The Island Climate Update

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7 July 2004

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

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European Centre for Medium Range Weather Forecasts; ECMWF

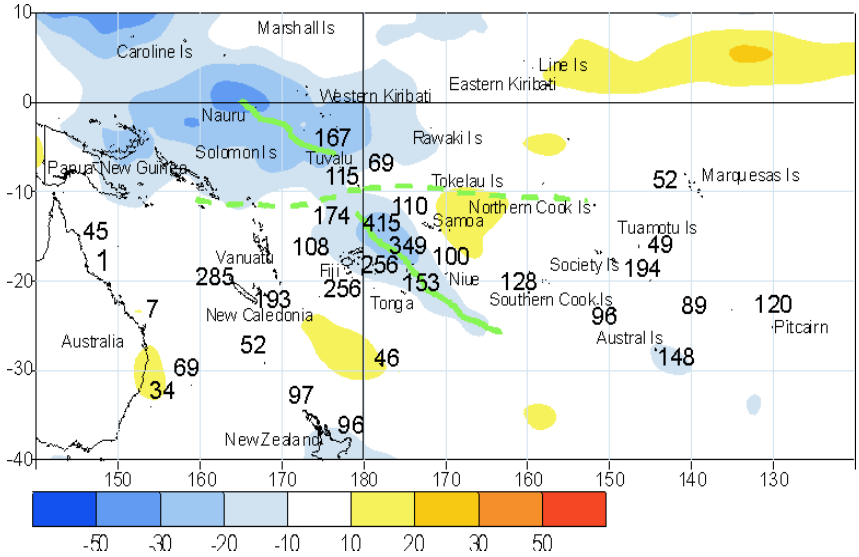
UK Met Office

World Meteorological Organisation, WMO

Produced by the National Institute of Water and Atmospheric Research, New Zealand

June's climate

- Active convergence about and west of the Date Line
- High rainfall in parts of New Caledonia, Fiji, Tonga and central French Polynesia
- Equatorial westerly wind burst during the last few weeks of June



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 June 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 June Southern Oscillation Index (SOI) was -1.7 but the tropical Pacific continues in a neutral El Niño Southern Oscillation (ENSO) state
- June sea surface temperatures (SST) were about 0.5°C above normal in the equatorial Pacific around Western and Eastern Kiribati

The next three months July to September 2004

- Above average rainfall is forecast for the Austral Islands
- Near average or below average rainfall is expected over Vanuatu, New Caledonia, and Fiji

SOPAC

nzaid

New Zealand Agency for International Development

Nga Hoe Tuputupu-mai-tawhiti

SPREP

NIWA

Taihoro Nukurangi

Climate developments in June 2004

Enhanced convection and above average rainfall occurred over much of the tropical Western Pacific extending southeast towards the Date Line, affecting eastern parts of Papua New Guinea, the Solomon Islands, the Caroline Islands, Nauru, Western Kiribati, Tuvalu, and areas in Fiji. This was in contrast to suppressed convection about and west of the Date Line in the Southwest Pacific during May. The South Pacific Convergence Zone (SPCZ) extended from Nauru southeast to the region south of Niue, being further north than average west of the Date Line and further south than average east of the Date Line. Rainfall was at least 125% of normal over much of these regions, and 200% or more of normal in southeastern areas of Fiji's main island. Rainfall was also about 200% or more of normal in parts of New Caledonia, Tonga, and the Society Islands of French Polynesia, and at least 125% of normal in the Southern Cook Islands. Rainfall was below average along the east coast of Australia, and in the Tuamotu and Marquesas Islands of French Polynesia.

Mean air temperatures were at least 1.0°C above average in Fiji, Samoa and southern Tonga, and about 0.5°C above average in the Southern Cook Islands.

During June, stronger than normal southeast tradewinds were recorded in New Caledonia and Fiji.

Periods of surface westerlies occurred in the western equatorial Pacific from 19 June onwards (into the first week of July). Tropical Southwest Pacific mean sea-level pressures were above average over Australia and the region north of New Zealand, but below average east of the Date Line from the Equator to southern French Polynesia.

