The Island Climate Update

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An overview of the present climate in the tropical South Pacific, with an outlook for the coming months

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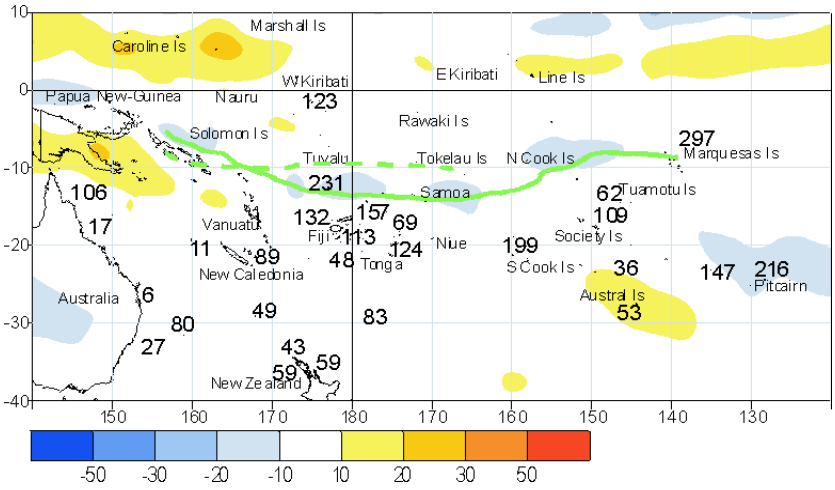
July's climate

- The South Pacific Convergence Zone (SPCZ) extended from the Solomon Islands to the Marquesas Islands; with high rainfall occurring in some of these areas
- High rainfall, exceeding 100 mm occurred in parts of Fiji on 23 July
- Suppressed convection occurred over Papua New Guinea and low rainfall occurred in parts of New Caledonia and Queensland, Australia
- Equatorial westerly wind bursts lasted until 20 July



Outgoing Long-wave Radiation (OLR) anomalies, in Wm^{-2} are represented by hatched areas, and rainfall percentage of average, shown by numbers. High radiation levels (yellow) are typically associated with clearer skies and lower rainfall, while cloudy conditions lower the OLR (blue) and typically mean higher rainfalls. The July 2004 position of the South Pacific Convergence Zone (SPCZ), as identified from total rainfall, is indicated by the solid green line. The average position of the SPCZ is identified by the dashed green line.

ENSO and Sea Surface Temperatures

- The tropical Pacific continues in a near neutral El Niño Southern Oscillation (ENSO) state with the July Southern Oscillation Index (SOI) being -0.7
- July sea surface temperatures (SST) were more than 1°C above normal near the Date Line

The next three months August to October 2004

- Enhanced convection is likely in the tropical Pacific, with above average rainfall forecast for Eastern and Western Kiribati
- Rainfall is expected to be near average or below average for Papua New Guinea, New Caledonia, Vanuatu and Fiji

SOPAC

nzaid

New Zealand Agency for International Development

Nga Hoe Tuputupu-mai-tawhiti

SPREP

NIWA

Taihoro Nukurangi

Climate developments in July 2004

The SPCZ (South Pacific Convergence Zone) extended from the Solomon Islands to the region north of Fiji, and across Samoa to the Northern Cook Islands and the Marquesas Islands, with average or above average rainfall (more than 200% of normal on Rotuma Island) over much of its extent. High rainfall, exceeding 100 mm, occurred in parts of Fiji on 23 July. Enhanced convection and about 200% of average rainfall occurred over Pitcairn Island. Rainfall was also above average in parts of Western Kiribati, Fiji, northern Vanuatu, southern Tonga, and the Southern Cook Islands.

