Pacific Climate Change Science

The Role of Climate Science Informing Integrated Climate Adaptation and Disaster Risk Reduction and Management in the Western Tropical Pacific

Brad Murphy, Kevin Hennessy and Geoff Gooley
With contributions from many PACCSAP colleagues

Pacific-Australia Climate Change Science and Adaptation Planning Program

Australian Government

PACCSAP (Science) – Goal/Objectives

- **PACCSAP goal and objective:**
  - Develop Pacific island country capacity to monitor & adapt to changing natural environment, & enhanced resilience to impacts of climate change
  - .....Emphasis on Pacific island country scientists, decision-makers & planners to apply info/tools & develop in-country responses

- **PACCSAP Science Program 'outcomes':**
  - Primary: Improved scientific understanding of climate change in the Pacific
  - Together with DIICCSRTE:
    - Increased awareness of climate change science, impacts and adaptation options
    - Better adaptation planning to build resilience to climate change impacts

Some examples of use of PCCSP science

Science is being used for diverse purposes from high-level policies to community-level adaptation projects:

- National Communications to the United Nations Framework Convention on Climate Change: Cook Islands, FSM and Palau, PNG.
- East Timor and PNG Ministers presentations to CoP17 United Nations Framework Convention on Climate Change.
- Informed National Climate Change Policies - Solomon Islands, Fiji Kiribati
- 11 WHO-supported climate change and health assessment plans
- SPC: nine country profiles
- EU planned hydro electricity project in FSM
- Nauru PACC project
- PCRAFI Cyclone Risk Model
- Nadi flood plain study

PACCSAP Science Program - Scope

New Science

- Seasonal predictions & climate data
- Large-scale climate features & variability
- Regionally specific projections & extreme events
- Ocean processes

Tools Development

- Seasonal predictions & climate data
- Large-scale climate features & variability
- Regionally specific projections & extreme events
- Ocean processes

Communication Products

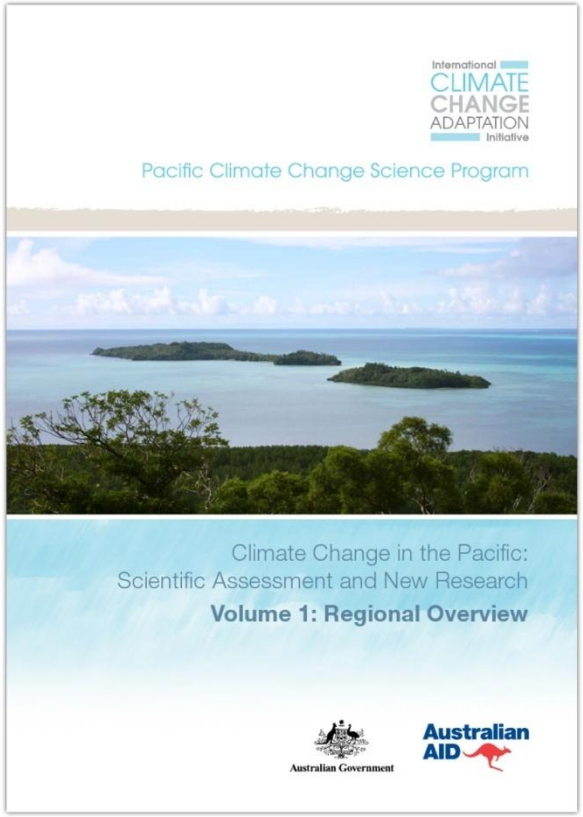
- Supplementary CCiP
- Synthesis report
- Other, e.g. animation, resources

Capacity Building

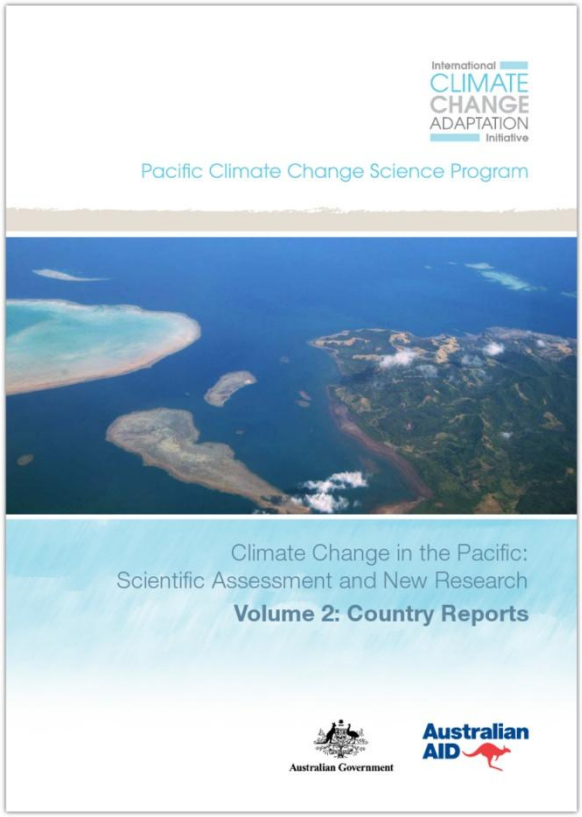
- Mentoring & attachments
- Technical training
- Workshops, conferences, symposiums
- Networking &relationship management

Communicating the science

Volume 1: Regional Overview



Volume 2: Country Reports



- Under-pinned by 44 peer-reviewed journal papers published or accepted
- 10 journal papers in preparation or submitted
- 58 conference papers

- Over 6500 copies distributed so far, over 100 authors including many Pacific island country authors

Communicating the science

- Brochures developed for all 15 partner countries
- English and translated into 11 local languages
- Over 55 000 copies distributed across the Pacific

