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11 June 2002

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.

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

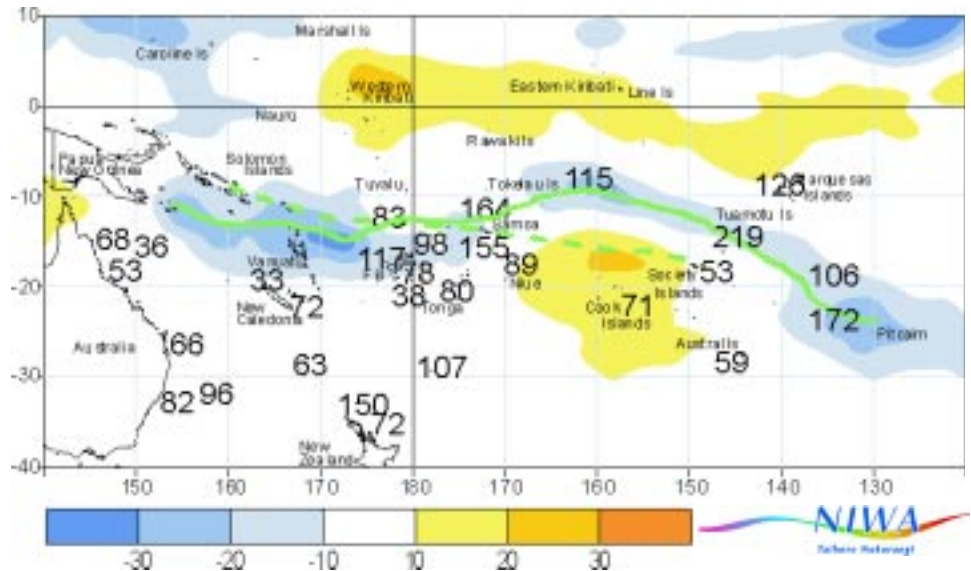


Contributors

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May's climate

The South Pacific Convergence Zone (SPCZ) was further south than average west of the date line, but further north than usual over much of the region to the east. Areas of enhanced convection and average to above average rainfall affected the region south of the Solomon Islands across Vanuatu to Fiji, with another band of enhanced convection extending from the east of the Tokelaus across the Northern Cook Islands through the Tuamotu Islands to Pitcairn Island. Sunny conditions prevailed about and east of Kiribati, with below average rainfall in the Southern Cooks Islands and the Society Islands of French Polynesia, as well as the Queensland coast of Australia and the western Coral Sea. Willis Island has now recorded 10 consecutive months with below average rainfall. Unusually high mean May air temperatures persisted in parts of Fiji. A weak tropical cyclone 'Upia', affected the sea area between Papua New Guinea and the Solomon Islands from 25 to 28 May. *More on Page 2.*



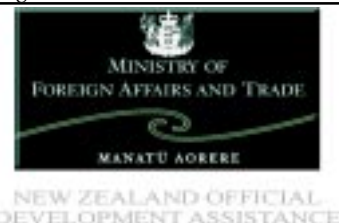
Outgoing Long-wave Radiation (OLR) anomalies, in Wm^{-2} , for May 2002 represented by shaded areas, and rainfall percentage of average, shown by numbers. High radiation levels (yellow) are typically associated with clearer skies and lower rainfall, while cloudy conditions lower the OLR (blue) and typically mean higher rainfalls. The May 2002 position of the South Pacific Convergence Zone (SPCZ), as identified from total rainfall, is indicated by the solid green line. The average climatological position of the SPCZ is identified by the dashed green line. Data source: NOAA-CIRES Climate Diagnostics Center.

ENSO and sea surface temperatures

In May, a widespread weakening of the tradewinds coupled with a rapidly falling Southern Oscillation Index (SOI) and warming of the equatorial Pacific sea surface has increased the chance of an El Niño to at least 70%. Currently, sea surface temperatures in central equatorial Pacific are about $1^{\circ}C$ warmer than normal. Notably, this is the first month since the 1997/98 El Niño when the SOI has fallen so low. *Details Page 2.*

The next three months (June to August 2002)

Above average rainfall is likely in equatorial latitudes from west to east, with a tendency towards below average rainfall in Papua New Guinea, New Caledonia, Fiji, Samoa and the Marquesas and Austral Islands; mainly average rainfall in other areas. *More on Page 3.*





Climate developments in May 2002

Enhanced convection south of the Solomon Islands across to Fiji and from the Tokelaus to Pitcairn Island

Below average rainfall in the Southern Cooks and Society Islands

A large area of enhanced convection with areas of above average rainfall affected the region south of the Solomon Islands across Vanuatu to the north of Fiji, as the SPCZ continued to be displaced south of its mean position in that region. However, the SPCZ was further north than usual over much of the region east of the date line, with another band of enhanced convection and areas of above average rainfall, extending from the east of the Tokelaus across the Northern Cook Islands through the Tuamotu Islands to Pitcairn Island. Rainfall was at least 125% of average at many locations within these

