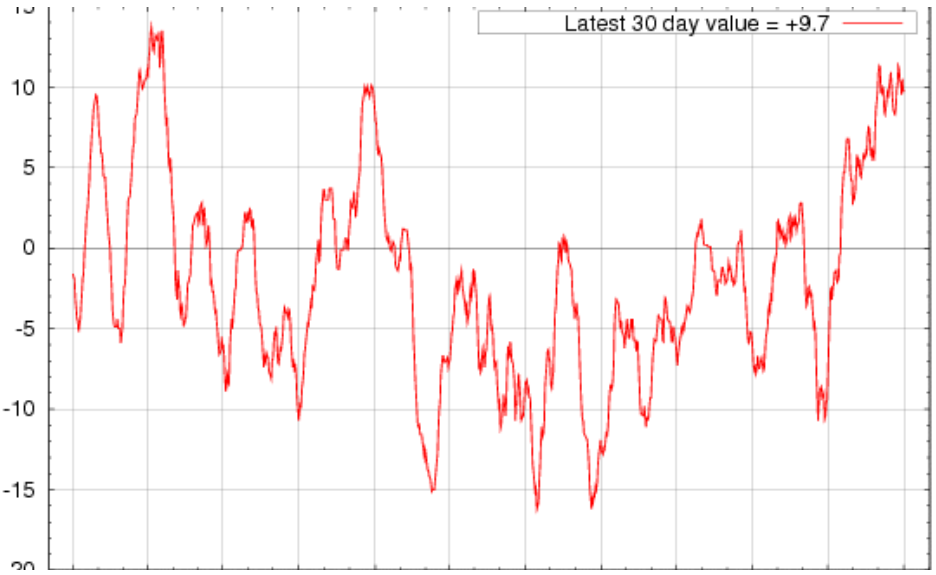
The Bureau's ENSO Outlook has moved to La Niña, indicating La Niña is established in the tropical Pacific. All surveyed international climate models indicate this La Niña will persist until at least January 2021.

While models agree La Niña will continue well into summer 2020-21, around half the models predict a strong event, while 3 of 8 models suggest moderate strength. Overall, models do not currently anticipate this event will be as strong as the La Niña of 2010-12, which was one of the four strongest La Niñas on record. The strength of La Niña impacts on Australia and Pacific Islands are often related to the strength of the event.

Central and eastern tropical Pacific Ocean sea surface temperatures exceed La Niña thresholds (0.8 °C below average) and atmospheric indicators, including the Southern Oscillation Index (SOI), trade winds and cloud, are also at La Niña levels.

In the Indian Ocean, the latest values of the Indian Ocean Dipole (IOD) index have again gone into negative dipole territory. Five of the 6 surveyed models indicate the IOD will be negative for October, and three models continue negative IOD values into November.

Both La Niña and negative IOD typically increase the chance of above average rainfall across much of Australia and western Pacific during spring (September-November). Above average summer rainfall is also typical across eastern Australia during La Niña. Current climate outlooks indicate the remainder of 2020 will be wetter than average across the western Pacific.
The 30-day Southern-Oscillation Index (SOI) for the 30 days ending 27 September was +10.4.
The 90-day value is also above La Niña threshold at +8.1.

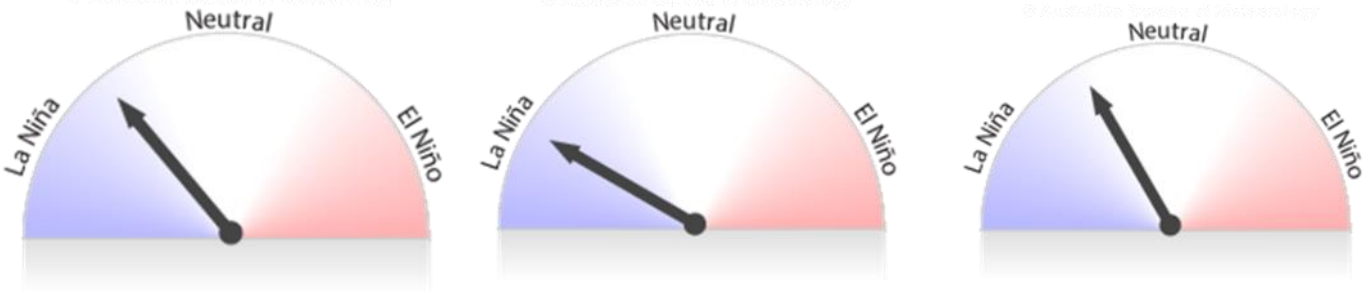


EL NIÑO–SOUTHERN OSCILLATION

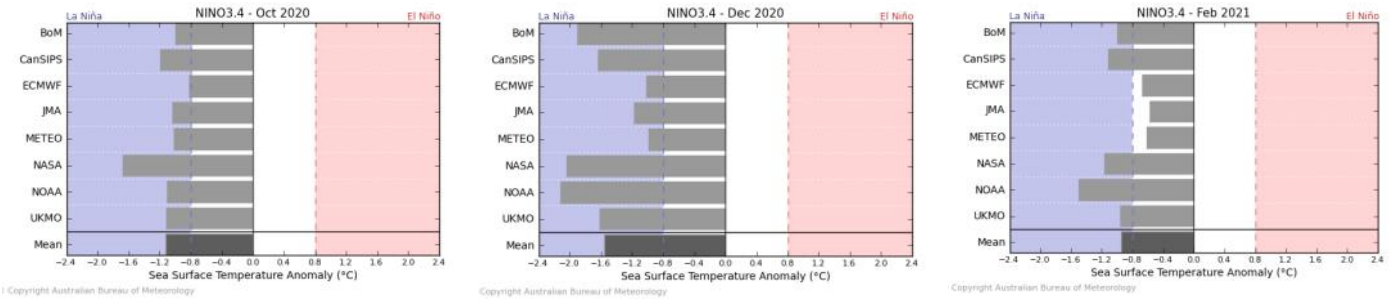
La Niña underway in the tropical Pacific

Climate Driver Update issued on 29 September 2020

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



Bureau of Meteorology NINO3.4 International Model Outlooks



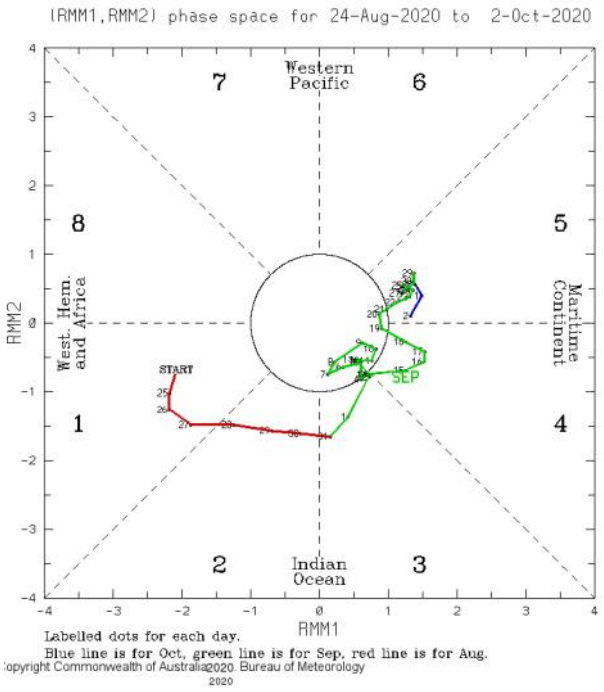
Bureau of Meteorology summary of international model outlooks for NINO3.4: http://www.bom.gov.au/climate/model-summary/#tabs=Pacific-Ocean

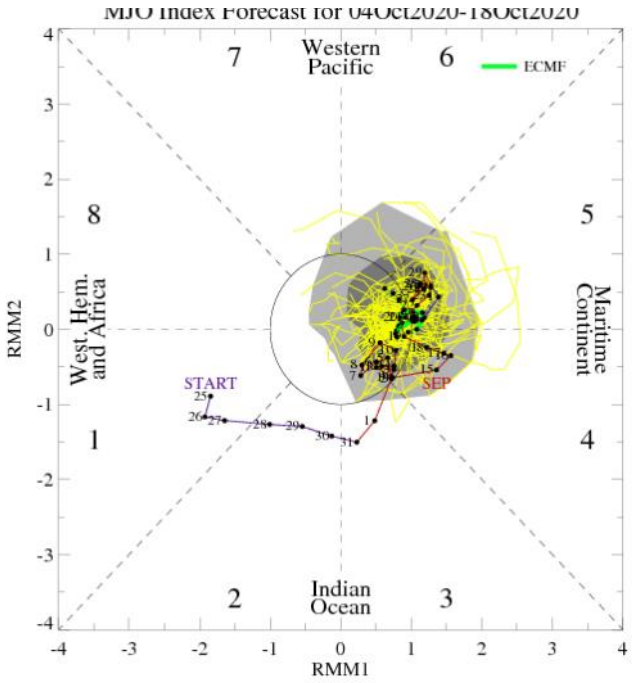
MADDEN–JULIAN OSCILLATION

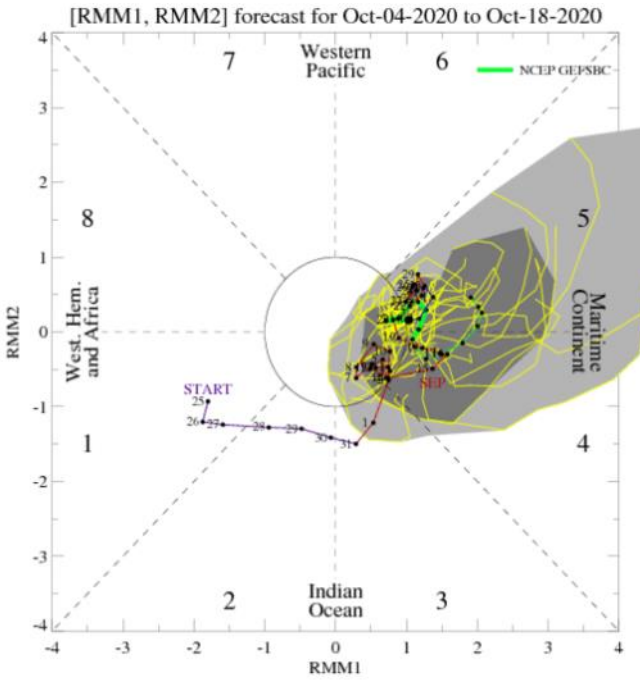
Weekly Tropical Note [Issued on Tuesday 29 September 2020

The Madden-Julian Oscillation (MJO) is currently weak or indiscernible but may increase in strength as it moves from the Maritime Continent into the Western Pacific Ocean.