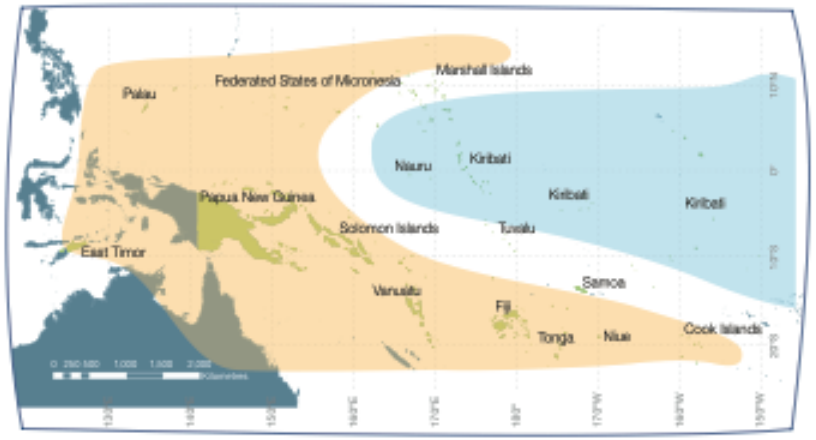
www.pacificclimatechangescience.org

Capacity building - country visits

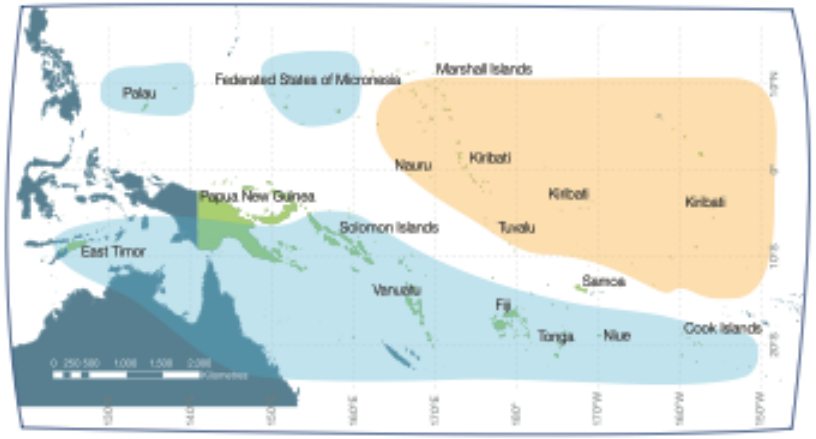
Over 80 visits to the Pacific – over 400 days, involved 50 PACCSAP staff

- 30 Climate Futures visits - 15 included basic climate science workshops
- 27 CliDE visits - training and installation
- 5 data digitization trips
- 5 mentoring trips
- 18 liaison, communication, outreach, evaluation visits
- Over 500 people reached through climate change science workshops across all our partner countries.

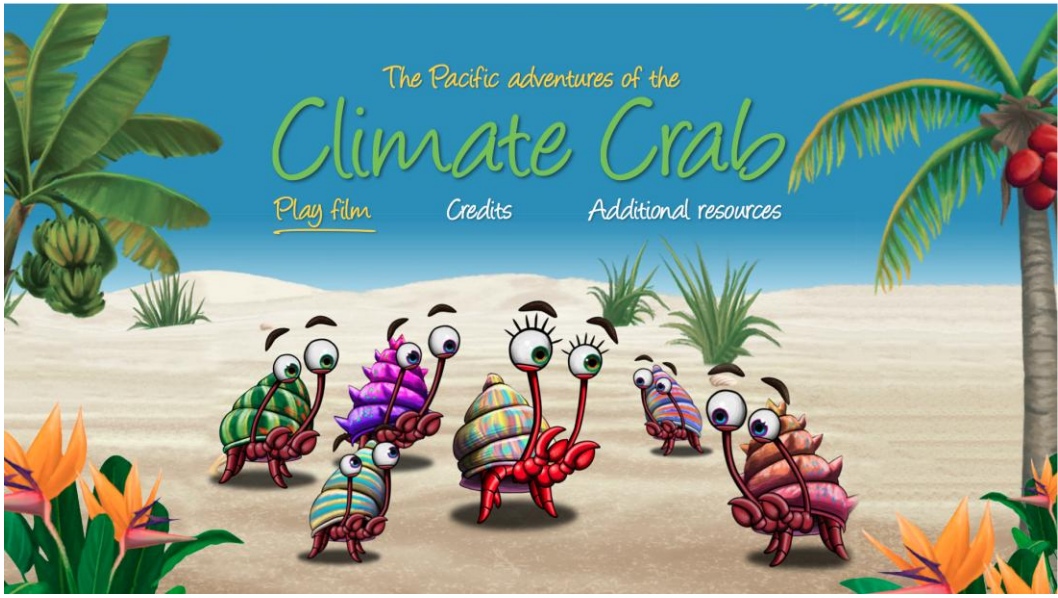
Communicating ENSO impacts on all countries



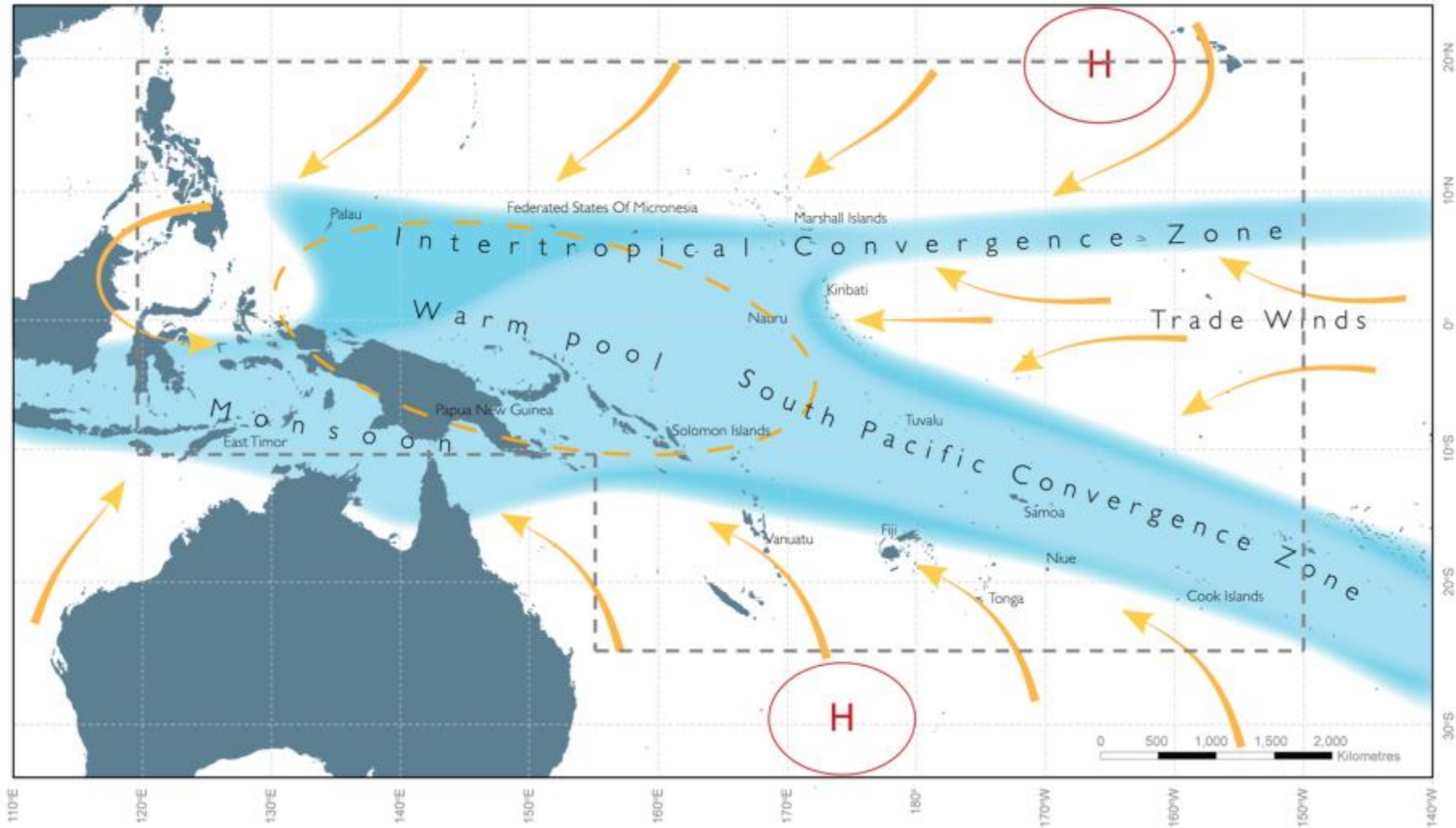
This map of the Pacific Islands shows areas that are more commonly wet (blue) and dry (yellow) during an El Nino event.



