Ninth Pacific Islands Climate Outlook Forum

May to October 2021 summary and November 2021 to April 2022 climate, ocean and tropical cyclone outlook | Issued: 29 October 2021

Outlook for November 2021 to May 2022

- Climate model outlooks favour weak La Niña conditions in the tropical Pacific Ocean from November to February. It is expected that the La Niña conditions will return to the neutral state in March.
- The transition from neutral to a La Niña-like ENSO state is evident in the following ocean and atmosphere outlooks for November to January and February to April.
- Drier than normal conditions are favoured for island groups near and west of the Date Line that are located close to the equator over November to January. The drier than normal conditions extend northeast and southeast from the Date Line towards the subtropics especially in the southern hemisphere. Wetter than normal conditions are favoured for islands located between Palau and the central Marshall Islands in the north Pacific and from southeast PNG to the southernmost French Polynesian islands in the South Pacific. The February to April rainfall outlook pattern is similar to the earlier November to January outlook with minor differences.
- Sea surface temperature is favoured to remain warmer than normal in the western Pacific and regions close to the Coral Sea over November to January. Boomerang shaped warm anomalies are predicted to remain in the western Pacific. The central and eastern regions show cooling conditions, a typical of La Niña. The coral bleaching outlook favours coral bleaching in the tropical north-west Pacific off the equator.
- Sea level is favoured to be notably higher than normal for most of the countries in the region. Patches of below normal sea level are favoured in a few regions such as Kiritmati atoll in Kiribati. Communities are encouraged to note periods of higher-than-normal tides especially when a tropical cyclone is in the vicinity.
- There is an enhanced risk for tropical cyclone activity in the western part of the basin over November to April. In the central part of the region, cyclone risks are generally near normal, with reduced chances farther east.
- It's important to remember that 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. Communities should remain vigilant, and follow forecast information provided by their National Meteorological and Hydrological Service (NMHS).

Climate since May 2021

- The oceanic climate state over the equatorial central to eastern Pacific in the mid-October implies the formation of a La Niña event. In October, WMO RA-V Pacific RCC LRF members indicated varying levels of La Niña watch (APCC), alert (BoM and NIWA), and event (NOAA). The tropical atmospheric condition also coincides with the oceanic signal for La Niña development.
- Below normal rainfall was experienced in Tuvalu, the southern Islands of Kiribati, Tokelau, northern Cook Islands and northern French Polynesia from May to July. Over July to September, rainfall deficiencies in the above countries gradually eased, however, at some locations e.g. Tokelau and central Kiribati, rainfall remained in the lowest 10% of historical records. Serious to severe rainfall deficiencies have developed

in northern FSM, northern RMI and around New Caledonia and southern Vanuatu since July.

- Sea level was higher than normal for most of the countries in the region. In the central and western Pacific, sea level was 10-25 cm higher than normal. A distinct pool of higher-than-normal sea level was observed just north of the equator.
- As of mid-October, there had been 24 tropical cyclones in the western north Pacific, with three of those reaching super typhoon intensity; and four of them reaching typhoon intensity. Seasonal activity in 2021 has been markedly busier than 2020, with more activity across the U.S. Affiliated Pacific Islands. A shift toward La Niña for the end of the year will likely result in a westward shift of tropical cyclone activity for the remainder of 2021.

Review of May to October 2021 climate

Since May, El Niño-Southern Oscillation (ENSO) conditions remained neutral. From July to mid-October, below normal oceanic heat content developed. At the same time, the cooler-than-normal sub-surface temperature in the eastern Pacific Ocean deepened and expanded towards the west. The evolution of the oceanic state favours the development of La Niña. Warmer-than-normal ocean surface temperatures in the equatorial western Pacific and cooler-than-normal over the eastern Pacific in mid-October were observed. The oceanic climate state over the equatorial central to eastern Pacific in the mid-October implies the formation of a La Niña event. The tropical atmospheric condition also coincides with the oceanic signal for La Niña development. The lower-level easterly and upper-level westerly over the equatorial western to eastern Pacific Ocean are observed. WMO RA-V Pacific RCC LRF members indicate varying levels of La Niña watch (APCC), alert (BoM and NIWA), and event (NOAA). The differences are due to a range of La Niña event definitions. A universal La Niña definition does not exist. Impacts can occur, regardless of thresholds being met.

