WEATHER CLIMATE WATER
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Current status of operations of Pacific RCC-Network

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NIWA

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World Meteorological Organization
Organisation météorologique mondiale

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Pacific RCC-Network Background

Target region = Pacific Islands

Coordinating institutions = NIWA, NOAA, BoM, SPREP, CSIRO, UH

Start date including demonstration phase = October 2018

Main season(s)/parameters = Wet (Oct-Apr) and Dry (May-Sep)

Major forcings on the regional climate = ENSO, MJO

Potential applications of RCC products/services = Country-specific seasonal forecasts and climate services

RCC operational schedule = Ongoing

Governance (including coordination mechanisms if RCC-Network) = Management group

Partnerships = SPC, Meteo-France, UPNG, NMHSs, PMC

Resource base = Voluntary contributions

RCC Operations: Mandatory Functions

1. Operational Data Services

Ongoing and planned operational activities:

- *Climate data availability for the region of interest = Global plus some regional datasets*
- *Quality control of data = Some homogenisation performed*
- *Regional datasets = Sea-level, TC and basic climate*
- *On-line data/product access from/to NMHSs = Limited*
- *Climate database/archiving services = Limited*
- *Major constraints, if any = Coordination, data sharing, funding*

Operational Data Services

National Meteorological and Hydrological Services (NMHSs) in the Pacific Islands region operate and maintain their own climate observation networks. Climate data are quality checked and stored in national climate databases. The data resources below can be used to compare with national climate datasets and to assess regional trends and patterns.

Regional and Global Climate Data

The **Pacific Climate Change Data Portal** provides historical climate information and trends from individual observation sites across the Pacific region and East Timor.

The **Global Historical Climatology Network-Monthly (GHCN-M) temperature dataset** was first developed in the early 1990s. A second version was released in 1997. The latest iteration was released in May of 2011.

The **Integrated Surface Database (ISD)** consists of global hourly and synoptic observations compiled from numerous sources into a single common ASCII format and common data model.

Tropical Cyclone Data

The **Southern Hemisphere Tropical Cyclone Data Portal** improves knowledge of past tropical cyclone activity in the Pacific Islands and Timor-Leste by plotting tracks of cyclones in the South Pacific from 1969. Meteorologists and stakeholders can use this tool to analyse the tracks of historical tropical cyclones and relate them to the impact on lives and infrastructure recorded on the ground.

Sea Level Data

The **Climate and Oceans Support Program in the Pacific (COSPPac) Ocean Portal: Sea Level** page is a tool for plotting and downloading historical sea level data from tide gauges from across the Pacific Islands region and from satellite altimetry.

Real Time Data Display

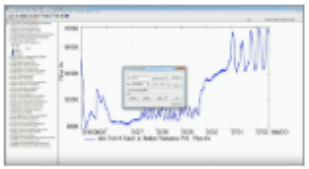
The **UHSLC tide gauge data** has two levels of quality-control (QC): Fast Delivery (FD) data are released within 1-2 months of data collection and receive only basic QC focused on large level shifts and obvious outliers; and Research Quality Data (RQD) receive thorough QC and are considered to be the final science-ready data set. This final QC process is time-consuming, and as a result, the RQD are released 1-2 years after data is received from the data originators.

Multi-Variate Data

Multiple oceanic and atmospheric global datasets provided by Asia-Pacific Data Research Center, which is a part of the International Pacific Research Center at the University of Hawai'i at Mānoa.

Data Management Services

CliDE (Climate Data for the Environment) is a Climate Data Management System (CDMS) which provides Pacific Island countries with a central database for climate records, with key entry forms, quality assurance tools, reports and data dumps. It is free and open-source software, using a web-based user interface and high reliability relational database system.



Tideda (Time Dependent Data) is a software package for making databases to store and analyse any time series data. It is particularly suitable for processing environmental and hydrological data.

national climate database

CliFlo is the web system that provides access to New Zealand's National Climate Database. The climate database holds data from about 6500 climate stations which have been operating for various periods since the earliest observations were made in the year 1850. The database continues to receive data from over 600 stations that are currently operating.

The **Bureau of Meteorology** is Australia's national weather, climate and water agency. Its expertise and services assist Australians in dealing with the harsh realities of their natural environment, including drought, floods, fires, storms, tsunami and tropical cyclones. Through regular forecasts, warnings, monitoring and advice spanning the Australian region and Antarctic territory, the Bureau provides one of the most fundamental and widely used services of government.

