Fourteenth Pacific Islands Climate Outlook Forum (PICOF-14)

April 2024



Hosted by the Secretariat of the Pacific Regional Environment Programme Pacific Met Desk Partnership and World Meteorological Organisation in a hybrid setting (Face to face and online)



Introduction

Regional Climate Outlook Forums have been held annually in the Pacific since 2015, and biannually since 2020, allowing dialogue and learning between the providers and users of climate information. The Pacific Islands Climate Outlook Forum (PICOF) is based on the World Meteorological Organization (WMO) <u>https://public.wmo.int/en/our-mandate/climate/regional-climate-outlook-products</u> Regional Climate Outlook Forum concept.

PICOF is a WMO associated RCOF delivered via the Pacific RCC-Network aimed at producing objective, user-relevant climate outlooks in real time to reduce climate-related risks and support sustainable development for the coming season in sectors of critical socioeconomic significance in the Pacific Island region

NMHSs are the primary participants of the April 2024 PICOF but the focus remains delivering climate information to climate-sensitive sectors and the community

PICOF sessions are co-sponsored by the WMO through CREWS Pacific SIDS Project, funded by the CREWS Initiative and Environment and Climate Change Canada (ECCC), the ClimSA. BOM, NIWA, SPREP and SPC support is largely provided via the Australian and New Zealand Aid funded Climate and Oceans Support Program in the Pacific.

This report offers a short summary of material presented during the virtual meeting, the key discussion points, and any Meeting recommendations and action points.

Opening & setting the scene

The Meeting: (opening statements/remarks summary)

The Chair for the PICS panel welcomed participants to the 14th Pacific Islands Climate Outlook Forum (PICOF14) that was held virtually and in person. Director for Niue Met Services, Ms Rossy Mitiepo, opened the meeting with a prayer.

The Vice Chair of the PICS panel Ms Arieta Baleisolomone from Fiji Met Services opened the meeting with welcoming remarks where she:

- Acknowledged that this platform being in its 14th meeting is an important platform for the Met community
- Urged the NMHS to continue to use this platform to meet and discuss events affecting climate services
- Noted that the last ENSO events impacted the countries differently and encourage d NMHS to share their experiences and fruitful discussions

This was followed by opening remarks from Mr Naheed Hussein (ClimSA Project Manager and SPREP representative) who

- Acknowledged the presence of partners and NMHs
- Noted the importance of climate services and the production of information by NMHS

- Acknowledged the continuous support from various partners and projects to boost services and foster collaboration in
- Encouraged NMHS to continue to use this platform to report and reflect on the impacts to ensure alignment of reports to inform regional discussions
- Encouraged engagement and discussions amongst all partners
- Acknowledge the uniqueness of this forum which allows the discussions between scientists and decision makers and urge all participants to make the most of this meeting.
- Acknowledge the financial support of the partners that has allowed for this meeting to continue

WMO Representative

- Acknowledged the leadership from the Lead nodes and the work of the panels to support the work and effort dedicated to the successful continuous forums
- Acknowledged the leadership of the Chair and the team and recognise the challenges with sustaining funding support for PICOF
- Recognise the commitment and resilience of the countries and the partners that continue to fundraise and make sure the forum continues
- Encouraged to hear the discussions on the way forward, recognising the value of synergizing and looking at the future of PICOFs and inclusion of future climate
- SOFF and the importance of data quality feeding into the NMHs and the global networks
- Recognise regional initiatives and the direction it's moving, how Anticipatory Action is moving towards forecast based information, setting trigger points for issuing and mobilizing information
- Encouraged the meeting to continue to work and listen to the user's needs and discussion to inform the development of the work we do.
- Recognizing investment that is coming into the Weather and Climate space, and the need to remember both quick and slow onset events are all part of the discussions for Early Warning for all.
- Acknowledge the continuous support from SPREP, partners, Chair of the PICS panel and the member countries.

The Chair in wrapping up the opening session acknowledged the effort over the last 14 years and contributions by many of the Met community to supporting the work of the PICOF.

The PICS panel Co-chair provided the overview of the meeting objectives.

- Noted the objectives of the PICOF-14 to produce objective, user-relevant climate with aims to
 - Review the climate of November 2023 to April 2024 including the performance climate, ocean and tropical cyclone outlooks for this period.
 - Discuss how seasonal outlooks are produced in terms of accuracy, utility, weaknesses and strengths.
 - Present climate, ocean and tropical cyclone outlooks for May to October 2024.

where possible discuss how NMHSs are currently obtaining and assessing the available guidance, making it nationally relevant, tailoring them for specific end users, and disseminating them to users.

• Continue to include climate change historical trends and projection updates. On this occasion focusing on ocean temperature, coral bleaching and marine heatwaves

With a view of achieving the following outputs.

- NMHSs have a better understanding of recent and near future climate.
- A PICOF statement summarizing discussions at the PICOF with an official outlook for May to October 2024 which NMHSs can use to guide NCOF discussions and assist with the production of national productions/services.
- Improved coordination between RCC-N members including a better understanding of individual member products and services.

The Chair

• Acknowledged and congratulated the community with the 1st PICOF and the work that has gone into this.