During the May to July period, the Intertropical Convergence Zone and South Pacific Convergence Zone (SPCZ) were displaced north and southwest of their normal position respectively and this was expected during a La Niña event (toward the end of the previous La Niña event).

As is typically experienced after during and in the months following a La Niña, below normal rainfall was experienced in Tuvalu, southern Islands of Kiribati, Tokelau, northern Cook Islands and northern French Polynesia until July 2021. Below normal rainfall was also received in the northern Marshall Islands, central Solomon Islands, New Caledonia, Vanuatu, Samoa and Pitcairn Islands. Other countries in the Pacific received above normal rainfall. From July to September, rainfall in the Tuvalu, Kiribati, Tokelau, northern Cook Islands and French Polynesia gradually eased but for some locations remain at drought thresholds. Serious to severe (less than 10% and less than 5% respectively) rainfall deficiencies developed in northern FSM, northern RMI and around New Caledonia and southern Vanuatu. The Indian Ocean Dipole is currently negative, which may have contributed to enhanced rainfall over New Guinea.

Ninth Pacific Islands Climate Outlook Forum

May to October 2021 summary and November 2021 to April 2022 climate, ocean and tropical cyclone outlook | Issued: 29 October 2021

Dynamical and statistical model rainfall forecasts have been consistent within the western Pacific for nearly all regions since PICOF-8. For most regions, the model forecasts verified well ('were correct'), particularly the seasonal forecasts for April to June just after the La Niña event.

Near normal temperatures were observed across most of the tropical Pacific over May to July. Above normal temperatures were observed just to the west of Fiji and around the southern Cook Islands and southern French Polynesia. Over July to September, above normal air temperatures were observed over southern PNG, western Solomon Is., Vanuatu, Fiji, Niue, Southern Cook Islands and Southern French Polynesia.

Over April to June, sea surface temperatures were warmer than normal in the north-western Pacific and for the remainder of the countries in the region with conditions varying from warmer than normal to near normal. Parts of Kiribati region experienced ocean temperatures that were cooler than normal, consistent with the waning La Niña event. Sea level was higher than normal for most of the countries in the region. In the central and western Pacific, sea level was 10-25 cm higher than normal. A distinct pool of higher-than-normal sea level was observed just north of the equator.

A NOAA NWS/CPC coordinated tropical cyclone outlook was released for the U.S. Affiliated Pacific Islands (USAPI) of the western North Pacific in early June 2021. That outlook called for near-normal activity for the last half of 2021. That outlook was consistent with ENSO neutral conditions.

Tropical cyclone activity across the western North Pacific is closely related to the current ENSO pattern. Tropical cyclone numbers show little fluctuation from year-to-year, regardless of the ENSO pattern. However, the genesis location and track of tropical cyclones show a dramatic relationship with the ENSO cycle. Tropical cyclone activity shifts eastward during an El Niño; and shifts westward during a La Niña.

The NOAA NWS/CPC Tropical Cyclone Outlook segmented the region into zones to better correlate seasonal activity (genesis and track) to climatological averages based on the current ENSO cycle, as opposed to a basin-wide set of numbers as is done in the Central Pacific, Eastern Pacific and the Atlantic.

At the time of PICOF-9 in mid-October, there had been 24 tropical cyclones, with 3 of those reaching super typhoon intensity; and 4 of them reaching typhoon intensity. Seasonal activity in 2021 has been markedly busier than 2020, with more activity across the USAPI. Of note, only one tropical cyclone, Super Typhoon Surigae (April 2021), affected any of the USAPI (Republic of Palau and Yap State, FSM) this year.

Ninth Pacific Islands Climate Outlook Forum

May to October 2021 summary and November 2021 to April 2022 climate, ocean and tropical cyclone outlook | Issued: 29 October 2021

A shift toward La Niña for the end of the year will likely result in a westward shift of tropical cyclone activity for the remainder of 2021.