Traditional Knowledge

COSPAC

RCC Operations: Mandatory Functions

2. Climate Monitoring

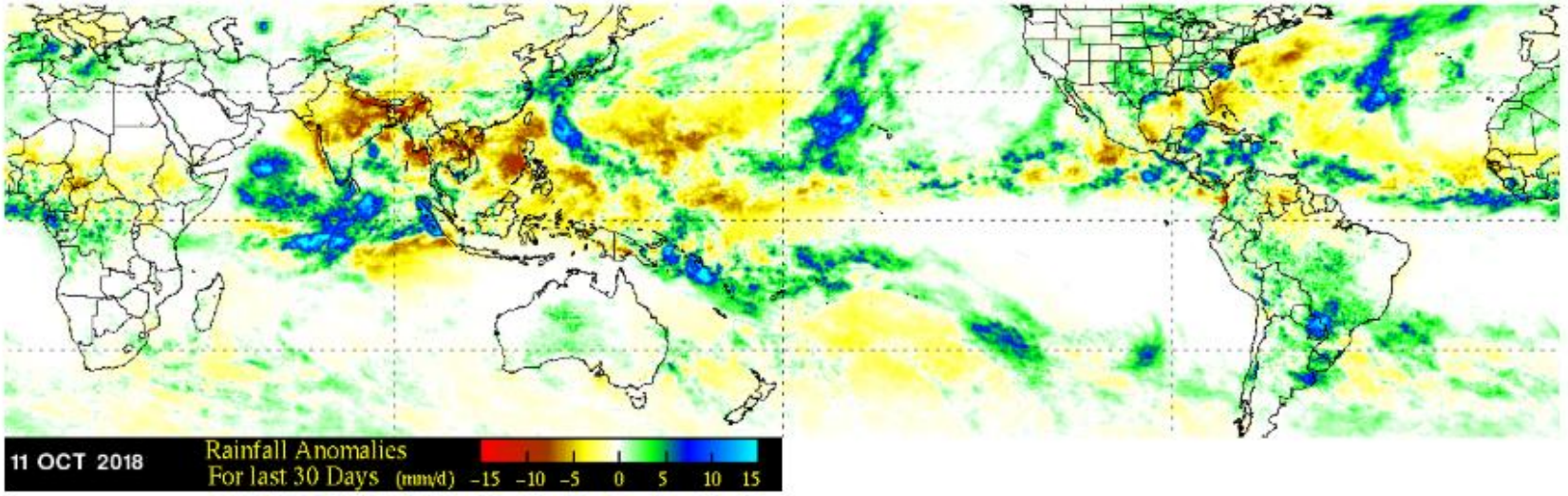
Ongoing and planned operational activities:

- *Climate diagnostics including analysis of variability and extremes = Project specific*
- *Key climate monitoring products and their operational schedules = Maps of SST, precipitation, air temp, OLR*
- *Historical reference climatology (including space/time resolution) = Station-based, satellite-based, and event-based (TCs)*
- *Regional climate watch advisories = Project specific*
- *Major constraints, if any = Good level of information*

Climate Monitoring

National Meteorological and Hydrological Services (NMHSs) in the Pacific Islands region are required to constantly monitor the state of the global- and regional-scale climate and oceans to assess the likelihood and risk of the formation and movement of tropical cyclones and storms, coral bleaching events, anomalously high seas, the location and intensity of the South Pacific and Inter-Tropical Convergence Zones, and abnormal sea surface and air temperatures. This information is regularly reported to stakeholders alongside national-scale data and sector-relevant impact indicators. The up-to-date global- and regional-scale climate monitoring products below are key resources for this purpose.

