

# The Island Climate Update

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## January's climate

- South Pacific Convergence Zone (SPCZ) further north and east than normal, with enhanced convection north of the Solomon Islands, southeast to Central French Polynesia; wet in Western Kiribati, and Central and Southern French Polynesia
- Suppressed convection with low rainfall over Niue, Tonga, and the Coral Sea
- Warmer than normal throughout Tonga and French Polynesia, cooler in New Caledonia
- Two tropical cyclones in January; four so far this season

## El Niño/Southern Oscillation (ENSO) and seasonal rainfall forecasts

- The El Niño is expected to wane over the coming months
- Below average rainfall expected over New Caledonia



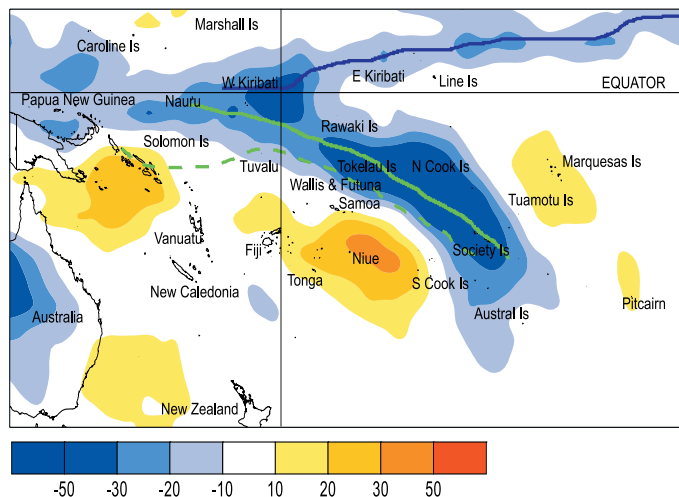
## Climate developments in January 2007

The South Pacific Convergence Zone (SPCZ) was located further north and east of its normal location in January, which is characteristic during an El Niño. Enhanced convection occurred extending from the region north of the Solomon Islands, southeast to Central French Polynesia, including Nauru, Tokelau, and the Northern Cook Islands. The Inter-Tropical Convergence Zone (ITCZ) continued to be more active than normal north of the Equator. A region of suppressed convection and low rainfall existed south of the SPCZ, centred near Niue, extending over Tonga and toward the Southern Cook Islands. Another region of suppressed convection occurred in the Coral, extending over the Solomon Islands.

January rainfall was 25% or less of normal throughout Tonga and Niue, as well as on Lord Howe Island, and Raoul Island. Rainfall was also low, being 50% or less of normal, in parts of New Caledonia (especially in the west), Fiji, and the Marquesas Islands. In contrast, rainfall was above average (at least 150% of normal) in parts of Western Kiribati, the Northern Cook Islands, and Central French Polynesia (as much as 450 mm in 10 days at Tahiti-Faaa) and Southern French Polynesia. Rainfall in the last 8 month period has only been about 50% of normal in parts of New Caledonia.

January mean air temperatures were about 1.0 °C above average north of Fiji, 0.5 °C or more above average throughout much of Tonga and French Polynesia, and 0.5 °C below average throughout much of New Caledonia.

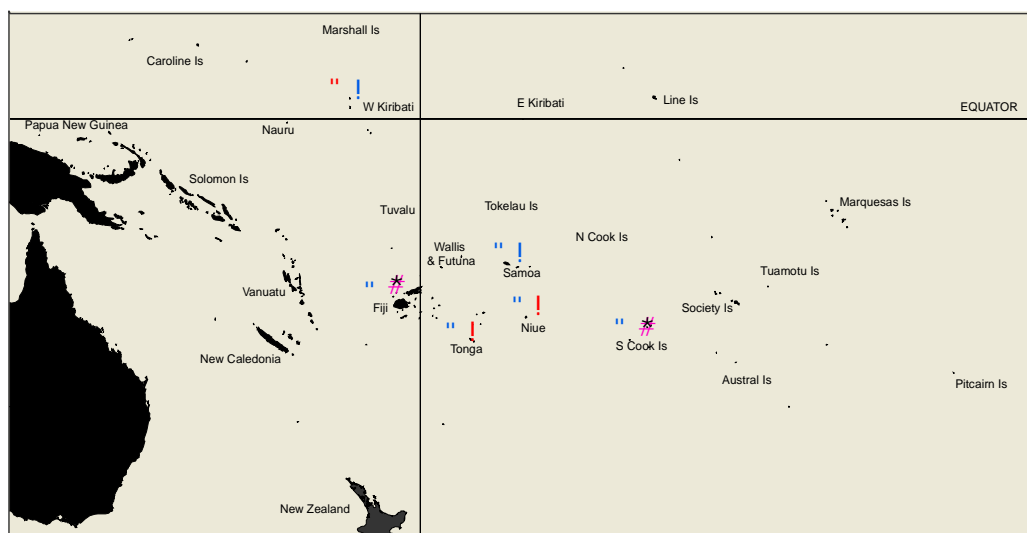
Tropical Southwest Pacific mean sea-level pressures were above average in the North Tasman Sea, and tended to be below average in the tropics areas east of the Date Line, with a -3 hPa anomaly centred near the Cook Islands, enhancing southeasterlies over Tonga. Equatorial surface westerlies were only sporadic in January, occurring in about 5% of observations at Tarawa, 10% less than December, and about 25% less than November.