This map of the Pacific Islands shows areas that are more commonly wet (blue) and dry (yellow) during a La Nina event.



Enhanced knowledge of climate processes



Drought of 2010/11

Drought in Kavieng during 2010/11 La Nina when much of Australia was strongly affected by floods.

The National – March 3rd 2011

4 The National – Thursday, March 3, 2011

NATION

Dry spell kills five in New Ireland

PROLONGED drought in the New Ireland has resulted in the death of five people as water and food crops dried up.

Member for Namatanai Byron Chan said that five people, mostly young children and the old, had died of dehydration as the dry spell entered its fifth month.

The member said that food crops had died while creeks and streams used for drinking had all dried up forcing people to walk long distances in search of food and water.

He said that cash crops like copra, cocoa and oil palm had all been affected as the leaves were becoming yellowish brown, an indication that the plants were not receiving enough water.

He added that the yields were affected and many of the crops were hardly bearing fruits and that was now becoming a concern for his Namatanai electorate.

Chan said that plantations and small holder farmers were facing a financial crisis as their normal harvests had been affected and that was now becoming a concern for everyone as the drought continued into the fifth month.

"The climate change has really affected the province as rivers, plants, and food crops are becoming scarce.

"Five people have been reported dead as a result of dehydration and possibly hunger," he said.

Chan said the national disaster office was informed to check out with the claims but his report had never been addressed.

"My people are dying and the authorities should check on the reports immediately so that the people are assisted," he said.

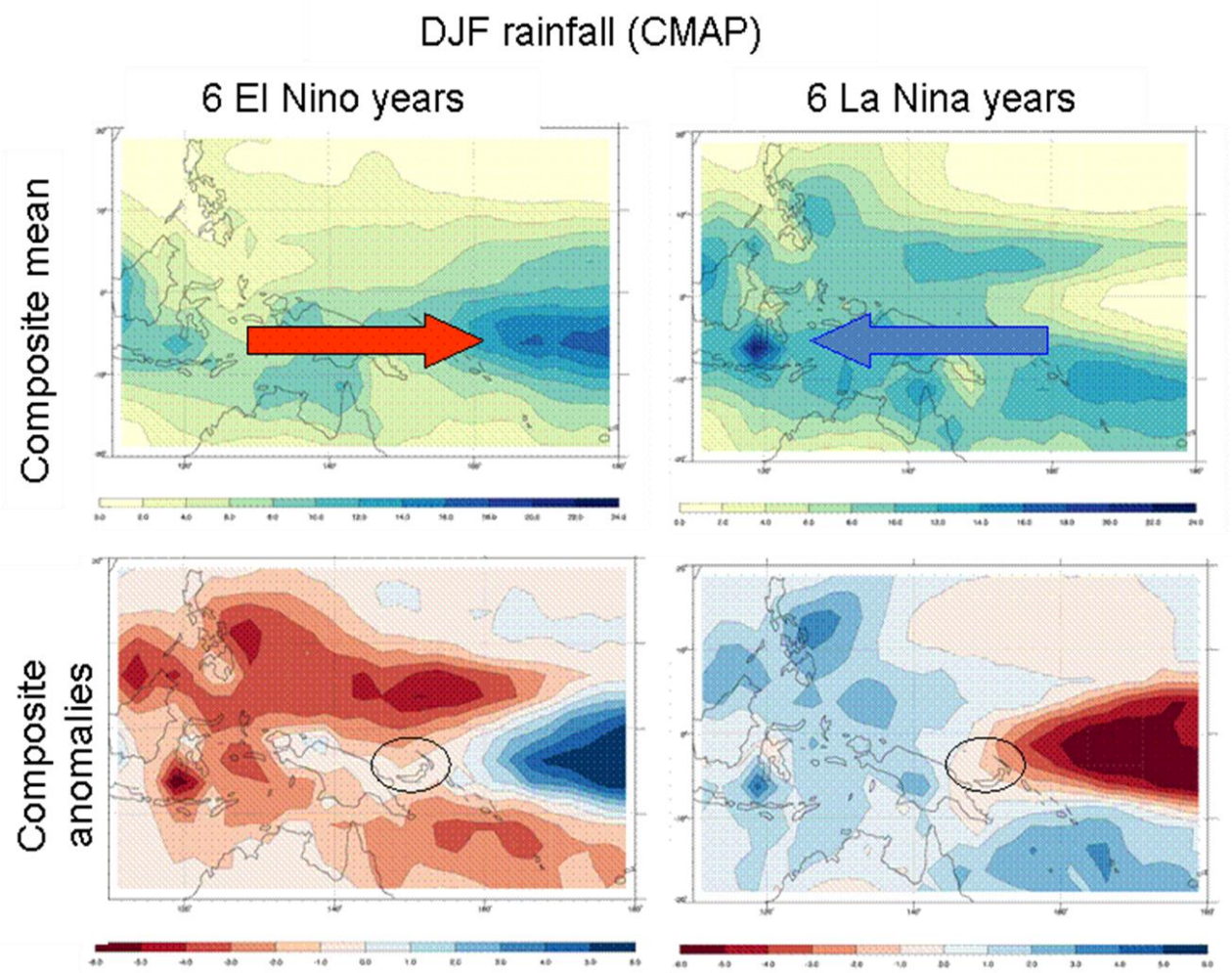
He said that the lack of action by the government authorities indicated that they had no concern for the very little people they were paid to serve without fear or favour.

The National visited and toured the province and witnessed creeks and streams drying up while the plants were fruitless.

Meanwhile, several community leaders within the West Coast Namatanai area have also confirmed the disaster, claiming that it was really threatening their livelihood.

