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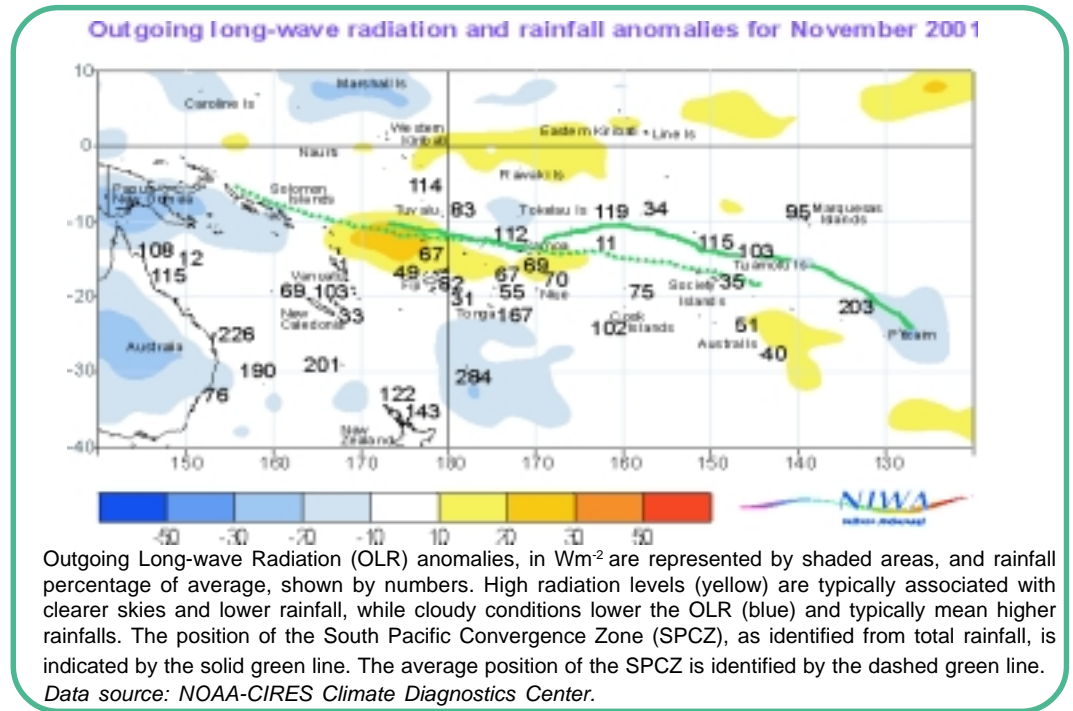
# The Island Climate Update



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

**November's climate**

The monsoon was well established over Indonesia, northern Australia and Papua New Guinea, with active convection over these areas, as well as parts of the Solomon Islands. Convection was also enhanced over the seas between New Zealand and Tonga, and over Pitcairn Island. Some areas within these regions received at least 200% of their average rainfall, including islands in the north Tasman Sea and Gambier Island in French Polynesia. Rainfall was also enhanced over northern New Zealand. Below average rainfall occurred in many areas from the Coral Sea eastward to French Polynesia, including Kiribati. 'Trina', the first tropical cyclone of the season, developed near the Southern Cook Islands on 30 November. *More on Page 2.*



**ENSO and sea surface temperatures**

The three-month mean Southern Oscillation Index (SOI) was close to zero. The November value was +0.6, indicating a slight La Niña component. However, overall atmospheric conditions and sea surface temperature (SST) anomalies remain weak and are expected to continue in the neutral range throughout the Southwest Pacific for the next three to six months. *Details on Page 2.*

**The next three months (December 2001 to February 2002)**

The trade winds are still expected to remain slightly enhanced across the central Pacific promoting below average to average rainfall in Tokelau, Eastern Kiribati, Samoa, the Northern Cook Islands, and the Marquesas Islands. Average to above average rainfalls are indicated for many places west of 170°E and south of 20°S. *More on Page 3.*





## Climate developments in November 2001

### Monsoon well established in the northwest

### Areas of below average rainfall from the Coral Sea across to French Polynesia

The monsoon was well established over Indonesia, northern Australia and Papua New Guinea during November, with outgoing long-wave radiation (OLR) anomalies below average, indicating active convection, over these areas as well as parts of the Solomon Islands. Convection was also enhanced over the seas between New Zealand and Tonga, and over Pitcairn Island. Some areas within these regions received at least 200% of average rainfall, including islands in the north Tasman Sea and Gambier Island in French Polynesia. Rainfall totals were also enhanced over northern New Zealand, with totals at least 120% of average.

