

Number 68, May 2006

# The Island Climate Update

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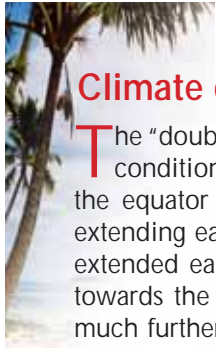
## April's climate

- Double Inter-Tropical Convergence Zone (ITCZ) in April; South Pacific Convergence Zone (SPCZ) much further southwest than average
- Suppressed convection over Nauru, Western and Eastern Kiribati, Tuvalu, and from Vanuatu to Pitcairn Island
- Rainfall above average in Niue
- Much warmer than average in parts of New Caledonia and Tonga
- Eight tropical cyclones so far this season

## El Niño/Southern Oscillation and seasonal rainfall forecasts

- The equatorial Pacific returns to a neutral ENSO state
- Above average rainfall likely in Niue and the Southern Cook Islands
- Below average rainfall expected in Tokelau





## Climate developments in April 2006

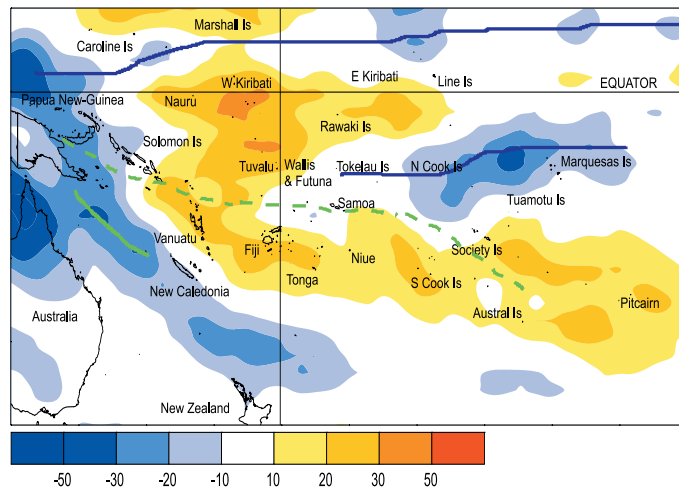
The "double ITCZ" structure, usually seen only in La Niña conditions, persisted in April. One region lay north of the equator from the area north of Papua New Guinea extending east across much of the Pacific. Another region extended east, south of the equator, from about Tokelau towards the Marquesas Islands. The SPCZ was displaced much further southwest than average, extending from the Coral Sea southeast toward New Caledonia. This pattern was similar to that of March, with enhanced convection and/or above average rainfall over Papua New Guinea, the northeastern seaboard of Australia, the northwest of the Solomon Islands, and some areas of New Caledonia, the Northern Cook Islands, and the Marquesas Islands.

Rainfall was at least 150% of average in Niue and much of northern New Zealand. Mixed rainfall anomalies occurred in New Caledonia, Tonga, and French Polynesia.

A region of suppressed convection affected Nauru, Western and Eastern Kiribati, extending to Tuvalu, Vanuatu, Fiji, Southern Tonga, Niue, the Southern Cook Islands, the Society Islands, and Pitcairn Island, with below average rainfall in many areas.

Mean air temperatures were at least 1.0 °C above average in parts of New Caledonia, and more than 1.5 °C above average in parts of Tonga.

Southwest Pacific mean sea-level pressures were above average south of the Cook Islands, and below average

