

Tenth Pacific Islands Climate Outlook Forum

November 2021 to April 2022 summary and May to October 2022 climate, ocean and tropical cyclone outlook | Issued: 28 April 2022

Outlook for May to October 2022

- Climate model outlooks favour ENSO-neutral conditions as the most likely outcome from May to October with a second most likely outcome the continuation of La Niña.
- The continuing influence of La Niña is evident in atmospheric and ocean seasonal forecasts especially for May to July.
- Drier than normal conditions are favoured for the equatorial Pacific. This area of drier than normal conditions extends southeast towards the subtropics of the southern hemisphere. Wetter than normal conditions are favoured for Marshall Islands in the North Pacific and for southern Papua New Guinea (PNG) southeast to the southern Cook Islands in the South Pacific.
- Cooler than normal conditions are predicted along the equator and the off-equatorial South Pacific near and east of the Date Line. Warmer than normal conditions are broadly favoured for region extending northeast and southeast towards the subtropics.
- Models favour the southern Pacific Ocean cooling and ocean heat stress dissipating by May 2022, Coral Bleaching alerts for Papua New Guinea (PNG) persist until July 2022.
- Sea surface temperature (SST) is favoured to be below average for May to July across the central equatorial Pacific. Models favour SSTs returning to normal for these island groups around June-July. SSTs remain above average for most of the other PICTs over May-July. For a majority of countries these warm conditions prevail but decrease in intensity through August-October.
- Sea level is favoured to be notably higher than normal (>10 cm) over May-July and August-October in the vicinity of PNG, Solomon Islands, northern Vanuatu, northern Fiji and southern Tuvalu.
- A preliminary cyclone outlook for the northwest Pacific is for near-average seasonal activity based on the ongoing, but weakening, La Niña conditions.

Climate since November 2021

- La Niña conditions prevailed across the Pacific. The atmospheric response to the La Niña has been particularly strong, indicators have been consistently at La Niña levels over the last six months.
- Rainfall, temperature, and wind forecasts issued in October 2021 for the November 2021-April 2022 period were generally consistent with the observations over the same period. Model guidance was too wet in Samoa, American Samoa, central Federated States of Micronesia, and the Line Islands of Kiribati.
- Air temperatures were forecast to be closely aligned with sea temperature anomalies resulting from La Niña, leaning towards warmer than normal except for island groups near the equator and east of the International Date Line. Long range temperature forecasts were consistent with the observations with anomalies of 0.5 to 1.0°C commonplace away from the equator.
- Winds were forecast to be stronger than normal along the equator due to the effect of La Niña, with more northerlies extending into the western Pacific in the South

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Hemisphere. This was consistent with the observation, with enhanced trade winds playing an important role in atmospheric and oceanic patterns.

- Sea surface (ocean surface) temperatures across the region were consistent with the La Niña conditions. The equatorial Pacific, east of Nauru experiencing cooler than normal conditions, surrounded by warmer than normal temperatures.
- Sea level was higher than normal for most of the countries in the region. In the central and western Pacific, sea level was 25-35 cm higher than normal. A distinct pool of higher-than-normal sea level was observed countries like Palau, PNG, Solomon Islands and FSM.
- Seven tropical cyclones have developed in the southwest Pacific to date in the 2021-22 season, with two of those reaching the Cat. 3 or higher (hurricane intensity) status. Seasonal activity in 2021-22 was markedly lower than the 2020-21 season.

Review of November to April 2022 climate

Since PICO9, La Niña conditions have prevailed across the Pacific. The 2021-22 La Niña has been comparable to previous moderate-strong eastern Pacific (or traditional) La Niña's. The atmospheric response to the La Niña has been particularly strong, where indicators have been consistently at La Niña levels during the last six months. As the La Niña slowly trends towards ENSO-neutral, as is usual for this time of year, there is forecast to be a continuation of La Niña related impacts for the coming season such as for rainfall and temperature.