El Niño – Southern Oscillation Impacts

- Examined rainfall in El Niño and La Niña years
- Noted the shift in rainfall in both cases – east in El Niño and west in La Niña
- Both result in reduced rainfall in New Ireland



El Niño – Southern Oscillation: Impacts of the 1997 El Niño

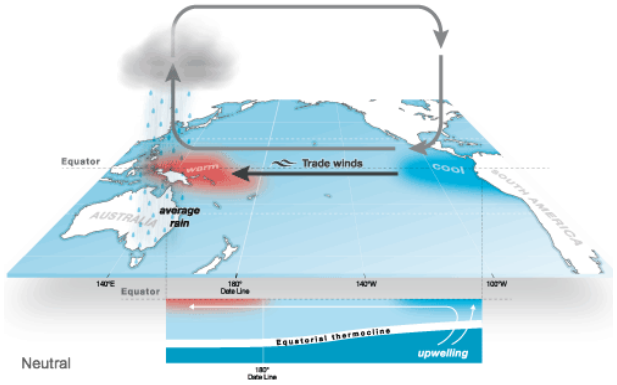
Drought
- Fiji, PNG, Solomon Is., Tonga, FSM, Palau, Guam, Marshalls

Wildfires -> air quality

Fisheries: overall decline in catch

Extreme tides
- Yap and Palau:
- saltwater intrusion damaging crops

Coral bleaching
- temperatures and low tides
- loss of reef fish



Water resources

Agriculture

Energy

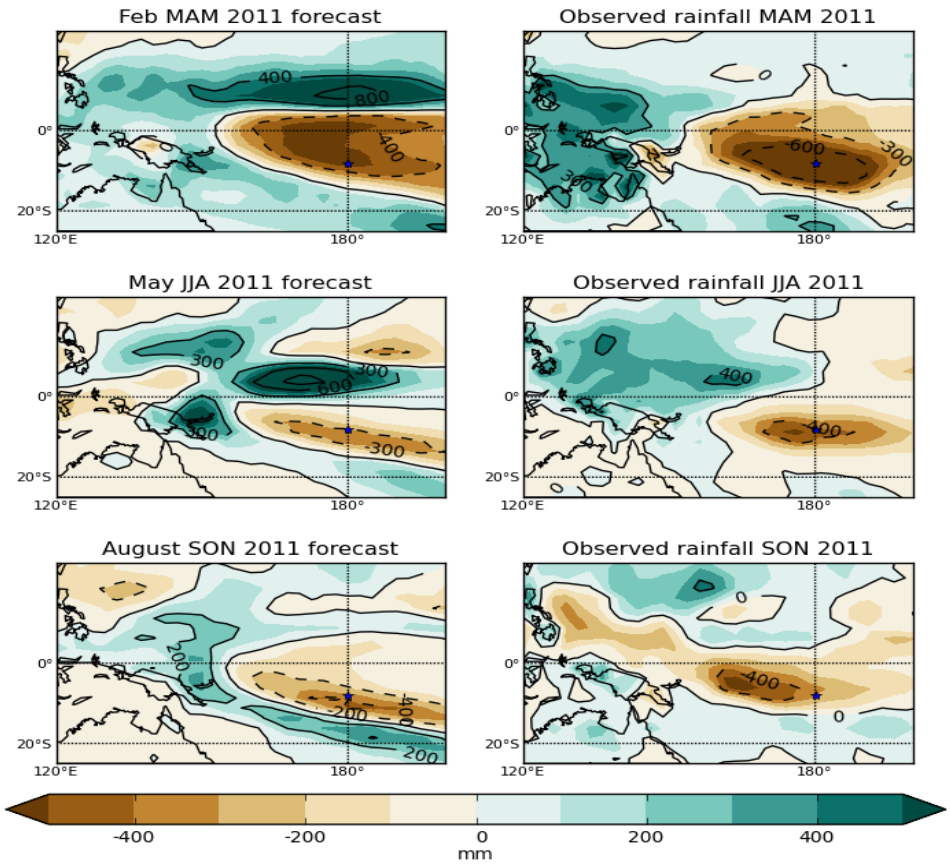
Forestry

Coastal infrastructure

Fisheries

Health

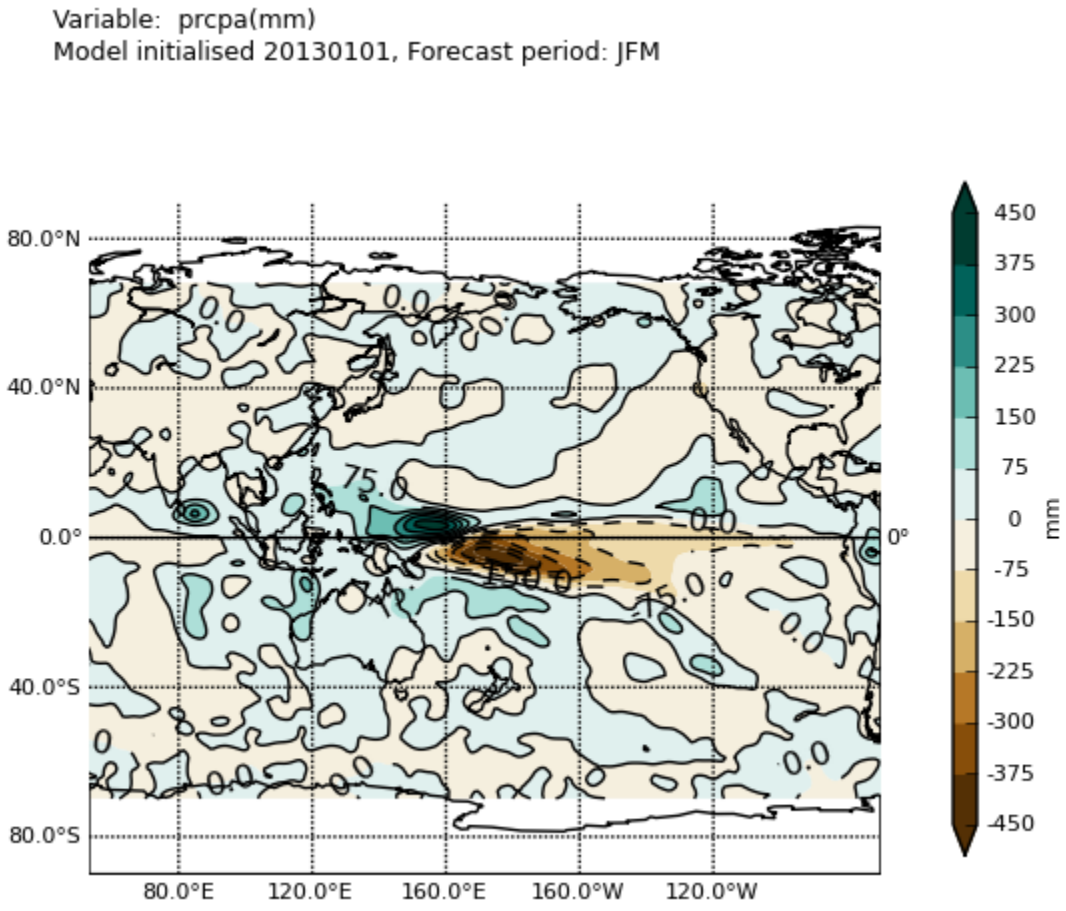
La Niña: Tuvalu Drought 2011



Model outlooks from POAMA 2.4: poama.bom.gov.au/experimental/pasap/
Observed rainfall from CAMS-OPI monitoring data:
http://www.cpc.ncep.noaa.gov/products/global_precip/html/wpage.cams_opi.html

- Dynamical prediction models provided valuable guidance of rainfall deficiencies throughout 2011.