CLIMATE EXTREMES IN JULY 2004

Country	Location	Rainfall (mm)	% of average	Comments
Cook Islands	Rarotonga Airport	207	199	Well above normal
Fiji	Rotuma	460	231	Well above normal
French Polynesia	Hiva Hoa, Autona	357	297	Extremely high
Pitcairn Island	Pitcairn Island	285	216	Well above normal
Australia	Townsville Airport	2	17	Extremely low
Australia	Brisbane Airport	4	6	Extremely low
New Caledonia	Koumac	6	11	Extremely low

Suppressed convection occurred over Papua New Guinea, and rainfall was below average in New Caledonia, the Austral Islands, and notably so in parts of Queensland, Australia.

Mean air temperatures were at least 1.0ºC above average in southern Tonga, and 0.5 to 0.9ºC above average in Tuvalu. Temperatures were about 0.5ºC below average in parts of Vanuatu, and 0.5 to 1.0ºC below average in the Austral Islands.

Periods of surface westerlies occurred in the western equatorial Pacific for four weeks until 20 July, after which easterlies resumed. Tropical Southwest Pacific mean sea level pressures remained above average over Australia, and continued below average east of the Date Line from the Equator to southern French Polynesia, including Fiji and Tonga.

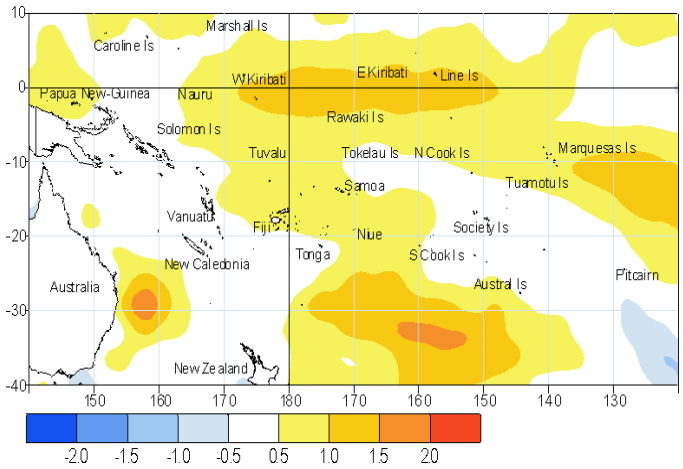
SOI negative for second month Equatorial Pacific about 1.0°C warmer than normal

The tropical Pacific remains near neutral, with mixed warming and cooling signals and a fluctuating SOI over the past few months. July equatorial SST anomalies were below average near the South American coast, but above normal in the remainder of the equatorial Pacific east of the Date Line, and more than 1.0°C above normal near the Date Line.

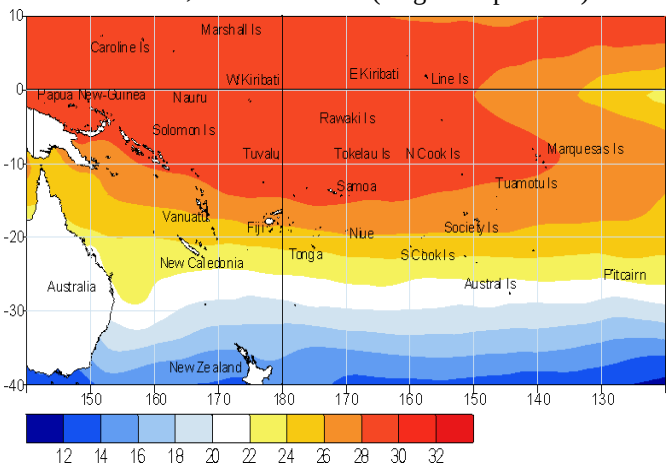
The NINO3 SST anomaly was +0.0°C for July (+0.1°C in June), and NINO4 was +1.0°C (+0.6°C in June). May to July SST means for NINO3 and 4 were about +0.1°C and +0.7°C, respectively. Subsurface temperatures show quite a strong positive anomaly (exceeding +3.0°C) at 150 m depth just east of the Date Line, which has developed following a strong westerly wind-burst at 160°E in June.