Precipitation



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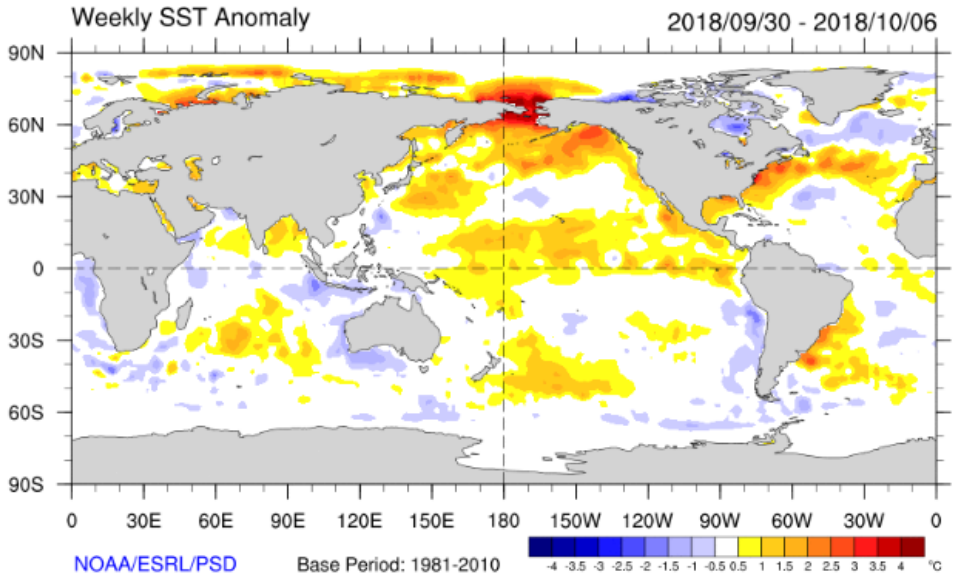
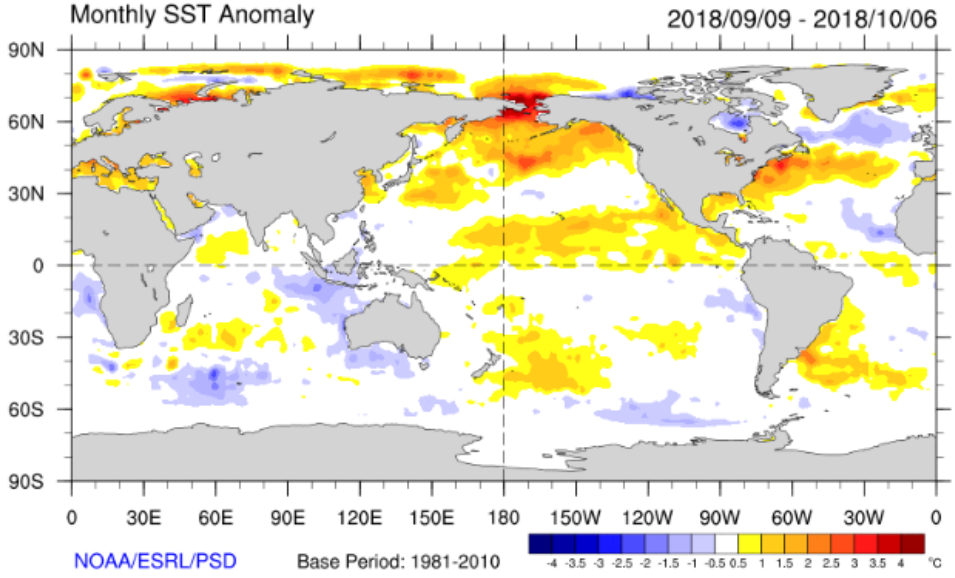
Sea Surface Temperature (SST)





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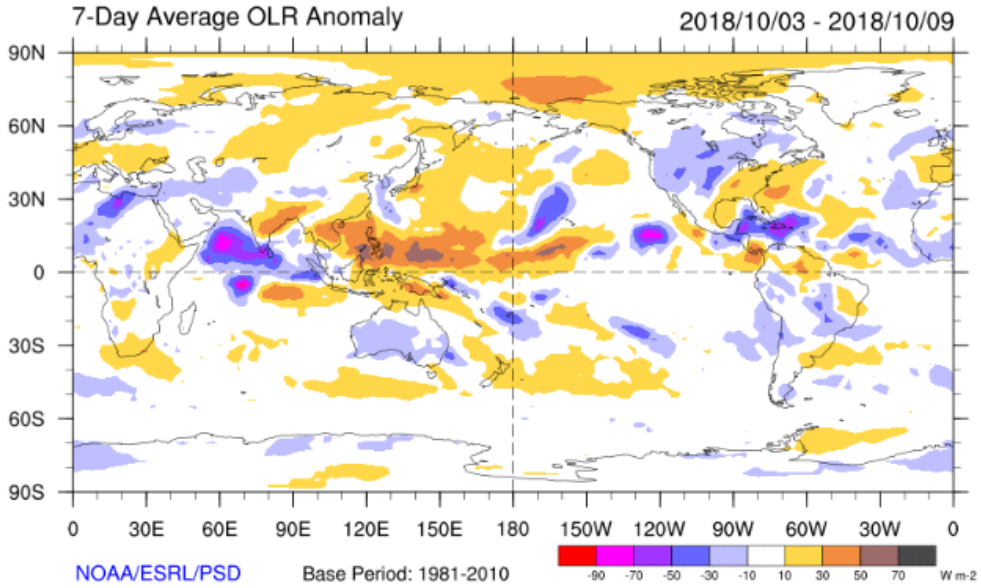
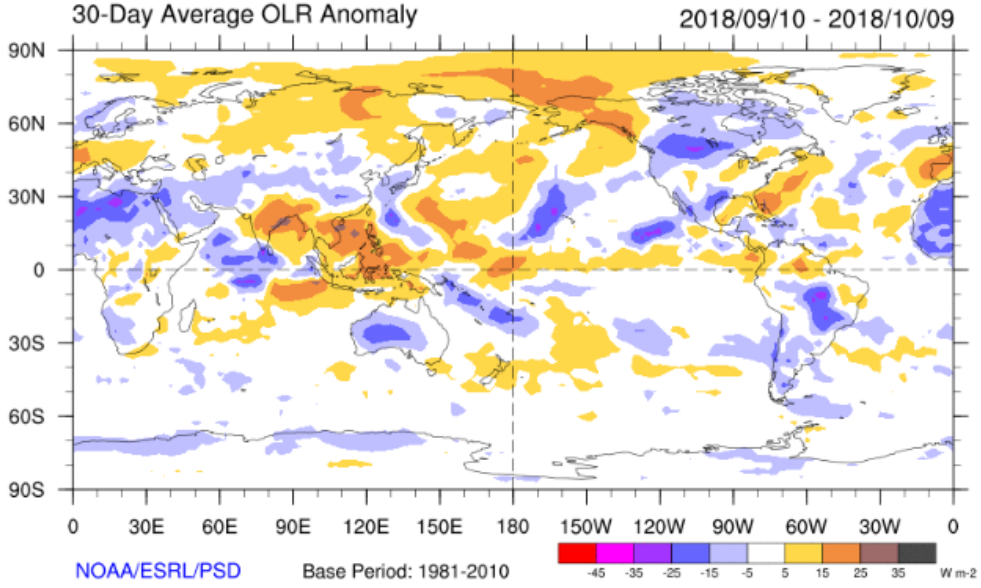
Outgoing Longwave Radiation (OLR)