### Warmer than average seas around Nauru

SST anomalies have still shown little change since the middle of the year, with an area of warm 30°C surface waters and positive SST anomalies (at least 1.0°C above average) around Nauru, between the Solomon Islands and Western Kiribati. SST anomalies also continued above average about and to the east of the Tuamotu Islands and were well above average south of the Cook Islands. A tongue of cooler equatorial waters remains off the South American coast, still enhancing the cooler east - warmer west temperature gradient. However, these anomalies are generally weak and are expected to stay in the neutral range for several more months. There are indications of a gradual evolution towards weak warm ENSO conditions during 2002, in the months following the southern hemisphere wet season. The November Southern Oscillation Index (SOI) averaged +0.6 (largely because of positive pressure anomalies over Tahiti); the 3-month mean was +0.1, with trade winds remaining slightly enhanced in the central Equatorial Pacific.



## Forecast validation

### Forecast period: September to November 2001

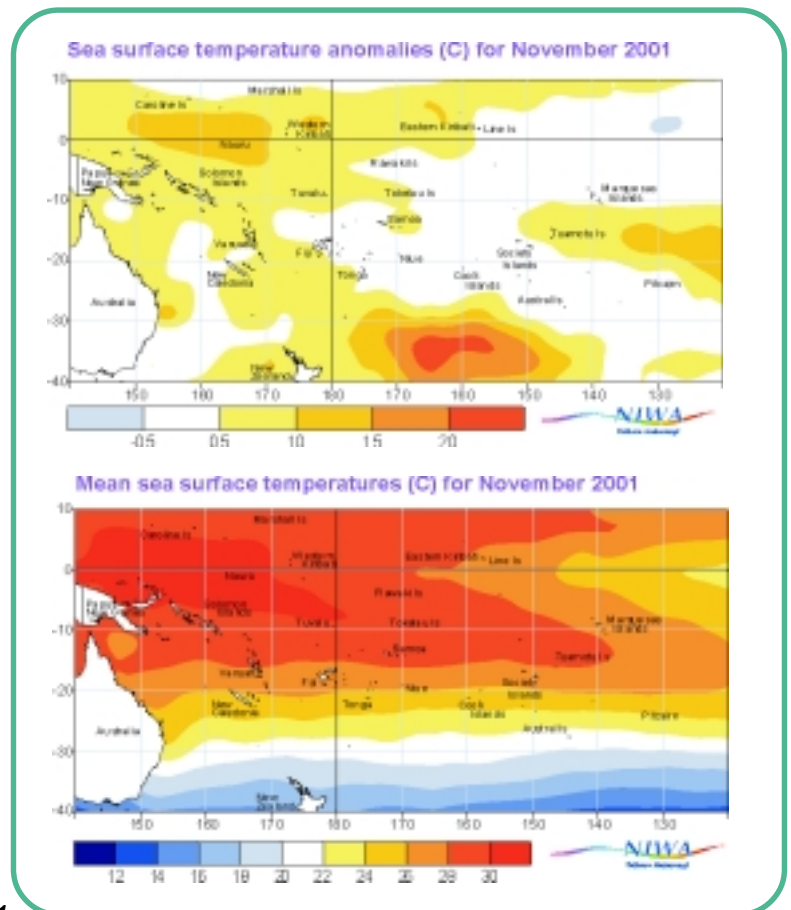
Average to above average rainfall was expected in a band from Vanuatu, across Fiji, southeast to the Southern Cooks, the SPCZ being more active than usual in this region. Below average rainfalls were forecast for a broad area from Tuvalu to the Marquesas, including the Austral, Society and Tuamotu Islands of French Polynesia. Near average rainfalls were expected in most other parts of the tropical South West Pacific, although uncertainties were high for Kiribati. This scenario was correct for many

Unusually high November rainfall was recorded at:			
Country	Location	Rainfall (mm)	% of normal
French Polynesia	Gambier, Rikitea	288	203
New Zealand	Raoul Island	253	284

Unusually low November rainfall was recorded at:			
Country	Location	Rainfall (mm)	% of normal
Cook Islands	Pukapuka	29	11