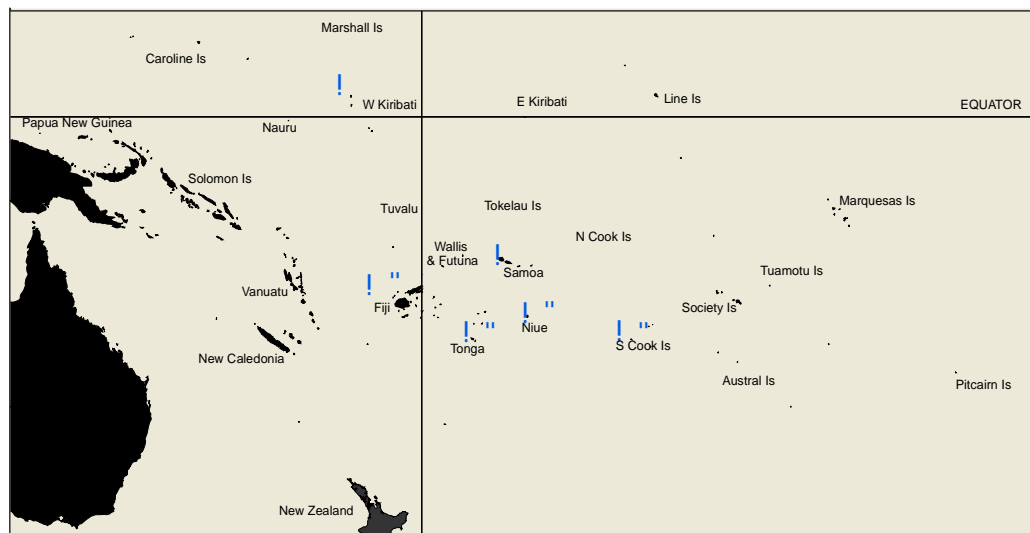


Outgoing Long-wave Radiation (OLR) anomalies, in  $Wm^{-2}$  (blue equals high rainfall and yellow equals low rainfall). The April 2006 position of the SPCZ, as identified from total rainfall, is indicated by the solid green line. The average position of the SPCZ is identified by the dashed green line. The April position of ITCZ is identified by the solid blue line.

over northern French Polynesia. Equatorial surface easterlies continued to be very persistent along the equator, occurring in 99% of observations at Tarawa.

Country	Location	Mean Air Temp. °C	Dep. from average	Comments
New Caledonia	La Tontouta	25.5	+1.3	Well above average
New Caledonia	Noumea	25.7	+1.2	Well above average
New Caledonia	Moue	25.1	+1.1	Well above average
Tonga	Ha'apai	27.8	+1.6	Extremely high
Tonga	Fua'amotu Airport	26.9	+1.6	Record high

## Soil moisture in April 2006



- Dry conditions April 2005
- Wet conditions April 2005
- Dry conditions April 2006
- Wet conditions April 2006

Estimated soil moisture conditions at the end of April 2006, using monthly rainfall data.

Estimates of soil moisture shown in the map (above) are based on monthly rainfall for one station in each country. Currently there are not many sites in the water balance model. It is planned to include more stations in the future.

The information displayed is based on a simple water balance technique to determine soil moisture levels. Addition of moisture to available water already in the soil occurs by rainfall with losses via evapotranspiration. Monthly rainfall and evapotranspiration is used to determine the soil moisture level and its changes.

Please note that these soil moisture calculations are made at the end of the month. For practical purposes, generalisations were made about the available water capacity of the soils at each site.

At the end of April, all sites – Tarawa, Nadi, Apia, Nuku'alofa, Hanan, and Rarotonga in the water balance model were at full soil moisture capacity. All sites had similar soil conditions at the same time last year. Data are not available to show conditions for the same time last year for Apia and Tarawa.

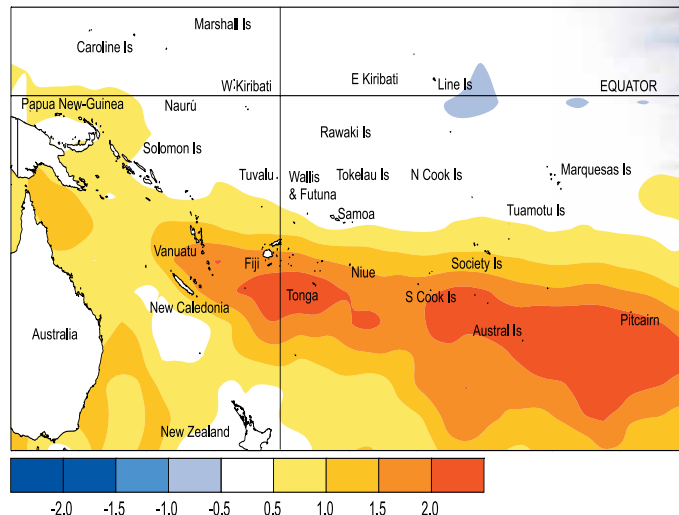
## El Niño/Southern Oscillation (ENSO)

The tropical Pacific has returned to a neutral state, although it still exhibits some weak La Niña anomalies. Equatorial Pacific sea surface temperature (SST) anomalies are close to zero, except near South America where cool anomalies have emerged.