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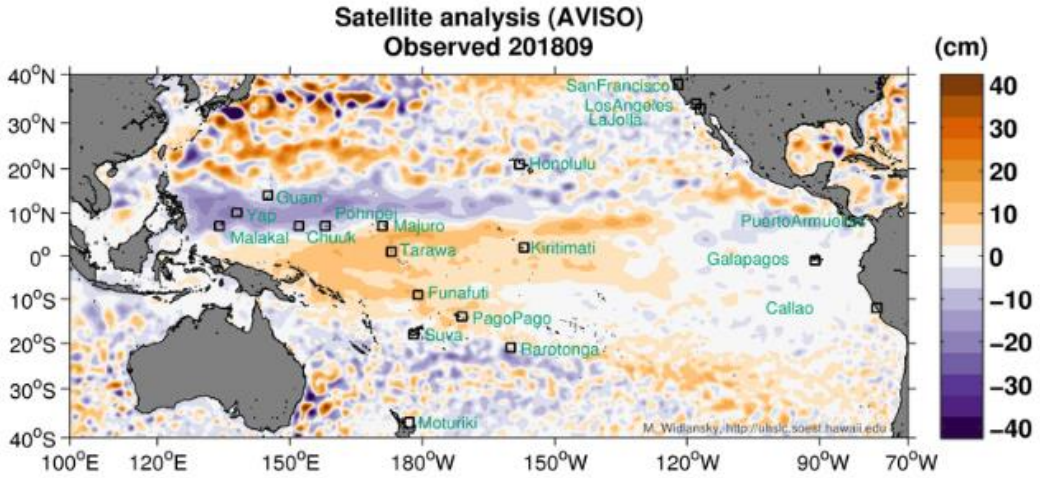
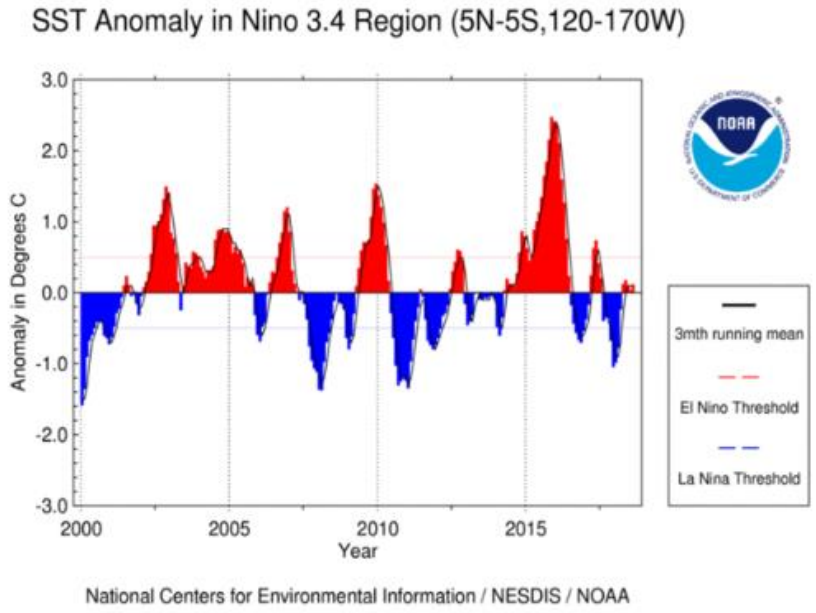
Sea Level



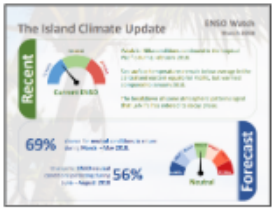
El Niño Southern Oscillation (ENSO)



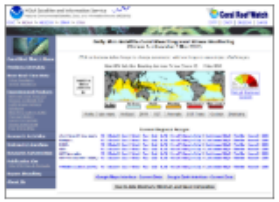
Climate Watches

The **Climate and Oceans Support Program in the Pacific (COSPPac) Bulletin** is a wrap-up of the current state of the El Niño Southern Oscillation (ENSO), Madden-Julian Oscillation (MJO) & Wind, Cloud, Rain, Oceanic Conditions, Mean Sea Level Pressure (MSLP), Model Outlooks, and Cyclones & Other.