Marshall Islands drought early 2013



Rainfall deficit in Marshall Islands, Tuvalu

375 mm below average rainfall

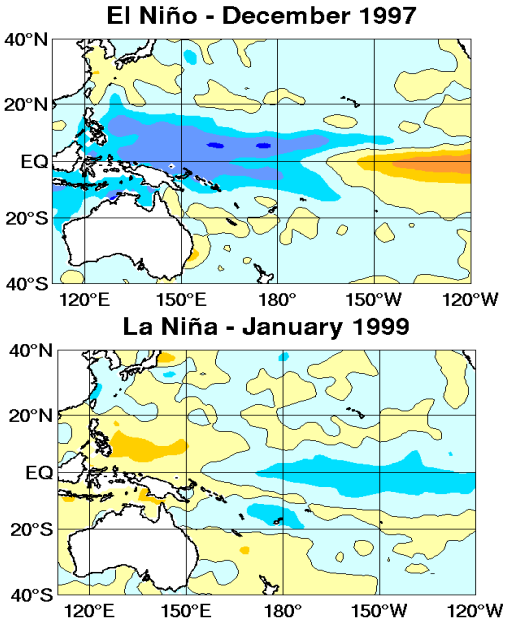
Governments declared state of emergency

Seasonal Climate Outlook - Accumulated rainfall over 3 month periods 2013-01-01

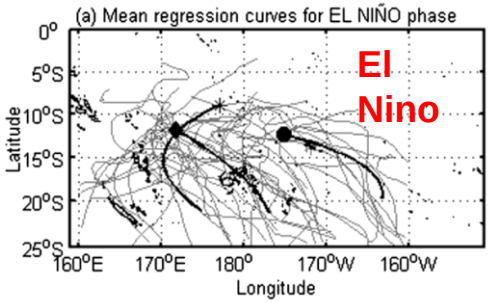
Forecasts from dynamical climate models: a low cost adaptation

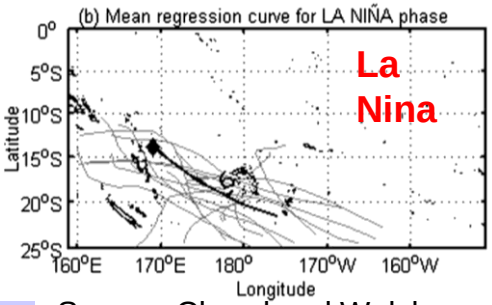
- Using forecasts promotes awareness of climate risk
- Early warnings targeted to the most dangerous aspects of climate change: extremes
- Prepare for the risk
- The best forecasts will change decisions

Contributions to Extreme Sea Levels

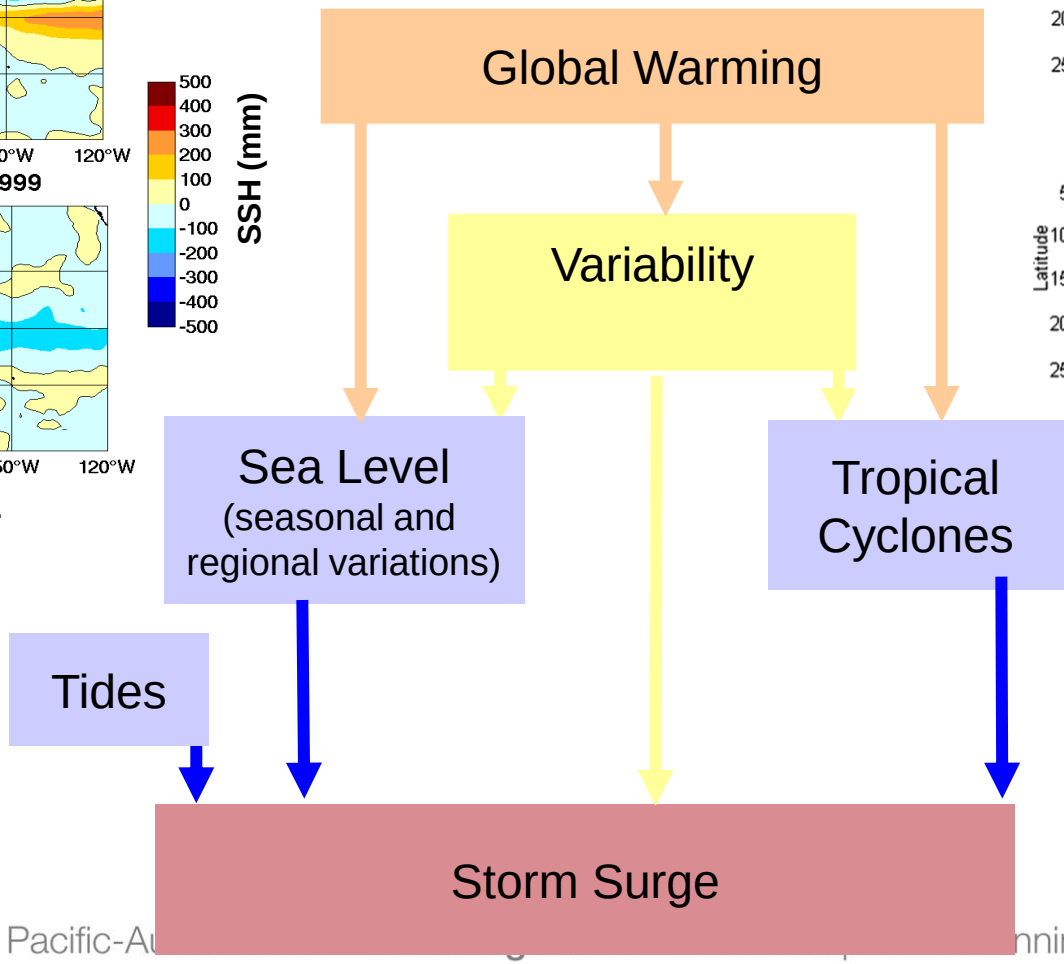


Courtesy: Neil White.