Outgoing Long-wave Radiation (OLR) anomalies, in  $Wm^{-2}$  (blue equals high rainfall and yellow equals low rainfall). The January 2007 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 January 2007 ITCZ is identified by the solid blue line.

Country	Location	Rainfall (mm)	% of average	Comments
Fiji	Nausori	102	28	Extremely low
Niue	Liku	43	17	Extremely low
Tonga	Lupepau'u	71	25	Well below normal
Tonga	Ha'apai	13	8	Extremely low
Australia	Lord Howe Island	18	16	Well below normal
New Zealand	Raoul Island	20	15	Well below normal
Cook Islands	Penryhn	680	262	2 <sup>nd</sup> highest for January
French Polynesia	Tahiti-Faaa	665	244	Well above normal

## Soil moisture in January 2007



January 2007

- ! Dry
- ! Wet
- \* Moderate

January 2006

- ! Dry
- ! Wet
- \* Moderate

Estimated soil moisture conditions at the end of January 2007, 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 comes from rainfall with losses via evapotranspiration. Monthly rainfall and evapotranspiration are 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 January 2007, Fua'amotu and Hanan soils were relatively dry soil while Apia and Tarawa soils were at field capacity (full). Nadi and Rarotonga soil moisture levels were moderate.

## El Niño/Southern Oscillation (ENSO)

The current El Niño episode in the tropical Pacific is weakening rapidly. Conditions are expected to return to neutral over the coming months.

Sea surface temperature anomalies near the Date Line and in the eastern Pacific peaked in early December. The NINO3 and NINO4 anomalies were +1.1°C and +1.0°C respectively in January (down from +1.5°C and +1.3°C in December), with the respective November–January 3-month means +1.3°C and +1.2°C.

Easterly trade winds returned briefly to near normal strength at the Date Line at the end of December, hastening the decline of equatorial sea temperatures, and contributing to the rapid eastward movement of a cold sub-surface anomaly.

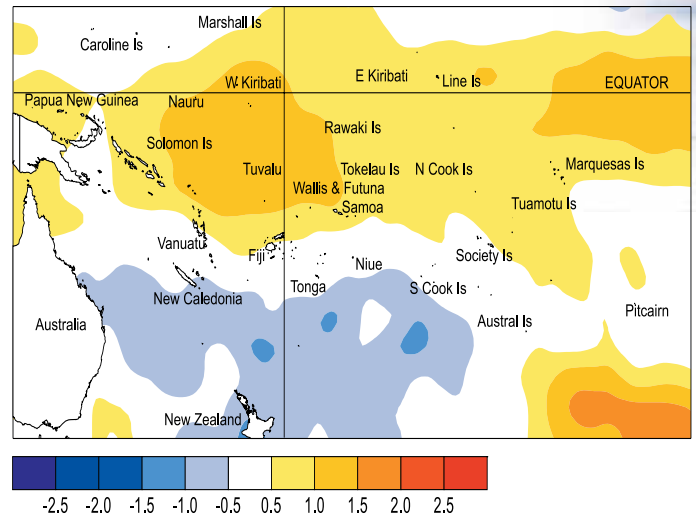
The sub-surface warming along the Equatorial thermocline weakened substantially during January and is now confined mainly to the top 75 metres east of 130°W, whilst the cold anomaly at 150 metres depth has reached 140°W. However, the easterlies weakened again in January, with enhanced Madden-Julian Oscillation (MJO) activity, and this might halt any further immediate decline of tropical Pacific sea surface temperatures.