Below average rainfall continued during November in the Coral Sea, with totals about 10% of average on Willis Island. Low rainfall, less than 50% of average, also persisted for the third month running throughout central Tonga. Rainfall was 75% or less of average throughout much of New Caledonia, Vanuatu, Fiji, Samoa, Tuvalu and Kiribati. The SPCZ was near its average position from Tuvalu to Samoa, but it was displaced further north than normal in the east.



islands between 5 and 15°S, including New Caledonia and Fiji. However, rainfall was lower than expected for most other regions, especially Tonga, Niue, and the Southern Cook Islands, where below average rainfall resulted when average to above average rainfall was expected. Average or above average rainfall resulted over much of French Polynesia when average to below average rainfall was expected. The overall 'hit rate' for the September to November rainfall outlook was 50%.



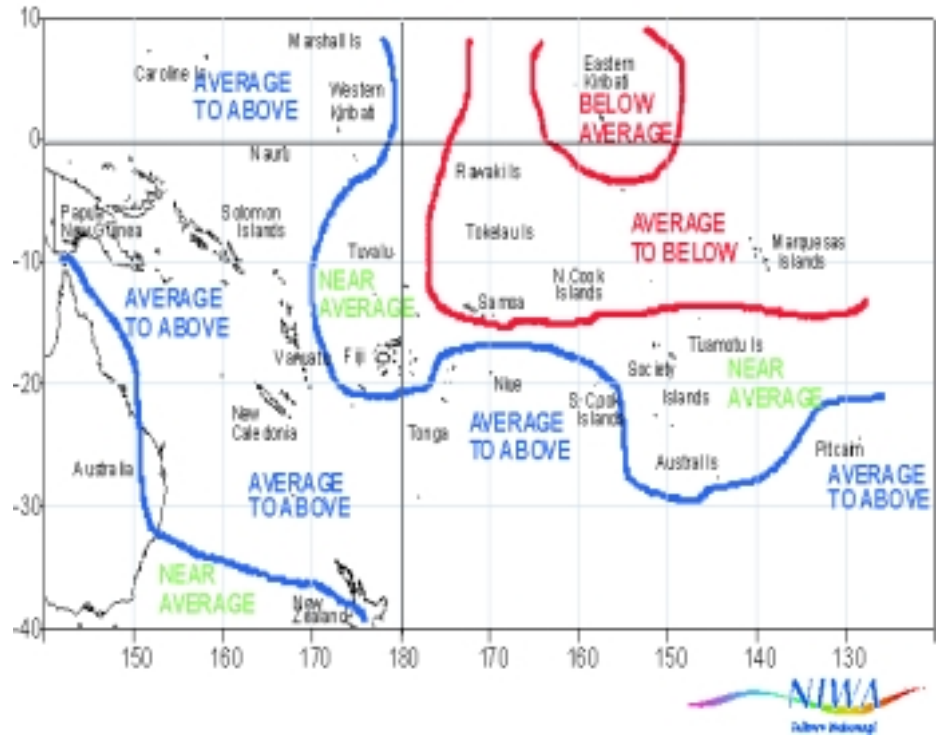
## Rainfall outlook: December 2001 to February 2002

### Rainfall still suppressed in the central Pacific

**Average to above average rainfall in the western Pacific and Coral Sea, trending towards average or below average further east and northeast**

In November the SPCZ was displaced further north than usual east of Samoa, but near its average position elsewhere. However, December through February trade winds are expected to remain slightly enhanced across the central Pacific pushing the SPCZ a little further south than usual. As a result, rainfall is projected to be below average to average in Tokelau, Eastern Kiribati, Samoa, the Northern Cook Islands, and the Marquesas Islands of French Polynesia. Average rainfall is expected in other parts of French Polynesia and Fiji to Tuvalu. Average to above average rainfalls are indicated for most places west of 170°E, including Niue, Tonga, and the Southern Cook Islands.

Rainfall outlook map for December 2001 to February 2002



### 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 TABLE  
(DECEMBER 2001 - FEBRUARY 2002)**

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



## Tropical cyclones

### 'Trina' the first tropical cyclone of the season

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'Trina' developed at 21°S 160°W near Rarotonga in the Southern Cook Islands on 30 November, with estimated maximum sustained winds of 65 km/h. Winds at Rarotonga Airport gusted between 100 and 104 km/h at times between 30 Nov 0110 UTC and 1 December 2100 UTC. Some flooding was reported. The system moved northeast decaying to tropical storm intensity by 2 December 2100 UTC. The chances of tropical cyclone activity remain slightly lower than normal for most of the South Pacific for the December-February period.