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





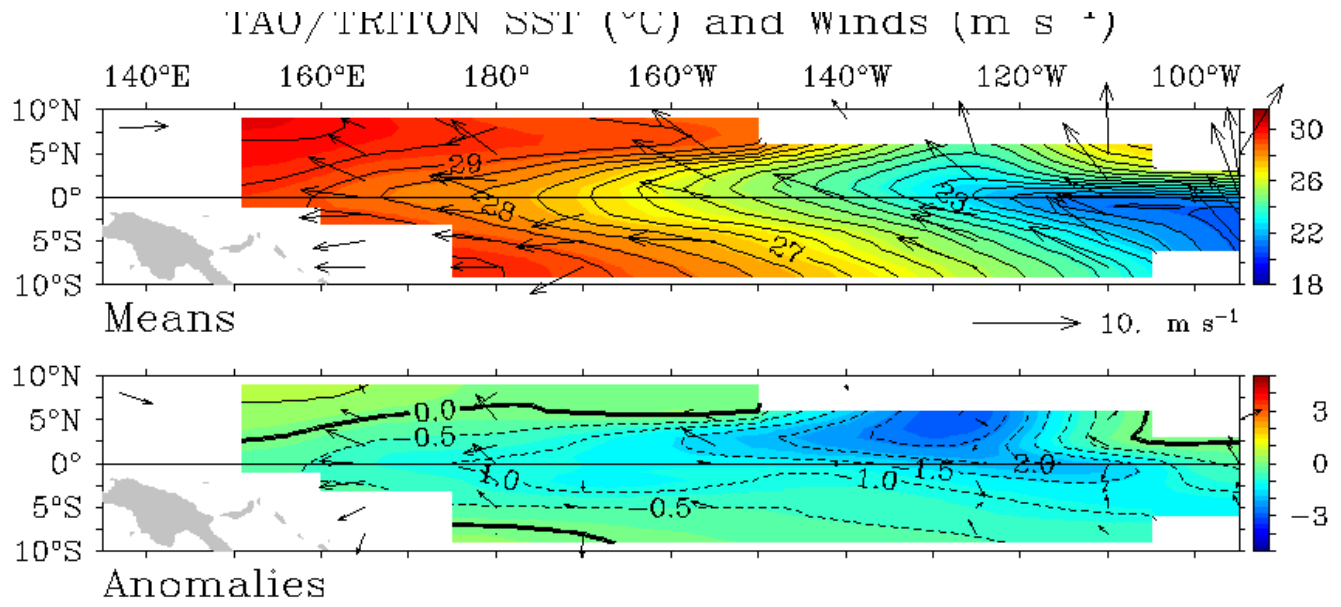


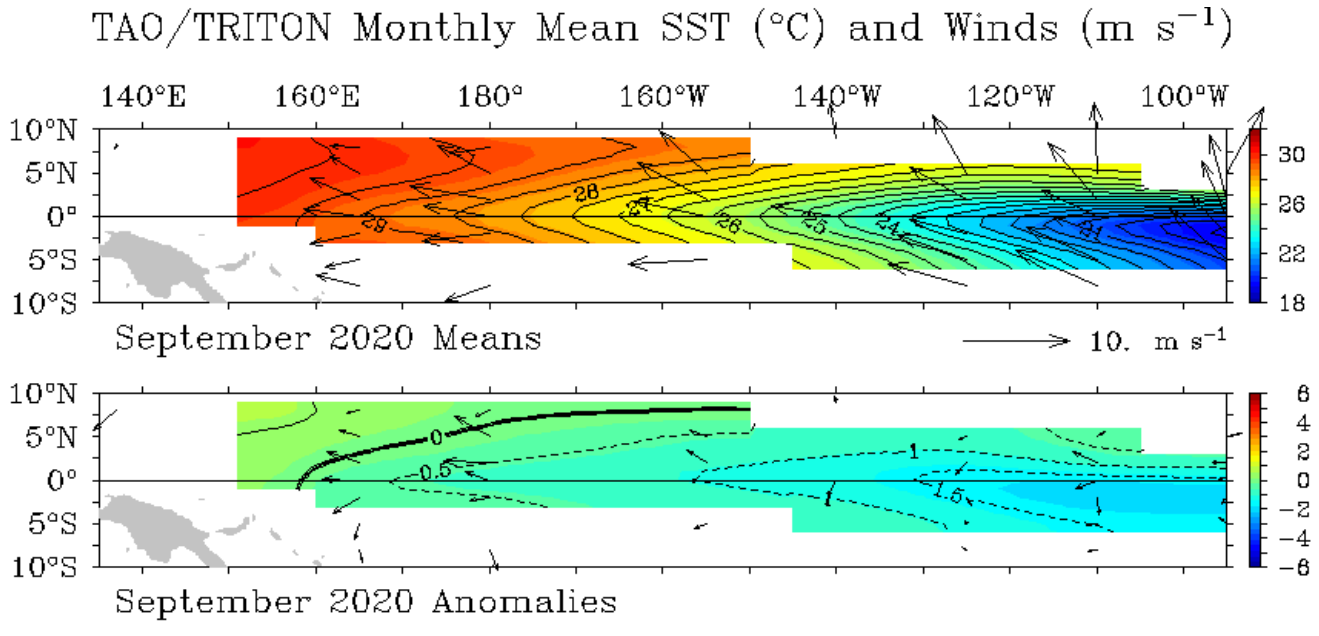
WIND

Display link

The equatorial trade winds in the 5-day snapshot ending 03 October shows enhanced trade winds in the central and western equatorial Pacific. For September, the TAO/TRITON data show slightly enhanced trade winds across most of 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.