CLIMATE EXTREMES IN JUNE 2004

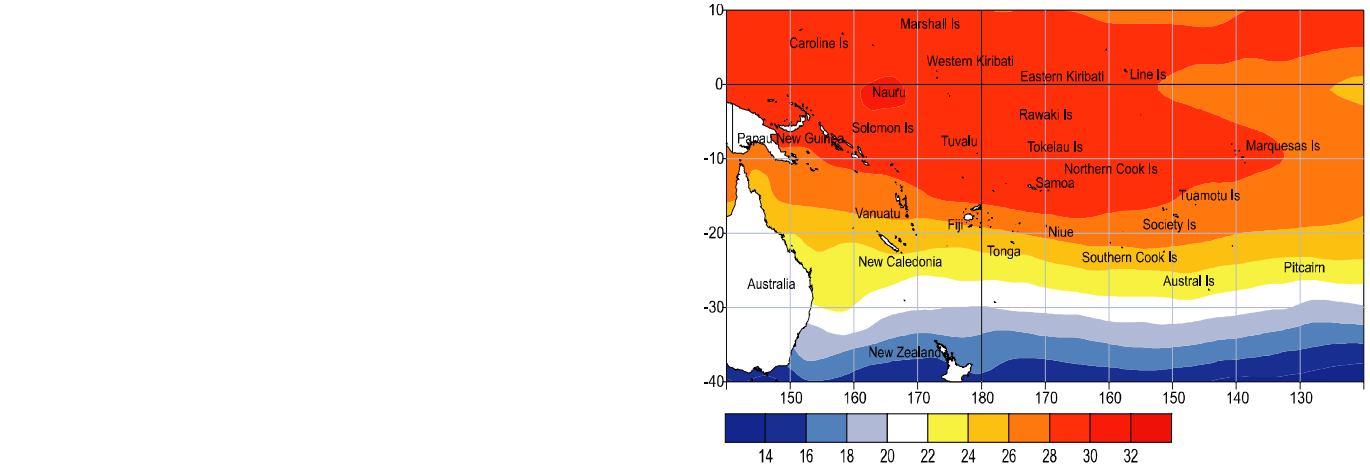
Country	Location	Rainfall (mm)	% of average	Comments
New Caledonia	Koumac	199	285	Well above normal
New Caledonia	La Tontouta	202	225	Well above normal
New Caledonia	Noumea	200	193	Well above normal
Fiji	Viwa	205	307	Record high
Fiji	Monasavu	640	268	Record high
Fiji	Navua	587	301	Record high
Tonga	Lupepau'u	440	349	Record high
Tonga	Salote Pilolevu Airport	197	246	Well above normal
Tonga	Fua'amotu Airport	211	209	Extremely high
French Polynesia	Tahiti-Faaa	118	194	Well above normal
Australia	Townsville	<1	1	Extremely low

SOI strongly negative
SST anomalies below average near the South American coast

The tropical Pacific remains in a near neutral state with mixed warming and cooling signals and a fluctuating SOI over the past few months. June SST's were about 0.5°C above normal in the equatorial Pacific around Western and Eastern Kiribati.

The three month SOI (April-June) continues in the neutral range, at -0.7. For June, the NINO3 SST anomaly was about +0.4°C, and NINO4 was about +0.7°C. Three-month means for NINO3 and NINO4 were about +0.2°C and +0.5°C, respectively. Subsurface temperatures show a small positive anomaly remaining in the top 100 m near the Date Line, and a newly developed (but still weak) negative anomaly near 130°W.

June averaged OLR anomalies show an extensive region of enhanced convection west of the Date Line. Most models indicate neutral conditions continuing through the end of 2004, but with weakly positive SST anomalies forecast in the Nino3.4 region. The recent incoherence in oceanic and atmospheric signals in the tropical Pacific mean that there is a continuing need to monitor the ENSO situation closely.