CLIMATE EXTREMES IN MAY 2002				
Country	Location	Rainfall (mm)	% of normal	Comments
Kiribati	Kiritimati	231	257	Above average
Fiji	Lakeba	285	261	Above average
French Polynesia	Tuamotu, Takaroa	186	219	Above average
Kiribati	Kanton island	19	15	Well below average

Country	Location	Mean temperature, °C	Departure from average	Comments
Fiji	Rotuma	28.5	+1.6	Extremely high
Fiji	Nabouwalu	27.1	+1.9	Extremely high
Fiji	Laucala Bay	26.6	+1.9	Extremely high

Country	Location	Maximum temperature, °C	Date of occurrence	Comments
Fiji	Rotuma	33.3	9 May	Highest
Fiji	Tokotoko, Navua	31.7	11 May	Highest

convective regions, a few locations recording more than 200% of average. Rainfall totaling more than 300 mm was measured in the 24 hours to 6am 9 May at Bauerfield, Vanuatu. An extensive region of divergence and sunny conditions extended from Western Kiribati east to the region north of the Marquesas Island. Sunny conditions with rainfall less than 75% of average occurred in the Southern Cooks Islands and over the Society Islands of French Polynesia. Low rainfall (35-75% of average) continued on the Queensland coast of Australia and the western Coral Sea.

Unusually high mean May air temperatures (1.5°C or more above average), associated with very warm sea surface temperatures persisted in parts of Fiji. However, mean air temperatures were 0.5°C or more below average in parts of New Caledonia.

A weak tropical cyclone 'Upia', affected the sea area between Papua New Guinea and the Solomon Islands from 25 to 28 May with maximum sustained wind speeds of 65 km/h. This brings the total to six tropical cyclones for the 2001/02 season overall.

Warmer than average seas persist in the South Pacific

Increased chance of an El Niño

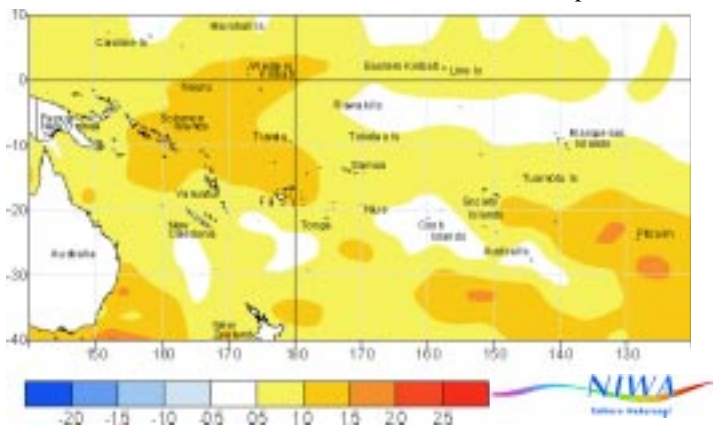
In the tropical Southwest Pacific, a band of much warmer than usual water at the surface (at least 1.0°C above average) extends from Kiribati south to affect the Solomon Islands, Fiji and Tuvalu. Surface waters at least 1.0°C above average also encompass the region to the south and west of Pitcairn Island.

Most of the Southwest Pacific is warmer than average (0.5-1.0°C).

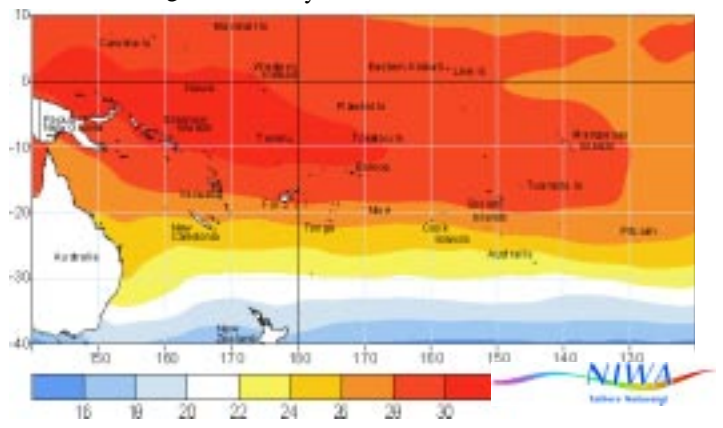
Equatorial Pacific Ocean temperatures continued to warm through May with SSTs being 1.0°C warmer (US analysis, +1.0°C) immediately west of the date line. SSTs were as much as 2°C warmer than usual in the region between the Galapagos Islands and the South American coast. Both NINO3 and NINO4 SST anomalies showed warming since April. Overall surface warming has

intensified. There are patches of ocean where the SSTs are near normal near New Caledonia, south of Fiji and around the Southern Cooks.

