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NIWA

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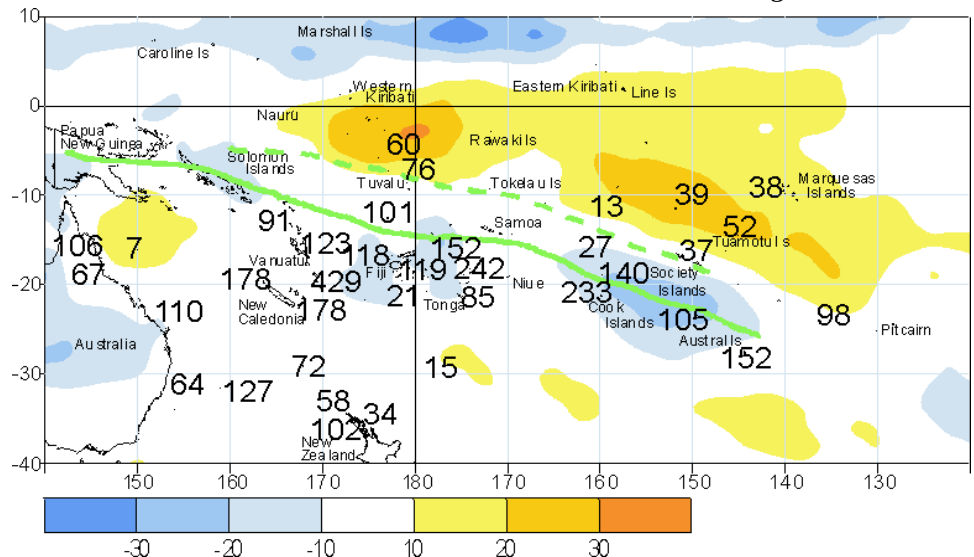
# The Island Climate Update



An overview of the present climate in the tropical South Pacific, with an outlook for the coming months, to assist in dissemination of climate information in the Pacific region

### December's climate

Enhanced convection was associated with the monsoon over Indonesia, northern Australia, and Papua New Guinea, which merged with the Inter-tropical convergence zone (ITCZ) north of the equator and the South Pacific Convergence Zone (SPCZ) to the southeast. The SPCZ was displaced much further south of its mean location, extending from Papua New Guinea southeast to the Austral Islands of French Polynesia and was more active than in recent months. It was rather unsettled in parts of New Caledonia, the southeast of Fiji, Wallis and Futuna Islands, American Samoa and the Austral Islands. Suppressed convection and below average rainfall persisted in Western and Eastern Kiribati, and parts of northern French Polynesia. Air temperatures were above average on most islands between 10°N and 15°S, as well as parts of Vanuatu and Tonga. 'Heta', the first tropical cyclone of the season, affected Samoa, and devastated Niue. **More on Page 2**



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 December 2003 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 Equatorial Pacific continues in a neutral state. Equatorial sea surface temperatures (SST) have eased recently, but are still higher than normal. The mean Southern Oscillation Index (SOI) for December was +0.9. Almost all of the global climate models indicate neutral conditions in the equatorial Pacific for the first quarter of the new year. **Details Page 2**

### The next three months January to March 2004

Average or above average rainfall from the Solomon Islands trending east to the Austral Islands, including Samoa, the Northern Cook Islands and the Society and Austral Islands. Below average rainfall is expected for the Marquesas Islands. Near average rainfall is likely elsewhere in the region.

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New Zealand Agency for International Development  
Nga Hoe Tuputupu-mai-tawhiti





## Climate developments in December 2003

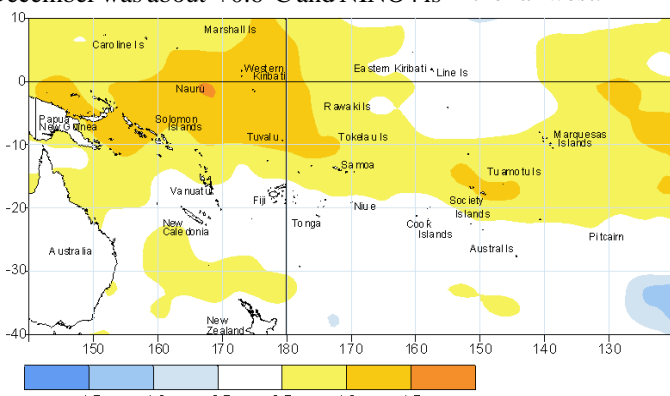
**Active SPCZ further south than usual**

**Below average rainfall persists over much of the equatorial Southwest Pacific**

A large region of enhanced convection was associated with the monsoon over Indonesia, northern Australia, and Papua New Guinea. This extended east to merge with the ITCZ north of the equator and the SPCZ to the southeast. The SPCZ was displaced much further south of its mean location, extending from Papua New Guinea southeast to the Austral Islands of French Polynesia, including the Solomon Islands, Wallis and Futuna, Samoa and the southern Cook Islands. It was more active than in recent months. Most locations in the SPCZ affected region recorded above average rainfall ranging from 200 to 450 mm.

