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**8 July 2001**

# 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.**

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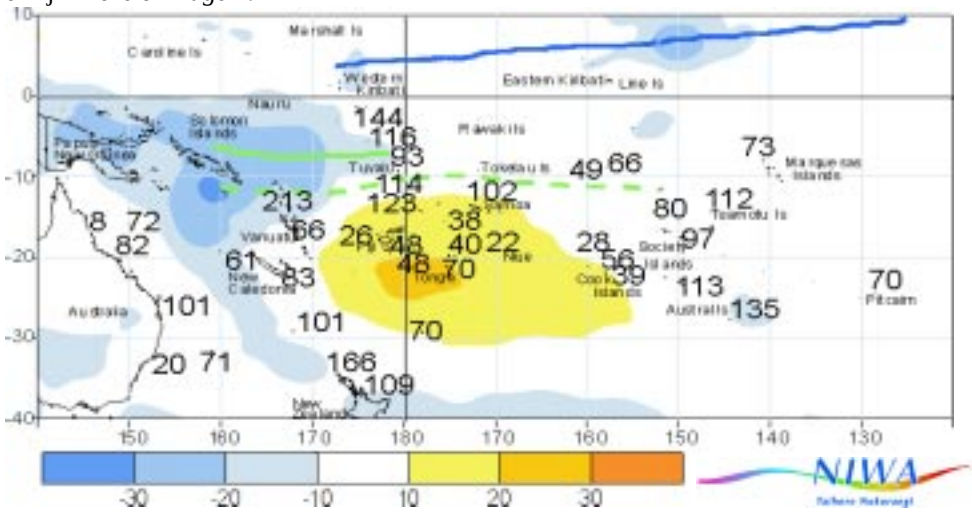
## June's climate

The South Pacific Convergence Zone (SPCZ) extended east from the Solomon Islands toward Tuvalu. However, it was virtually non-existent further east in the Southwest Pacific. A large area of enhanced convection with areas of above average rainfall affected the region from the Solomon Islands west to Papua-New Guinea. In the north, the Inter-Tropical Convergence Zone (ITCZ) was further south than usual, enhancing rainfall and cloudiness over parts of Kiribati. An extensive region of divergence and mainly sunny conditions extended from Fiji east to the Southern Cook Islands, including Tonga, Samoa and Niue, with less than 50% of average rainfall in many areas. Rainfall was also below average over much of New Caledonia, Vanuatu and the Northern Cook Islands. Below average rainfall continued in some areas on the northern Queensland coast of Australia, extending into the western Coral Sea. Willis Island has now recorded 11 consecutive months with less than 75% of average rainfall. Unusually high mean air temperatures were associated with very warm sea surface temperatures around Fiji. *More on Page 2.*




Outgoing Long-wave Radiation (OLR) anomalies, in $Wm^{-2}$, for June 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 June 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. Inter-Tropical Convergence Zone (ITCZ), as identified from total rainfall, is indicated by the solid blue line.

## ENSO and sea surface temperatures

In June, above average SST in the tropical Pacific and continuing negative SOI has increased the chance of an El Niño occuring to at least 85%. Currently, sea surface temperatures in the parts of the central equatorial Pacific are about 1.0°C warmer than normal. Notably, there was a westerly wind burst at the end of the month in Fiji and Western Kiribati. *Details Page 2.*

## The next three months (July to September 2002)

Above average rainfall is likely in Western and Eastern Kiribati, with average to above average rainfall in the Solomon Islands, Vanuatu and Tuvalu. Average to below average rainfall is likely in New Caledonia, Fiji, Samoa, Tokelau and Marquesas Islands. *More on Page 3.*

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# Climate developments in June 2002

## Enhanced convection over Papua New Guinea and the Solomon Islands

## Below average rainfall from Fiji to the Southern Cook Islands

In June, the SPCZ extended east from the Solomon Islands toward Tuvalu, being displaced north of its mean position in that region. However, it was virtually non-existent further east in the Southwest Pacific.

A large area of enhanced convection with areas of above average rainfall affected the region from the Solomon Islands west to Papua-New Guinea. In the north, the ITCZ was further south than usual, enhancing rainfall and cloudiness over parts of Kiribati. Rainfall was at least 125% of average at many locations within these convective regions, some locations recording more than 200% of average.