The probability of an El Niño has increased with the changing conditions in the Pacific Ocean. The weakening of the tradewinds and warming of the equatorial Pacific has increased the possibility of El Niño affecting Southwest Pacific climate later this year.



Sea surface temperature anomalies (°C) for May 2002



Mean sea surface temperatures (°C) for May 2002



Forecast validation

**Forecast period:
March to May 2002**

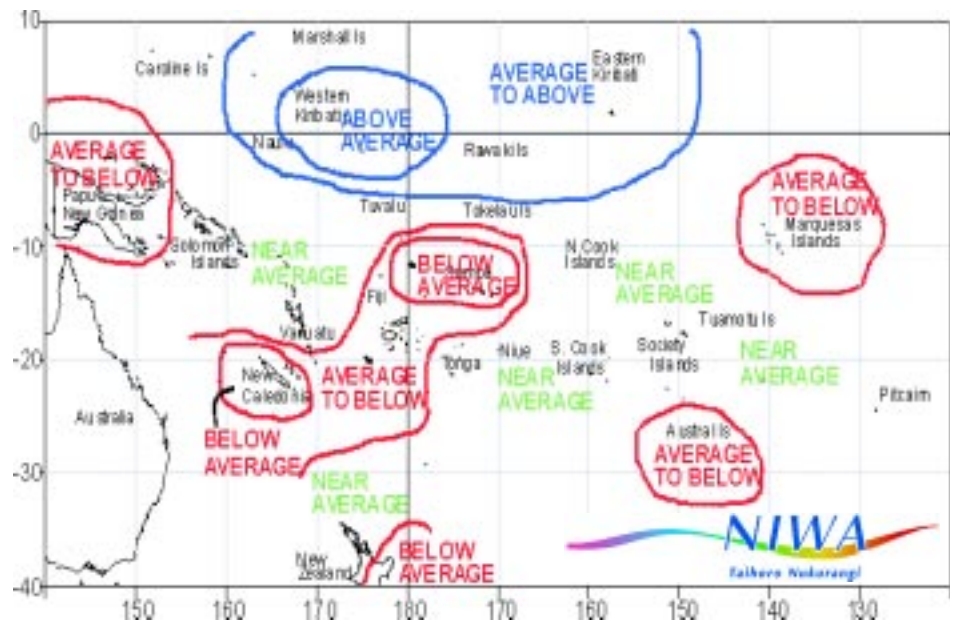
Rainfall was expected to be above average in Niue, and average to above average from Fiji across to Tonga, and in Western Kiribati. Below average rainfall was forecast for the region north of about 12°S from Tokelau to the Marquesas, including Eastern Kiribati. Average rainfall was expected in the other parts of the region.

Rainfall was as expected for many of the forecast areas. However, it was higher than forecast in New Caledonia, Samoa and the Marquesas and Austral Islands. Rainfall was lower than expected in Niue, the Society Islands and Pitcairn. The overall 'hit rate' for the March to May rainfall outlook was about 60%.



Rainfall outlook: June to August 2002

- Above average rainfall in equatorial latitudes from Nauru to Kiribati
- Average to below average rainfall in Papua New Guinea, Fiji and the Marquesas and Austral Islands
- Below average rainfall for New Caledonia and Samoa
- Mainly average rainfall in other areas



Rainfall outlook map for June to August 2002

In the Western Pacific, the South Pacific Convergence Zone (SPCZ) was further south of its normal position lying just north of Vanuatu and Fiji during May. It lay further northeast than average east of the date line, lying just north of the Cook Islands and over parts of French

Polynesia. Rainfall is projected to trend towards being above average in Western and Eastern Kiribati for the June - August period. Rainfall is likely to be below average to average in Papua New Guinea, Fiji, and the Marquesas and Austral Islands. Below average rainfall is forecast

for New Caledonia and Samoa. Near average rainfall is projected for the Solomon Islands, Tuvalu, Vanuatu, Tokelau, Tonga, Southern and Northern Cook Islands, Society and Tuamotu Islands and Pitcairn.

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 (JUNE - AUGUST 2002)

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

The Interdecadal Pacific Oscillation - Pacific Climate Shifts

By Ashmita Gosai, Dr Jim Salinger and Dr Brett Mullan, NIWA

Climate variability observed in the Pacific is dominated by changes in the tropics on timescales ranging from interannual to interdecadal.

The El Niño-Southern Oscillation (ENSO) dominates interannual climate variability not only over the Pacific but globally. Research shows that the Interdecadal Pacific Oscillation (IPO) modulates South Pacific climate on the decadal time scale.