November 2021 to April 2022 outlook

Most climate model outlooks favour weak La Niña conditions in the tropical Pacific Ocean from November to February. This would be a multi-year La Niña event, following on from the last La Niña event which began in late 2020, with a transition to ENSO neutral conditions in mid-2021. It is expected that the La Niña conditions will return to the neutral state in March. After the maximum peak in November 2021, the relative magnitude will decrease throughout the period until March 2022. Although there is strong cross-model agreement for the occurrence of a La Niña event, it is worth noting that the evolution and strength for the event for the whole forecast period is slightly different amongst the models.

The statements below have been crafted using the WMO Lead Centre (LC) for Long-Range Forecast (LRF) Multi-Model Ensemble (MME) https://www.wmolc.org/ outlooks. Where an element forecast is not available e.g., for TCs or coral bleaching, outlooks are obtained from Pacific RCC Network Node for LRF members https://www.pacificmet.net/rcc. **These outlook statements are for use by National Meteorological and Hydrological Services (NMHSs). They do not constitute an official outlook for any nation. For more information, please contact your local meteorological office.**

The transition from neutral to a La Niña-like ENSO state is evident in the ocean and atmosphere outlooks for November 2021 to January 2022 and February to April 2022. These outlooks are largely consistent with conditions experienced over the same period in the past when a La Niña-like ENSO state was present.

For November to January, drier than normal conditions are favoured for island groups near and west of the Date Line that are located close to the equator (excluding the area west of New Guinea). This area of drier than normal conditions extends northeast and southeast from the Date Line towards the subtropics especially in the southern hemisphere (Fig. 1). Islands in this region that have experienced low rainfall during or since the last La Niña event are likely to continue to experience these conditions. Forecast confidence for this region is high. Wetter than normal conditions are favoured for islands located between Palau and the central Marshall Islands in the north Pacific and from southeast PNG to the southernmost French Polynesian islands in the South Pacific. Forecast confidence for this region is moderate to high.

The February to April rainfall outlook pattern is similar to the earlier November to January outlook with minor differences. Consistent with signs of a La Niña event maturity and declining, the chances of drier than normal conditions ease near and west of the Date Line. The chances of wetter than normal conditions also ease in the South Pacific but become stronger and the area of above normal rainfall covers a large portion of the tropical north Pacific.

Ninth Pacific Islands Climate Outlook Forum

May to October 2021 summary and November 2021 to April 2022 climate, ocean and tropical cyclone outlook | Issued: 29 October 2021

Sea surface temperature is favoured to remain warmer than normal in the western Pacific and regions close to the Coral Sea over November to January. Boomerang shaped warm anomalies are predicted to remain in the western Pacific with temperatures 70 to 80% higher than normal (Fig. 2). The central and eastern regions show cooling conditions, a typical La Niña like pattern.

The coral bleaching outlook favours coral bleaching in the tropical north-west Pacific off the equator. Coral bleaching Watch and Warning levels are favoured in almost all countries in the region, east of 160 degrees west.

Associated with the ocean surface temperature patterns, warmer than normal air temperatures are favoured for many island groups, particularly in the western equatorial Pacific, extending northeast and southeast towards the subtropics. Cooler than normal air temperatures are more likely closer to and off the equator near and east of the Date Line (Fig. 3). The air temperature outlook pattern for February to April 2022 period is similar but less emphatic.

Wind outlooks show a stronger than normal easterly air flow along the equator over November to January with an enhanced flow of warm and moist air into the northern and southern hemisphere in the western Pacific. This pattern is consistent with the warmer and wetter air temperature outlook above.

Sea level is favoured to be notably higher than normal for most of the countries in the region (>20cm) in Palau and FSM with remainder of the countries slightly above normal (10cm) and near normal. Patches of below normal sea level are favoured in a few regions such as Kiritmati Atoll in Kiribati.

The SST convergence zone that forms the boundary of the western warm pool is an important feature for tuna fisheries, with the area of skipjack abundance highly correlated within this region. The convergence zone is favoured to contract westward near the equator, and expand further to the north and south.

The 2020/21 cyclone season featured eight tropical cyclones compared to a long-term normal of nine east of the tip of Cape York, Australia. There were three tropical cyclones that reached severe status. Pre-season outlooks successfully pinpointed a season with near or slightly below normal activity. Last year's cyclone season was influenced by a moderate La Niña event.