The **ENSO Wrap-Up** provides information on the current state of the El Niño–Southern Oscillation based on several oceanic and atmospheric metrics together with the outlook for the next several months.



The **Island Climate Update (ICU)** is a monthly publication which comprises three climate watches for the Pacific Islands region: an ENSO Watch, Rain Watch and Drought Watch.

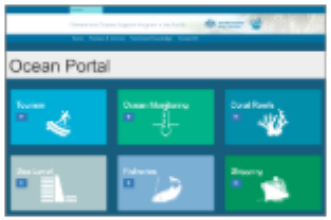


The **Coral Reef Watch** program uses satellite data to provide current reef environmental conditions to quickly identify areas at risk for coral bleaching. Bleaching is the process by which corals lose the symbiotic algae that give them their distinctive colors. If a coral is severely bleached, disease and death become likely. *NOTE: This product is experimental.*

The **Pacific Sea Level Ensemble Forecast** product provides maps of observed sea level anomalies for the past six months and an outlook of monthly sea level anomalies for the next one to two seasons. *NOTE: This seasonal forecast product is experimental.*

Exploratory tools

The **Southern Hemisphere Tropical Cyclone Data Portal** improves knowledge of past tropical cyclone activity in the Pacific Islands and Timor-Leste by plotting tracks of cyclones in the South Pacific from 1969. Meteorologists and stakeholders can use this tool to analyse the tracks of historical tropical cyclones and relate them to the impact on lives and infrastructure recorded on the ground.



The **Climate and Oceans Support Program in the Pacific (COSPPac) Ocean Portal** provides ocean information to inform Pacific stakeholders in fisheries, shipping, environmental management and tourism.

The **Climate Indices: Monthly Atmospheric and Ocean Time Series** page lets you plot, analyze and compare different monthly mean climate time series.

The **Sea Level Trends** display tool shows local relative sea level (RSL) measured by tide gauges around the world.

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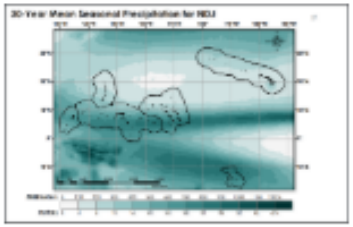
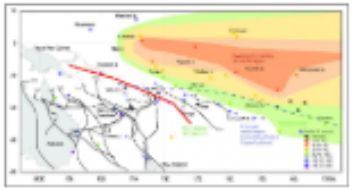
Reference climatologies

The **Pacific Climate Change Data Portal** provides historical climate information and trends from individual observation sites across the Pacific region and East Timor.



An **El Niño Southern Oscillation (ENSO) Based Precipitation Climatology** for the United States Affiliated Pacific Islands (USAPI) using the PERSIANN Climate Data Record (CDR) *[PDF 50 MB]*.



The **South Pacific Rainfall Atlas (SPRAT)** uses Pacific Island rainfall data to generate historic seasonal rainfall anomaly maps for the Southwest Pacific Islands, based on the 1961-1990 average.

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RCC Operations: Mandatory Functions

3. Long Range Forecasting

Ongoing and planned operational activities:

- *Methodology/approach for preparing the seasonal predictions including the tools used = National-scale, statistical (mostly) and dynamic models*
- *Input from GPCs-LRF/LC-LRFMME (NOAA, BoM, APCC), other RCCs (none), use of their real-time products (yes), indicate if there are challenges in accessing/using their products (slow internet speed)*
- *Evaluation of model skills, and identification of specific models with relatively better performance for the region of interest = ad hoc*
- *Consideration of sources of predictability for the concerned region, with special reference to ENSO and other global circulation parameters = good understanding*
- *Regional/sub-regional tailored products = some*
- *Consensus statements (including RCOF coordination) = yes, at RCOF*
- *Verification/evaluation of seasonal predictions = yes, at National scale*
- *User feedback assessment = yes, at RCOF*
- *Major constraints, if any = capacity of NMHSs*

Long Range Forecasts (LRFs)

National Meteorological and Hydrological Services (NMHSs) throughout the Pacific Islands region are mandated by their governments to regularly produce country-specific long range climate forecasts and disseminate these to their national stakeholders. The resources shown below aid this process by providing regularly-updated global- and regional-scale climate model output, analysis tools, and consensus-based forecast and validation products.

Global Producing Centre (GPC) Products

The Australian Bureau of Meteorology Pacific Seasonal Prediction Global Producing Centre (GPC) for long-range forecasts provides dynamical model based climate outlooks focused on the Pacific Region partner countries to reduce their vulnerability to climate variability in the context of a changing climate. *NOTE: These products are experimental.*

The APEC Climate Center (APCC) Climate Information Service includes a synthesis of the latest global model forecasts for the next six months. The service includes multi-model ensemble probabilistic and deterministic forecasts and verification diagnostics.