**Pacific in a neutral ENSO state  
Westerly surface wind anomalies**

The Equatorial Pacific continues in a neutral state. Positive equatorial SSTs have eased recently, but are still higher than normal, especially in the west. The mean SOI for December was +0.9, and 0.0 for October-December. The NINO3 SST anomaly for December was about +0.6°C and NINO4 is



Sea surface temperature anomalies (°C) for December 2003



## Forecast validation

**Forecast period:  
October to  
December 2003**

CLIMATE EXTREMES IN DECEMBER 2003				
Country	Location	Rainfall (mm)	% of average	Comments
Vanuatu	Aneityum	726	429	Extremely high
New Caledonia	La Tontouta	252	311	Well above average
Fiji	Ba/Rarawai Mill	424	188	Well above average
Tonga	Lupepau'u	591	242	Highest
Cook Islands	Rarotonga Airport	438	233	Well above average
Cook Islands	Penrhyn	41	13	Well below average
Country	Location	Mean Air Temp (°C)	Dep. from Av	Comments
Western Kiribati	Tarawa	29.3	+1.1	Record high
Eastern Kiribati	Kanton Island	29.5	+1.1	Extremely high
Tuvalu	Nanumea	30.0	+1.7	Record high
French Polynesia	Bora Bora	28.7	+1.5	Record high
French Polynesia	Tahiti-Faaa	27.8	+1.2	Record high
French Polynesia	Hereheretue	27.2	+1.1	Record high
Country	Location	Max Air Temp (°C)	Date	Comments
New Caledonia	La Tontouta	36.8	23 <sup>rd</sup>	Extremely high
Country	Location	Min Air Temp (°C)	Date	Comments
Fiji	Tokotoko, Navua	26.0	27 <sup>th</sup>	Record high

It was very unsettled during December with at least 25 days with rainfall in parts of New Caledonia, the southeast of Fiji, Wallis and Futuna Islands, American Samoa, and the Austral Islands.

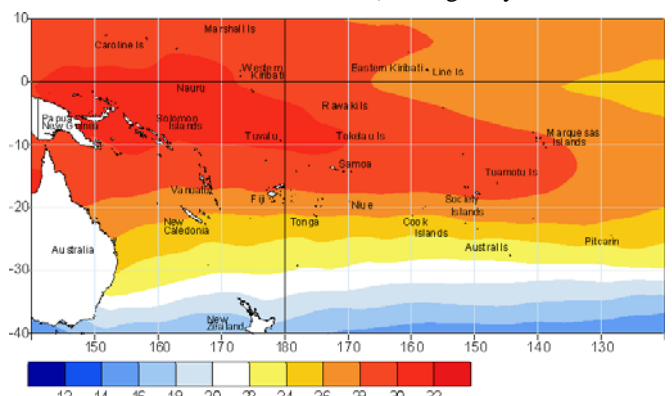
A large region of suppressed convection and below average rainfall (75% of less of normal) continued to encompass Western and Eastern Kiribati, and parts of northern French Polynesia.

around +0.9°C (3-month means are +0.7°C and +1.0°C, respectively). The trade winds have been near-normal or somewhat stronger than normal in the eastern Equatorial Pacific during December, but a westerly wind burst occurred in the west in early January. Subsurface ocean temperature anomalies show a positive anomaly above 100 m depth in the east, and a weak negative anomaly in the far west.

December was the 10<sup>th</sup> consecutive month with below average rainfall in parts of Eastern Kiribati.

Air temperatures were 0.5 to 0.9°C above average on most islands between 10°N and 15°S, and at least 1.0°C above average in parts of Vanuatu, Western and Eastern Kiribati, Tuvalu, Tonga, and the Marquesas and Society Islands. Elsewhere, temperatures were near average.

OLR anomalies show a region of suppressed equatorial convection from the Date Line eastwards. Enhanced convection and westerly surface wind anomalies are evident over Indonesia and northern Australia, associated with a Madden-Julian Oscillation (MJO) event that developed in early December. Almost all global climate models indicate neutral conditions (with positive SST anomalies) during early 2004.