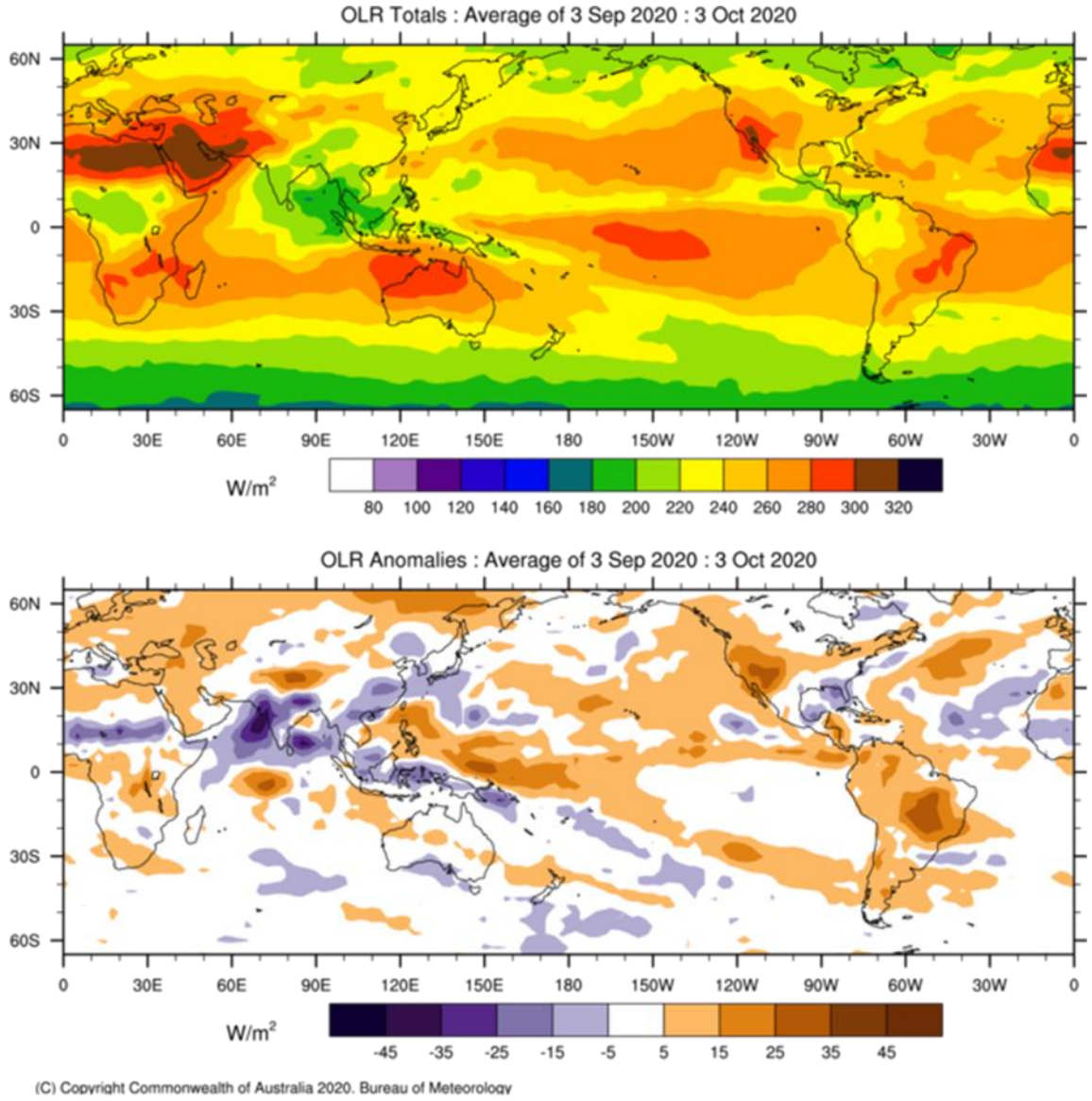
CLOUD AND RAINFALL

OLR link

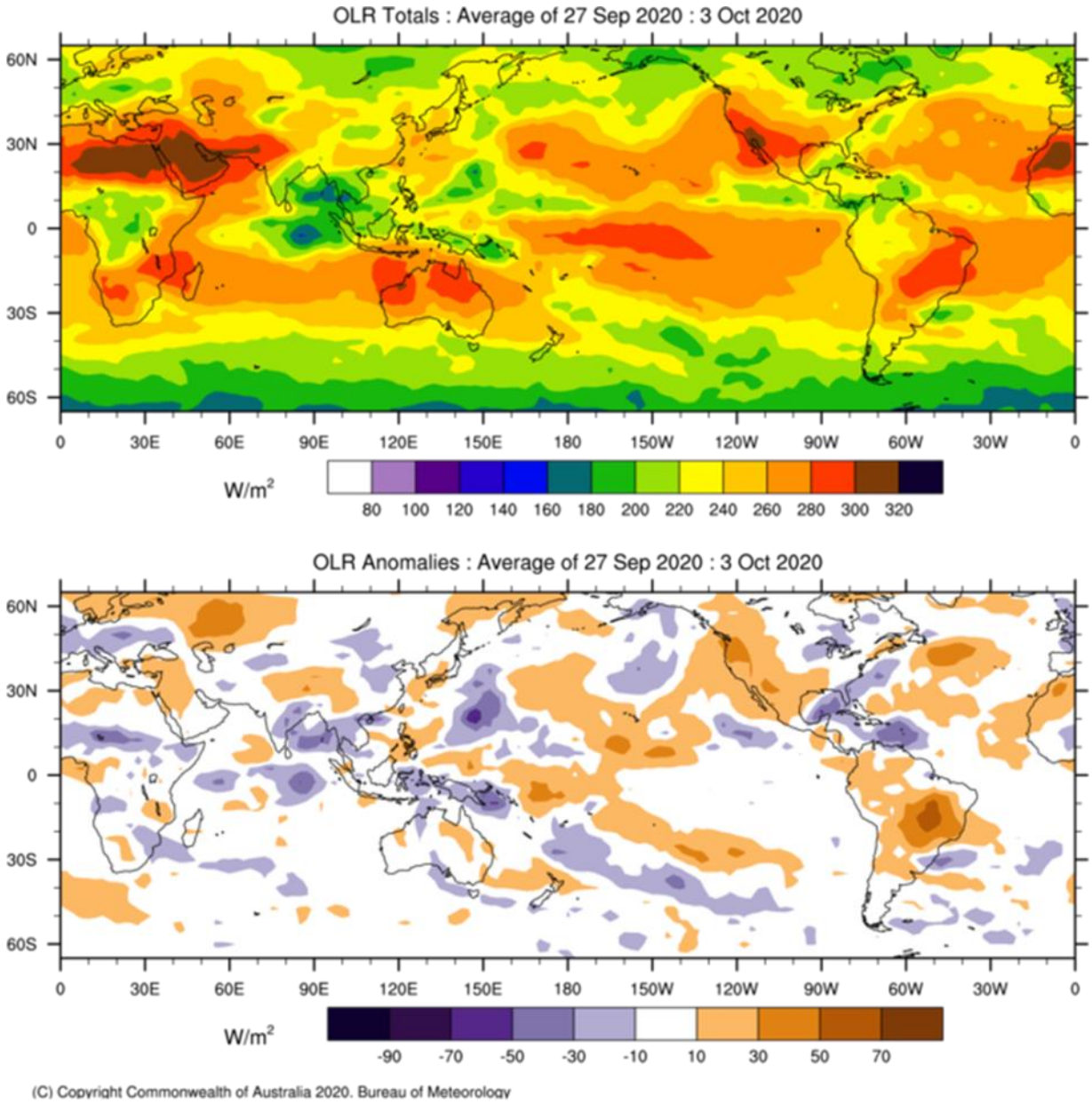
The September 30-day OLR total and anomaly maps suggest the Intertropical Convergence Zone (ITCZ) was weaker than normal and shifted north across the Pacific. However, the South Pacific Convergence Zone (SPCZ) was shifted southwest, which may result in higher rainfall over countries that normally don't see much activity from it. This pattern is typical during a La Niña event.

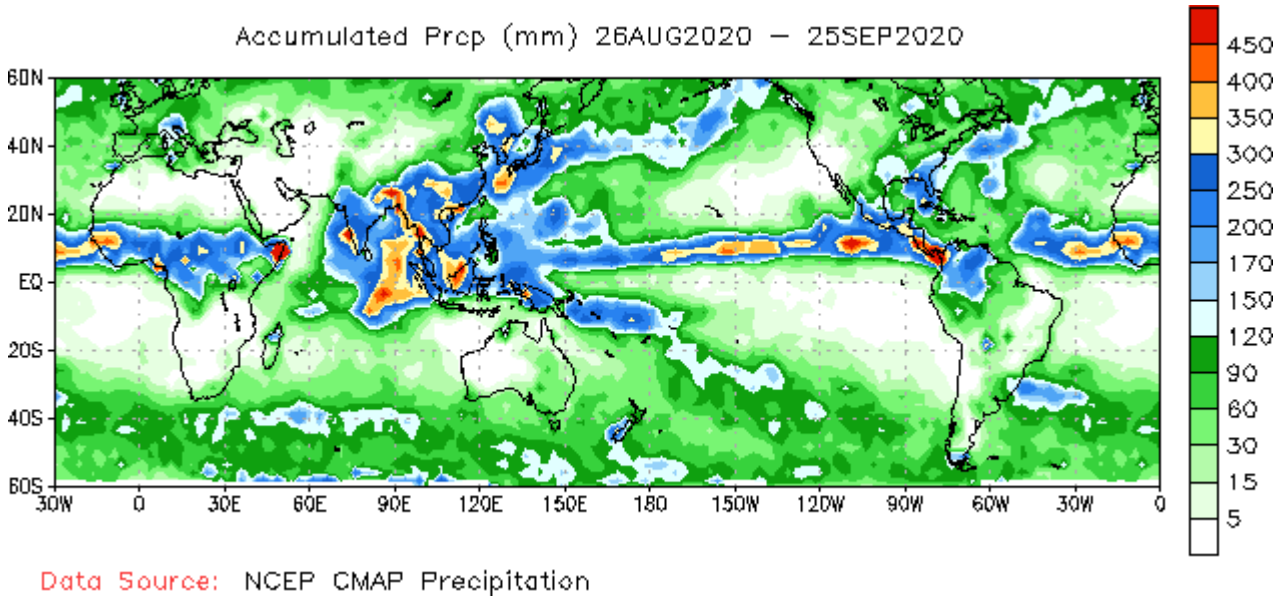
Note: Global maps of OLR below highlight regions experiencing more or less cloudiness. The top panel is the total OLR in Watts per square metre (W/m^2) and the bottom panel is the anomaly (current minus the 1979-1998 climate average), in W/m^2. In the bottom panel, negative values (blue shading) represent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