July averaged OLR anomalies show convection was below normal for the month around Indonesia and northern Australia, and along most of the Pacific Equatorial belt.

The majority of models indicate neutral conditions to the end of 2004, although NINO3 SST anomalies remain positive. Four of the available models indicate sufficient warming in the NINO3 region to qualify as El Niño conditions by early 2005. The chances of an ENSO event evolving this year have increased significantly, but neutral conditions on the warmer side are more likely to continue for the immediate three-months (August-September).



Sea surface temperature anomalies (°C) for July 2004



Mean sea surface temperatures (°C) for July 2004

Forecast validation

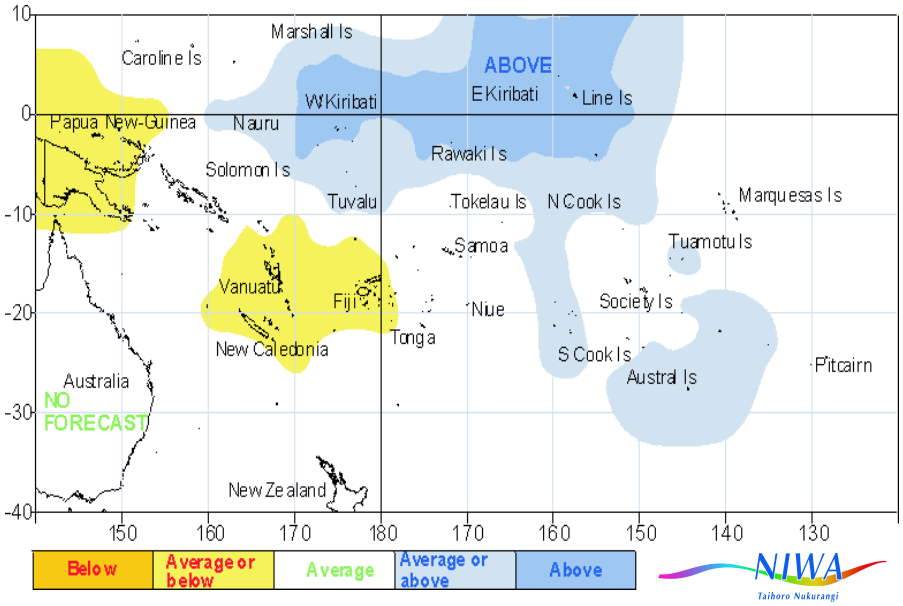
Forecast period:
May to July 2004

Enhanced convection was expected in the Southwest Pacific equatorial region resulting in above average rainfall in the Solomon Islands and average or above average rainfall in Western and Eastern Kiribati, Samoa, and the Northern Cook Islands, as well as central and southern French Polynesia. Suppressed convection and a tendency towards below average rainfall was expected over the Marquesas Islands, Tuvalu and Tokelau, with near average rainfall elsewhere in the region.

A region of enhanced convection and above average rainfall affected the Solomon Islands and extended southeast to Samoa, including Fiji and Tonga, with another region of above average rainfall over the Marquesas Islands and Pitcairn Island. Rainfall was higher than forecast in Fiji, Tonga, the Marquesas Islands, and Pitcairn Island, and lower than expected in the Tuamotu Islands. The overall 'hit' rate for the May to July 2004 rainfall outlook was about 65%, the highest in the last six months.

Rainfall outlook: August to October 2004

- **Above average rainfall likely in Eastern and Western Kiribati**
- **Suppressed convection in Papua New Guinea and the Coral Sea is expected**



Rainfall outlook map for August to October 2004

The continuing lack of coherence between the atmosphere and the ocean in the equatorial Pacific Ocean means that the mix of global model seasonal rainfall forecast guidance is still inconsistent. Therefore, local climate effects are important for the upcoming three months.

Enhanced convection in the equatorial Pacific Ocean is likely to result in above average rainfall in Eastern and Western Kiribati, trending south-south east to include Tuvalu, the Cook Islands and the Austral and Tuamotu Islands of French Polynesia.