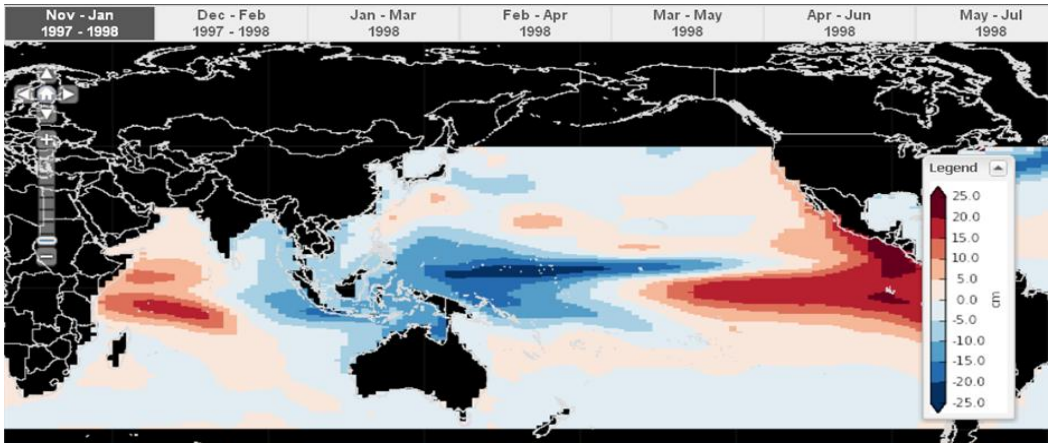




Source: Chand and Walsh (2009)



Prediction of Seasonal Sea Level Anomalies



- Applications: Preparation for potential flood inundation.
- Predictable because of the effect ENSO has on the temperature and salinity values in the ocean.
- The first product of its kind to use a dynamical model.

Seasonal Prediction of Tropical Cyclones

- Applications: Preparation for increased risk of TC impact; allocation of resources.
- Prediction mechanism: number and location of tropical cyclones strongly influenced by ENSO.

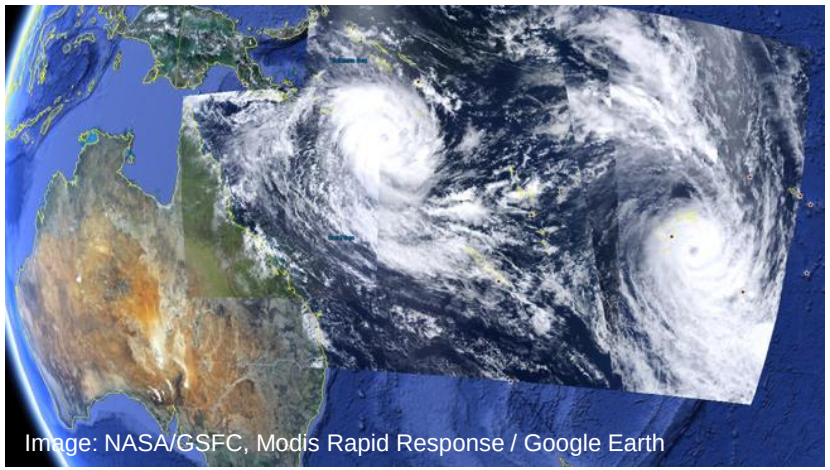
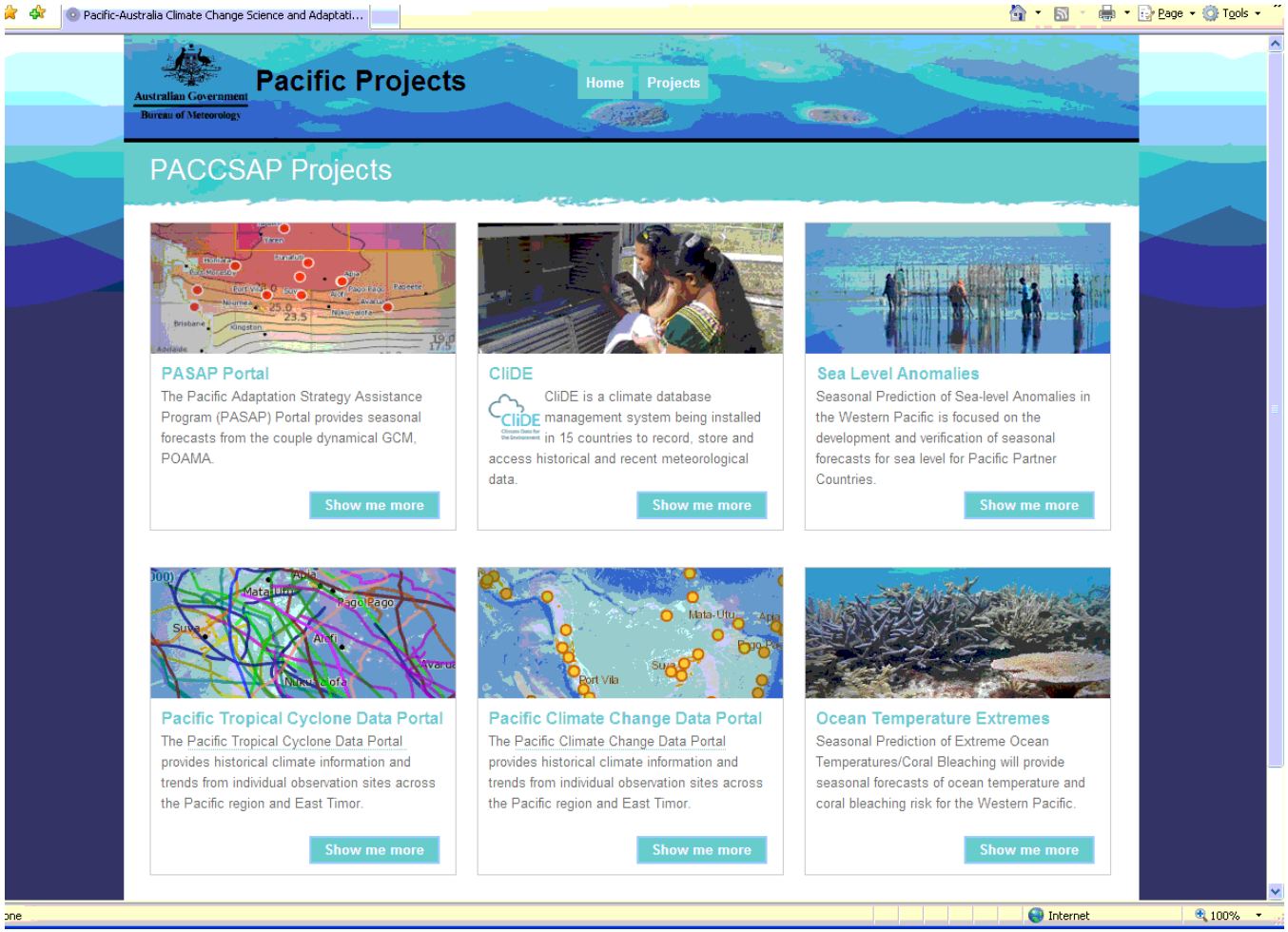


Image: NASA/GSFC, Modis Rapid Response / Google Earth

Seasonal activity forecasts can give information on likely risk, but it only takes one tropical cyclone to ruin your summer.