OLR Total and Anomalies, 30 Day OLR



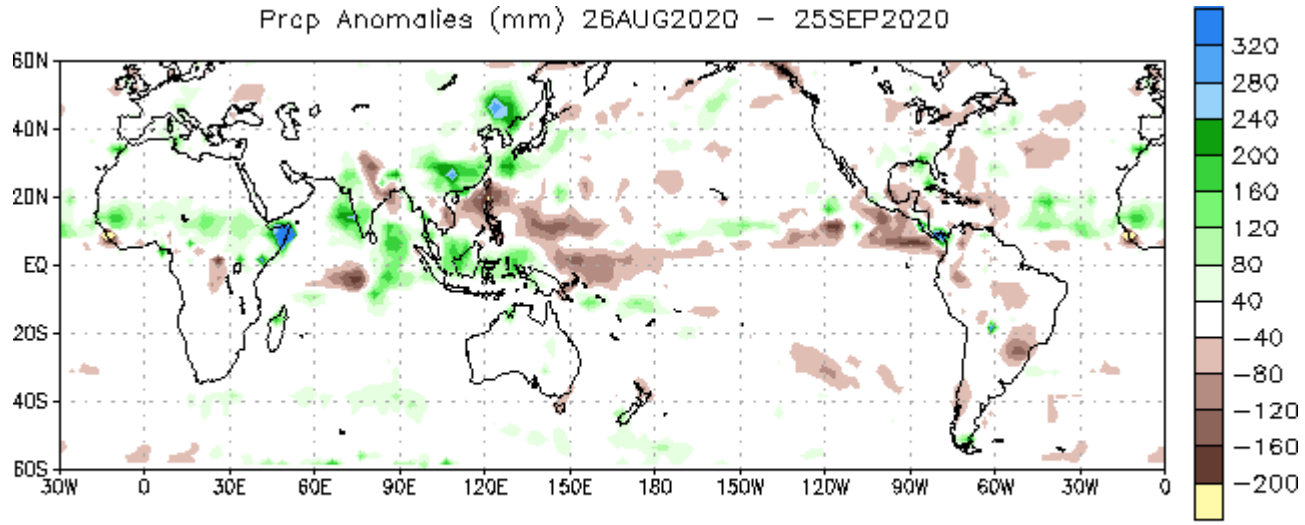
OLR Total and Anomalies, 7 Day OLR



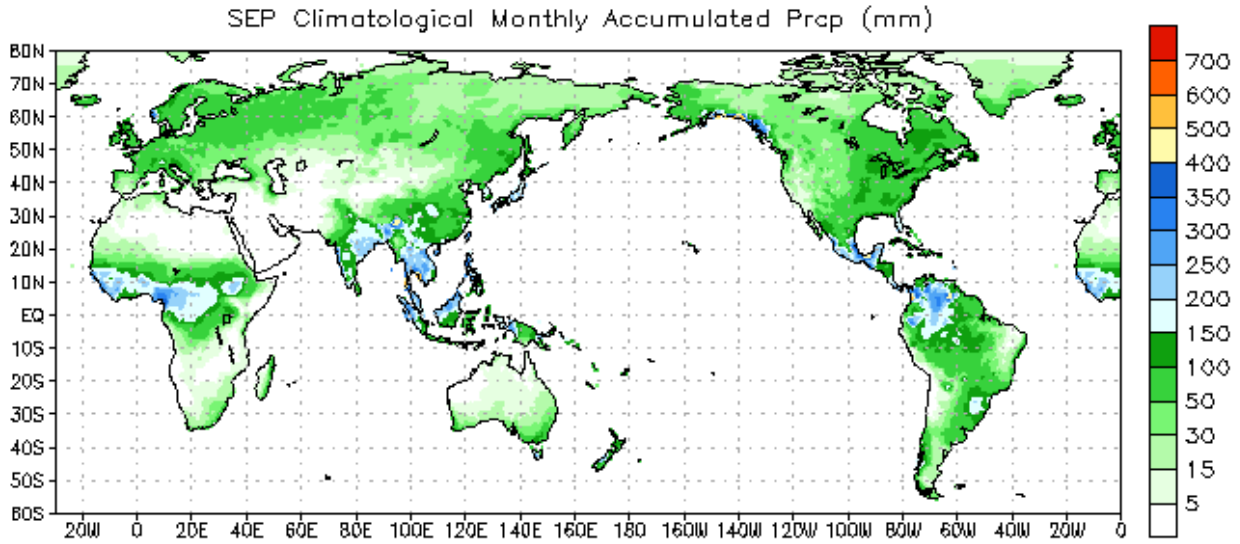


Data Source: NCEP CMAP Precipitation

30-Day Rainfall Anomalies



Data Source: NCEP CMAP Precipitation
Climatology (1979–1995)



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

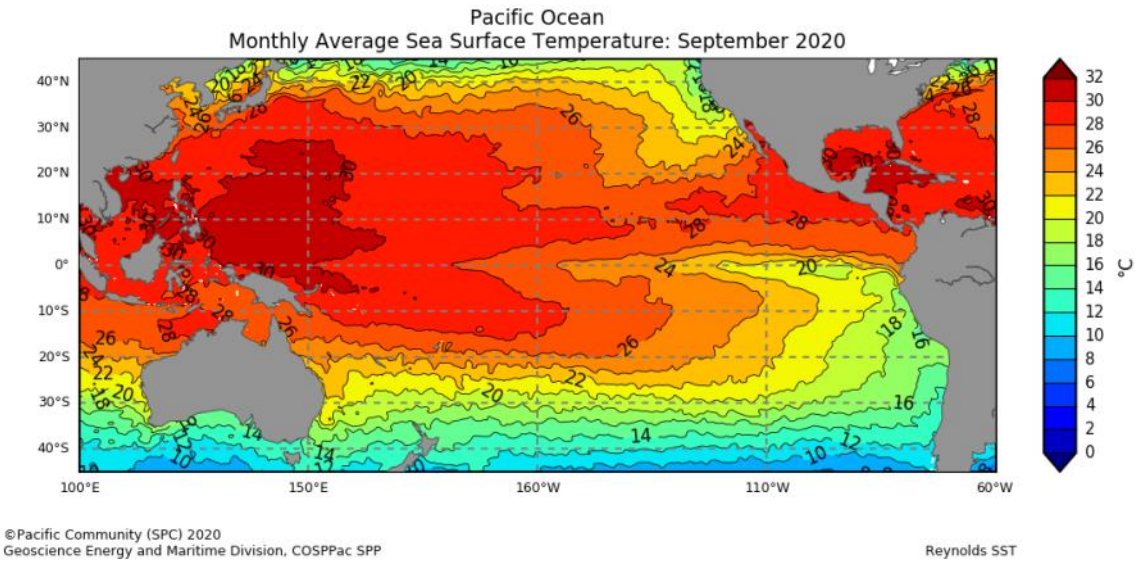
SEA SURFACE TEMPERATURE

Pacific Community COSPPac Ocean Portal

Sea surface temperatures (SSTs) for September show a profound cooling in the central and eastern tropical Pacific Ocean compared with August consistent with the evolving La Niña. Cool SST anomalies were observed near the equator from 160°E eastwards to South America. Cool anomalies also covered most of the southern tropics east of about 130°W, but in the northern hemisphere they only reached about 10° north. In COSPPac countries, the Line Islands of the Kiribati group experienced the strongest negative anomalies of about 1.0 degree. Nauru and parts of New Caledonia, Vanuatu, Fiji and Cook Islands also experienced below average ocean temperatures.

SSTs were 0.5 to 1.0 degree above normal across remaining COSPPac countries, especially in the north western Pacific around Palau, FSM and northern PNG where anomalies approached +1.5°C. In terms of the deciles, regions of Highest on Record for September occurred in northern Palau, much of FSM, and in parts of PNG, Solomon Islands, Tuvalu, Samoa, and French Polynesia EEZs. Regions of above average to very much above average (deciles 8-10) SSTs also spanned across the same countries, as well as RMI, north and central Vanuatu, most of Fiji, northern and central Tonga, Niue and most of the central to southern Cook Islands. In contrast, below average (decile 2-3) SSTs were observed in Nauru and Kiribati, particularly the east where a small region of decile 1 was analysed. Deciles 2 and 3 also occurred in the north of Cook Islands EEZ.