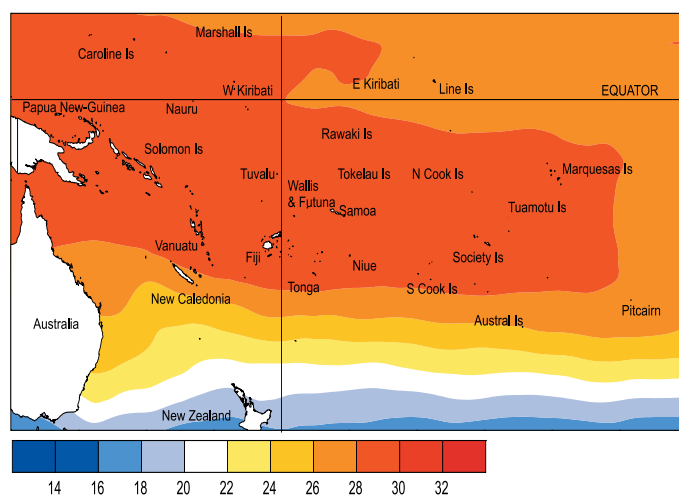
For April, the NINO3 SST anomaly was around +0.3 °C (-0.1 °C for February–April) and NINO4 was near 0.0 °C (-0.4 °C for February–April). The region of negative subsurface temperature anomaly in the eastern Equatorial Pacific has contracted and all but disappeared. There is a small cold pool near 110 °W (1 °C below average).

Conversely, the Southern Oscillation Index (SOI) was +1.7 for April and the February–April 3-month mean was +0.9. Stronger than normal easterly winds occurred west of the Date Line, and patterns of convection in April remained consistent with La Niña conditions. The NASA ENSO precipitation index for April was -1.2 (negative values are indicative of La Niña). Convection in April was strongly enhanced over Indonesia and northern Australia (with tropical cyclone activity near Darwin), and the SPCZ shows a southwards displacement. Convection was suppressed near the Date Line and the “double ITCZ” persisted between the Date Line and 90 °W. The Madden–Julian Oscillation showed renewed activity during the first week of April, but then weakened.

All ENSO forecast models are in the neutral range for May–July 2006. The Scripps model is forecasting the previously cold conditions to be replaced by mild warm conditions (weak El Niño) by the end of 2006. The International Research Institute for Climate and Society (IRI) April summary gives a 75% chance of neutral conditions through June.



Sea surface temperature anomalies (°C) for April 2006.



Mean sea surface temperatures (°C) for April 2006.

## Tropical cyclones

There have been eight tropical cyclones to date in the Southwest Pacific (including the region west of latitude 150°E). The most severe tropical cyclone this season occurred over 17–24 April. ‘Monica’ originated south of Papua New Guinea, and tracked west over Australia’s Cape York Peninsula, over the Gulf of Carpentaria, and toward Darwin. ‘Monica’ was one of the most intense tropical cyclones ever seen in Australia waters, and strongest on record to affect Australia’s Northern Territory, with estimated maximum sustained wind speeds reaching 250–290 km/h, with gusts to 350 km/h.

Please visit <http://www.bom.gov.au/announcements/sevwx/nt/nitc20060417.shtml> for more detail on Tropical Cyclone Monica.

In the Southwest Pacific, there is on average less than one tropical cyclone every three years in May. The June issue of the ICU will provide a summary of the southwest Pacific 2005–06 tropical cyclone season.

## Forecast validation: February to April 2006

Suppressed convection with below average rainfall was expected in the equatorial region of Western and Eastern Kiribati, with near or below average rainfall from Tuvalu east to the Marquesas Islands. A large region of near or above average rainfall was expected over Fiji east to the Austral Islands, including Tonga, Niue, the Northern and Southern Cook Islands, and the Society Islands. Near average rainfall is expected elsewhere in the region.

Areas of enhanced convection and above average rainfall affected Samoa, parts of Tonga, Niue, and the Austral and Marquesas Islands. Suppressed convection or below average rainfall occurred over Western Kiribati, Tuvalu, and the Tuamotu Islands. Rainfall was higher than expected in Eastern Kiribati, Samoa, and Niue, and lower than forecast in parts of Fiji. The ‘hit’ rate for the February–April 2006 outlook was about 70%.