Rainfall, temperature, and wind forecasts issued in October 2021 for November 2021-April 2022 were generally skilful and well-aligned with observations. La Niña conditions likely had a positive influence on forecast skill across the region.

Rainfall was forecast to be below normal for island groups near the equator and extending southeastward toward the sub-tropics in the Southwest Pacific, while wetter than normal conditions were most likely from Papua New Guinea to southern French Polynesia. The overall theme of the prediction was good with a few exceptions: model guidance was too wet in Samoa, American Samoa, the central Federated States of Micronesia, and the Line Islands of Kiribati. Samoa Met Service noted that meteorological drought occurred at some sites. While the WMO-LRFMME ensemble mean forecast presented at PICO9 did not have a noteworthy signal for dryness, five out of 13 model members within the WMO-LRFMME indicated a risk for dryness; this highlights the benefit of looking at the spread of possible forecast scenarios to gauge forecast confidence. At the end of the forecast period, several island groups experienced particularly low rainfall over the previous 90 days, including: parts of Papua New Guinea, Nauru, Kiribati, Tuvalu, Tokelau, Wallis & Futuna, Samoa, American Samoa, the Cook Islands, and parts of French Polynesia.

Air temperatures were forecast to be closely aligned with sea temperature anomalies resulting from La Niña, leaning warmer than normal except for island groups near the equator and east of the International Date Line. Long range temperature forecasts were very good overall with anomalies of 0.5 to 1.0°C commonplace away from the equator.

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Winds were forecast to be stronger than normal along the equator due to the effect of La Niña, with more northerlies extending into the western Pacific in the South Hemisphere. This was consistent with the observation, with enhanced trade winds playing an important role in atmospheric and oceanic patterns.

The South Pacific Convergence Zone was displaced south-west of its climatological position for much of the last six months, consistent with La Niña conditions. The convectively active phase of the Madden-Julian Oscillation, a driver of climatic variability in the global tropics, frequently affected the Maritime Continent and less commonly impacted the Pacific — this likely influenced slightly lower than normal tropical cyclone activity in the Southwest Pacific from November 2021-April 2022.

Sea surface temperature continued to show the classic La Niña patterns with below average temperature prevailing along the equator to Nauru surrounded by a distinct boomerang shaped above normal temperature. Thermal stress from the continued warmer than normal conditions had the Coral Bleaching on watch to alert levels for countries experiencing prolonged warm conditions.

Over November 2021 to April 2022 sea level remained higher than normal for most of the countries in the region, with near normal conditions east of the equator. Notably, western Pacific and countries around the Coral Sea region continued with higher than normal conditions, ranging from 25 to 35 cm. Pools of lower than normal sea level were observed in a few countries.

In much of the western tropical Pacific, sea level has risen approximately 10—15 cm, close to or nearly twice the global rate measured since 1993. In the central tropical Pacific sea level has risen approximately 5—10 cm. For the most part, local rates of change obtained from tide gauges are in agreement with those derived from satellites. However owing to vertical land motion and other factors, there are locations such as Pago Pago, American Samoa where the local change of 31 ± 7 cm since 1993 as measured in the tide gauge is well above the amount derived from satellite observations. Natural patterns of variability play an important role in regional and local variation in sea level. These seasonal, interannual, and multi-decadal changes in sea level sometimes exceed 30 cm above or below normal, which is a much larger amplitude than the observed long-term trend. Rising mean sea levels have already resulted in dramatic increases in the frequency of minor flooding since 1980.

As of end of April 2022, there had been seven tropical cyclones in the southwest Pacific, with two of those reaching the Cat. 3 or higher category. Seasonal activity in 2021-22 has been markedly lower than 2020-21. The reduction in numbers may have owed to a reluctance of the MJO to cross into the Pacific, as influenced by La Niña's cooler ocean waters.