Rainfall was extremely high at Hereheretue in Tuamotu, French Polynesia, due to unsettled conditions and almost 300 mm over 20-22 June. Rainfall was also very high at Nacocolevu in Fiji, due to record high 1-day rainfall totalling 181mm on 2 June.

An extensive region of divergence, with sunny conditions, extended from Fiji east to the Southern Cook Islands, including Tonga, Samoa and Niue, with totals between 20 and 60 mm and less than 50% of average rainfall in many areas. Rainfall was less than 75 of average over much of New Caledonia,Vanuatu and the Northern Cook Islands.

Below average rainfall continued in some areas on the northern Queensland coast of Australia, extending into the western Coral Sea. Willis Island has now recorded 11 consecutive months with less than 75% of average rainfall.

Unusually high mean May air temperatures (1.5ºC or more above average), associated with very warm sea surface temperatures persisted in parts of Fiji.

CLIMATE EXTREMES IN JUNE 2002

| Country | Location | Rainfall (mm) | % of normal | Comments |
|---|---|---|---|---|
| Fiji | Nacocolevu | 203 | 274 | Extremely High |
| French Polynesia | Tuamotu, Hereheretue | 332 | 322 | Extremely high |

| Country | Location | Rainfall (mm) | % of normal | Comments |
|---|---|---|---|---|
| Australia | Cairns Airport | 4 | 8 | Extremely low |
| Niue | Hanan Aiport | 19 | 22 | Lowest |

| Country | Location | Mean air temp(°C) | Departure | Comments |
|---|---|---|---|---|
| Fiji | Laucala Bay | 26.0 | +2.0 | Extremely high |
| Fiji | Nabouwalu | 26.2 | +1.6 | Extremely high |

| Country | Location | Mean air temp(°C) | Date of Occurrence | Comments |
|---|---|---|---|---|
| Fiji | Lautoka | 33.2 | 17 June | Highest |
| Fiji | Suva | 32.3 | 1 June | Highest |

## Equatorial Pacific Ocean up to +1.5°C warmer than average

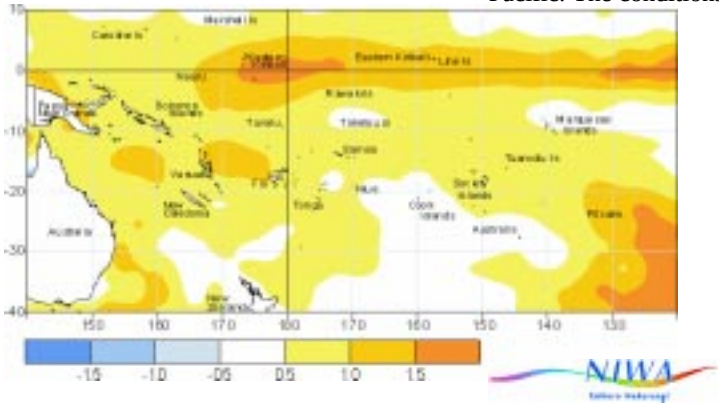
## El Niño likely if conditions persist

In the tropical central Pacific, a band of anomalously warm water (+1.5°C above average) extends from Western Kiribati towards the coast of South America. An area of the Pacific which is also very much warmer than average lies southeast of Pitcairn Island (+2.0°C above average).

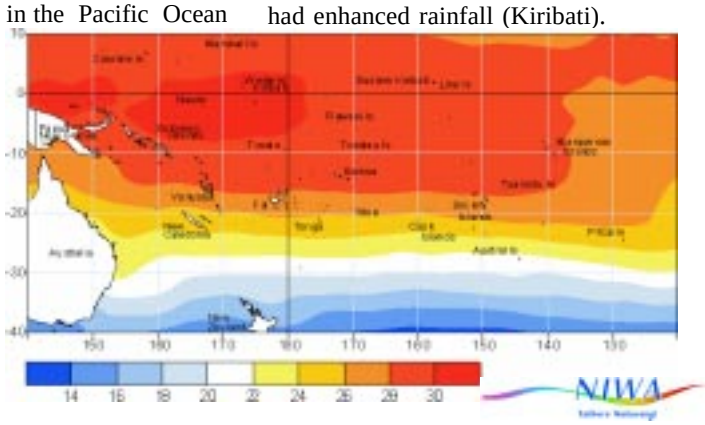
Generally, most of the Southwest Pacific is warmer than average ( +1.0 to 1.5°C). Notably, there is no typical cold 'horseshoe' SST anomaly in the Western Pacific which is usually present during an El Niño.