The World Meteorological Organisation Lead Centre for Long Range Forecast Multi-Model Ensemble has the objective to reduce the socio-economic losses associated with seasonal climate variability, and protect life and property. With this in mind, the Lead Centre for LRFMME has as its main goal the pooling and sharing of GPC forecast information in order to increase the reliability of LRF.

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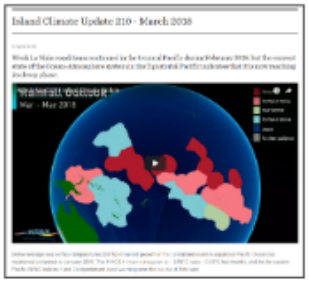
Tailored Regional LRF Products and Services

The **Online Climate Outlook Forum (OCOF)** allows partners in 11 Pacific Island NMHSs to validate their previous climate outlook, discuss their current climate outlook, and the possible implications for their countries. Participants are encouraged to raise questions about outlooks and about the SCOPIC tool (see below). The OCOF also provides an opportunity to discuss updates and get feedback.

Seasonal Climate Outlooks for Pacific Island Countries (SCOPIC) was developed to provide Pacific Island nations with an accessible, stand-alone seasonal climate prediction system. The software uses a statistical method to determine forecast probabilities, based on historic data, and provides graphics and text to support the outlooks, including skill tests, hindcasts, data-browsing, statistical analyses, scatter plots, and drought monitoring.



The **Island Climate Update (ICU)** is a monthly summary of the climate in the tropical South Pacific islands, with an outlook for the coming months. This bulletin is a multi-national project with collaboration from a number of Pacific nations and support from various organisations.

Multi-model Ensemble Tool for Pacific Islands (METPI) is utilised by NIWA to produce integrated results for many climate forecast models, and the result is the production of probabilistic forecasts for 22 Island countries and an outlook for the position and convective intensity of the South Pacific Convergence Zone (SPCZ). In addition, METPI retains information about past model indications for rainfall and Sea-Surface Temperature (SST) for all the Island countries, and as such we can track the performance of those models through time.

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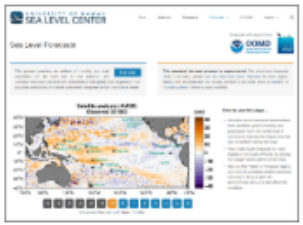
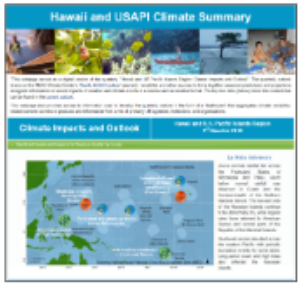
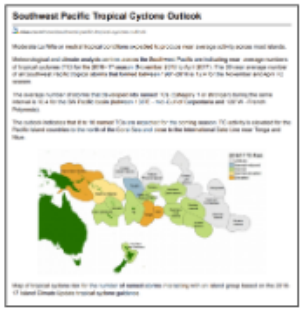
CLIK® (CLimate Information toolKit Pacific) is a regionally tailored online tool for Pacific Islands Countries and Territories. CLIK® provides Pacific oriented information using the multi model dynamical seasonal forecast based on different combinations of the user's preference. As the forecasts are combined with the past performance of each forecast generated, climate forecasters, disaster managers, water resource managers, researchers, and other users in the Pacific, can use this service to generate customized climate predictions on seasonal to inter-annual timescales for their region of interest.



The **Pacific Sea Level Ensemble Forecast** product provides an outlook of monthly sea level anomalies for the next one to two seasons. We combine sea level forecasts with astronomical tide predictions to provide more accurate predictions of coastal water level compared to tide predictions alone. *NOTE: This seasonal forecast product is experimental.*



The quarterly **Hawaii and US Pacific Islands Region Climate Impacts and Outlook** draws on the Pacific ENSO Applications Climate (PEAC) Center's **Pacific ENSO Update** quarterly newsletter and other sources to bring together seasonal predictions and projections alongside information on recent impacts of weather and climate events in a concise and accessible format.



An **annual tropical cyclone outlook**, issued in early October, is prepared by New Zealand's National Institute of Water & Atmospheric Research (NIWA) and Meteorological Service of New Zealand (MetService) along with meteorological forecasting organisations from the Southwest Pacific, including the Australian Bureau of Meteorology, MeteoFrance and the Pacific Island National Meteorological Services.

RCC Operations: Mandatory Functions

4. Training/Guidance in the use of RCC products

Ongoing and planned operational activities:

- *Information on methodologies = Project specific*
- *Product specifications = yes*
- *Guidance documents/manuals = yes*
- *Training organization/coordination = Distributed*
- *Major constraints, if any = NMHS staff turnover*

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Training and Guidance

There are multiple opportunities for training in data management and analysis, the use of software tools, producing tailored climate information and delivering fit-for-purpose **climate services**. National Meteorological and Hydrological Services (NMHSs) climate staff can track these opportunities using the websites shown below.