Trends in total numbers of tropical cyclones (<995hPa) and severe tropical cyclones (<970hPa) were examined for the period 1981 to 2021 for the greater Southwest Pacific region (135°E – 120°W; 0° – 50°S) and for a sub-region of the North-west Pacific Ocean (125°E – 180°W; 0° – 20°N). Trends were presented at a sub-regional scale as the numbers of tropical cyclones occurring within Pacific Island EEZs are insufficient for reliable long-term trends analysis. It

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was found that there has been little change in total numbers of tropical cyclones as well as in the numbers of severe tropical cyclones over the examined regions over the last 40 seasons.

May to October 2022 outlook

Both climate models and past history indicate that ENSO-neutral conditions are the most likely outcome over the coming six months until PICO-11, the second most likely outcome is a continuation of La Niña into a third (or prolonged) event, with El Niño considered to be unlikely for 2022. This is however the most difficult time of year for accurate ENSO predictions, the forecast becoming more skilful over the coming months.

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 a La Niña to ENSO neutral to state is evident in the ocean and atmosphere outlooks for May to October 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 May to July 2022, drier than normal conditions are favoured for the equatorial Pacific. This area of drier than normal conditions extends southeast towards the subtropics of the southern hemisphere. Wetter than normal conditions are favoured for Marshall Islands in the North Pacific and for islands southeast from PNG to southern French Polynesia in the South Pacific. Cooler than normal conditions are predicted along the equator and the off-equatorial South Pacific near and east of the Date Line. Warmer than normal conditions are favoured in the western Pacific, extending northeast and southeast towards the subtropics (excluding the central Marshall Islands).

The August to October 2022 rainfall outlook pattern is similar to the May to July 2022 outlook with decreased chances for drier and wetter than normal conditions for the aforementioned regions (excluding islands along the off-equatorial region in the South Pacific near and east of the Date Line). In the meantime, near normal conditions are expected to be enhanced along the equator east of the Date Line. Cooler than normal conditions are going to ease, whereas warmer than normal conditions are expected to persist.

Multiple sources of information from LRF node members are in agreement with the outlook of WMO LC LRF MME. Furthermore, the skill of each LRF node's outlook as well as the skill of the WMO LC LRF MME's outlook is reasonably good for most regions of the Pacific Islands, which gives confidence in the rainfall and temperature outlook for May to July and August to October 2022.

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Below-average SSTs are favoured for May-July across the central equatorial Pacific (Nauru, Kiribati, northern Cook Islands and northern French Polynesia). With ENSO neutral becoming the most likely category at the end of austral winter (June-August), SSTs are expected to return to normal for these islands groups. A boomerang-shaped pool of warmer water dominates the western and mid-latitude Pacific. SSTs remain above average for the remaining PICTs for May-July : Palau, FSM in the north Pacific and PNG, Solomon Islands, Vanuatu, New Caledonia, Vanuatu, Fiji, Tonga, Niue, Southern Cook islands and Austral islands (French Polynesia) in the South Pacific. These warm conditions prevails out to August-October. Overall these positive anomalies decrease in intensity, except for PNG, Solomon islands, Palau, Yap and Chuuk (FSM) where waters are warming up. WMO LRFMME LC outlooks provide useful information to summarize seasonal forecasts quality. Reliability diagrams show that predicted probabilities of above-normal SST from WMO LRFMME are well-calibrated, so we are quite confident with this warm scenario. Elsewhere, across Tuvalu, Tokelau, Samoa, Wallis-and-Futuna, Northern Cook Islands and the remainder of French Polynesia, there is no consensus within the WMO MME outlook: no clear-cut scenario emerges.

The transition to winter is a welcome relief in the southern hemisphere. Although the southern Pacific Ocean cools and heat stress completely dissipates from Great Barrier Reef, New Caledonia, Vanuatu, Fiji, Southern Tonga and Austral islands by May 2022, the NOAA Coral Reef Watch's Outlook expects heat stress on PNG and Solomon islands to continue over the next three months. With the strengthening of positive anomalies and the seasonal warming, there is a significant risk of coral bleaching for Palau and FSM.

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.