Agenda Item 1: ENSO status and outlook

The Meeting: (notes from the presentation) Including highlights from Global Seasonal Climate Update (GSCU)

According to the Niño 3.4 indicator, El Niño has been present since June 2023 until now, with a maximum peak intensity of +2.0°C in December, according to the monthly ERSSTv5 Niño 3.4 index (centered base periods). However, the ocean / atmosphere coupling has been discontinuous since January (SOI, OLR anomalies on this page, or rain and surface wind anomalies as shown on the following pages). As a result, the persistence of El Niño since January is questionable (as proposed by the APCC

In coherence with OLR distribution, rainfall anomalies over the Pacific Ocean are consistent with an El Niño event during Oct-Nov-Dec, but not since January, reflecting a weakening of El Niño since the beginning of the year.

In terms of surface wind, we can't observe a continuous phasing with El Niño between January and March. The repeated presence of easterly wind anomalies since January is favorable to the resurgence of upwellings in the east of the equatorial Pacific basin

Unlike typical El Niño event, no cold SST's anomalies were observed in the west of the basin throughout the period from June to March (except in December), which is unprecedented during an El Niño episode.

Nevertheless, a hot/cold dipole was well established at depth from November to January. Since February, these cold deep waters have extended throughout the equatorial Pacific, suggesting an upcoming La Niña episode. Since mid-March and until mid-April, an upwelling has appeared along the coasts of Peru and is spreading day by day, as a precursor of a new La Niña event. Over the coming months, the central and eastern of equatorial Pacific are expected to cool.

Summary

- El Niño has been present since June 2023. But this El Niño stands out because the cold alter anomaly hasn't been really present in the west of the Pacific basin.
- Since January, it has been showing signs of weakness (the ocean / atmosphere coupling has been discontinuous).
- **Since mid-March**, cold water anomaly has been appearing along the east coast of the Pacific basin, as a precursor of a La Niña event.
- Most of the climate models suggest a transition from El Niño to ENSO-neutral by April-May-June.

La Niña is then favored by June-July-August.

The meeting.

- Noted the presentation by Thomas Abinun, Meteorologist from Météo-France New Caledonia
- Noted that El Niño has been present since June 2023. But this El Niño stands out because the cold-water anomaly hasn't been really present in the west of the Pacific basin.
- Noted that since January, it has been showing signs of weakness (the ocean / atmosphere coupling has been discontinuous).
- Noted that since mid-March, cold water anomaly has been appearing along the east coast of the Pacific basin, as a precursor of a LA Niña event.
- Noted that most of the climate models suggest a transition from El Niño to ENSO-neutral by April-May-June.
- **Conclusion:** La Niña is then favored by June-July-August.

Discussion:

Moleni from SPC: Thanked the presenter for the comprehensive presentation. Noted that it was a unique event which was witnessed in the Pacific and globally. Curious about the mechanism which caused the western cooler oceans to be absent from this El Nino compared to El Nino in previous years.

Meteo France: Unable to provide a response at this time.

NIWA: Acknowledged the question. Highlighted that the oddities of this El Nino event were worth reflecting on. One of the key differences of this El Nino event was linked to the triple dipole La Nina which preceded the El Nino event. Over that period (triple dipole La Nina) a lot of ocean heat was built up in Western Pacific. Lengthy process of ocean heating, whereas the heating in

the atmosphere lagged. Reiterated that the triple dipole is worth noting. The effect of climate change and the broader picture of global ocean temperatures is also worth noting. Concluded conclude, going forward, the experiences with previous occurrences may not be the same for future occurrences.

Action Items

No action items were raised in this session.

Agenda Item 2: Looking Back- Review and Evaluation of November to April 2024 Climate outlook.

i. Atmosphere- Overview of November to April state of the climate, plus evaluation of the last PICOF outlook - **SPREP** (Philip Malsale)

The Meeting:

Summary

- El Nino event peaks in December 2023 and January 2024 and this is in line with the PICOF-13 prediction
- Above normal rainfall: PNG, Solomon Islands, central Vanuatu, central Fiji Islands, Nauru, Kiribati (Gilbert and northern Line Islands), central Tonga, southern Niue, central French Polynesia and Pitcairn Islands.
- Below normal rainfall: CNMI, FSM, RMI, southern Tuvalu, Wallis and Futuna, Samoa, southern Cook Islands, southern and northern French Polynesia
- Most countries experienced above normal temperatures in the last six months, aside from the southern Cooks and Austral Islands.
- Many countries experienced above normal wind speeds in the last six months, particularly in the northwest Pacific, the Solomon Islands, southern Tonga, Niue, and the southern Cooks. In Nauru and Kiribati, wind speeds were below normal.
- The velocity potential map shows 2023-24 had more rising motion than 1997/2015, This meant that the atmospheric effects of the 2023-24 El Niño differed.

Discussion:

Kiku - Where is Palau in the rainfall distribution in the last 6 months. Phil responded that he just mentioned countries that experienced below or above normal rainfall. Palau was in the normal category and it's in the white shading.

Brandon (NOAA) commented that the gradual warmth and why Palau's experience did not correlate as per normal El Nino events is due to the triple La Nina dipole effect mentioned in the previous discussion.

Zulfi (SPC) - Asking if there are any models that picked up the drier than normal condition for Fiji and if the models picked up any of the difference in the rainfall distribution across the region

Phil and Ben responded that the models picked up some events but not fully. This showed how local events such as marine heatwaves can overwhelm broader climate events. This shows the importance of looking at information and following models including intraseasonal monitoring and verification.