After easing in mid-2021, La Niña thresholds are now being reached once again in the Pacific, with models outlooks indicating the potential for it to reach moderate levels by early 2022. However, compared to this time last year, sea surface temperatures are warmer across the Southwest Pacific, particularly in the Coral Sea region. These warm seas may be connected to

an ongoing negative Indian Ocean Dipole (IOD) event, an ocean-atmosphere seesaw that impacts sea surface temperatures, rainfall, and wind in the tropical Indian Ocean.

Furthermore, the SPCZ tends to be displaced to the southwest during La Niña events and this behaviour has already been observed during October.

With this mind, The Australian Bureau of Meteorology (BoM) and National Institute of Water and Atmospheric Research (NIWA New Zealand) agree on an enhanced risk for tropical cyclone activity in the western part of the basin. In the central part of the region, cyclone risks are generally near normal, with reduced chances farther east.

NIWA expects 9 to 12 named tropical cyclones between November 2021 and April 2022, qualifying as near to slightly above normal. At least three severe cyclones reaching category 3 or higher might occur across the region. Both outlooks consider relationships between ENSO indicators and tropical cyclone numbers. BoM reports a high level of accuracy in the western part of the region.

It's important to remember that it does not take a severe cyclone to produce severe impacts. Flooding rainfall can occur with a weaker or former cyclone. All communities should remain vigilant and follow forecast information provided by their National Meteorological and Hydrological Service (NMHS).

Linking science to the Pacific Energy sector

There are currently efforts implemented by partners across the Pacific Islands countries to meet the Pacific energy goal of 100% renewable energy by 2030. Net emissions by 2050 is also a Pacific target. Under the Framework for Energy Security and Resilience in the Pacific (FESRIP 2021-2030), the long-term goal is to access and secure, robust, sustainable and affordable electricity, transport fuel and household energy services that are resilient to climate change and natural disasters. The renewable energy activities in the region includes providing a climate-related early warning system to energy companies for decision making, providing low carbon maritime transport through installation of solar power panels on the shipping industry, providing solar panel installation to power health facilities and desalination plant to communities.

ENSO impacts solar radiation and wind patterns across the region which are the primary sources of renewable energy in the region. The expansion and contraction of the western Pacific warm pool correlates well with distribution of cloud and wind across the Pacific region. With a La Niña favoured, countries in the western Pacific are likely to observe more clouds and more rainfall. This increases the potential hydropower use during the upcoming wet season. Countries in the central and eastern Pacific are encouraged to use solar power for

household energy needs noting the likelihood of reduced cloud-cover and higher than normal sunshine hours.

Several NMHSs are regularly producing energy and climate bulletins that are used by the power companies and energy sector to reduce risks and increase the use of renewable sources of energy. These products include the Fiji Monasavu Dam outlook and Samoan Afulio Water Storage outlook.

Recommendations from PICOF-9

Regional Climate Outlook Forums such as the PICOF are important mechanisms for sharing climate and ocean information, best practices, and lessons learnt on climate and ocean prediction and its likely implications on sectors where productivity is heavily dependent on the state of climate. This should continue and be linked to the functions of the Pacific Islands Regional Climate Centre Network (PI-RCC Network).

Close working relationships between Pacific rim and Pacific Island NMHSs, regional organisations and WMO are critical to effective warning of climate hazards leading to early preparedness. Further enhancement of these relationships is essential, as well as relationships between NMHSs, their primary stakeholders and the community. These can be frequent meetings such as one-on-one discussions, cluster group meetings, and national climate outlook forums.

In addition to the production of national seasonal climate outlooks, there is a need for simplified products and messaging especially for rural and remote communities. Sectoral impacts are most often related to prolonged drier or wetter than normal conditions. NMHSs should continue to develop climate products tailored for national sectors, relevant to their needs, and incorporating where possible traditional knowledge elements.

Further Information

The PICS Panel and Pacific Regional Climate Centre (RCC) Network Node for Long Range Forecasting have been coordinating the Pacific Islands Climate Outlook Forum (PICOF) since 2015 in collaboration with WMO. PICOF is a platform used discuss the seasonal outlook (cyclone, precipitation, temperature and oceanic conditions) for the upcoming season and state of ENSO, capacity build and enable knowledge exchange between National Meteorological and Hydrological Services (NMHSs) and strengthen relationships between NMHSs and stakeholders. PICOF is held twice a year, a face-to-face session, when possible, in October focusing on November to April season and a virtual session in April to produce a seasonal outlook for May to October season.