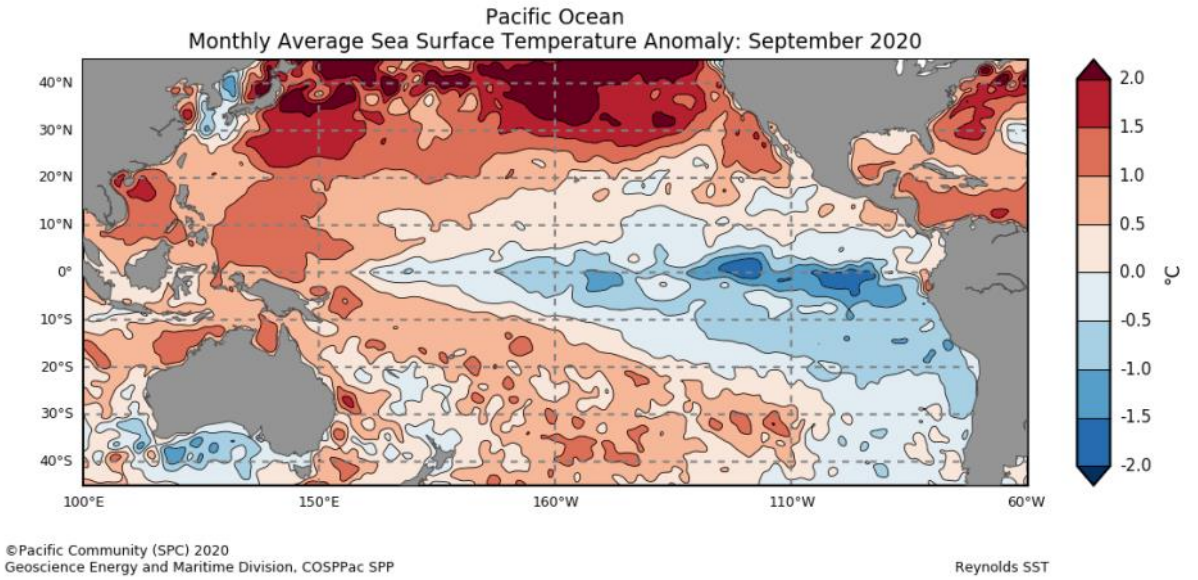
Mean Sea Surface Temperature



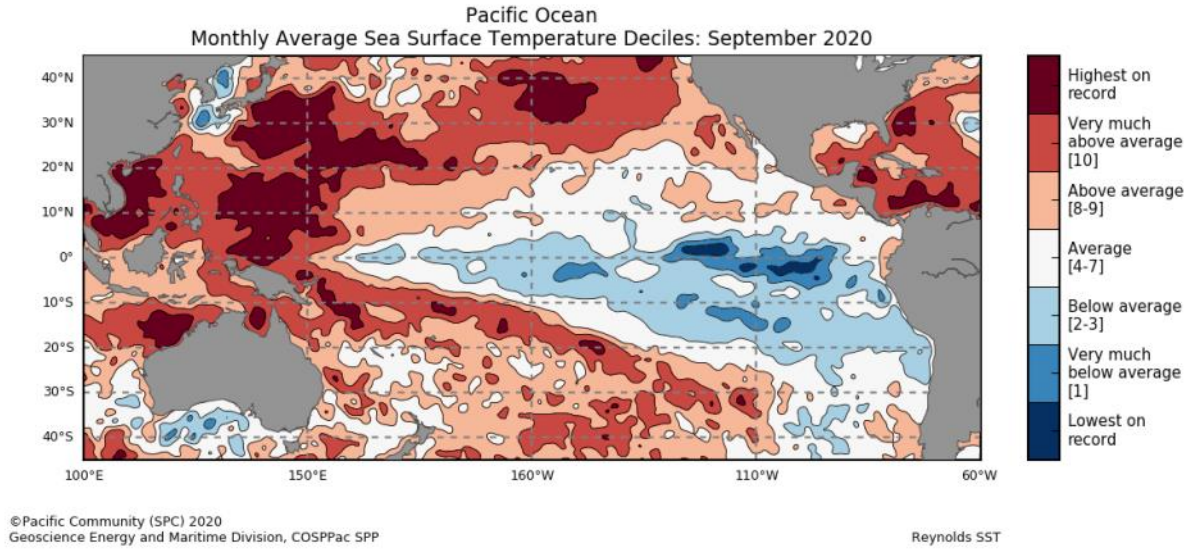
OCEAN CONDITIONS

SEA SURFACE TEMPERATURE

Anomalous Sea Surface Temperature



Sea Surface Temperatures Deciles

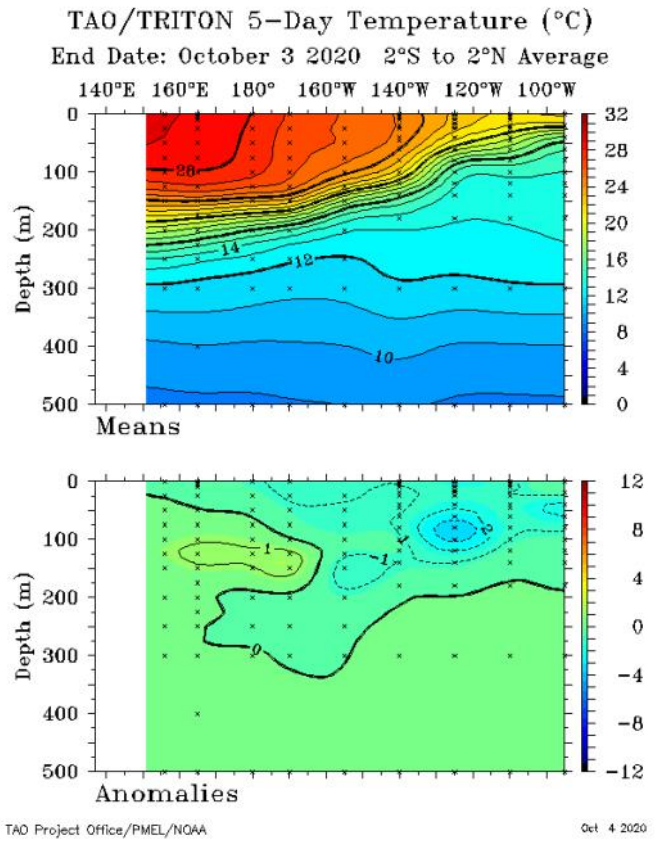


OCEAN CONDITIONS

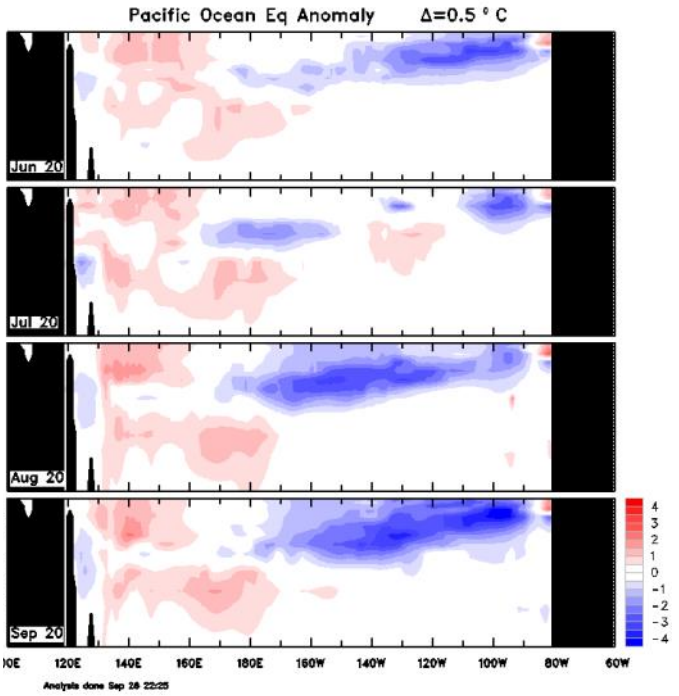
SUB SURFACE

The Bureau of Meteorology's four-month sequence of equatorial sub-surface temperature anomalies to (24 September) shows cool anomalies extending across the top 200 m of the sub-surface of the equatorial Pacific east of the Date Line. Consistent with the developing La Niña, these cool anomalies intensified in August and September. Weak warm anomalies persist across large parts of the column depth in the western equatorial Pacific.

Weekly Temperatures Mean and Anomalies



Monthly Temperatures Anomalies



Bureau of Meteorology Sea Temperature Analysis:http://www.bom.gov.au/marine/sst.shtml

TAO/TRITON Data Display:http://www.pmel.noaa.gov/tao/jsdisplay/

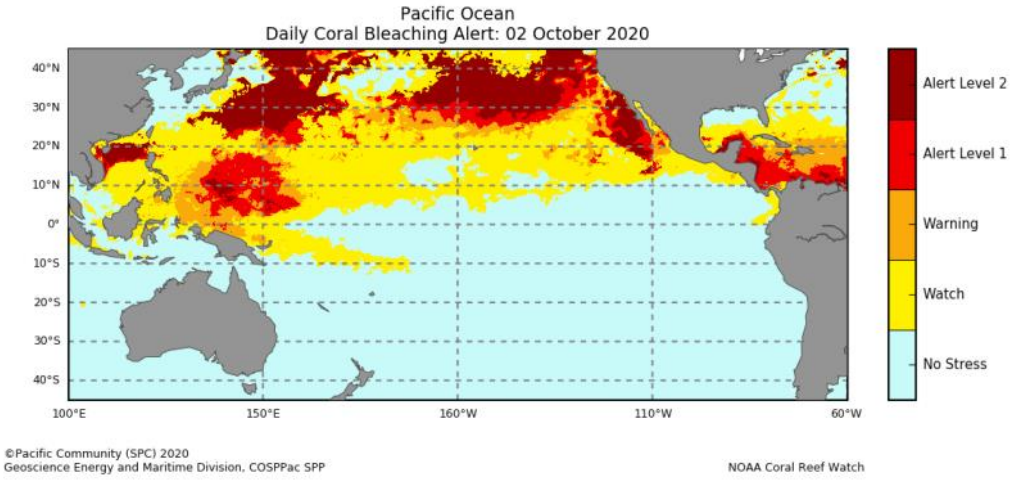
OCEAN CONDITIONS

CORAL BLEACHING

The daily Coral Bleaching Alert for 02 October 2020 shows Alert Level 2 in the western part of FSM while areas of Alert Level 1 exist around FSM and eastern Palau. Parts of Palau and northern PNG are on Warning while other parts of PNG, RMI, Solomon Islands and Tuvalu are on Watch. The remainder of Pacific Island countries are in 'no stress'. The four weeks Coral Bleaching Outlook to 25 October shows the region of Alert Level 2 expanding over most of FSM, with Alert 1 in remainder of FSM, Palau and northern PNG. The rest of northern PNG, the Solomon Islands RMI, Nauru, southern Tuvalu, northern Fiji and Samoa are on Warning and Watch alert, while remaining south west Pacific countries are rated as 'no stress'.

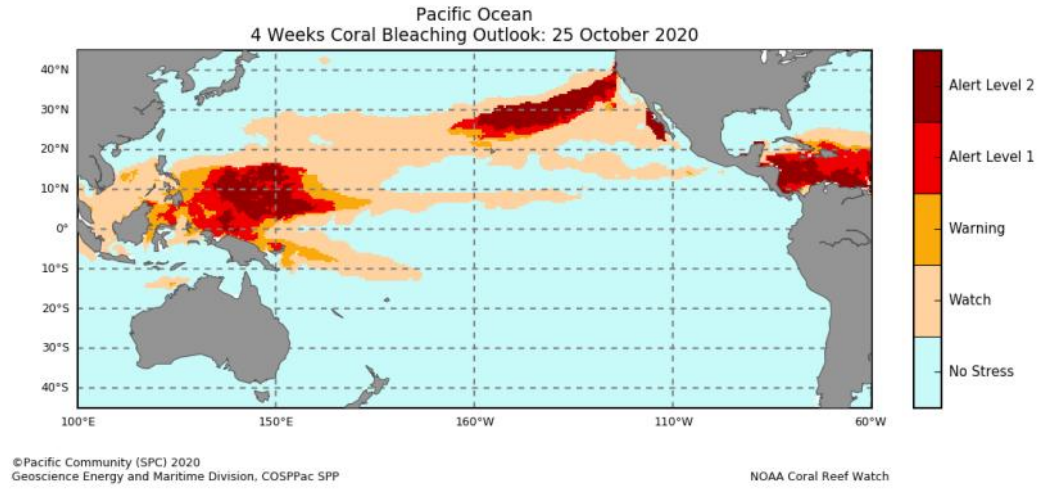
Daily Coral Bleaching Alert

(Source: Pacific Community COSPPac Ocean Porta Coral Bleaching)



4-Weeks Coral Bleaching Outlook

(Source: Pacific Community COSPPac Ocean Portal)