A question was asked why the additional wind speed map was added. Ben responded that this was a tailored map produced for Phil to be added to the report on wind patterns and hasn't been part of the report or reporting from countries. However, there is interest to see if any of the countries experienced or picked up wind speed anomalies. Ben added that the last event wind flow showed stronger winds across the South Pacific. This consisted of and if used can increase the validation of wind speed and strength as predicted in the last PICOF statement.

Luteru - acknowledged the presentation. Seek clarification if this El Nino has more rising air than the previous one. (Referring to the last bullet point - Phils pptx)

Phil - Tripple dip El Nino happened three times since observation starts and we will consider reviewing the past event as mentioned by Ben in the previous discussion.

Simon - In SCOPIC there is a Drought monitoring tool that can determine past events that might help with Luteru's question.

Terry - we need to look back on previous months and consider in depth a review of past events. We need to consider working with countries to identify localise climate conditions that can affect the overall climate systems in the region. (Terry to verify this)

SPC: SPCZ was further south of its climatological position and mean average position during El Nino. Can you comment in terms of the two trade winds North and South during this season?

NIWA: Acknowledged the question. Suspects that it may have been linked to the very warm seas, as is being presented by John Marra, in the Western Pacific, making things a little more La Ninalike.

Action Items

The Chair requested if Phil and Ben can put together a statement from the verification aspect to be added in the PICOF statement.

ii. Ocean - Overview of November to April state of the ocean, plus evaluation of the last PICOF outlook-

John Marra, NOAA Presented

The Meeting:

John Marra, NOAA presented on the state of the Ocean and how the Ocean Outlook from PICOF-13 performed against observations.

Sea Surface Temperature:

During the December to March period, SST anomalies were above normal across most of the region. Peaking in January, SST was exceptionally high across the central and eastern tropical Pacific Ocean.

El Nino's oceanic intensity gradually waned during the first half of 2024.

- Last period: Projected warmer than average SST favored in most of the region except in New Caledonia
- Observed: From DJF-JFM period, SST anomalies were above-normal across the central and eastern tropical Pacific. El Nino diminishing in strength from JFM
- Marine Heatwave in January 2024 at the peak of the El Nino event
- Nov-April Observed: SST Anomalies show a peak in January 2024, with high SST across the western Pacific, but starts to break up by April 2024 with some cooler anomalies emerging on the west coast of South America
- SST Ranking from Nov-Apr illustrates exceptional warmth- amongst the highest temperature SST since records started in 1940
- We predicted the El Nino would wane in early 2024 and this is what the NINO indices illustrate as well
- Subsurface Temperature Anomalies from Oct 2023- Mar 2024 illustrates the dissipation of hot water over time

Sea Level:

- Sea Level Projected: Slightly higher than normal sea levels predicted
- Observed: Above normal SL was observed across much of the eastern Pacific
- UHC Sea level centre sea level records in Palau, Fiji, Tonga, and American Samoa

Coral Bleaching:

- The risk for coral bleaching is enhanced in the equatorial Pacific.
- Observed: This was seen across the region, exemplified by coral reef watch observations in American Samoa, Palmyra atoll

Discussion:

NIWA: Is anyone aware of a 6-month composite of SPCZ position? That would be helpful here.

Simon, BOM: No but Elise might be able to produce a one-off plot using OLR.

Simon, BOM: Is anyone monitoring PDO or IPO? How are we tracking?

NOAA: The very warm central and northwest Pacific Ocean has kept the Pacific Decadal Oscillation strongly in the negative phase. <u>https://www.ncei.noaa.gov/access/monitoring/pdo/</u>

Wallace, FSM: Can you elaborate on what caused the recent inundation that affected RMI and FSM? Any records of inundation events in past El Ninos?

John, NOAA: Some debate about exactly what caused it but suggested that it may have been a Meteo tsunami or storm. Sea levels may be relatively low but the Aleutian Low spins up during El Nino, so you have strong storms in the Northern Winter. It creates big surf in Hawaii. This may have been related to that.

Brandon, NOAA: This was a basin-wide event that caused coastal flooding as far west as Yap to the Cook Islands and Solomon Islands. An extremely powerful hurricane-force low across the Marshall. It was a very impressive event. At the same time, there was an MJO moving through the Pacific and during intraseasonal periods, you do see slight increase in SL height, so that may have been a factor. Overwhelmingly, an impressive storm event.

Grant, BOM: The Taimasa in American Samoa sees less pronounced in the satellite obs than in previous El Nino events, so it's interesting to hear there were still noticeable lower sea levels in Samoa.

Rossy, Niue: In the coral bleaching time series graphs, could you explain more on what are the other islands included?

John, NOAA: Regarding Niue's question, here is where to get a look at the plots for multiple locations, using a virtual station. <u>https://coralreefwatch.noaa.gov/product/vs/map.php</u>

Action Items

No action items were raised in this session.

iii. Tropical cyclones- Overview of the TCs over November to April

The Meeting:

Noted the presentation by Simon McGree on Tropical Cyclones predicted and observed over the November 2023- April 2024 period.

Summary:

- Fewer than expected TCs in the East Pacific
- As forecast in the West Pacific (3 BOM, 5 NIWA)
- 8 TCs (NIWA) between Nov-Apr
- 6 of 8 TCs pass through the 'Enhanced expected value' region according to the ECMWF outlook
- Severe cyclones:
 - NIWA favored 4-8 severe TCs across the region
 - 5 severe TCs total in the forecast area

Normal to enhanced TC activity

Discussion

Ben, NIWA: the first 3 TCs of the season were severe, the first time since 1969 that the first 3 TCs of the season were severe, tying back to the ENSO indicating there may have been better coupling early in the season and then that coupling was interrupted, and things sputtered in mid to late season. At PICOF-13 in October 2023 we had the severe TC Lola over Vanuatu. Given that early start you would have thought we'd be in for a long and challenging season, but that was not the case

Simon, BOM: The historical record is not as homogenous so may be safer to say this is the first time we've seen this since 1981 as the 1969-70 data is not as reliable. It was certainly an interesting start to the season.