This statement was produced during the ninth virtual session of Pacific Islands Climate Outlook Forum (PICOF-9) held on 21-22 October 2021. The forum had a specific focus on the overview of regional climate of May to October 2021 as well as November 2021 to April

Ninth Pacific Islands Climate Outlook Forum

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2022 rainfall, air temperature, ocean, sea level and North Pacific TC outlooks where available.

PICOF-9 was attended virtually by members from American Samoa, Australia, Cook Islands, Fiji, French Polynesia, Guam, Japan, Kiribati, Micronesia, Nauru, New Caledonia, New Zealand, Niue, Palau, Papua New Guinea, Samoa, Solomon Islands, South Korea, Switzerland, Tonga, Tuvalu, United Kingdom, United States of America, and Vanuatu (Fig. 4). Representatives from the following organisations also participated, Secretariat of the Pacific Regional Environment Programme (SPREP), World Meteorological Organisation (WMO), Pacific Community (SPC), Australian Bureau of Meteorology (BoM), United States National Oceanic and Atmospheric Administration (NOAA), Météo-France, New Zealand National Institute of Water and Atmospheric Research (NIWA), Asia-Pacific Economic Cooperation (APEC) Climate Center (APCC).

This statement is consistent with the Nuku'alofa Ministerial Declaration and Honiara Ministerial Statement for Sustainable Weather, Water, Ocean and Climate Services for the Resilient Pacific, which recognises the importance of Meteorological and Hydrological Services in support of relevant national needs, including protection of life and property, sustainable development and safeguarding the environment. The same noted that weather and climate services are not an option but are a responsibility and a basic human right.