Mean sea surface temperatures (°C) for December 2003

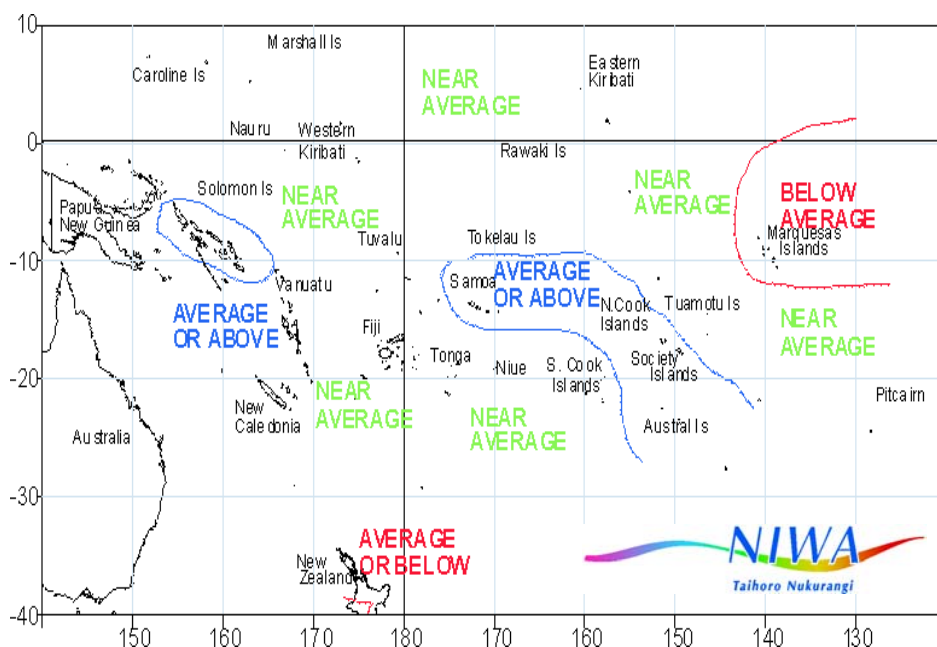
Average or above average rainfall was expected in Samoa. A large area of suppressed convection in the equatorial region was expected to extend south, to affect areas west of the Date Line, with below average rainfall in Western and Eastern Kiribati, and average or below average rainfall in New Caledonia, and Vanuatu, as well as the Marquesas Islands. Average rainfall was expected elsewhere in the region. Rainfall was above average from the Solomon Islands east

through to Samoa, and the southern Cook Islands. Totals were below average in Western and Eastern Kiribati, the Marquesas Islands, and Niue. Rainfall was higher than forecast in the Solomon Islands, Vanuatu, and the Southern Cook Islands, and lower than expected in Niue, and Tokelau.

The overall 'hit rate' for the October to December rainfall outlook was about 60%.

## Rainfall outlook: January to March 2004

- Average or above average rainfall likely from the Solomon Islands east southeast to the Austral Islands
- Below average rainfall likely in the Marquesas Islands
- Near average rainfall elsewhere in the region



Rainfall outlook map for January to March 2004

Enhanced convection is expected in parts of the tropical Southwest Pacific resulting in average or above average rainfall from the Solomon Islands trending east to the Austral Islands, including Samoa, the Northern Cook

Islands and the Society and Austral Islands. However, below average rainfall is expected for the Marquesas Islands. The rest of the region is expected to experience near average

rainfall over the next three months.

Moderate to high model skill usually prevails during the wet season.

## Probabilities of rainfall departures from average

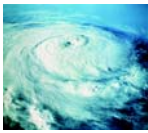
Broad-scale rainfall patterns and anomalies in the southern tropical Pacific area are estimated from the state of large-scale regional climate factors, such as La Niña or El Niño, their effect on the South Pacific and Tropical Convergence Zones, surface and sub-surface sea temperatures, and computer 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 (JANUARY - MARCH 2004)

Island Group	Rainfall Outlook	Confidence in the Outlook
Solomon Islands	20:45:35 (Average or Above)	Moderate
Samoa	10:50:40 (Average or Above)	Moderate
Northern Cook Islands	10:45:45 (Average or Above)	Moderate
Society Islands	20:40:40 (Average or Above)	Moderate
Austral Islands	15:45:40 (Average or Above)	Moderate
Western Kiribati	20:50:30 (Near average)	Moderate
Eastern Kiribati	30:35:35 (Near average)	Moderate
Papua New Guinea	30:50:20 (Near average)	Moderate
Vanuatu	15:55:30 (Near average)	Moderate - High
New Caledonia	25:50:25 (Near average)	Moderate
Tuvalu	20:45:35 (Near average)	Moderate
Wallis and Futuna	15:50:35 (Near average)	Moderate
Tokelau	20:50:30 (Near average)	Moderate
Fiji	30:50:20 (Near average)	Moderate - High
Tonga	20:60:20 (Near average)	Moderate
Niue	20:50:30 (Near average)	Moderate
Southern Cook Islands	20:55:25 (Near average)	Moderate - High
Tuamotu Island	20:50:30 (Near average)	Moderate
Pitcairn Island	25:50:25 (Near average)	Moderate
Marquesas Islands	50:30:20 (Below average)	Moderate