Terry, SPREP: In terms of TCs this season, it's very abnormal in the sense that we don't really have Cat 5 TCs in November. We're expecting things to peak around January and February, but the opposite happened. Things quieted down. It would be good for experts to investigate and try and understand why TCs don't happen the way we predicted before the season. Everyone who's looking at the outlooks will have a lot of questions, why things didn't happen the way we predicted. We need to learn from lessons and give confidence to users of the statements.

Niue: Can we hear from FMS about their TC outlook?

Arieta, FMS: Wondering why models were going above normal and bigger strong El Nino when we did our TC outlooks according to the forecast.

Simon, BOM: Asking Fiji and NIWA, noting that you're using a statistical method, does this account for the declining trend in TC numbers?

Ben, NIWA: It's more anecdotal, we're aware of the trend and it factors into the decision-making process and the total number of TCs. The objective outlook using the statistical model in NIWA was producing a more aggressive forecast than the one we went out with- we lowered the # by 1-2 based on the trend.

Brendon, NOAA: In the North Pacific we had the same challenge. We saw the strong signal for El Niño, but we didn't see the classic enhanced TC threat across Micronesia. Going forward, we can work together and what happens in Micronesia could inform Oct-Apr TC outlook for the South Pacific.

Moleni, SPC: During typical El NIno years, you expect to have later TCs. We saw severe TCs in the first three months, so perhaps we could have anticipated fewer overall.

Ben, NIWA: responding to Terry's question, it is speculative, but the expanse of very warm seas across the Pacific more broadly may have affected stability profiles (e.g. no cool areas to offset the warmth and encourage stability)

Grant Beard, BOM: RE: TCs and ENSO, the forecasts were quite reasonable, but the El Nino showed unusual behavior. The walker circulation strengthened from October (e.g Australian SOI rose from -13.6 in Sept to +3.7 in Jan). In addition, the cold boomerang which usually surrounds the warm equatorial tongue failed to form, so overall SST pattern wasn't as conducive to large eastward shift of TCs as you'd normally expect in an El NIno. Traditional ocean indicators such as the NINO indices don't tell the whole story. They can be misleading.

Action Items

- Experts investigated why we had fewer TCs this season and why TCs didn't peak as predicted in JFM.
- North and South Pacific to work together so the TC season outlook in the North can inform the TC Oct-Apr outlook in the South.

Iv. Impacts Summary

i. Impacts Summary (Micronesia)

The Meeting:

• Noted the report from FSM, Palau, RMI and Kiribati.

FSM

Impacts on plants: soil erosion and nutrient loss, oxygen deprivation, disease and fungal issues

- Landsides and Flooding
- Saltwater intrusion and prolonged drought damaged crops and contaminated ground wells, increased outbreaks of diseases such as diarrhea and typhoid.

State of Emergency declared, and relief efforts were conducted delivering food, water, and materials to vulnerable affected islands. Extreme droughts and swells in Chuuk since January 2024

Below average rainfall and high swells in Pohnpei. Yap conditions would be like Palau.

Palau

- El Nino and Drying Trend (end of 2023 into early 2024).
- Elevated Northeasterly Trade Winds: Convection found further south of Palau; over the southwest islands and near the equator.
- Obscuration of Haze: Due mainly to Sea Salt, no obvious source. Beautiful sunsets.
 Shear Line: Important source of convection, especially if it interacts with the Near Equatorial Trough (NET) and/or a circulation/Invest Area.
- NET and Circulation/Invest Area 94W.
- Torrential rainfall totals in late January and late February but much milder in March due to the Shear Line-NET-Circulation/Invest Area. Enough rainfall to meet the monthly average rainfall threshold of 8 inches (203.2mm) of rainfall needed for most water needs.
- During March, fire located northeast of WSO Palau.
- Water Shortage Watch (March 26, 2024)

January convective activity brought above normal rainfall. While it was mostly dry throughout the year these two extreme rainfall events in January and February brought enough rainfall. March was mostly dry, and the National Emergency committee issued a Water Shortage Watch

Kiribati

- November to April 2023/2024 season which coincides with the onset of the El Nino in the Tropical Pacific greatly affects lives and infrastructure in Kiribati.
- The onset of the El Nino event positively impacts Kiribati from Drought-to-Drought recovery.
- The sudden onset of weather extremes poses high risks to the communities around the Kiribati islands including the Line islands.
- It was noted from impacts that Kiritimati islands were mostly affected by low pressure systems generated from the Northern Hemisphere and territory of the US while islands in

the Gilbert Group are affected by low pressure systems generated and developed from the southern Hemisphere.

• Hurricane force winds coupled with spring tide events; swell events brought by low pressure systems resulted in coastal inundation

RMI

- Drought across all RMI with water shortage
- King tide events January 19 and 21st, (Army base) and the March 10th and 11th brought high swells and inundation to RMI.
- Noted actions taken by the RMI government with NMDO coordinating responses to both droughts and inundation impacts.