Sea surface temperature anomalies (°C) for June 2004

Mean sea surface temperatures (°C) for June 2004

Forecast validation

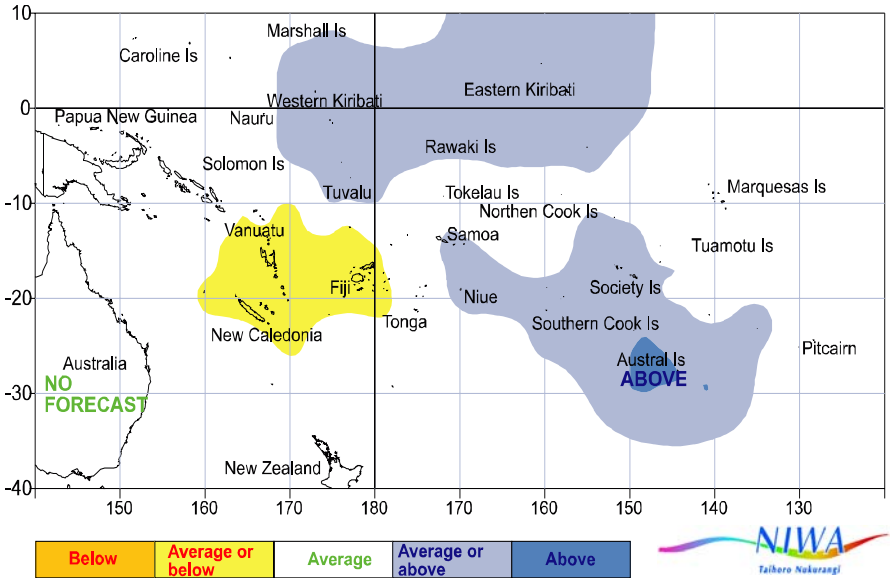
Forecast period:
April to
June 2004

Rainfall was expected to be above average in the Solomon Islands. Regions of enhanced convection and average or above average rainfall were also expected in Papua New Guinea and Western Kiribati, and over Tonga and Niue. Average or below average rainfall was expected over Eastern Kiribati and the Tuamotu and Society Islands, with suppressed convection over the Marquesas Islands. Near average rainfall was predicted elsewhere in the region.

A large region of enhanced convection occurred in the western equatorial region as expected. However, rainfall was above average in the Marquesas Islands, and from central French Polynesia east to Pitcairn Island, being higher than forecast. Rainfall was as forecast in most other regions. The overall 'hit' rate for the April to June 2004 rainfall outlook was about 60%, the highest for several months.

Rainfall outlook: July to September 2004

- Above average rainfall over the Austral Islands
- Suppressed convection over Vanuatu, New Caledonia and Fiji



Rainfall outlook map for July to September 2004

Variability in the ENSO system, and the present lack of coherent large-scale forcing of the tropical Pacific climate system mean that global model seasonal rainfall guidance is quite inconsistent for most Pacific Island countries. Hence, it is likely that rainfall patterns will be dominated by local effects and by episodic events for the upcoming three months.

Enhanced convection is expected over the Austral Islands of French Polynesia where rainfall is forecast to be above average. Rainfall is also expected to be average or above average in a region extending south southeast from Western and Eastern Kiribati to the Society Islands, including Tuvalu, Samoa, Niue and the Southern Cook Islands.

A region of suppressed convection is forecast just west of the Date Line, where rainfall is expected to be near average or below average over Vanuatu, New Caledonia and Fiji. Rainfall is expected to be near average elsewhere in the region. The consensus for model forecast skill is low to moderate for 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 (JULY – SEPTEMBER 2004)

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

ARGO in the South Pacific

Dr Philip Sutton, NIWA*

The ocean has a remarkable capacity to transport and store heat. With 2.5m depth of water having the same heat capacity as the entire depth of the atmosphere, even small changes in ocean temperature can have large impacts on climate. Observations of the distributions of heat and freshwater (through measuring changes in salinity) are essential for understanding the oceans' role in climate and for forecasting climate and ocean conditions. A continual problem with understanding the role of the ocean in climate, and including the ocean state in climate predictions, is lack of ocean data. The ocean covers 75% of the surface of the earth and much of the ocean is inaccessible, making observations difficult and expensive.