Sea level is favoured to be notably higher than normal (>10 cm) for May-July and August-October in the vicinity of PNG, Solomon Islands, Northern Vanuatu, northern Fiji and southern Tuvalu. Periods of higher-than-normal tides are critical when a tropical cyclone is in the vicinity, a distant storm generates a long swell that breaks on the coast or a tsunami threatens the coastline. Pools of lower sea levels are predicted in RMI, New Caledonia, Tonga and Marquesas.

Seasonal climate forecast provides useful information for decision-making processes in the fishing industry. Equatorial PICTs rely on skipjack tuna stock for food development and economic development. Skipjack catches are highest in the western Pacific warm pool. The 29°C isotherm is used as a proxy to delimit the area where fishing vessels have the best chance of success. With La-Niña conditions prevailing, the western Pacific warm pool is predicted to

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contract westward (west of Phoenix Islands Protected Area), so is the spatial distribution of skipjack tuna catches. In the South Pacific, warmer waters are predicted in the vicinity of PNG and Solomon Islands, so good fishing locations are likely to extend further south (15°S-10°S), as depicted by ACCESS-S ocean data available on the SPC Ocean Data Portal.

The 2022 Tropical Cyclone Outlook for the western North Pacific is currently in development and will be released late May 2022 by the NWS Weather Forecast Office on Guam. A preliminary outlook is for average seasonal activity based on the ongoing, but weakening, La Niña phase that could transition to an ENSO-neutral pattern late this summer or fall. 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).

At PICOF-10, discussion includes tropical cyclone and sea level long-term projections. Tropical cyclones are projected to have greater impact, with higher rainfall rates, making landfall on top of a higher sea level, as well as a greater proportion of tropical cyclones in the more intense categories and higher peak wind intensities. Sea level will continue to rise for centuries, but the rise would be significantly lower and slower under low emissions pathways compared to higher ones.

Recommendations from PICOF-10

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.

Please note that there is no extensive validation of subsurface data in seasonal forecasting systems, despite its potential applications for a sustainable ocean economy. Ocean heat

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content, or even temperature at a particular depth below the surface are not accessible on data dissemination platforms.

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 (PICOFF) since 2015 in collaboration with WMO. PICOFF is a platform used to 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. PICOFF 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 tenth virtual session of Pacific Islands Climate Outlook Forum (PICOFF-10) held on 26 April 2022. The forum had a specific focus on the overview of regional climate of November to April 2022 as well as May to October 2022 rainfall, air temperature, ocean, sea level and North Pacific TC outlooks where available.

PICOFF-10 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 meeting is supported by the Pacific Island Development Program (PIDP) of the East-West Centre based in Hawaii.

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.

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Probabilistic Multi-Model Ensemble Forecast

Beijing,CMCC,CPTEC,ECMWF,Exeter,Melbourne,Montreal,Moscow,Offenbach,Seoul,Tokyo,Toulouse,Washington

Precipitation : MJJ2022

(issued on Apr2022)