Discussion

Acknowledgement from the Chair to all the countries for presenting the impact. Due to the time, the recommendation was to move ahead to the next Sub region.

ii. Impacts (Melanesia)

Noted: Notable events with an average rainfall

Flooding in all of Melanesia washed away bridges, some of the river's bursting causing banks to burst.

Fiji - Flooding in Ovalau central areas of Fiji, landslide in Fiji and Solomon Islands

Sea swells in Solomon Islands, impacts from TC Mal with associated damages

TC Lola, disturbance observed in Tikopia island and in Solomon Islands

This year's El Niño event is quite extraordinary from the previous events.

- Instead of severe shortages of water and droughts, the country was experiencing unprecedented severe droughts and landslides across the highlands, like anticipated impacts during La Niña events.
- PNG experienced a 7.0 magnitude earthquake that also caused havoc to Madang, Sepik and parts of the highlands.
- The country is now struggling with providing disaster relief to the worst affected areas.

iii Impacts (Polynesia)

The Meeting:

- Noted flooding from swells from the high seas affecting Tuvalu
- October-March Tonga showing drought impacts, January-March showing above average rainfall consistence with the outlooks
- Noted impacts of drought from Tonga
- Negative impacts. >> Water shortage rainwater tanks >> Agriculture root crops,

watermelon, kava plants. The impacts to agriculture cause high price to watermelons and

kava.

- Positive Impacts
 - Vanilla Flowering of vanilla is very good with less rain (Vavau and Eua).
- Fooding from swells and king tides affected Tokelau with waves reaching houses, Tonga and Tuvalu
- Heavy rain,
 - Flooding of low-lying areas ≫affected Infrastructure in Eua, Tokelau, washed

away roads joining islands, damage to roads,

- Delay in flights to outer islands due to bad weather, low clouds and poor visibility Sea level rising, king tides- soil erosion, soil water intrusion - Swells: flooding from swells. High winds/ gusts.
- Temperature High STTs would harm marine species and ecosystems and may cause fish to migrate to different locations. Coral bleaching in Tokelau
- Human activities would harm coral to bleaching, e.g pollution, reclaim lands and overfishing.
- Predicting El Niño & La Nina is important
 - Better predictions of the potential for extreme likelihood of droughts and floods save costs.
 - Improved climate predictions will also result in significantly enhanced economic opportunities, particularly for agriculture and climate related sectors as well as social benefits.
- In response to the impacts.
 - NDRMO shipped and distributed water to small islands and villages that were experiencing water shortage., also issued water tanks to assist with collection of water
 - National Disaster Risk Management Committee Meeting to Assess Situation and Response Readiness due to the Heavy rain and flash flood alert issued.

Discussion

No questions for this session.

Agenda Item 3: Looking Back Long-Term status of key variables - Seasonal and Intra-seasonal Pacific guidance for 2023/24.

A brief examination of long-term trends for variables of interest to Pacific communities: In April 2024, these will be surface and subsurface ocean temperature, coral bleaching and marine heatwaves. Presentation focused on trends, heat content, degree heating weeks Presented by Jim Potemara (NOAA)

The presentation presented:

- Ocean Heat Content
 - The ocean is storing an estimated 91 percent of the excess heat energy trapped in the Earth's climate system by excess greenhouse gases.
 - Averaged over the full depth of the ocean, the 1993–2022 heat-gain rates are approximately 0.64 to 0.83 Watts per square meter averaged over the surface of the Earth. We are seeing Climate Change figures.
 - Ocean sequestering a lot more energy as time goes by. The amount of heat the ocean is taking up and, in most places, this is above the limit.
 - Distribution of heat and it looks like the Pacific Equator is sequestering a lot more heat than other areas.

Degree Heating Weeks:

- The DHW shows how much heat stress has accumulated in an area over the past 12 weeks (3 months). In other words, we add up the Coral Bleaching Hotspot values whenever the temperature exceeds the bleaching threshold.
- Noted the impacts and problems of the reefs at the Equator and the South Pacific being affected by this heating coupled with El Nino. When you look at the Decadal aggregated DHW is projecting an increase in the number of DHW and increase in marine heat weeks.

Marine Heatwaves

- Marine heat waves are usually defined as any time the ocean temperature is above the 90th percentile for a specific length of time. This means that the temperatures are warmer than 90% of the previous observations for a given time of year. Marine heat waves can last for weeks, months or years.
- Heatwave from 2 days ago (NOAA Coral Reef Site) is showing the SST Climatology is showing Category 1-2 across the region. MHW is showing the early decades were 10 or less and in the last decade it's 50 0r more.
- Severity of Heatwave is in the center row, trends are unclear, but the records are showing the number of events increasing and the length of these events are also increasing.
- Noted the Ocean Temperature for the Tropical Pacific dominated by ENSO variability
- Upward trend in SST with trend in upper ocean heat content (ocean storing excess heat) and serious implications for coral reefs, marine heat waves more widespread
- Sea Surface Temperature Trend: •Trend in SST over the period 1982-2020 from NOAA blended product
- Noted the Region-wide warming of about 0.1 to 0.2 °C/decade with Trends near constant across the region, Marquesas an exception
- Trends vary by decade, as shown earlier (ENSO)
- •Critically important to know the "base" period,