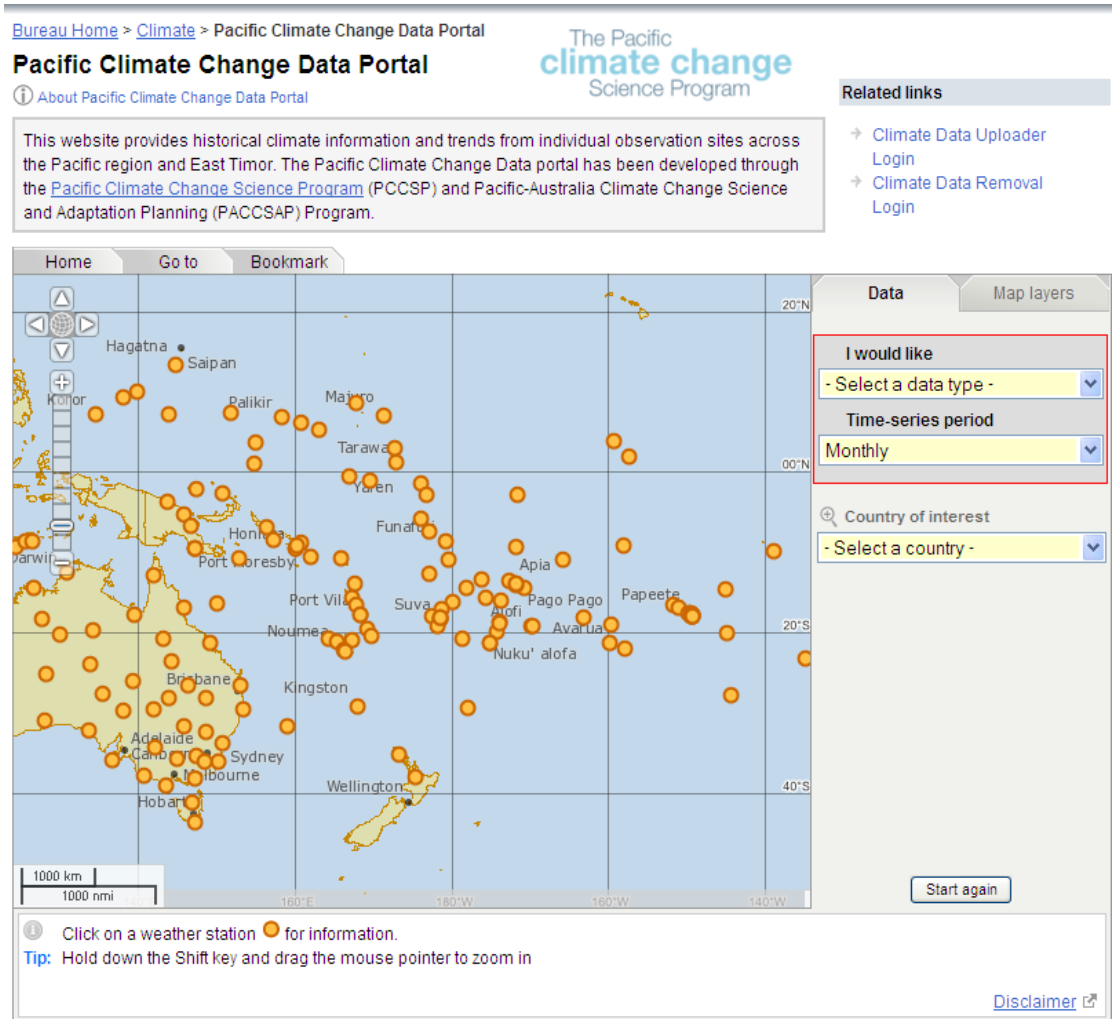
Climate data, seasonal prediction and tropical cyclones portals



- Climate Data Portals
- Seasonal prediction Portals
- Tropical cyclones

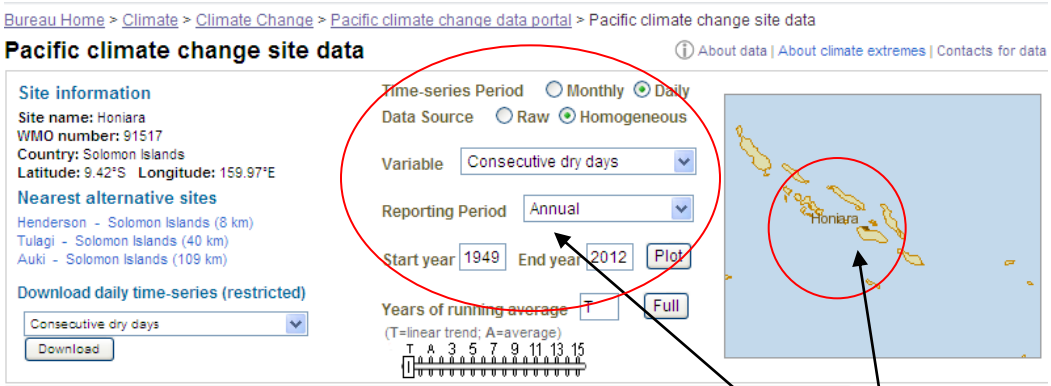
http://www.bom.gov.au/climate/pacific/projects.shtml