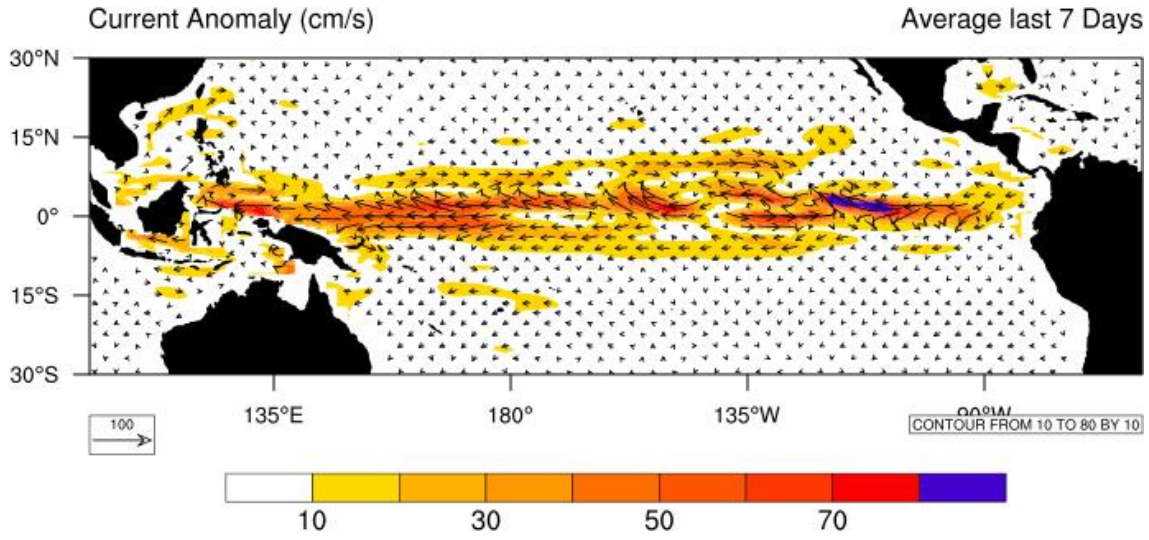


OCEAN CONDITIONS

OCEAN SURFACE CURRENTS AND SEA LEVEL

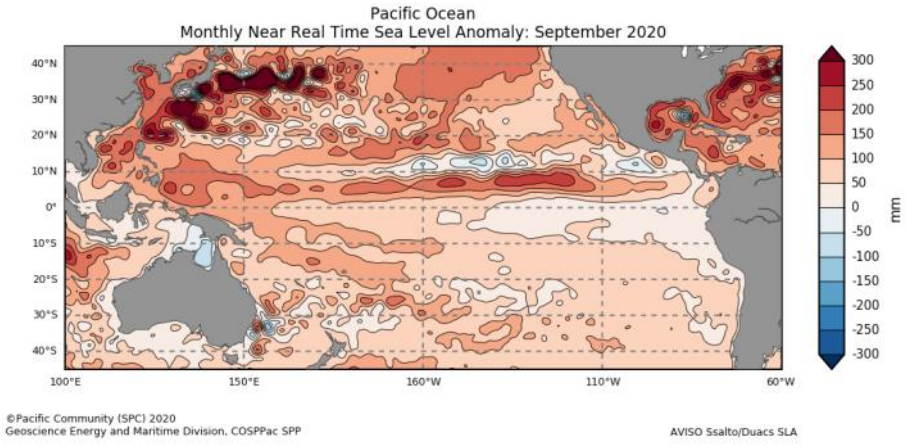
The most recent 7-day ocean surface currents plot shows a stronger than normal westward flowing Equatorial Current in the equatorial Pacific with clear divergence along the equator, especially east of about 140° W. The plot also shows an anomalous eddy field exists between 145°W and 130°W.
Sea level in September was higher than normal for most countries in the region, with positive anomalies (15 -25cm) situated around Palau, FSM, RMI, and the far north of eastern Kiribati, while smaller patches of +15 to +20cm anomalies occurred around the Solomon Islands, Vanuatu, Fiji, Tonga and Niue. Sea level in the central to eastern equatorial Pacific was lower in September than August, although anomalies remained positive. Continued development of the La Niña should see a further fall in equatorial sea-level anomalies.

Ocean Surface Current (Last 7-Days)



Monthly Sea Level Anomalies

Source: Pacific Community COSPPac Ocean Portal

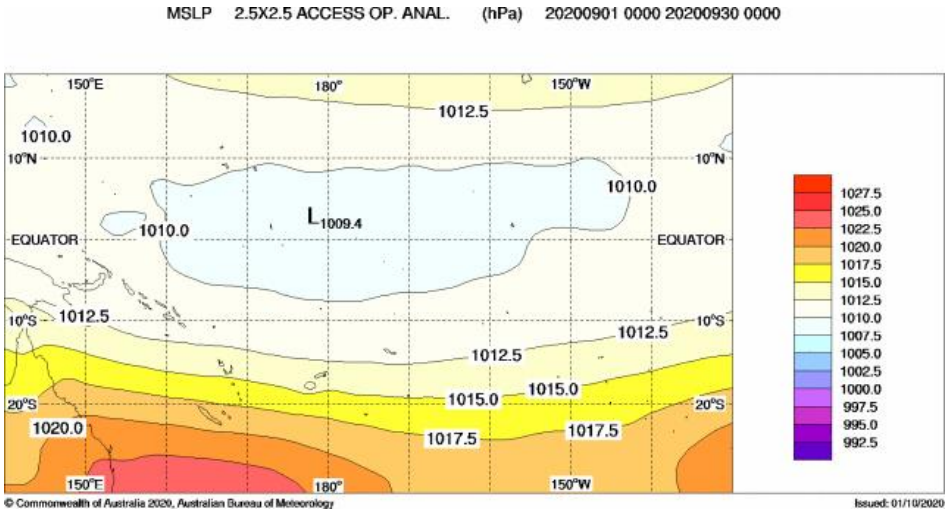


MEAN SEA LEVEL PRESSURE

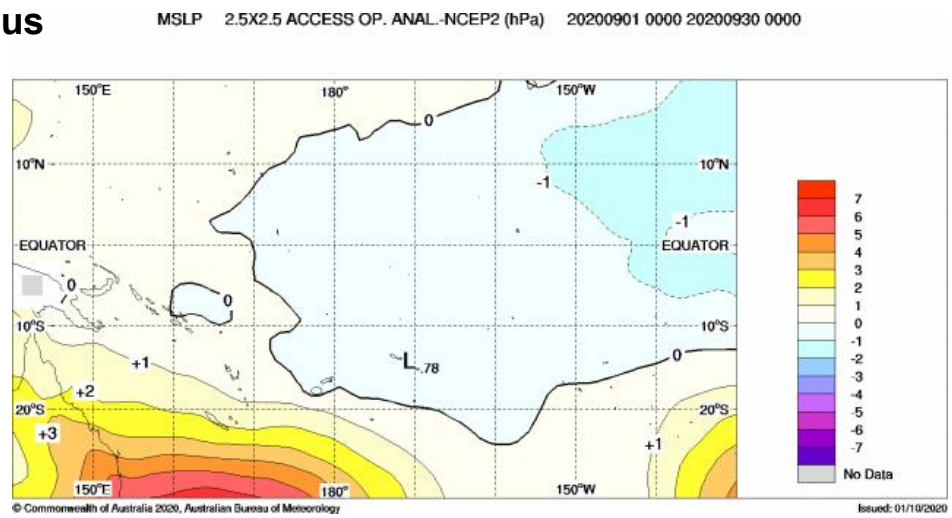
The September mean sea level pressure (MSLP) anomaly map shows negative anomalies east of about 150°W in the tropical Pacific. Positive anomalies were present in the southern tropical Pacific between Australia and 170°W.

Areas of above (below) average MSLP usually coincide with areas of suppressed (enhanced) convection and rain throughout the month.

Mean



Anomalous



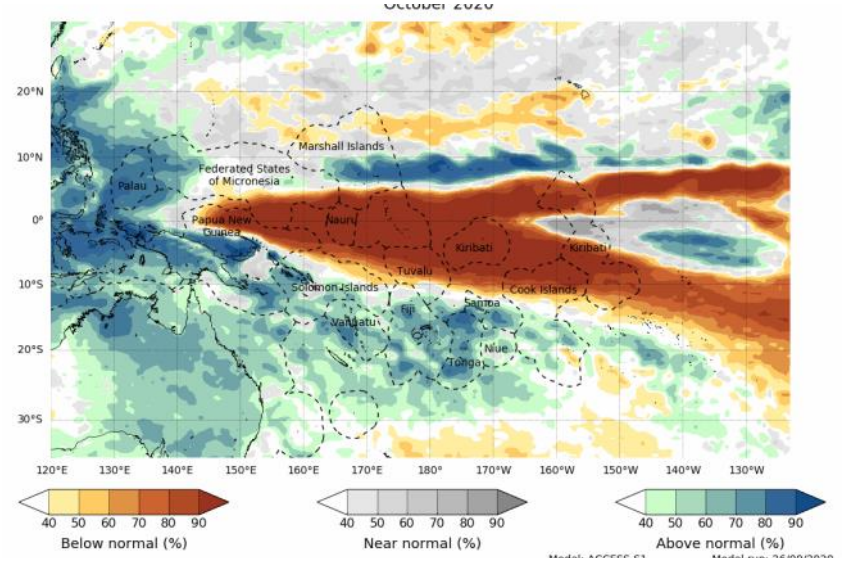
Bureau of Meteorology South Pacific Circulation Patterns: http://www.bom.gov.au/cgi-bin/climate/cmb.cgi?variable=mslp&area=spac&map=anomaly&time=latest

SEASONAL RAINFALL OUTLOOK

October—December 2020

For October, the ACCESS-S model favours below normal rainfall for southern FSM, the southern and parts of the northern Marshall Islands, the northernmost part of PNG, Nauru, Kiribati, north and central Tuvalu, Tokelau, northern Cook Islands and parts of central and northern French Polynesia. Above normal rainfall is favoured for Palau, western FSM, central Marshall Islands, most parts of PNG, Solomon Islands, New Caledonia, Vanuatu, Fiji, southern Tuvalu, Tonga, Samoa, Niue and southern Cook Islands. The three-month outlook (October-December) is similar outlook to that for October, except for above normal rainfall extending over the northern half of FSM. The overall pattern is typical of La Niña. Above normal maximum and minimum temperatures are favoured for all COSPPac countries, except for areas close to the equator east of 160°E, namely the southern Marshall Islands, Kiribati, Nauru, northern Tuvalu, northern Cook Islands and northern French Polynesia where near-normal to below normal temperatures are favoured.

Monthly ACCESS-S



The Copernicus multi-model outlook favours below normal rainfall for the northernmost New Guinea Islands, northern Marshall Islands, Nauru, Kiribati, Tuvalu, northern Cook Islands and northern French Polynesia. Above normal rainfall is favoured for Palau, most parts of PNG, Solomon Islands, New Caledonia, Vanuatu, Fiji, Tonga, Samoa, Niue and southern Cook Islands.

The SCOPIC statistical model favours normal or climatology for FSM, Kiribati, Niue and central and northern Cook Islands. Above normal rainfall is favoured for Palau, southern Marshall Islands, the Momote region of PNG, western and central Solomon Islands, Vanuatu, most of Fiji, central Tonga and southern Cook Islands.