The IPO is an 'ENSO-like' feature of the climate system that operates on time scales of several decades. There is a tight coupling between the ocean and atmosphere. The main centre of action in SST departures is in the north Pacific centred near the dateline at 40°N, with an opposing weaker centre just south of the equator in the eastern Pacific north of the Easter Island at 10°S. There is also another weaker centre of action, in the south west Pacific centred near the Cook Islands at 20°S, which is in the same phase as the north Pacific centre. The matching atmospheric sea level pressure pattern (SLP) is one of an east/west seesaw at all latitudes, but again centred over the north Pacific, with the centre of action over the Aleutian Islands.

In the positive phase of the IPO, over the south west Pacific region southerly winds are more prevalent, with south westerlies more frequent in the New Zealand area. The negative phase of the IPO brings a tendency for a reversal of the SST and SLP anomalies for the positive phase, and more frequent northerly winds for the south west Pacific, and north easterly winds in the New Zealand area.

Three phases of the IPO have been identified during the 20th century, being: positive (1922-1944), negative (1946-1977) and another positive phase (1978-1998). Recent findings show that there has been another shift towards a negative IPO since 1999 (Figure 1). These changes cause climate shifts in the South Pacific.

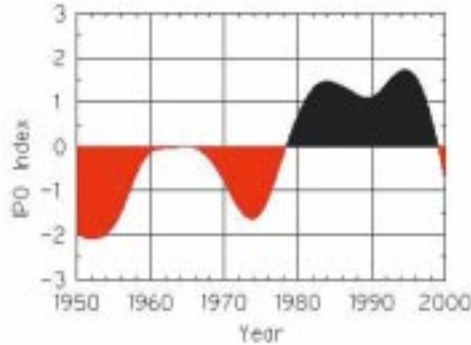


Figure 1. Phases of the Interdecadal Pacific Oscillation from 1950 to 2000.

Changes in mean annual surface air temperatures between the most recent negative (1947-77) and most recent positive (1977-98) IPO period are shown in Figure 2.

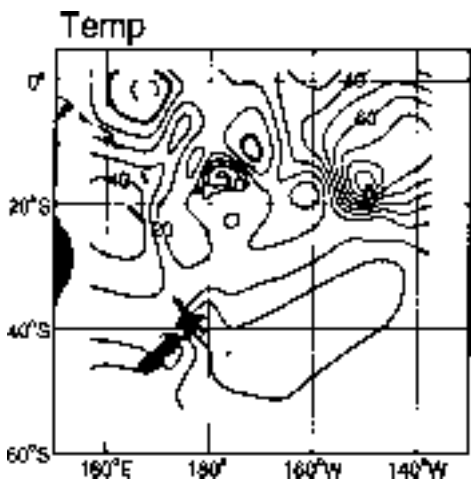


Figure 2. Changes in annual mean temperature (0.01°C) between the most recent positive and negative phase of the IPO.

There is warming over much of the region, which is to be expected with the global warming trend of 0.2°C/decade that has occurred since 1976 compared with no warming during the period 1946-1975.

The warming in the region south of 20°S is similar to the average global mean surface air temperature trends. However, in the north east of the region increases in mean temperatures exceed this amount, and in the north west there is less, or no warming. This is consistent with higher pressures and more anomalous southerly flow in the northwest, and lower pressures and more anomalous northerly flow in the north east.

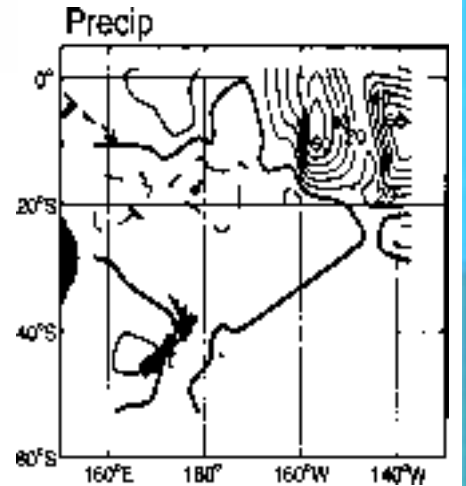


Figure 3. Changes in mean annual precipitation (%) between the most recent positive and negative phase of the IPO.

The changes in annual rainfall from the negative to positive phase of the IPO show the north east of the region much wetter during the positive phase (Figure 3). Rainfall in the extreme north east increases by more than 50 percent. The line of zero change runs from Funafuti, north of Apia and then south eastwards to Rapa. Annual rainfall shows decreases south west of the zero line. The annual rainfall changes are consistent with increases in atmospheric pressure in the west and south of the region and decreases in the north east of the region with a change to the positive IPO phase.



Visit The Island Climate Update website at: www.niwa.cri.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 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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