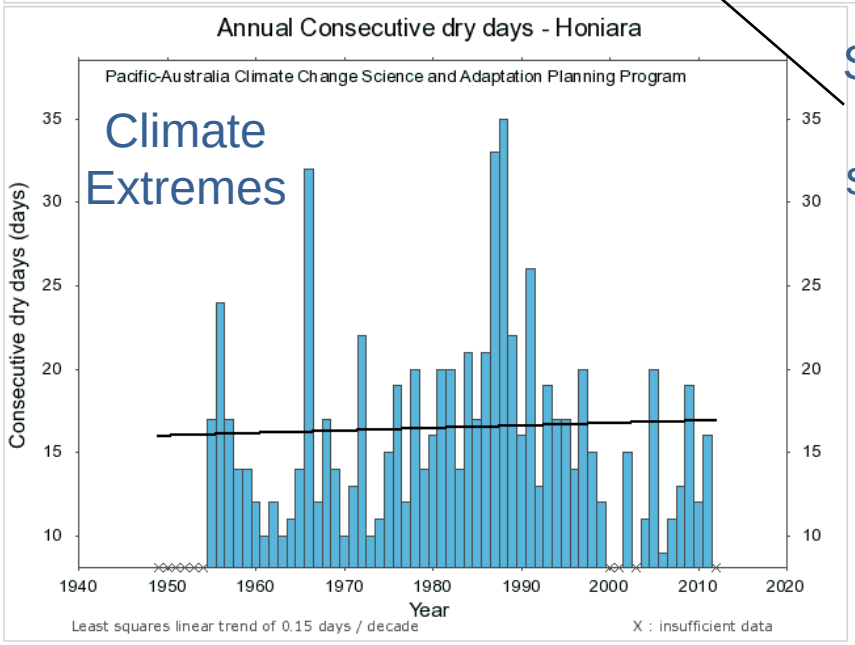
Pacific Climate Change Data Portal



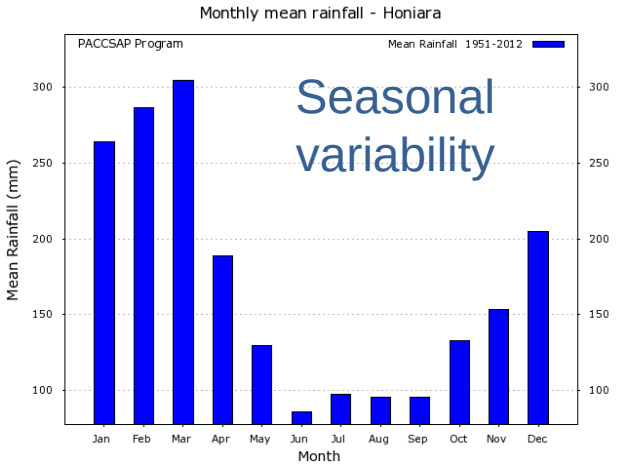
Currently, 92 station records for 23 countries and territories (excl. the Aust. and NZ mainland)

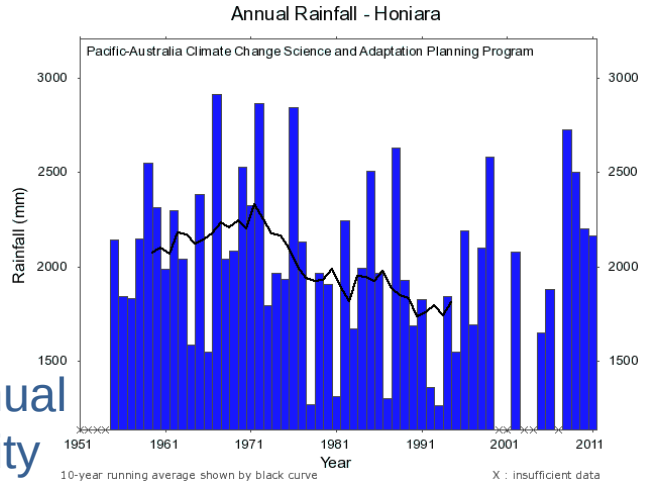
Pacific Climate Change Data Portal - Functionality





Station & data selection





Inter annual variability and trends

Pacific Climate Futures

Web-based tool to assist decision makers and planners in understanding how their climate has changed and how it may change in the future.

- Designed to provide information and guidance in the generation of
  - –national climate projections
  - – data for detailed impact and risk assessments.

Pacific Climate Futures

Uses a novel approach:

– Projections are classified using two climate variables and grouped into so called "climate futures" (e.g. "hotter, drier" or "slightly warmer, much wetter").

• Training given to participants from a number of government sectors (including NMS), NGOs and regional organisations, preceded by an introduction to climate change science

•420 people trained in 15 countries

•http://www.pacificclimatefutures.net

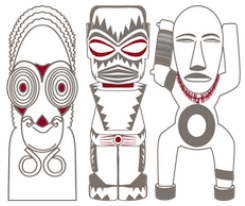
3 interfaces: Basic, Intermediate & Advanced

- Temperature and rainfall changes in a table
- Identify most likely scenario as well as lower likelihood and ‘best’/ or ’worst’ case scenarios

Climate future for 2030 using the A2 emission scenario

		Annual Surface Temperature (C)			
		Slightly Warmer < 0.50	Warmer 0.50 to 1.50	Hotter 1.50 to 3.00	Much Hotter > 3.00
Annual Rainfall (%)	Much Drier < -15.00				
	Drier -15.00 to -5.00		Likelihood: 4 of 18 models (22%)		
	Little Change -5.00 to 5.00	Likelihood: 1 of 18 models (5%)	Likelihood: 11 of 18 models (61%)		
	Wetter 5.00 to 15.00		Likelihood: 2 of 18 models (11%)		
	Much Wetter > 15.00				

PCRAFI – Risk modelling for now and the future



PCRAFI

Pacific Catastrophe Risk Assessment & Financing Initiative

OBJECTIVE:
Assess changes in tropical cyclone risk between current and future climate for building, infrastructure and agricultural assets across the Pacific region.

Geoscience Australia is evaluating changes in TC wind hazard and tracks between current and future climate

AIR Worldwide is using the changes to inform changes in impacts and integrating them to evaluate financial risks

Summary

- Enhanced understanding of extreme weather and climate events and underlying climate processes

  => Improved basis for seasonal prediction and of higher confidence in projections for long-term planning

- Publications, tools, workshops, mentoring, training

  => Capacity for NMS climate communication with stakeholders

- Seasonal prediction tools for: tropical cyclones, extreme ocean temperatures and sea levels

  => Improved planning and risk reduction strategies

- Data tools and portals, Climate Future tool for projections, application ready data sets

  => Long term hazard, vulnerability planning, risk assessments

Next steps

- PACCSAP is continuing to conduct science and develop tools
- Research is ongoing – science is developing rapidly
  - Input from Pacific countries into future research essential
  - Science evidence needs to be mainstreamed into decision making for sustainable development
- Collaboration sought on future research
- Outreach of science and tools needs to extend beyond NMS
  - NMS will remain central to future capacity building
  - Direct collaboration with other agencies sought

Thank you

For further information

Brad Murphy

Senior Research Scientist

Email: B.Murphy@bom.gov.au

Phone: +61 3 9669 4409

Geoff Gooley

PACCSAP Science Program Manager

Email: Geoff.Gooley@csiro.au

Phone: xxxxx

Australian AID

Australian Government
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Australian Government
Department of Climate Change and Energy Efficiency

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