Average or below average rainfall is forecast for Papua New Guinea, New Caledonia, Vanuatu and Fiji. Rainfall is expected to be near average elsewhere in the region. The forecast model skill ranges from low to moderate at this time of year.

Probabilities of rainfall departures from average

Broad-scale rainfall patterns and anomalies in the southern tropical Pacific area are estimated from the state of large-scale regional climate factors, such as La Niña or El Niño, their effect on the South Pacific and Tropical Convergence Zones, surface and sub-surface sea temperatures, and computer models of the global climate.

Rainfall estimates for the next three months for Pacific Islands are given in the adjacent table. The tercile probabilities (e.g. 20:30:50) are derived from the interpretation of several global climate models. They correspond to the odds of the observed rainfall being in the lowest (driest) one third of the rainfall distribution, the middle one third, or the highest (wettest) one third of the distribution. On the long-term average, rainfall is equally likely (33% chance) in any tercile.

The probabilities shown express the expected shift in the distribution from the long-term average, based on predictions of oceanic and atmospheric conditions. The amount of inter-model forecast consistency is indicated by the levels of confidence expressed in the table.

TROPICAL PACIFIC RAINFALL OUTLOOK (AUGUST - OCTOBER 2004)

Island Group	Rainfall Outlook	Confidence in the Outlook
Western Kiribati	20:30:50 (Above)	Moderate
Eastern Kiribati	20:30:50 (Above)	Moderate
Tuvalu	20:40:40 (Average or above)	Moderate
Northern Cook Islands	20:40:40 (Average or above)	Low - Moderate
Southern Cook Islands	15:45:40 (Average or above)	Low - Moderate
Austral Islands	20:40:40 (Average or above)	Moderate
Tuamotu Islands	20:35:45 (Average or above)	Low
Solomon Islands	20:50:30 (Near average)	Low - Moderate
Wallis and Futuna	25:45:30 (Near average)	Moderate
Tokelau	20:45:35 (Near average)	Moderate
Samoa	20:50:30 (Near average)	Low - Moderate
Tonga	30:50:20 (Near average)	Low - Moderate
Niue	25:50:25 (Near average)	Low - Moderate
Society Islands	30:50:20 (Near average)	Moderate
Marquesas Islands	30:40:30 (Near average)	Low
Pitcairn Island	30:50:20 (Near average)	Moderate
Papua New Guinea	40:35:25 (Average or below)	Moderate
Vanuatu	40:40:20 (Average or below)	Low - Moderate
New Caledonia	35:40:25 (Average or below)	Low - Moderate
Fiji	35:40:25 (Average or below)	Low - Moderate

The South Pacific Sea Level and Climate Monitoring Project

Australian Marine Science and Technology, National Tidal Facility and Australian Bureau of Meteorology

More than a decade has passed since the South Pacific Sea Level and Climate Monitoring Project began measuring sea level and associated meteorological variables in the region. The Australian-funded project was implemented in 1990 to address concerns raised by Pacific Island Countries about the potential implications of sea level and climate changes resulting from global warming (from enhanced greenhouse gases).

As a result, there is now a network of 12 SEAFRAME (**Sea** Level **F**ine **R**esolution **A**coustic **M**easuring **E**quipment) gauges linked to 10 Continual Global Positioning Systems (CGPS) providing sea level, meteorological and terrestrial reference data throughout the South Pacific region (Refer to Figure 1). The array has been widely acknowledged as one of the most accurate and reliable sources available for information on sea level and climate change.

Tidal and sea level information produced by the project are already being used to assist the region's planning and management in the fisheries, water-resources, communication, transport, environment and coastal-development sectors, as well as in navigation and the forecasting of extreme weather conditions.