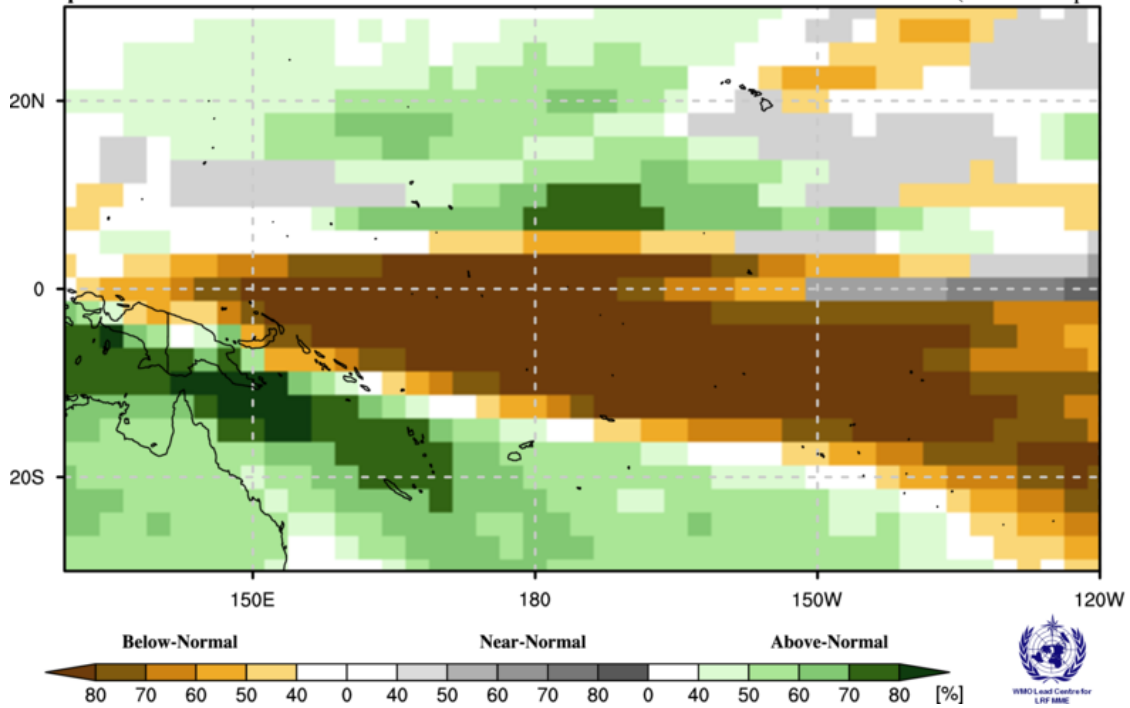


Fig. 1: Rainfall forecast for May to July 2022 for the western Pacific region.

Probabilistic Multi-Model Ensemble Forecast

Beijing,ECMWF,Exeter,Melbourne,Montreal,Offenbach,Seoul,Tokyo,Toulouse,Washington

Sea Surface Temperature : MJJ2022

(issued on Apr2022)