Argo is an international observing project designed to address the lack of ocean data. Argo uses a global broad-scale array of profiling floats to measure the upper ocean. The eventual aim is have an array of 3000 floats: to date 1270 floats have been deployed by 17 countries (See Figure 1). Each float provides real-time measurements of the temperature and salinity of the upper ocean that will help forecast climate change and events like El Niño and improve the prediction of tropical cyclones. The data are freely available to anyone interested over the internet. The floats are somewhat ironically named because the first thing they do is sink! Each float sinks to a pre-determined depth of between 1000 and 2000 metres, where it is carried by the currents for nine days. It then sinks to 2000 metres before rising to the surface, measuring the temperature and salinity of the water as it ascends. Once on the surface, it transmits the profile data and its position via satellite before sinking and beginning the next cycle (See Figure 2). The floats have a design life of five years, over which time they should collect about 180 profiles of the upper ocean as well as provide information about the deep flow fields through their drift. Each float costs about $NZ 20,000.

So far, the South Pacific is relatively poorly populated with floats. The situation was vastly improved by a voyage by NIWA's research vessel R/V Kaharoa in March/April 2004 which deployed 61 floats between New Zealand and Chile. These floats were deployed as part of a collaboration between the University of Washington, Scripps Institution of Oceanography (San Diego) and NIWA. Kaharoa is about to embark on a second collaborative voyage, this time from New Zealand, north through the Tasman Sea, then across to Tahiti for a port call. From Tahiti, Kaharoa will sail most of the way to Peru before returning to Tahiti and then finally, back to Wellington. Along the way 80 floats will be deployed, largely filling the gap in the tropical South Pacific.

Web reference: http://www.argo.ucsd.edu/index.html

*Dr Philip Sutton is a Marine Physics Reasearch Scientist at NIWA

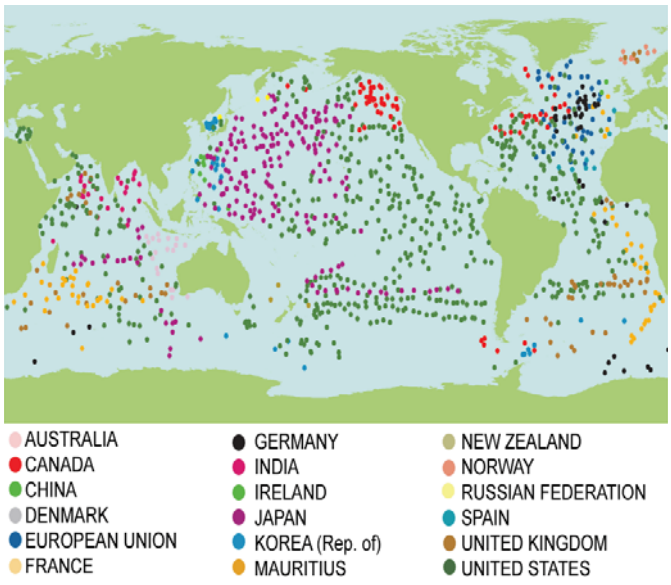


Figure 1 Global status of Argo as of 6/7/2004. 1270 Floats.

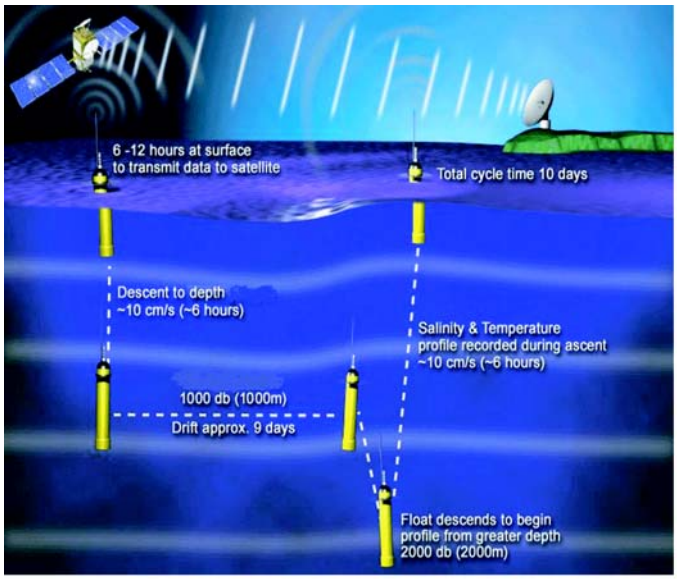


Figure 2 Diagram of a float cycle

The Island Climate Update

Visit The Island Climate Update website at: www.niwa.co.nz/NCC/ICU/.
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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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