## Tropical Pacific rainfall – April 2006

Territory and station name	April 2006 rainfall total (mm)	April 2006 percent of average
<b>Australia</b>		
Cairns Airport	644.8	339
Townsville Airport	204.6	330
Brisbane Airport	15.2	17
Sydney Airport	10.6	11
<b>Cook Islands</b>		
Penrhyn	219.2	108
Rarotonga EWS	170.4	81
<b>Fiji</b>		
Rotuma	93.0	32
Udu Point	370.6	134
Nadi	114.2	71
Nausori	264.2	74
Ono-I-Lau	196.8	125
<b>French Polynesia</b>		
Hiva Hoa, Atuona	189.4	109
Tahiti - Faa'a	229.2	199
Tuamotu, Takaroa	40.6	34
Gambier, Rikitea	192.6	128
Tubuai	125.8	69
Rapa	269.8	116
<b>Kiribati</b>		
Christmas Is/Kiritimati	198.1	114
Butaritari	400.9	130
Tarawa	148.8	76
Kanton Is	144.6	120
<b>Niue</b>		
Hanan Airport	373.1	166
<b>New Zealand</b>		
Kaitaia	169.3	178

Territory and station name	April 2006 rainfall total (mm)	April 2006 percent of average
<b>New Zealand</b>		
Whangarei Airport	163.2	139
Auckland Airport	158.4	167
<b>New Caledonia</b>		
Ile Art, Belep	67.2	38
Koumac	111.4	159
Ouloup	125.6	126
Ouanaham	126.6	85
Poindimie	132.2	57
La Roche	178.2	131
La Tontouta	89.2	124
Noumea	99.2	87
Moue	92.8	72
<b>North Tasman</b>		
Lord Howe Island	249.2	154
Norfolk Island	153.2	109
Raoul Island	176.4	173
<b>Samoa</b>		
Apia	185.7	103
Faleolo	144.5	65
<b>Tonga</b>		
Lupepau'u	339.1	162
Salote Airport	181.2	95
Fua'amotu Airport	356.6	224
<b>Tuvalu</b>		
Nanumea	112.7	47
Nui Island	45.2	19
Funafuti	58.8	22
Nuilakita	77.0	32

Rainfall totalling 200 percent or more is considered well above average. Totals of 40 percent or less are normally well below average. **Highlighted values are new records.**

Data are published as received and may be subject to change after undergoing quality control checks.

## Tropical rainfall outlook: May to July 2006

Although equatorial SSTs have returned to a neutral ENSO state, there is a lag in atmospheric conditions and rainfall in the southwest Pacific region still depicts La Niña like patterns.

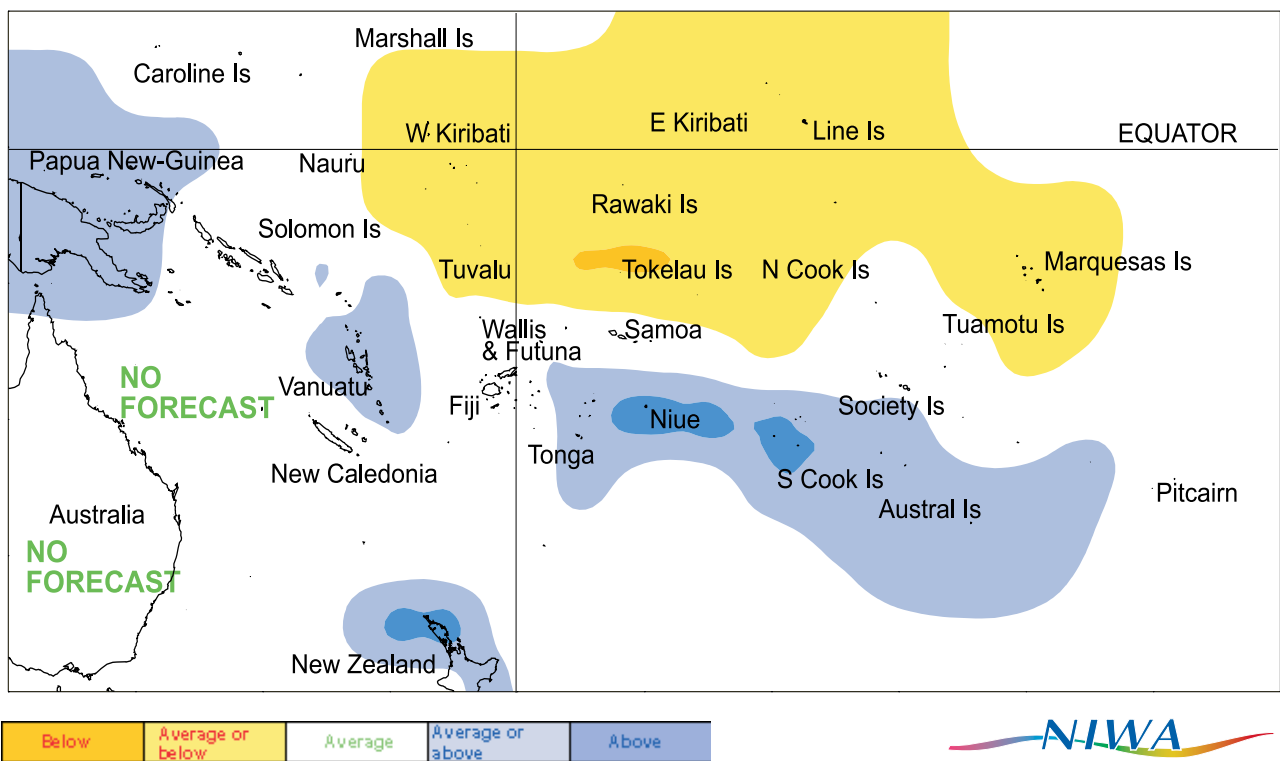
Enhanced convection is expected over Niue and the Southern Cook Islands, where rainfall is expected to be above average. A large region of near or above average rainfall is expected from Papua New Guinea extending eastwards to the Austral Islands, including Vanuatu, Tonga, and the Society Islands.