In addition, key WMO and other guidance material for the provision of effective climate services is listed here.

Training Opportunities

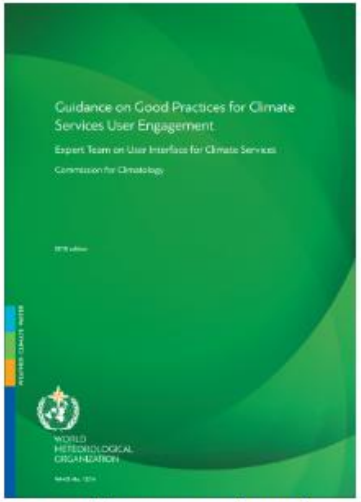
The annual **Pacific Islands Climate Outlook Forum (PICOF)** includes a training day for NMHSs climate staff. This day includes presentations on the latest guidance, data, tools and products for improving climate forecasts in the Pacific region. Training on the use of PI-RCC products is also held at every PICOF.

Also, the following websites are regularly updated with upcoming events in the region, including training sessions and workshops:

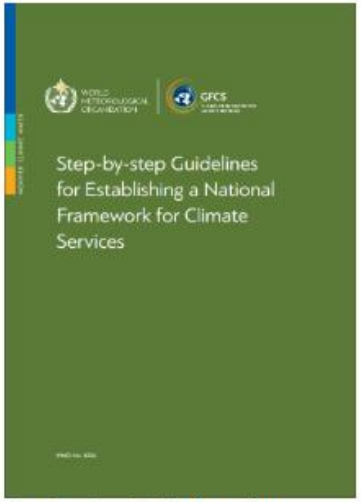
- **The Pacific Climate Change Portal**
- **Pacific Community - Events**
- **WMO Field Office for South-West Pacific**
- **NOAA NCEI Pacific Region**

Guidance Material

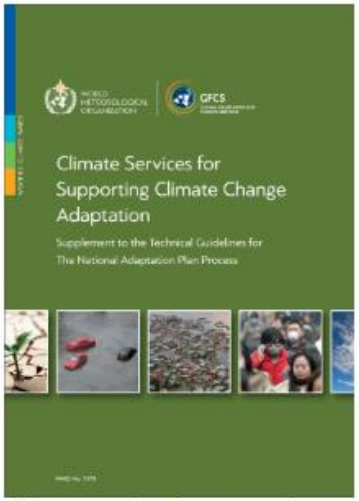
WMO Guide to Climatological Practices



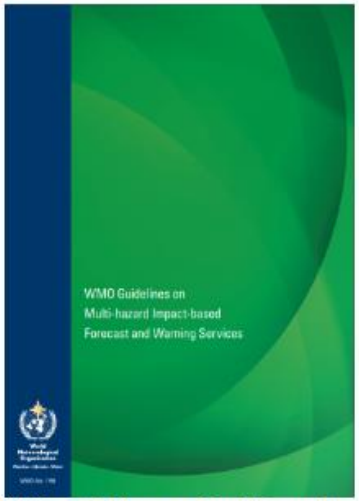
WMO Guidance on Good Practices for Climate Services User Engagement



Step-by-step Guidelines for Establishing a National Framework for Climate Services



Climate Services for Supporting Climate Change Adaptation



WMO Guidelines on Multi-hazard Impact-based Forecast and Warning Services

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RCC Operations: Highly Recommended Functions

Performance of highly recommended functions:

- *Non-operational data services (including WIS compliance) = Very limited*
- *Additional climate variables = Very limited*
- *Climate prediction (other than LRF) = Some (MJO-based)*
- *Climate change projection = Very good information*
- *Regional coordination/collaboration (including project implementation) = Very good*
- *Training/capacity development = Project specific*
- *Research and Development = Some (project specific)*
- *Use of Climate Services Toolkit = None (but other tools available)*
- *Major constraints, if any = Capacity of NMHSs and providers*

Climate Projections

Earth's climate and oceans are changing in response to increasing greenhouse gas concentrations in the atmosphere. The Pacific Islands region will experience higher air and sea temperatures, changes in wind and rainfall patterns, higher sea levels and increasing ocean acidification. The impacts of these changes are already being felt, and will continue to have significant implications on livelihoods and for sustainable development in the region.

The resources and tools shown here can help Pacific Island countries adapt to climate change and be better prepared to manage the impacts. It is the responsibility of the Pacific Islands National Meteorological and Hydrological Services (NMHSs) to utilise and effectively communicate to their stakeholders such information on climate change that is relevant to their country and region.