- Noted the Implications of Trends such as the Upper Ocean heat content, Degree heating weeks and Marine heat waves
- Noted that in 2023, we saw unprecedented ocean heat- with a record daily global surface temperature more than 1.5 degrees Celsius above the mean.
- Noted in summary the
 - Long-term trends in ocean temperatures in the region of about 0.1 to 0.2 °C per decade
 - Trend small compared to interannual variability, however important implications for ocean heat content, marine life
 - Degree heating weeks: heat stress on coral
 - Marine heat waves: fisheries and climate

Discussions

Kiku asked if Ocean acidity is included

Jim Potemra responded that Observations and data are limited, but what we have is showing a drop in pH in ocean acidification that is adding the threat based on increased CO2 in the oceans and increased in temp. We do have long term measurements of ocean pH; however, we do see an increase in CO2 in the upper ocean coincident with a decrease in pH, i.e. ocean acidification. This is yet another stress on reefs and other calcifying organisms <u>Hawaii Carbon Dioxide Time-Series (noaa.gov)</u>

Action Items

None

Agenda Item 4: Looking Forward - Monthly and Seasonal Outlooks for May to October 2024.

i. Atmosphere - PICOF outlook and RCC Node for LRF individual model/MME guidance and skill comparison - NIWA (Ben Noll)

The Meeting:

Summary

- Active Madden-Julian Oscillation in mid-to-late April; awareness around possible tropical cyclone development in western part of region (however, short-range models not showing an intense system)
- Stronger-than-normal easterly trade winds favored over the next 3-6 months, northerly toward the equator

- May-July rainfall favored to be below normal in the off-equatorial South Pacific, along the equator (a change from previous seasons), and in the northwest Pacific; note, models vary in the intensity and coverage of below normal rainfall near equator
- **May-July rainfall favored to be above normal** in an area extending from PNG to the Tuamotu Archipelago & narrow corridor from southern Palau to southern Marshall Islands
- May-July rainfall skill is generally good across the region, highest along the equator

 be aware of Northern Hemisphere "spring predictability barrier" when it comes to ENSO
 & slightly lower model skill during ENSO neutral periods
- May-July temperatures favored to be above normal in all countries (continuation of recent warmth)
- August-October rainfall favored to be below normal near the equator & in parts of the northwest Pacific (potential for consecutive drier than normal seasons in some groups) and normal or above normal in the off-equatorial South Pacific (La Niña-like pattern developing)
- August-October temperatures favored to be above normal except in Kiribati (continuation of recent warmth)

Discussion

No discussion.

Fiji: Is there a chance that even though a cross to La Nina is likely, that there may be a chance that we experience El Nino-like impacts?

BoM: A number of models are favoring 'Yes' especially in the beginning of the event.

Action Items

None

ii. Ocean

The Meeting:

Noted the key points in the presentation by Dr. Grant Smith of the Bureau of Meteorology (BOM) presented on ocean outlooks, focused on ocean temperature, coral bleaching

Ocean Temperature

- SSTs likely to be above average over broadscale regions in the west and southwest Pacific
- WMO- MME skill is at its lowest in the MJJ period

- Last week the region of cool anomalies was more negative, but there's been a weakening of the negative anomalies since the last update
- Cool tongue emerging in ACCESS-S model-- bands of lower skill can be seen in the western warm pool
- NIWA model comparison- some models show a distinct La Nina-like cold tongue. Similarities with all models- warm anomalies from Solomon Islands down to French Polynesia and show a warm north pacific and patch of cold SSTs in the south pacific

Sea Level Anomaly

- Lower than normal sea levels forecast across the central to easter equatorial pacific.
- Higher than normal sea level in Palau, FSM, RMI, PNG, Solomon Islands in the Western Warm pool regions
- Central to Eastern Equatorial pacific showing a negative anomaly for sea level.
- Lower tides across the region typically occur from May-October
- Solomon Islands and FSM have a few of the highest 10 tides of the year

Coral Bleaching Outlook

- 4, 8 12 weeks into the future to the end of June based on NOAA model
- Alerts are forecast to be high in the central Pacific in the upcoming 4 weeks

Fisheries Convergence zone

- Based on temperature changes, we predict tuna to be displaced farther east than average in the coming seasons, even though sSTs are cooler in the central and eastern equatorial Pacific.

Discussion

Ben, NIWA: Interesting that the modeling as pertains to possible development of La NIna, some of the GCMs backed away from La Nina intensity so we may wish to capture some of the language around that. If we'd delivered this a month ago, we would have had more confidence.

Action Items

PICOF Outlook may consider commenting on the reduced confidence on the development of an intense La Nina

ii. Tropical Cyclones

The Meeting:

2023 Overview and 2024 thus far TC activity was well below normal for western North Pacific (WNP) basin, with a distribution that did not follow the typical expectations for an El Niño onset year

- 2023 was the fourth year in a row with below normal typhoon counts across the WNP basin
- Typhoon Mawar (worst hit to Guam since December 2002) There has been no TC activity in the WNP basin so far in 2024
- TC activity was average for central North Pacific basin Outlook for the remainder of 2024
- Forecast for onset of La Niña the next several months would typically favor a reduced TC threat for islands of Micronesia and Hawaii
- Some of the rainfall charts point to a drier than normal in Micronesia with a higher than normal rainfall for the islands to the South of Micronesia consistent with a La Nina event. While these are typical of what is expected these are not definitive.
- Important to note that ENSO based tropical cyclone patterns are typical, but not guaranteed, as evidenced by 2023/2024 El Niño
- Official NOAA TC outlooks for WNP and CNP will be issued next month

The Meeting:

- Noted the presentation from the North Pacific and delivered by Brandon
- Location of tropical cyclone genesis can fluctuate significantly from year to year based on the current state of the climate (MJO Pacific Meridional mode
- Summary of 2023 WNP TC Season
 - El Niño onset year following the 3-peat La Niña (2020, 2021, 2022)
 - TC Pattern unconventional for an El Niño onset year (distribution and overall typhoon count) • Despite overall oddities of an El Niño onset year, Typhoon Mawar ravaged Guam and Typhoon Bolaven swept through the CNMI
 - Western North Pacific Tropical Zones, noticed the TC distribution was different to other El Nino
 - Typhon Mawar ad an estimated damage in the millions, and Typhoon Mawar was similar to Typhoon Pamela1976, but there is slight difference in tracks that can lead to challenges and what was observed on the ground, heavy rainfall and damaging impacts
 - <u>https://www.weather.gov/media/gum/TropicalEventSummary/20230905_NWS_G</u> <u>uam_STY_Mawar_Meteorological_Assessment.pdf</u>
- Noted and presented on the Joint Tropical Northwest Center which noted
 - Focusing on Hawaii 4 TCs in the CNP basin during 2023 (average) August 2023: Hurricane Dora passed well south of the Hawaiian Islands
 - Dora far to the south and an extremely strong high-pressure system to the north led to damaging winds and a dry air mass across Maui and nearby islands

- Damaging winds contributed to fast moving wildfires on August 8th, with over 100 deaths in Lahaina, Maui, deadliest US wildfire in more than 100 years
- Looking ahead, noted that 2024 is a transition year...
 - El Niño fading quickly
 - La Niña favored to materialize the next few months (60% chance of La Niña developing by June-August 2024
 - Western North Pacific Basin: Forecasts of La Niña, continued negative phase of the Pacific Decadal Oscillation (PDO) not typical to a La Nina, and a busy Atlantic basin forecast favors yet another below normal TC year for the WNP basin •, while these are typical outlooks it is not a definitive outlook
 - Central North Pacific Basin: Reduced activity is usually favored due to enhanced vertical wind shear and higher activity forecasted in the Atlantic basin

Noted the NOAA TC Outlooks

Western North Pacific TC Outlook will be presented during WFO Guam's 4th Annual Regional Climate Conference on 23 May 2024 Central Pacific Hurricane Outlook NOAA issues its outlook for each hurricane season in the Central Pacific during an in-person news conference at the University of Hawai'i at Manoa in mid to late May American Samoa TC Outlook Press release in October

Discussion

Ravin NZ Met raised a question on the Intensity change in 24 hours for TC Balavi in CNMI-Brandon responded that he believes it was a rapid intensification but will get back to Ravin NZ met with the details

Action Items

No action item

Agenda Item 5: Looking Forward Long-Term

The Meeting

Heard the presentation from Leanne Webb on the findings of the research climate change projections for variables of interest to Pacific communities: In April 2024, these will be surface and subsurface ocean temperature, coral bleaching and marine heatwaves

• Noted that the Pacific Island countries are among the most vulnerable in the world to climate change (The World Bank 2013)

- Marine heatwaves (MHWs) can significantly impact ecosystems (tropical coral reefs, seagrass and kelp habitats) and species, with flow-on effects to human communities and livelihoods
- MHW occurrences, intensity and duration are increasing with climate change! (e.g. Oliver et al. 2018, 2019; Frölicher et al. 2018)
- Ciguatera fish poisoning incidences have an association with temperature (Llewellyn 2010; Skinner et al. 2011)
- SST mean circulation, ITCZ and SPCZ, Tropical Western and central Pacific Ocean (TWCPO) are amongst the warmest SSTs
- Marine heatwave and intensity categorization and definitions is important e.g. Western Australia you can have one heat wave with a long peak, it can happen any time of the year.
- Pacific Fiji Samoa impacted by marine heatwave Palau heatwave in 1998 reached category 2 and consistent with an El Nino, Fiji example extreme 2015-16 El Nino reaching category 2 with fish deaths reported along Coral coast, august 2016/2017 Samoa with category 1 prevalent in 9 months
- Trends are showing globally are showing and increase in marine heatwaves, scale of change across heatwave events vary and it's important to keep track of these changes
- Observed MHW days in each intensity category over the years is showing 10 days and overage with most showing trends across the moderate across are showing are increasing with the intensity in number of days unclear
- Marine heatwave days change over ENSO condition and what is experienced
- Projected global surface temperature change according to Shared Socioeconomic pathways
- SSP5-8.5 and SSP3-7.0 (low international priority for environmental concerns and fossil fuel development) are potentially catastrophic scenarios
- SSP2-4.5 (middle of the road) best warming estimates of 2oC by 2060 and 2.7oC by 2100. The path reflects no marked shift in social, economic or technological trends.
- SSP1-2.6 and SSP1-1.9 are the more sustainable pathways. While 1.5oC is still likely to be exceeded by 2030, temperatures are projected to decline after 2050
- MHW cater category patterns CMIP6 under SSPe-2.6 and SSP5-8.5 when compared across the different scenarios highlight that global emissions needs to follow the low emission trajectory
- CMIP6 projections on MHWdays per year under 2 emission scenarios show the local temp change and clear indication that high emission scenarios will have marine heatwave every day for the whole year compared to the low emission scenarios.
- Accurate climate predictions (Dunstan et al. 2018) and climate change projections are important for planning, responses and to build adaptation strategies
- Noted the Key messages from the research of
 - MHWs in the TWCPO region have increased in occurrence and intensity over the past 40 years leading to tangible ecosystem and fisheries impacts

- MHW projections under SSP5-8.5 would be expected to have serious implications for food security, livelihoods and health of communities in Pacific Island countries (PICs)
- Adaptation options for PIC communities to strong or higher category MHWs may be insufficient in the future without aggressive emissions reduction
- Low emissions scenario (SSP1-2.6) will be important going forward!