Suppressed convection is likely over Tokelau, where rainfall is forecast to be below average. Near or below average rainfall is expected in the equatorial region of Western Kiribati east to the Marquesas Islands, including Eastern Kiribati, Tuvalu, and the Northern Cook Islands.

As the tropical cyclone season ends and the dry season approaches, the rainfall forecast model skills are expected to be in the low to moderate range.

Island group	Rainfall outlook	Outlook confidence
Niue	15:30:55 (Above average)	Moderate
Southern Cook Islands	15:35:50 (Above average)	Moderate
Papua New Guinea	10:40:50 (Near or above average)	Moderate
Vanuatu	15:40:45 (Near or above average)	Moderate
Tonga	15:40:45 (Near or above average)	Low – moderate
Society Islands	20:40:40 (Near or above average)	Low – moderate
Austral Islands	20:40:40 (Near or above average)	Low – moderate
Solomon Islands	20:45:35 (Near average)	Low
New Caledonia	25:40:35 (Near average)	Low
Wallis & Futuna	25:50:25 (Near average)	Moderate
Fiji	25:45:30 (Near average)	Low – moderate
Samoa	25:50:25 (Near average)	Moderate
Tuamotu Islands	30:40:30 (Near average)	Low – moderate
Pitcairn Island	20:50:30 (Near average)	Moderate
Western Kiribati	40:40:20 (Near or below average)	Low
Eastern Kiribati	45:40:15 (Near or below average)	Low – moderate
Tuvalu	40:40:20 (Near or below average)	Low – moderate
Northern Cook Islands	45:40:15 (Near or below average)	Low – moderate
Marquesas Islands	40:40:20 (Near or below average)	Low – moderate
Tokelau	55:25:20 (Below average)	Moderate

NOTE: Rainfall estimates for Pacific Islands for the next three months are given in the 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.



Rainfall outlook map for May to July 2006.

# Update on Pacific Islands rainfall outlook

S Burgess, NIWA

There have now been more than 60 seasonal rainfall outlooks issued for the Southwest Pacific through the ICU. Validation of these enables us to accurately assess how the forecasts have been progressing over the past five years. Figure 1 indicates how often the forecasts have been correct, in a categorical sense. The forecast category (below average, average or below, average, average or above, or above average) is taken to be that assigned the highest probability. The shaded areas on the map show the percentage frequency of correct forecasts (or the "hit" rate). The overall hit rate is equivalent to the percentage frequency of correct forecasts. This method provides a good indication of our skill over the period, whilst being reasonably simple to interpret.