Equatorial SSTs continued to increase through June within NINO3 and NINO 4 (+1.0°C and +1.2°C above average respectively) regions. During June there has been an expansion of the warm SST anomalies across the equatorial Pacific towards Eastern Pacific. The conditions in the Pacific Ocean have rapidly changedover the last month significantly increasing the probability of an El Niño.

The warmer Equatorial SSTs and weakening tradewinds are the main factors that led to an increased possibility of an El Niño. It is likely that this phenomenon will affect much of the Southwest Pacific climate later this year. Some areas have already experienced reduced rainfall (parts of southwest Pacific) and other areas have had enhanced rainfall (Kiribati).




Sea surface temperature anomalies (°C) for June 2002




Mean sea surface temperatures (°C) for June 2002

# Forecast validation

## Forecast period: April to June 2002

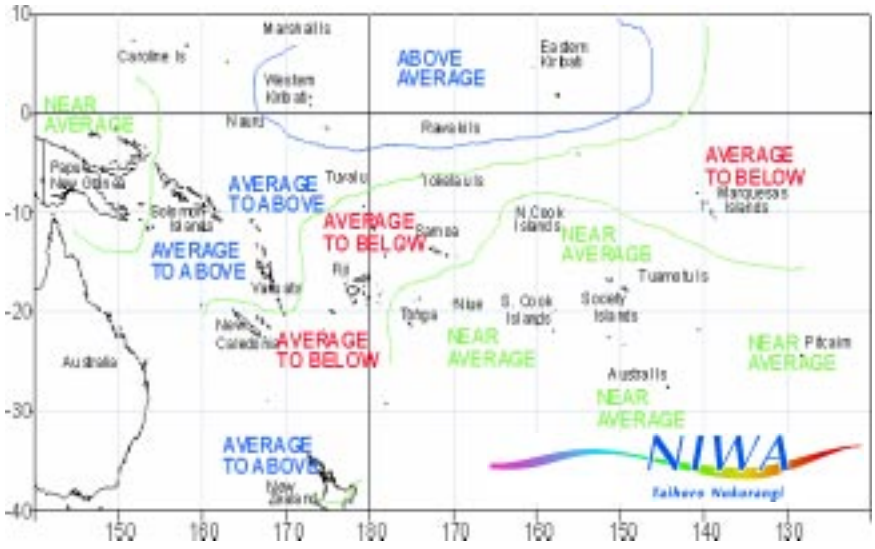
Rainfall was projected to be above average in the Western and Eastern Kiribati and Vanuatu, and average to above average in New Caledonia, Fiji, Niue and Pitcairn Island. Average to below average rainfall was expected for much of the region from the Solomon Islands east to the Marquesas including the Northern Cooks, and central French Polynesia.

Average rainfall was forecast for other areas.

Rainfall was as expected for many of the forecast areas. However, it was higher than forecast in 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 April to June rainfall outlook was about 60%.

# Rainfall outlook: July to September 2002

- Above average rainfall in equatorial latitudes from Nauru to Kiribati
- Average to above average rainfall for the Solomon Islands, Vanuatu and Tuvalu
- Average to below average rainfall in New Caledonia, Fiji, Samoa Tokelaus and Marquesas
- Mainly around average rainfall in other areas




Rainfall outlook map for July to September 2002

In the Western Pacific, the South Pacific Convergence Zone (SPCZ) extended east from Solomon Islands to Tuvalu and was virtually non-exsistent further east during June. The SPCZ lay just north of Solomon Islands and Tuvalu, which is further north than its normal position for June.

Rainfall is forecast to be above average in Western and Eastern Kiribati. Average or above average rainfall is expected in Solomon Islands, Vanuatu and Tuvalu.

Below average or average rainfall has been forecast for New Caledonia, Fiji, Samoa, Tokelau and Marquesas Islands.

Other areas are expected to receive around average rainfall for the upcoming three months.

## 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 2002)

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

# El Niño Update

## More progress towards the evolution of an El Niño in the last month

*Probabilities have increased to 85% for an El Niño event affecting the whole of the Southwest Pacific by September this year. Most of the key indicators such as the warm Sea Surface Temperatures (SSTs) in the Central Equatorial Pacific and further westerly wind bursts have progressed towards conditions that lead to the evolution of an El Niño event. The outlook guidance indicates there has been significant warming in the Equatorial Pacific, where SSTs are more than 1°C above normal. The 3-month value of the Southern Oscillation Index (SOI) is now -0.8, the lowest since the last El Niño event, increasing the chances of an ENSO event.*

**Present situation and outlook**

Historically this is the period of the year when transitions to an El Niño event can occur. However, in certain events September-October was also favoured as the transitional time toward ENSO events. Continuing evidence suggests that the chances of an El Niño this year have increased considerably since May 2002.