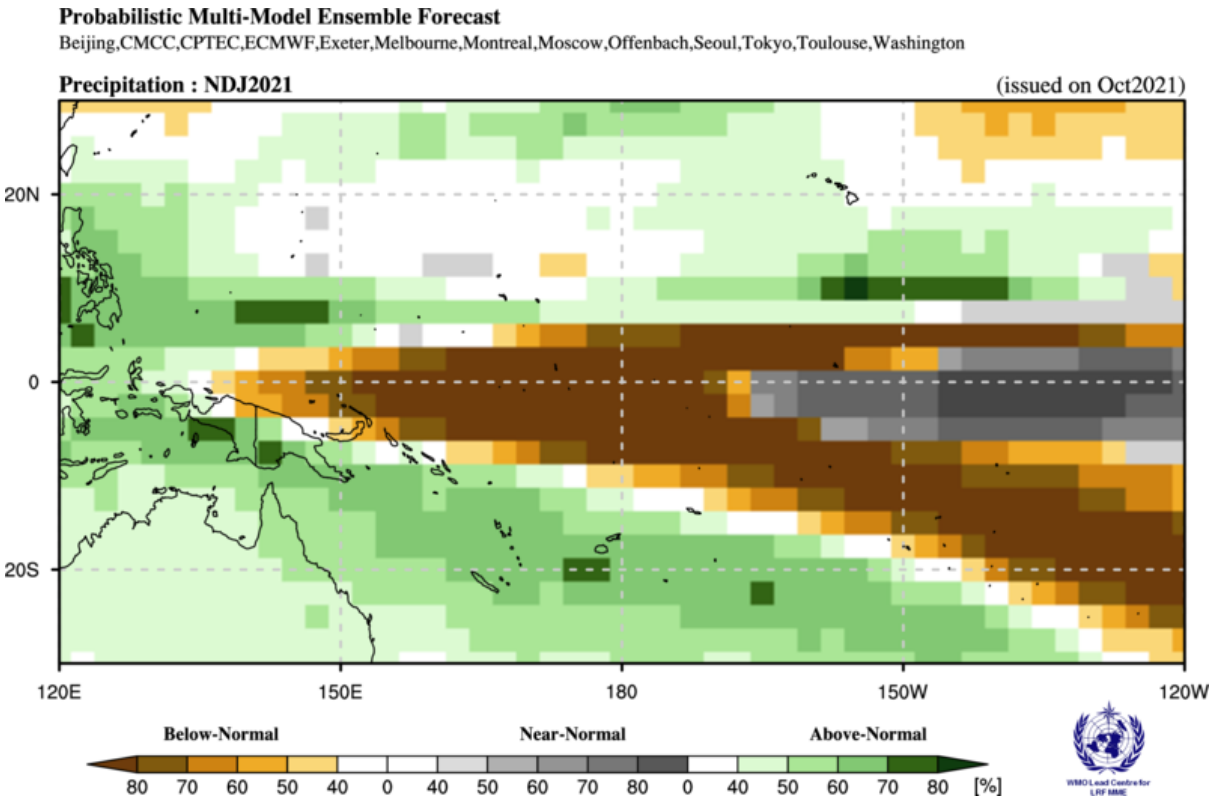

Fig. 1: Rainfall forecast for November 2021 to January 2022 for the western Pacific region.

Ninth Pacific Islands Climate Outlook Forum

May to October 2021 summary and November 2021 to April 2022 climate, ocean and tropical cyclone outlook | Issued: 29 October 2021

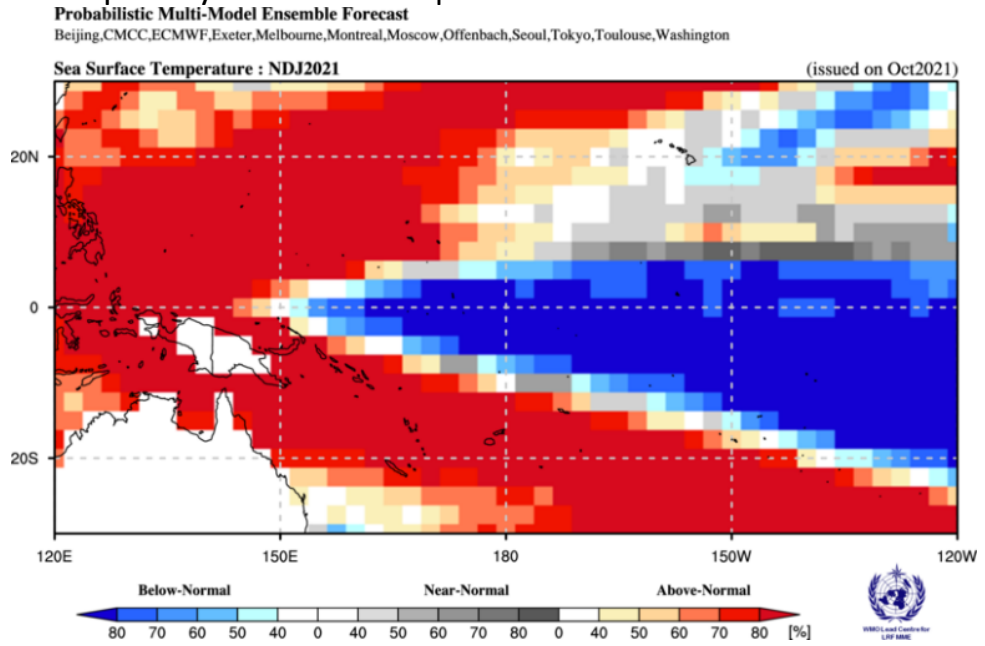

Fig. 2: Ocean surface temperature forecast for November 2021 to January 2022 for the western Pacific region.