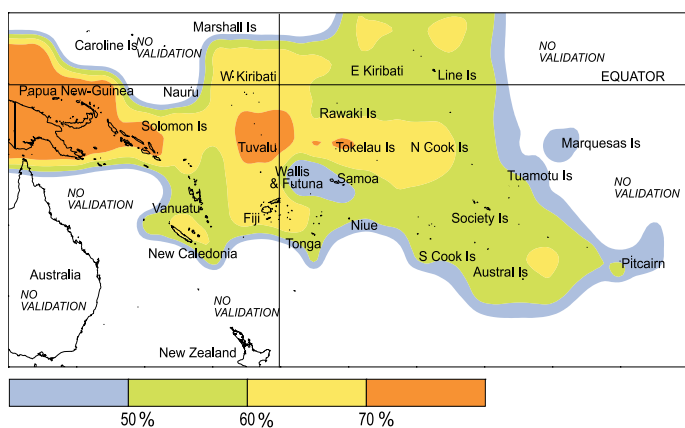


Figure 1. Frequency of correct 3-month rainfall outlooks. A score of 100 would mean that all were correct.

Since our earlier analyses (see ICU issues Nos. 11 and 33), the hit rate has been above 50% over much of our Southwest Pacific forecast area. The highest skill (> 70%) has occurred between latitudes 5 - 10 °S and west of about 165 °W. This region includes Papua New Guinea, the Solomon Islands, Tuvalu, and Tokelau. In contrast, scores have been much lower in Northern French Polynesia, and also the Wallis and Futuna – Western Samoa region. The area near Wallis and Futuna and Western Samoa is constantly in the transition zone for SPCZ-related rainfall, making it a more difficult region for seasonal rainfall prediction.

Over the entire time period (see Figure 2), the average hit rate for the total forecast region has ranged between about 35 and 80% throughout the period, with an overall mean of about 60%. If the forecasts were random, they would be correct about half the time on average. Overall, analysis of the statistics from over 60 rainfall outlooks overall shows that hit rates have exceeded 50% in most of (73%) forecasts, indicating about 10% more skill than "chance" of climatology. Inspection of the time series with the Southern Oscillation Index shows that the highest hit rates were achieved in the two La Niña periods. Skill during the weak El Niño and neutral episodes varied.

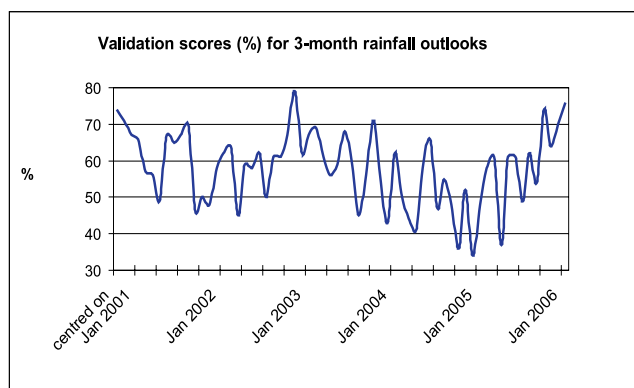


Figure 2. Validation scores for 64 (3-month) rainfall outlooks. This chart shows the percentage of correct forecasts. Scores of 60% or more indicate significantly better outcomes than chance.

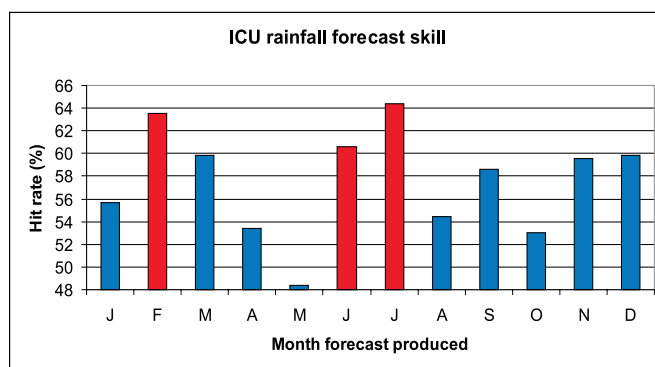


Figure 3. ICU rainfall forecast skill, by month. Forecasts issued in February, June, and July have the highest skill.

**The Island Climate Update**

Visit The Island Climate Update at: [www.niwascience.co.nz/ncc/icu](http://www.niwascience.co.nz/ncc/icu)

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 Island, Samoa, Solomon Islands, Tokelau, Tonga, Tuvalu, Vanuatu**

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NIWA

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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 National Meteorological Services (NMHS). 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 content.

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Requests for Pacific Island climate data should be directed to the Meteorological Services concerned.