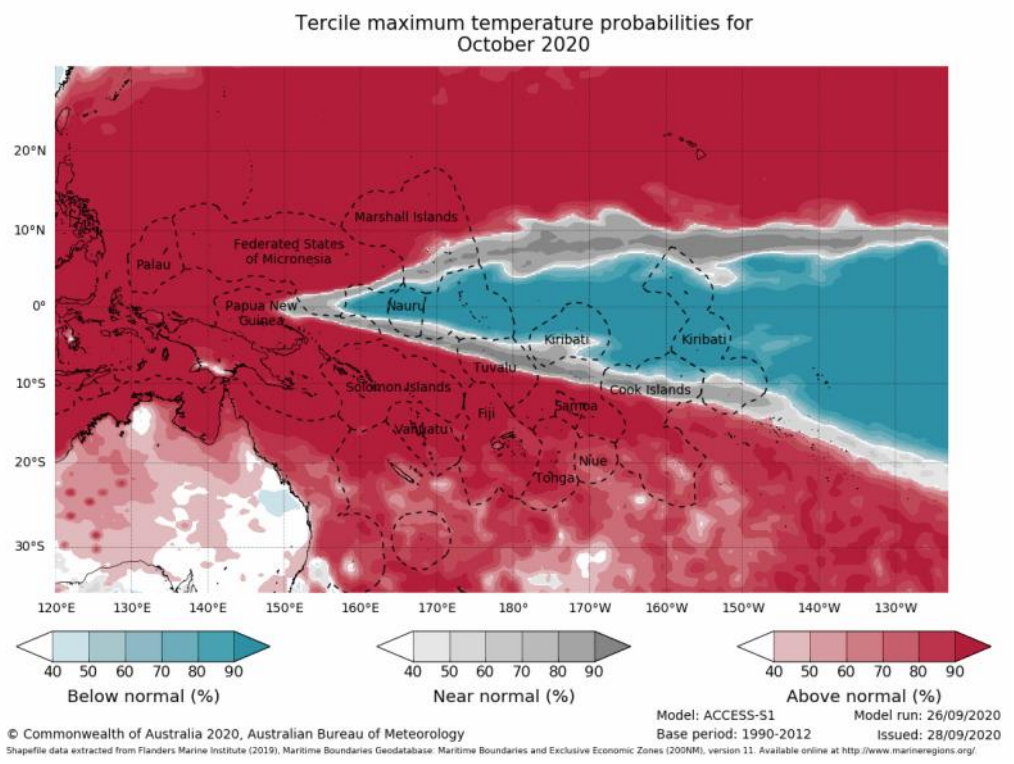
The APEC Climate Centre multi-model favours below normal rainfall for eastern FSM, northern and far southern Marshall Islands, northernmost New Guinea Islands, Nauru, northern Tuvalu, Kiribati, northern Cook Islands and northern and eastern French Polynesia. Above normal rainfall is favour for Palau, western and central FSM, most parts of PNG, Solomon Islands, New Caledonia, Vanuatu, Fiji, Tonga, Samoa, Niue, central and southern Cook Islands and parts of southern French Polynesia.

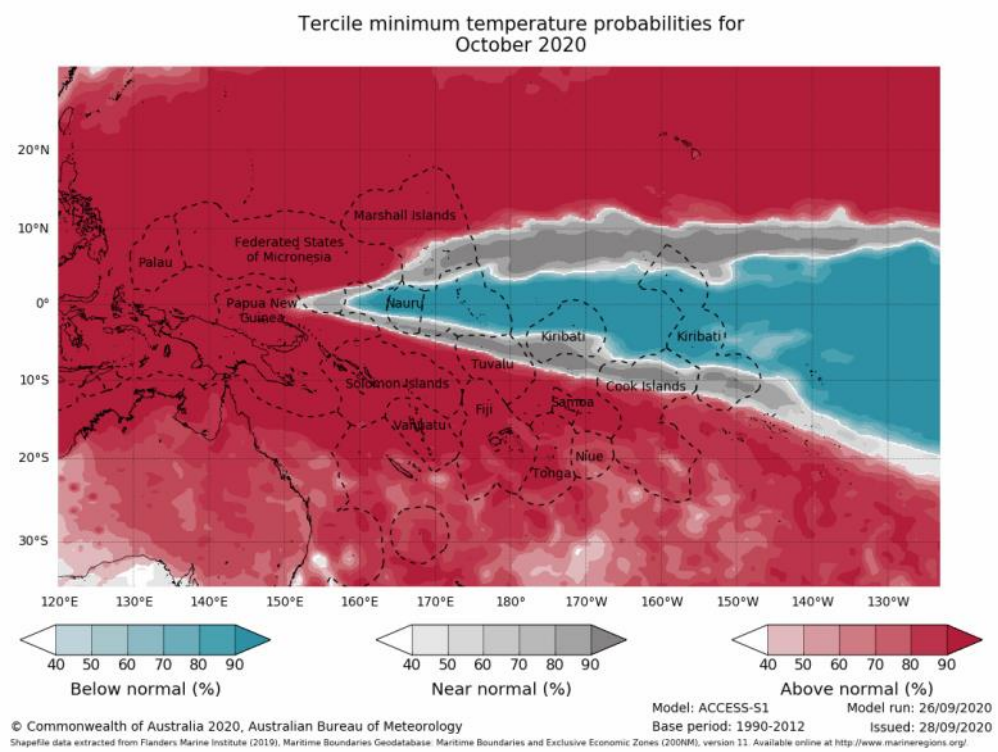
For October to December, the dynamical models (as well as SCOPIC) agree on above normal rainfall for Palau, southern Marshall Islands, most parts of PNG, Solomon Islands, New Caledonia, Vanuatu, Fiji, Tonga and southern Cook Islands. The models also agree on below normal rainfall eastern FSM, northern Marshall Islands, Nauru, Kiribati, Tuvalu and northern Cook Islands. The models disagree elsewhere.