Shorter-term variations in sea level are a useful indicator. It is important to note, however, that the fluctuations must be interpreted with caution (Refere to Figure 2). Observed variations in sea level include natural variability, such as effects of atmospheric, oceanographic (for example El Niño) and geological processes. As the sea level record becomes longer, longer-term trend estimates for sea levels at each gauge will become possible. At least 20 years of data will be required for the project to begin to observe any global warming signal (accelerated sea level rise) from background variability. In fact, the Intergovernmental Panel on Climate Change (IPCC) uses as a benchmark a record of at least 50 years to establish long-term trends in sea level.

The long-term results of the project will give the region and their governments a greater understanding of the potential scale and implications of changing sea levels, climate change and variability induced by global warming.

For Further Information contact: Communications Officer, AMSAT, P O Box 17955, Suva, Fiji. Phone or Fax: +6793304003 or Email: amsatlh@connect.com.fj

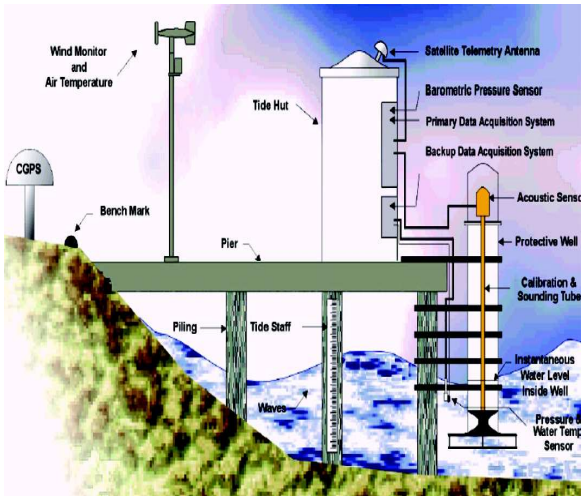
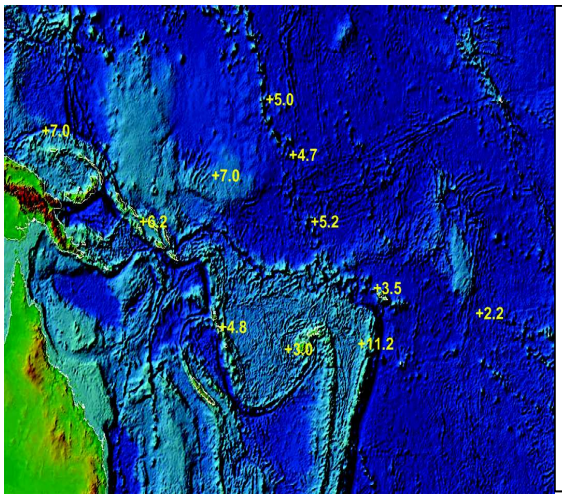


Figure 1. Seaframe monitoring station



Country	Trend (mm/yr)
Marshall Is.	+5.0
Kiribati	+4.7
Nauru	+7.0
Tuvalu	+5.2
Samoa	+3.5
Cook Is.	+2.2
Tonga	+11.2
Fiji	+3.0
Vanuatu	+4.8
Solomon Is.	+6.2
FSM	+7.0

Figure 2: The net relative sea level trend in mm/year after subtracting the effects of the vertical movement of the platform and the inverse barometric pressure effect utilising all the data collected since the start of the project up to the end of April 2004.

The Island Climate Update

Visit The Island Climate Update website at: www.niwa.co.nz/NCC/ICU/.
Your comments and ideas about The Island Climate Update are welcome. Please contact:

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Sources of South Pacific rainfall data

This bulletin is a multi-national project, with important collaboration from the following Meteorological Services:

American Samoa Australia Cook Islands Fiji French Polynesia Kiribati New Caledonia New Zealand Niue Papua New Guinea Pitcairn Island Samoa Solomon Islands Tokelau Tonga Tuvalu Vanuatu

Requests for Pacific island climate data should be directed to the Meteorological Services concerned.

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