The January issue of the ICU will provide an update on information relating to any occurrences of tropical cyclones in our forecast region of the South West Pacific over the remainder of the wet season.

## Forecasting climate

### - the odds on getting it right

By Alan Porteous and Stuart Burgess, NIWA

Forecasting climate is a process of looking at climate variables and weighing up the value and reliability of each piece of information. There's no smart menu of procedures or a clever computer program that can do the job for you.

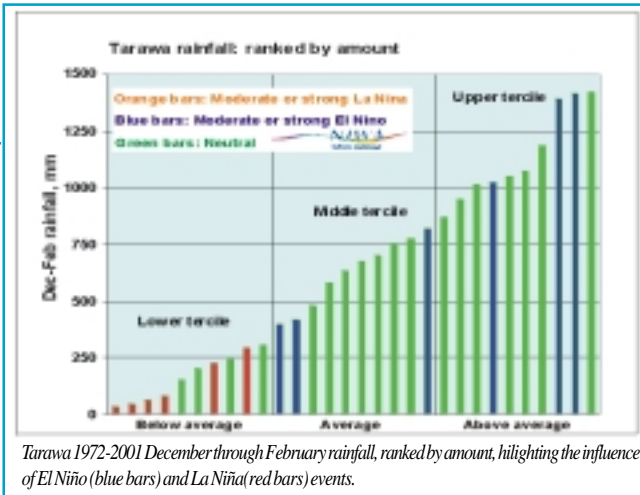
A good indicator of climate for the next few months is found in the historical climate patterns of the past 20 or more years. These tell us the likely mean state of the climate for any season or month, and the degree and frequency of climate variations on those time scales.

### The natural distribution and terciles

Like many natural phenomena, aspects of climate, such as rainfall amounts or mean temperatures, occur in a range of 'sizes' – there are high, medium, and low values. In the figure (above-right), the last 30 years of Tarawa December through February (DJF) rainfall is arranged in order of amount (from lowest to highest), and is shown divided into three categories (terciles) with a third of the rainfalls in each category. The data are arranged into terciles simply as a way to characterise three types of period – 'dry', 'average', and 'wet' – that are different from each other in practical terms. So from the Tarawa data we can define a dry, average, or wet DJF period as one having less than 398 mm, 398 to 817 mm, or more than 817 mm of rain respectively. Over the long term there is a 33% chance of rainfall being in any tercile, until other factors, such as a systematic shift in circulation like the El Niño-Southern Oscillation (ENSO) as we will explain, tip the odds in favour of one tercile or another.

## ENSO

Every now and then there is a systematic change in weather patterns – a tweak if you like in the normal circulation, affecting rainfall or temperatures, that might last for a few months or longer. ENSO is a Pacific-wide phenomenon that affects climate like that. For instance, when we examine past El Niño DJF periods in Tarawa (blue bars in the figure below), we find that on the whole they are more likely to be average or wetter than the average overall, while for La Niña (red bars in the figure below) they are most likely to be drier than average. The dramatic influence that ENSO has on rainfall at Tarawa was seen recently in the three most recent DJF periods, which were all drier than normal.



So, how would a La Niña affect our prediction of whether the DJF rainfall at Tarawa is likely to be in the top tercile (above average)? The data from previous La Niña DJF periods tells us that drier conditions are much more likely, increasing the chance from 33% to more than 90%. Conversely, an El Niño phase would decrease the chance of drier conditions from 33% to less than 10%, with average or wetter conditions more likely.

### Forecast models

Just as we need to know how ENSO changes the chances of drier or wetter seasons, we have also to look at a range of other climate models and climate factors. We have to determine what physical differences in the climate they indicate are likely, and the significance of those changes. Sometimes the models can be counter-suggestive, so we must assess how much credibility or 'weight' to give each one. In the end, each model or climate factor offers information on how the typical distribution of climate patterns might shift, on time scales of a month or two, or a season, or longer. Climate forecasting aims to achieve a consensus that draws together all these bits of information to tell a coherent story.



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