## TROPICAL CYCLONE UPDATE

'Heta' the first and severe tropical cyclone (category 5 - most severe) of the season, originated from a disturbance north of Fiji on 28 December. It moved to develop into a tropical cyclone just west of Atafu, the northernmost part of the Tokelau Islands on 2 January. Heta continued to track south, passing west of Samoa on 5 January, and then southeast, with sustained winds near its centre exceeding 220 km/h. The western Samoan island of Savai'i experienced 145-160 km/h wind gusts, and on the main island of Upolu, Apia airport was closed. A few roofs were lifted. Crops were destroyed, roads were blocked, bridges were damaged, and power cut. Heavy rainfall accompanied the high winds. American Samoa reported losses equivalent to \$226 million, due to roads washed away.

Heta also caused extensive damage to utilities, homes and vegetation in American Samoa. The acting Governor of American Samoa declared a "state of emergency" for the territory.

The cyclone increased in intensity and estimated maximum sustained wind speeds reached 260 km/h with gusts to 300 km/h as it approached Niue, its centre passing just west (within 50 km) of Niue on the evening of 6 January. The lowest mean sea level pressure recorded on Niue was 977.2 hPa. Niue Island was devastated, with estimated wind speeds of 220 km/h and gusts of 275 km/h. One person died and her baby girl was severely injured when their Alofi house collapsed. Several other people were also injured. Many people were left homeless. Much property was severely damaged or destroyed (including the hospital), many roads were closed, telecommunications and electricity were cut, and crops were badly damaged from the high winds and intense rainfall. A national disaster was declared.

The Cook Islands was another small nation that felt some of Heta's fury, producing 6 m swells. The worst affected area was the west coast of the main island Rarotonga, a popular tourist destination. The system gradually began to decay when it tracked further southeast over sub-tropical waters.

## PACIFIC ISLAND TRAINING INSTITUTE ON CLIMATE AND EXTREME EVENTS

### Announcement

The University of the South Pacific (USP), the East-West Center (EWC) and the National Institute of Water and Atmospheric Research (NIWA) will convene a two-week Pacific Island Training Institute on Climate and Extreme Events from 15-28 June 2004 at the Suva campus of the University of the South Pacific. The Asia-Pacific Network for Global Change Research (APN) and the U.S. National Oceanic and Atmospheric Administration are sponsoring the Training Institute with additional contributions from USP, EWC and NIWA. The Institute is intended to enhance the capacity of Pacific Island jurisdictions to understand, anticipate and effectively respond to the consequences of current and future patterns of climate variability and climate-related extreme events such as droughts, floods and tropical cyclones both today and in the future.

Small island developing states, including those in the Pacific, are considered among the most vulnerable to the consequences of climate variability and change and associated extremes:

- Year-to-year variability such as the El Niño-Southern Oscillation (ENSO) cycle has significant consequences for Pacific Island nations and climate change projections suggested a possible increase in climate variability and associated extreme events;
- Economic plans for most Pacific Island nations are dependent on climate-sensitive sectors (e.g., agriculture and tourism) and resources (e.g., coral reefs);
- Water resources are already stressed in many jurisdictions and many low-lying atoll nations are completely dependent on rainfall; and
- Climate-related extreme events such as droughts, floods, tropical cyclones and high temperatures already present significant challenges to public safety and community infrastructure.

For further information and an application form, see:

<http://www.niwa.co.nz/events/pacific-island>

Applications should be submitted to the University of the South Pacific. Additional contact information: Kanayathu Koshy, Director, Pacific Centre for Environment & Sustainable Development, University of the South Pacific, Suva, FIJI. Phone: (+679) 321-2184. Fax (+679) 330-9176. E-mail: [koshy\\_k@usp.ac.fj](mailto:koshy_k@usp.ac.fj).

**Applications are being accepted until 12 March 2004**

Visit The Island Climate Update website at: [www.niwa.co.nz/NCC/ICU/](http://www.niwa.co.nz/NCC/ICU/).

Your comments and ideas about The Island Climate Update are welcome. Please contact:

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The Island  
Climate Update



### 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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**DISCLAIMER:** This summary is prepared as soon as possible following the end of the month, once the data and information are received from the Pacific Island meteorological services. Delays in data collection and communication occasionally arise. While every effort is made to verify observational data, NIWA does not guarantee the accuracy and reliability of the analysis and forecast information presented, and accepts no liability for any losses incurred through the use of this bulletin and its contents.

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