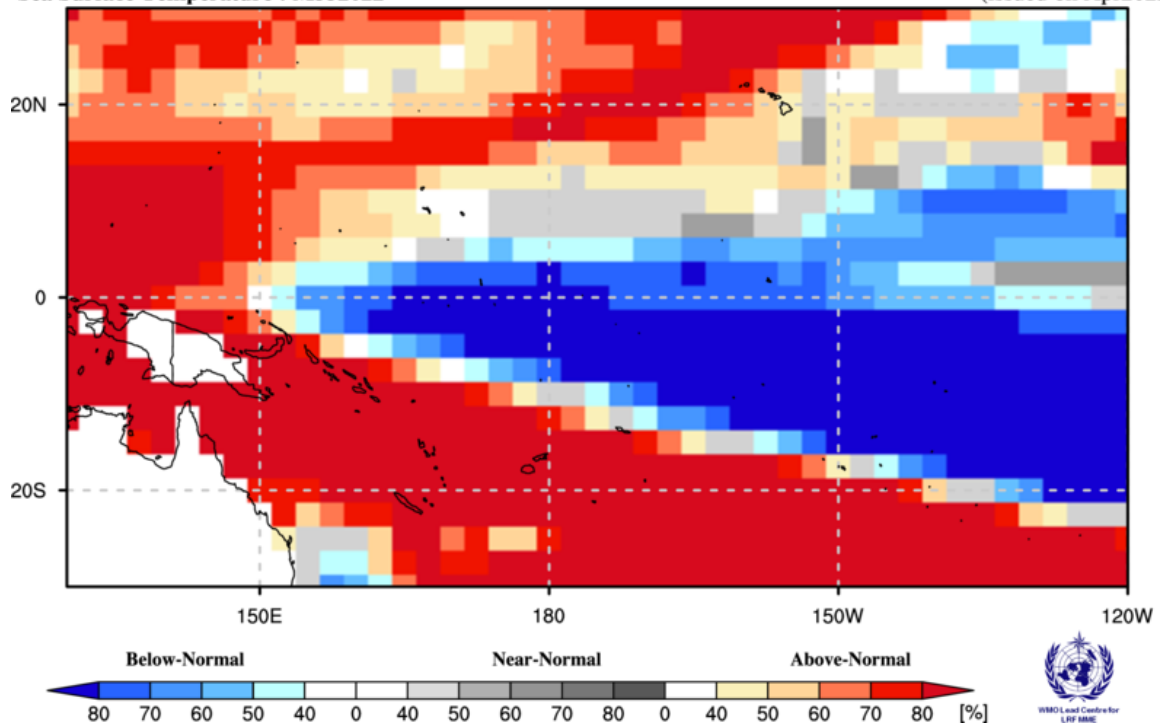


Fig. 2: Ocean surface temperature forecast for May to July 2022 for the western Pacific region.

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Probabilistic Multi-Model Ensemble Forecast

Beijing, CMCC, CPTEC, ECMWF, Exeter, Melbourne, Montreal, Moscow, Offenbach, Seoul, Tokyo, Toulouse, Washington

2m Temperature : MJJ2022

(issued on Apr2022)

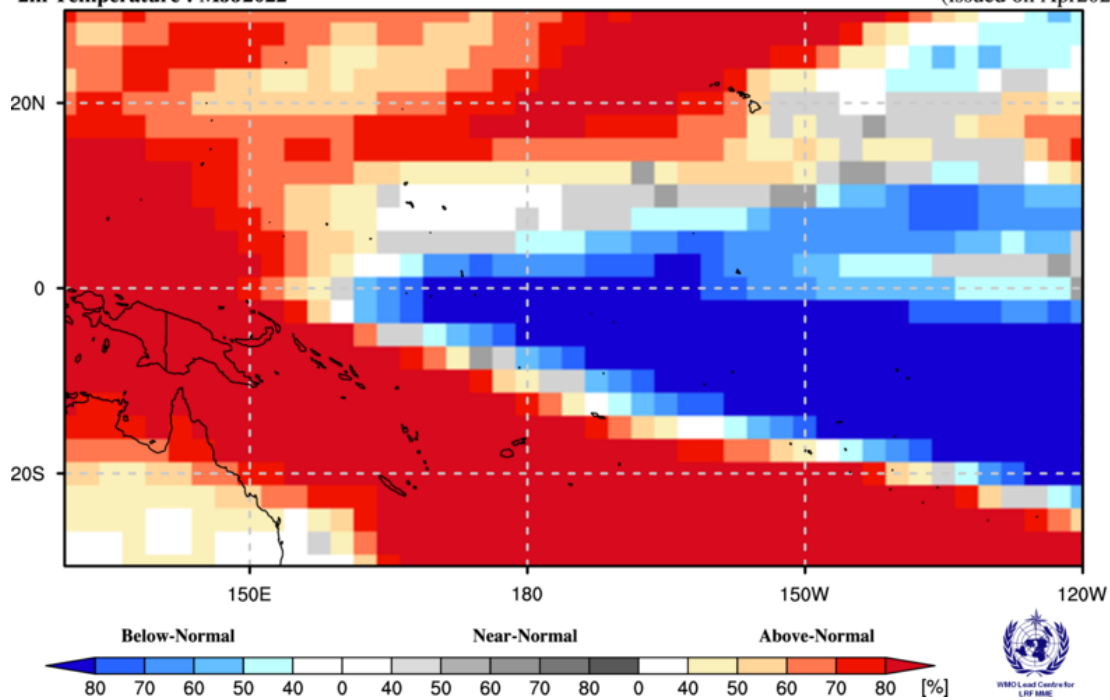


Fig. 3: Air temperature forecast for May to July 2022 for the western Pacific region.



Fig. 4: Map of the Pacific Islands region including those countries and territories involved in PICOF-10. Source: <https://www.infoplease.com/atlas/pacific-islands>