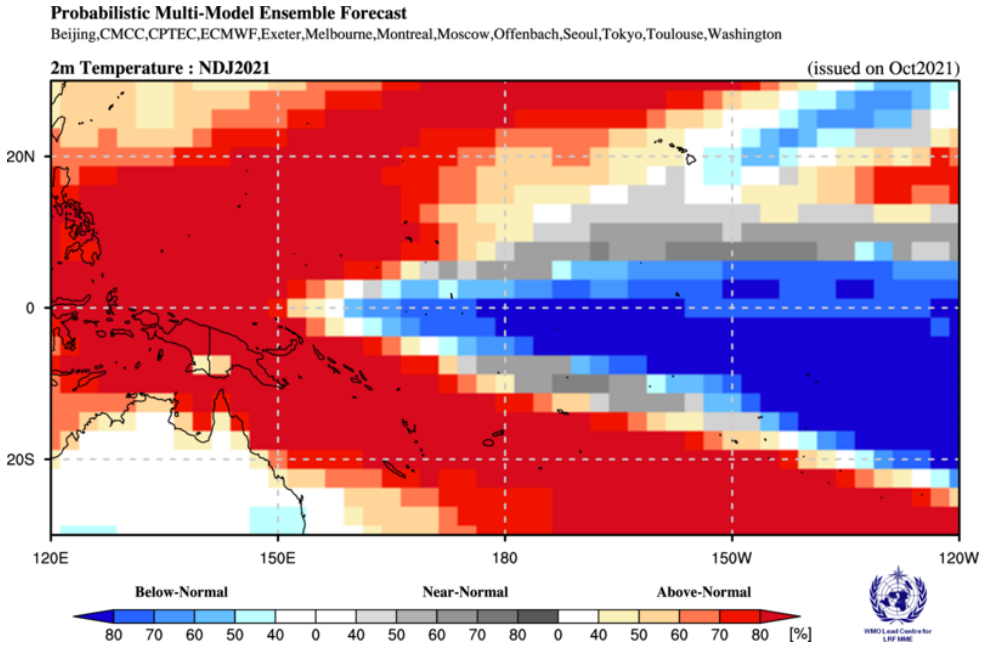

Fig. 3: Air temperature forecast for November 2021 to January 2022 for the western Pacific region.

Ninth Pacific Islands Climate Outlook Forum

May to October 2021 summary and November 2021 to April 2022 climate, ocean and tropical cyclone outlook | Issued: 29 October 2021

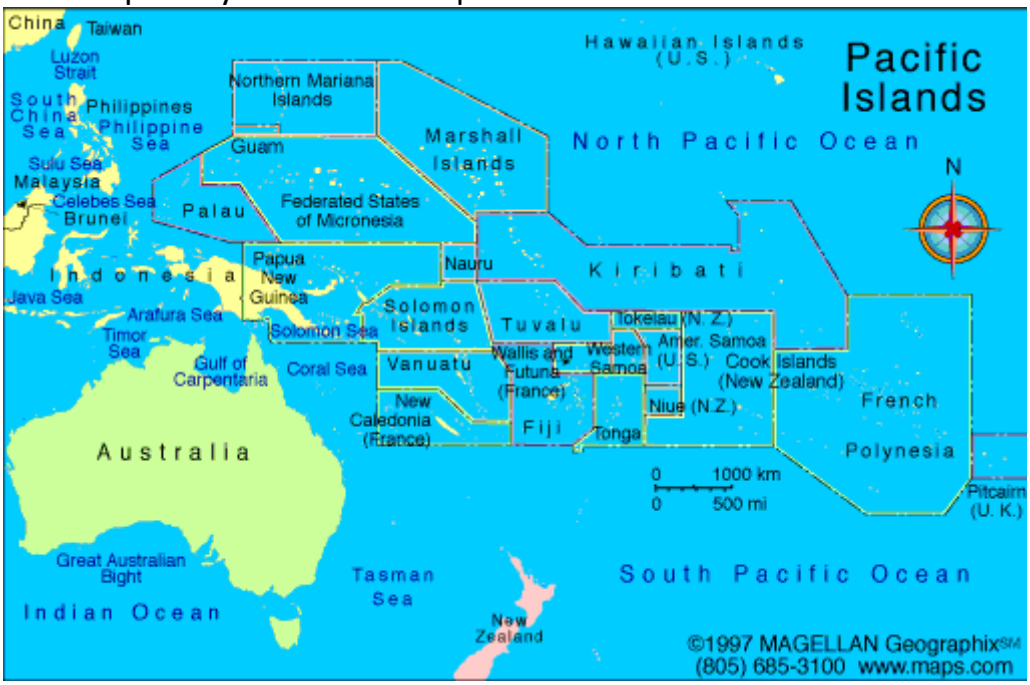

Fig. 4: Map of the Pacific Islands region including those countries and territories involved in PICOF-8. Source: https://www.infoplease.com/atlas/pacific-islands