The evidence for a developing El Niño event which is expected to influence much of the Pacific climate by September 2002, continues to strengthen, though the magnitude of the coming event remains uncertain. Monitoring of the climatic conditions in the Pacific Ocean is important due to uncertainty of the magnitude of this evolving El Niño.

Considerable parts of the equatorial Pacific Ocean remain more than 1°C warmer than normal. If the SSTs continue to warm, 2002 could be called an El Niño year (www.bom.gov.au). The NINO3 and NINO4 region SST anomalies have increased with some areas being at least 0.5°C to 1°C above normal.

The evidence of the evolution of an El Niño continues to strengthen, as the SOI (Fig. 1) remains negative (-6.3, Australian SOI ) with increased cloudiness in the central Pacific and weakening of the South Pacific Convergence Zone (SPCZ). The trade winds have also weakened.

The June OLR data showed a decrease in convection over Northern Australia and around the date line at 15°S – 20°S.

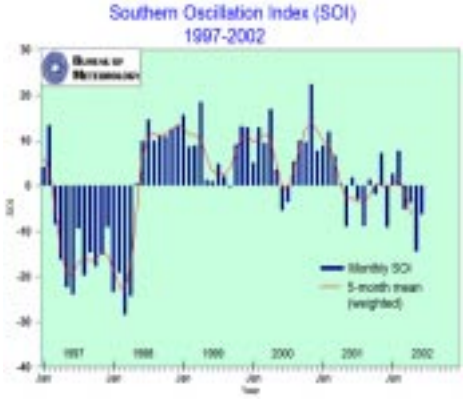



**Fig 1.** Southern Oscillation Index (SOI) adopted from Bureau of Meteorology, Australia.

During June, the SPCZ weakened and moved northwards towards equatorial regions resulting in drying in parts of the South West Pacific. There was also enhanced convective activity over the Eastern Tropical Pacific.

The sub-surface temperature data for equatorial Pacific showed a significant expansion of positive anomalies (red) in the Eastern Pacific (Fig. 2). The weakening trade winds across Pacific contributed to this warming in the Eastern Pacific.

Although most of the Global Climate Models were not predicting an El Niño in the last two months, 8 out of 11 models are now predicting El Niño by late 2002 or early 2003.

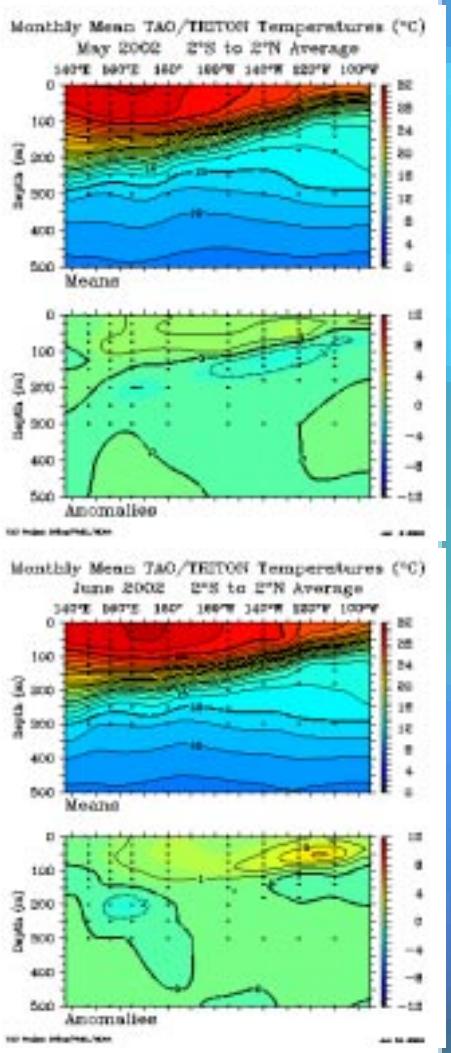



**Fig 2.** Sub Surface Temperature along the Equator for May (top) and June (bottom) 2002 (adopted from TOA/TRITON).


The Island Climate Update

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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 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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