Regional and national/sub-national projections

The **Regional Climate Consortium for Asia and the Pacific (RCCAP)** is a community of practice, established by the Asian Development Bank (**ADB**) to facilitate the development, dissemination and application of climate information in support climate resilient development in its Developing Member Countries (DMCs). This web portal provides access to climate data, and guidance material and other resources made available through the Technical Assistance project Regional Climate Projections Consortium and Data Facility in Asia and the Pacific. *Note: This Site is Under Development.*

The **Hawaii Regional Climate Model (HRCM) Simulations** use output from standard global climate models as the basis for much finer scale regional climate simulations for Hawai`i. We have configured a nested version of the advanced Weather Research and Forecasting (WRF) model with both high resolution and improved physics for the Hawaiian region.

Dynamical Downscaled and Projected Climate for the US Pacific Islands (includes Guam, Kauai, Oahu, Samoa). Climate projections include two scenarios, one for RCP4.5 and the other one for RCP8.5. The dynamical downscaling provides hourly atmospheric and land surface variables, such as rainfall, surface sensible heat fluxes and evaporation, radiative fluxes, wind, and temperature.

Resources, tools, data and training material

Pacific Climate Futures is a user-friendly, web-based tool, built upon the extensive analysis of global climate models (CMIP5 and CMIP3) from climate change in the Pacific. Users can explore the likelihood of future changes in a range of variables (temperature, rainfall, wind, sunshine, humidity and evaporation) based on 13 time periods (2030, 2035, 2040, ..., 2085, 2090) and four greenhouse gas emissions scenarios (very-low-RCP2.6, low-RCP4.5, medium-RCP6.0 and very-high-RCP8.5).

The Pacific-Australia Climate Change Science Adaptation Planning (PACCSAP) program **New Science and Updated Country Reports** provide a summary of information from climate variability, extremes and change in the Western Tropical Pacific for each partner country.

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Role in RCOF Activities

Overarching role of your RCC/RCC-Network in RCOFs, including:

- *Technical guidance for RCOF outputs = Leading role*
- *Training activities = Leading role*
- *Inter-session updates of RCOF products/outlooks = Individual institutions*
- *Resource mobilization for sustaining RCOFs = Leading role*
- *Major constraints, if any = Funding*

User Engagement

Indicate:

The main regional users (if any) involved in the RCC-Network = NMHSs, IFRC

Whether sector focused sessions are conducted in conjunction with RCOFs or other RCC events = yes (Water, DRR, Health)

Mechanisms if any for collecting users' feedback = Surveys

Whether the RCC-Network undertakes any actions to address users' needs (e.g. provision of tailored forecasts) = Guidance material

RCC Web Portal

Provide the URL of the home page = https://www.pacificmet.net/rcc

Illustrate the main features and contents of the RCC-Network web portal = see examples included above

The actions to keep it up-to-date = voluntary contributions

On-line user support = Working on it (Twitter and FB)

Major constraints, if any = Time

Pacific Meteorological Desk & Partnership

About Us | Home | Products & Services | PMC | PMMM | News | Projects | RCC

WMO RA-V Pacific Regional Climate Centre (RCC) Network

RCC Home
Long Range Forecasts
Climate Monitoring
Climate Projections
Climate Data
Training
Climate Services Help Desk
PICOFS
NCOFS

The WMO RA-V Pacific Regional Climate Centre (RCC) Network

The **WMO RA-V** Pacific Regional Climate Centre (RCC) Network is a virtual Centre of Excellence that assists National Meteorological and Hydrological Services (NMHSs) in the Pacific Islands region to deliver better **climate services** and products and to strengthen their capacity to meet national climate information and service delivery needs.

The RCC is support by the University of Papua New Guinea (**UPNG**), National Institute of Water and Atmospheric Research (**NIWA**) New Zealand, Australian Bureau of Meteorology (**BoM**), US National Oceanic and Atmospheric Administration (**NOAA**), South Pacific Regional Environment Programme (**SPREP**) and Australian Commonwealth Scientific and Industrial Research Organisation (**CSIRO**), **Meteo-France**, **University of Hawaii**, and Pacific Community (**SPC**)

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SWOT analysis

Strengths = *Excellent team of partners and regional support structures*

Weaknesses = *Low capacity of users to integrate information*

Opportunities = *Capacity development and regional coordination*

Threats = *Projects are traditionally not regionally-focused, funding is not secure*

Way Forward

Actions planned to be undertaken in operation, user engagement, sustainability and research, to improve the Pacific RCC-Network operations, outline key requirements for enhanced RCC operations

Enhance regional products and datasets

Consider 6-monthly RCOFs

Develop sector-specific products and services

Continue to develop training services

Thank you
Merci

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The RCC is support by the University of Papua New Guinea (**UPNG**), National Institute of Water and Atmospheric Research (**NIWA**) New Zealand, Australian Bureau of Meteorology (**BoM**), US National Oceanic and Atmospheric Administration (**NOAA**), South Pacific Regional Environment Programme (**SPREP**) and Australian Commonwealth Scientific and Industrial Research Organisation (**CSIRO**), **Meteo-France**, **University of Hawaii**, and Pacific Community (**SPC**)

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