SEASONAL TEMPERATURE OUTLOOK

October—December 2020

Monthly ACCESS-S Maps

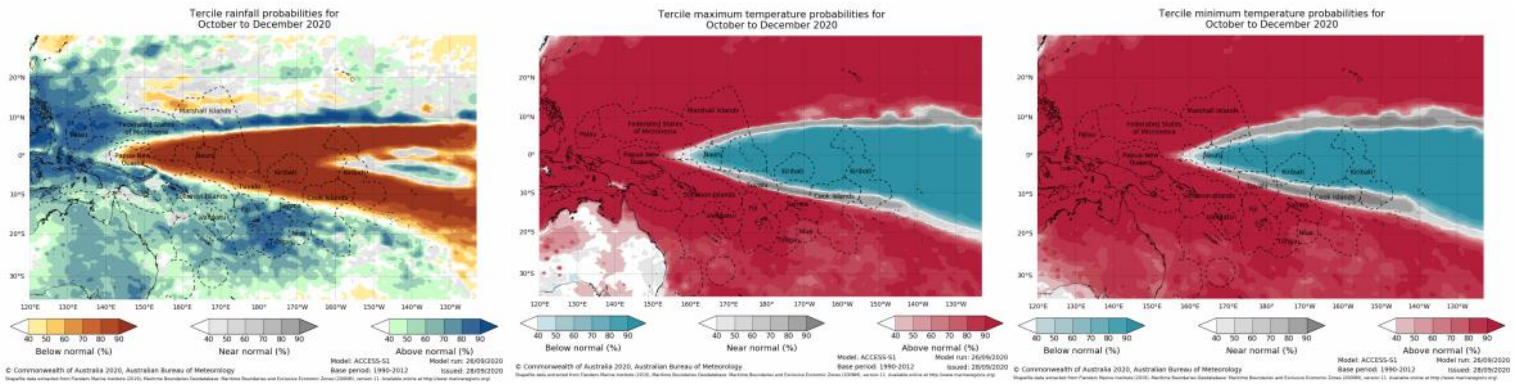




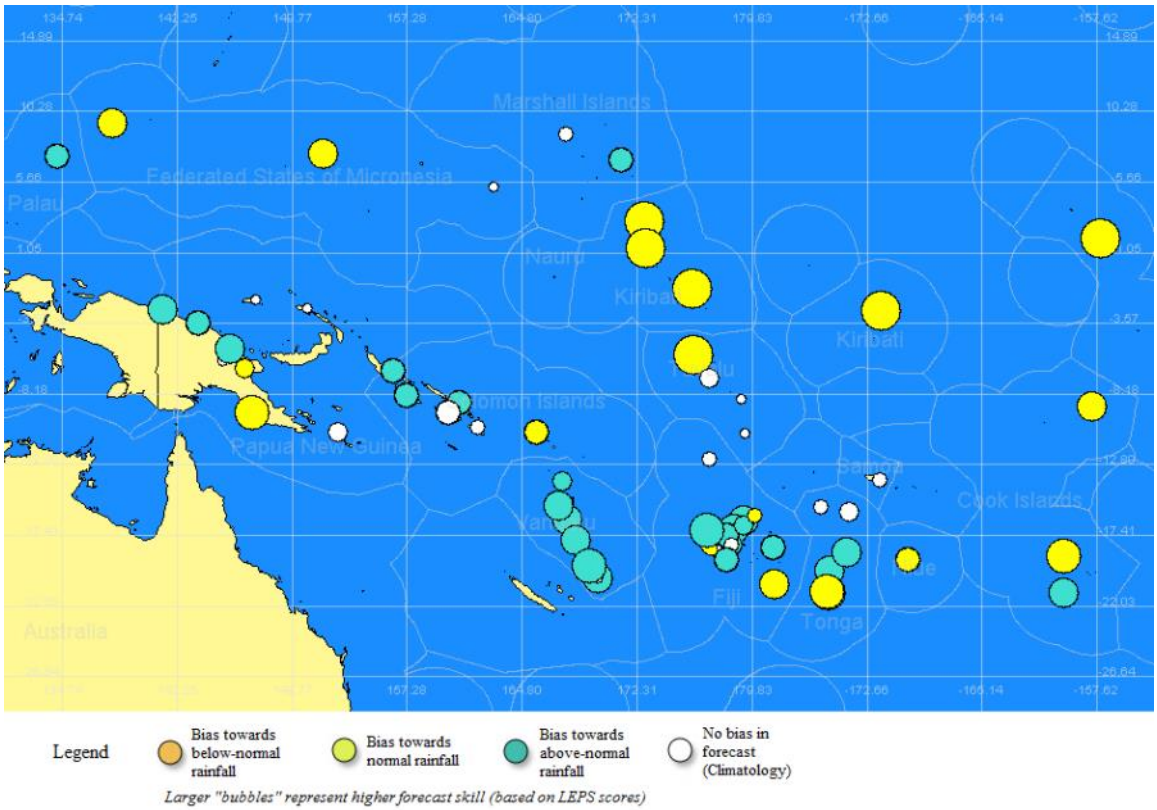
SEASONAL RAINFALL OUTLOOK

October—December 2020

Seasonal ACCESS-S maps



SCOPIC

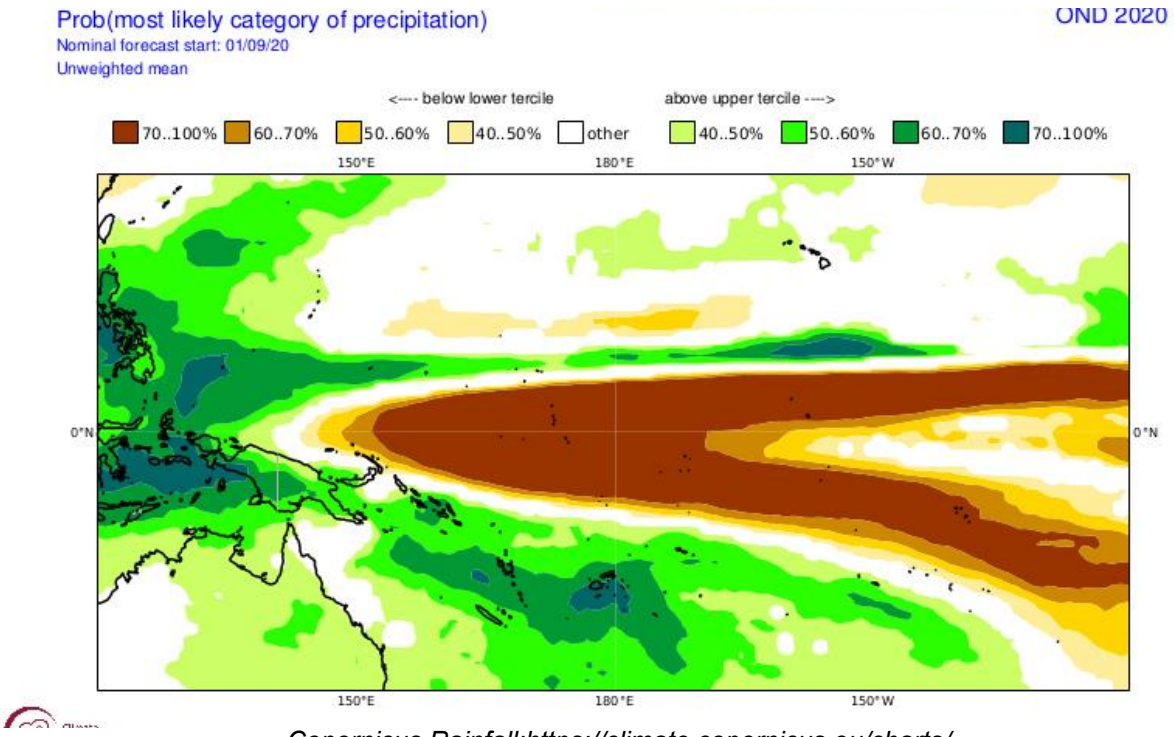


'About SCOPIC' www.pacificmet.net/project/climate-and-ocean-support-program-pacific-cosppac

SEASONAL RAINFALL OUTLOOK

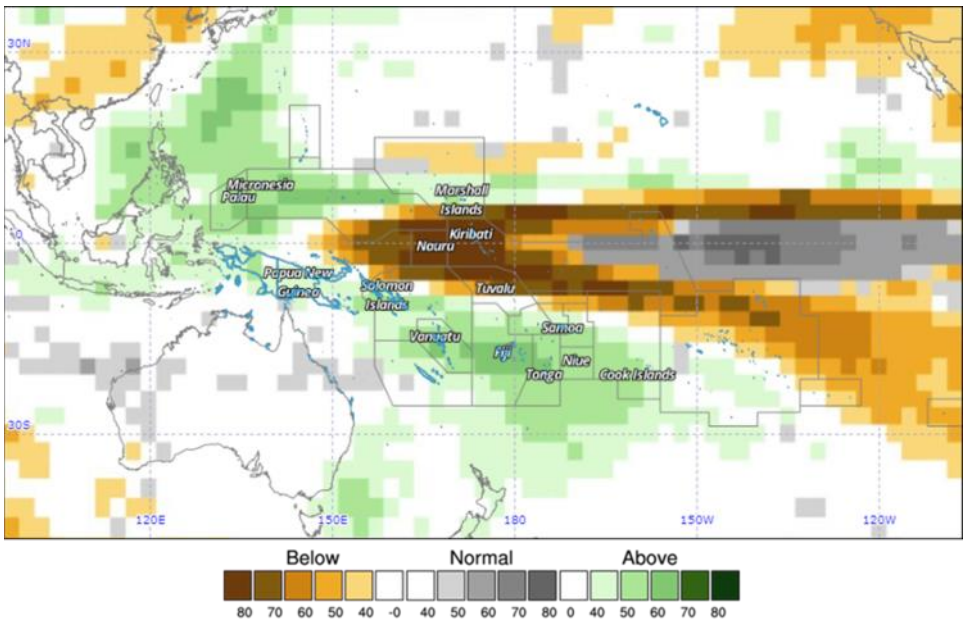
October—December 2020

Copernicus (C3S multi-system)-Rainfall



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

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



TROPICAL CYCLONE

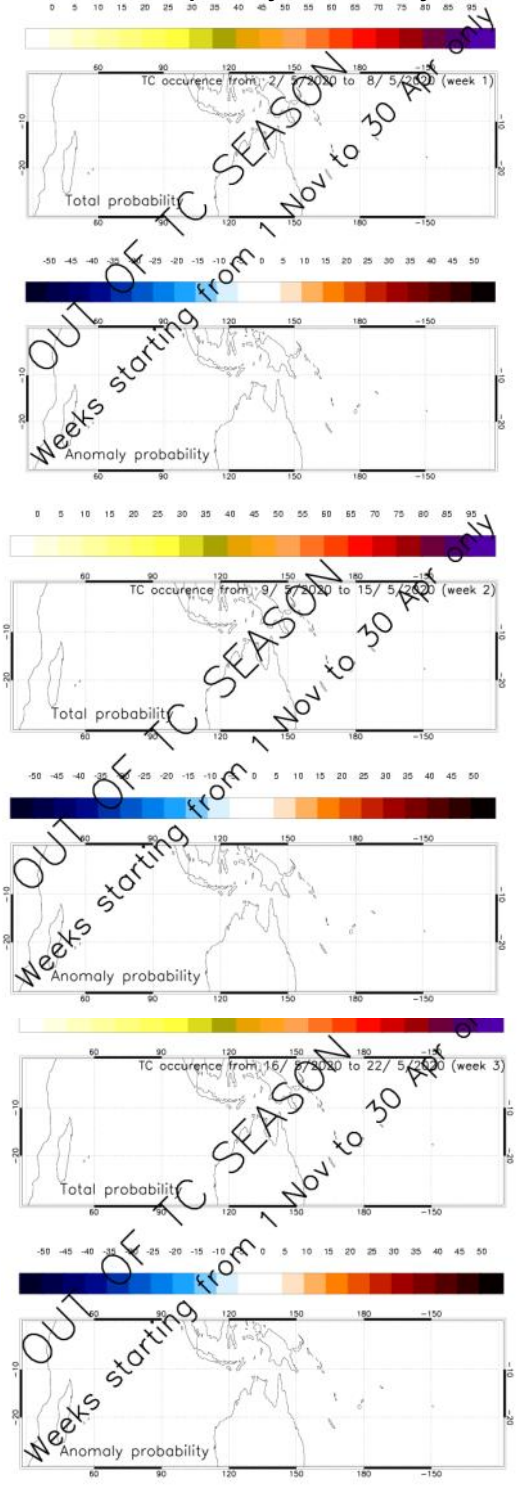
2019/2020 Season

Eight tropical cyclones (Rita, Sarai, Tino, Uesi, Vicky, Wasi, Gretel and Harold) formed in the 2019-20 south Pacific (east of the tip of Cape York, Queensland) cyclone season. These cyclones affected Solomon Islands, New Caledonia, Vanuatu, Fiji, Wallis and Futuna, Tonga, American Samoa, Samoa and Niue. Out of the eight cyclones, four severe cyclones: Rita, Tino, Uesi, and Harold. Harold was one of the most intense cyclones to make landfall in the Pacific Islands during April on record (minimum mean sea level pressure 912 hPa). The long-term average for the period 1969-70 to 2017-18 is nine cyclones. Although the official cyclone season for 2020/21 starts in November 2020, historical data has shown that cyclones can formed outside the normal cyclone season. Weekly tropical cyclone forecast from Meteo France model will resume in end of October 2020.

The tropical cyclone season outlook for 2019-20 is available via:http://www.bom.gov.au/climate/cyclones/south-pacific/

The tropical cyclone season outlook for 2018-19 is available via: http://www.bom.gov.au/climate/cyclones/south-pacific/

MeteoFrance Tropical Cyclone Weekly Forecasts



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.

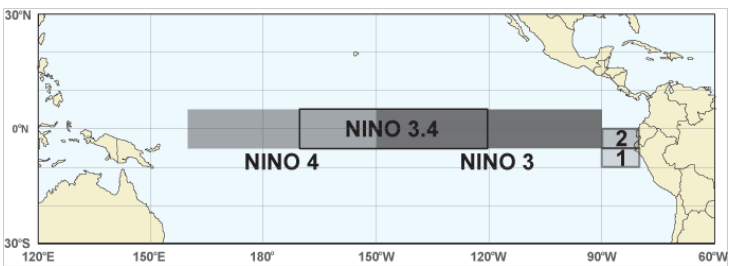
20 degrees Celsius Isotherm Depth

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 deeper than normal 20°C isotherm (positive anomaly) implies a greater heat content in the upper ocean, whilst 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