Discussion

No questions or comments.

Action Item

No action items.

Session 6: Summary of proceedings & next steps

The Meeting:

The Chair reminded presenters to provide summary if they have not done so, asked the group for volunteers to draft the statement which included Simon, Ben and Phil and Grant.

Once the statement is drafted, it will be shared with NMHS in advance with it being released and being shared online by SPREP and the statement to be completed by the 26th of April.

A survey was circulated to capture and better understand the characteristics of the El Nino event given the anomalies experienced and noticed.

Ben encouraged everyone that hasn't participated yet in the survey to do so.

PICS Panel Chair

- acknowledged the NMHs and the partners for attending
- Acknowledge presenters and organisers for volunteering in producing another successful PICOF
- Kiku on behalf of the NMHS acknowledged and thanked all the participants for another great PICOF.

Annex 1: Agenda

Timeline

Proposed Timeline for PICOF Statement development (dates refer to Samoa local time)

Time (Fiji Time)	Agenda Item	Responsible		
10:30am- 11:00am	Registration including morning tea	SPREP		
(7.30am Palau time, 1pm Honolulu time and 11pm UTC)				
11:00am -	Opening and Setting the Scene			
11.50am	Opening prayer	Niue NMHS - Director: Rossy Mitiepo		
	Remarks	Welcome remarks -Fiji Government (Fiji Met Director) Opening remarks -SPREP Rep (Salesa Nimhei) Keynote address -WMO Rep (Henry Taiki)		
	Meeting objectives	PICS Panel/RCC Management Committee Chair		
11:30am- 11:50am	Session 1: ENSO Status and Outlook	NIWA, BOM, Meteo-France, NOAA, University of Hawaii, APCC, SPREP, SPC		
	Including highlights from Global Seasonal Climate Update (GSCU)			

11.50am- 12.50pm	Session 2: Looking Back - Review and Evaluation of November to April Climate Outlook	(15 minutes each)	
	i. Atmosphere Overview of November to April state of the climate, plus evaluation of the last PICOF outlook	NOAA, University of Hawaii, BOM, SPC, SPREP, NIWA	
	ii. Ocean Overview of November to April state of the ocean, plus evaluation of the last PICOF outlook	NOAA, University of Hawaii, BOM, SPC, SPREP, NIWA	
	iii. Tropical cyclones Overview of the TCs over November to April	NOAA, University of Hawaii, BOM, SPC, SPREP, NIWA	
	iv. Impacts Overview of significant weather and ocean events over the last six months (November to April)	NOAA, University of Hawaii, BOM, SPC, FSM (Chuuk), Fiji, Tonga, NIWA	
12:50pm- 1:10pm	Session 3: Looking Back Long-Term: Status of key variables	NOAA, University of Hawaii, BOM, SPC, SPREP, NIWA	
	A brief examination of long-term trends for variables of interest to Pacific communities: In April 2024, these will be surface and subsurface ocean temperature, coral bleaching and marine heatwaves		
1.10pm-		1	

2.00pm-	Session 4: Looking Forward – Monthly and	(20 minutes each)	
3:00pm	Seasonal Outlooks for May to October 2024 i. Atmosphere PICOF outlook and RCC Node for LRF individual model/MME guidance and skill comparison	NIWA, BOM, Meteo-France, NOAA, University of Hawaii, APCC, SPREP, SPC	
	ii. Ocean PICOF outlook and RCC Node for LRF individual model/MME guidance and skill comparison iii. Tropical cyclones PICOF outlook and RCC Node for LRF individual model/MME guidance and skill comparison	NIWA, BOM, Meteo-France, NOAA, University of Hawaii, APCC, SPREP, SPC NIWA, BOM, Meteo-France, NOAA, University of Hawaii, APCC, SPREP, SPC	
3.00pm- 3.20pm	Session 5: Looking Forward Long-Term A brief review of climate change projections for variables of interest to Pacific communities: In April 2024, these will be surface and subsurface ocean temperature, coral bleaching and marine heatwaves	CSIRO, UGCRP, BoM and SPREP	
3.20pm- 3.30pm	Session 6: Summary of proceedings & next steps	PICS panel chair	
3.30pm- 4.00pm	Afternoon tea		

Annex 2: Participants



-Zoom Meeting				- • ×
💩 Recording		SPREP PMDP is talking		Sign in
Geoff Gooley CSIRO	Daeun Jeong (APCC)	Mitaki tagi e malga TOTOKKIOR KAR BO KARKE Mile Met service	philipm % philipm	brandon bukunt <i>i</i> brandon bukunt (NOAA)
Siosinamele Lui	Arieta Bale	christinet 1/2 christinet	Mele	Joseph Worwor
john marra (NO		Grant Beard (Bo	Ben Noll (NIWA)	C. Point-Dumon
Glenda Pakoa	john maugau	Kalsuak_VMGD	Samson Kaneko	Charlie - SPREP_IT



More PICOF-14 photos can be found in the link below

https://flic.kr/s/aHBqjBmTxR