The Southern Oscillation Index (SOI) showed little change with a value of -0.8 in January (-0.5 in December), with the 3-month mean at -0.5.

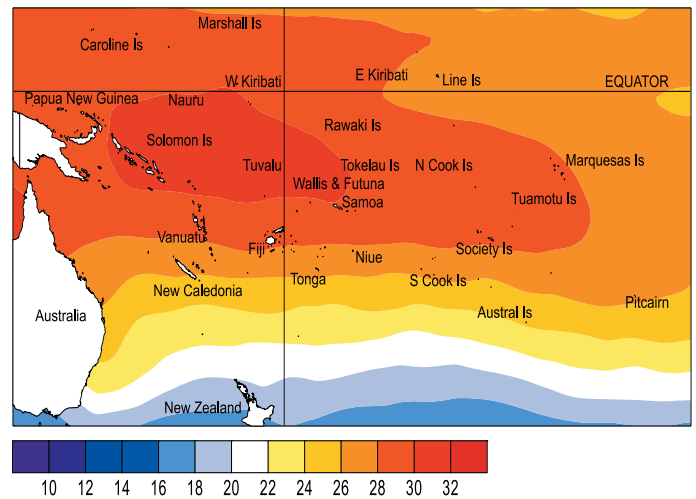
OLR and tropical rainfall anomalies continue to show enhanced convection east of the Date Line in the Intertropical Convergence Zone and also, this month, enhanced activity in the South Pacific Convergence Zone at 10°S, 160°W.

The focus of anomalous warmth near the Date Line may still generate increased convection for a month or two, leading to the persistence of the classical OLR-ENSO dipole. However, the intensity of the dipole should weaken as El Niño decays.

Most ENSO forecast models show a persistence of El Niño conditions through the February–April 2007 forecast period, but further weakening to a neutral state by the end



Sea surface temperature anomalies (°C) for January 2007.



Mean sea surface temperatures (°C) for January 2007

of autumn (May). The IRI synthesis of international models gives a 75% chance of maintaining El Niño conditions through the February–April period, but by April–June the probability of neutral conditions (52%) exceeds that of an El Niño (40%). NCEP (8 February statement) predict a transition from weak El Niño conditions to ENSO neutral conditions through March–May 2007.

## Forecast validation: November 2006 to January 2007

Suppressed convection, with below average rainfall was expected over Papua New Guinea and New Caledonia, as well as the Tuamotu and Marquesas Islands, with average or below average rainfall from the Solomon Islands southeast to the Southern Cook Islands, including Vanuatu, Fiji, Tonga, and Niue. Enhanced convection and above average rainfall was forecast for Western and Eastern Kiribati, Tuvalu, and Tokelau, with areas of near or above average rainfall over Wallis and Futuna, Samoa, and the Northern Cook Islands, as well as Pitcairn Island. Near average rainfall was expected in the Society and Austral Islands.

Enhanced convection and/or above average rainfall affected Western Kiribati (near and west of the Dateline), extending well east north of the Equator (within the ITCZ Zone). Suppressed convection and/or below average rainfall occurred in the Coral Sea and over New Caledonia, as well as Fiji, Tonga, Niue, the Northern Cook Islands, and Northern French Polynesia. Seasonal rainfall anomalies turned out as forecast for many Islands. Rainfall was lower than expected in Eastern Kiribati, Tuvalu, and Tokelau, the convective region being slightly further north than forecast. The 'hit' rate for the November 2006 - January 2007 outlook was about 65%.

## Tropical cyclones

Two named tropical cyclones occurred in the Southwest Pacific in January, being Zita from the 23rd-24th \*, and Arthur from the 24th-26th. This brings the total to four so far this season, for the region east of 150°E.

Tropical cyclone Zita's estimated maximum sustained wind speeds reached 50 knots on the 23rd near the Austral Islands, with damage reported in some areas. Arthurs's estimated maximum sustained wind speeds reached 65 knots on the 25th between the Southern Cook Islands and Central French Polynesia. Further south, in the Austral Islands, mean speeds of 45 knots with gusts to 62 knots and minor damage were reported. Tropical cyclone Nelson was active from 6-7 February in the Australian region (west of 150°W) tracking east from the Gulf of Carpentaria, with estimated mean speeds reaching 45 knots.

The present characteristics of the El Niño affecting in the Pacific still indicate that at least on average number of tropical cyclones may occur in several parts of the South Pacific near and east of the Date Line for the complete season, with a normal rate of occurrence in Islands west of the Date Line. Future issues of the ICU will provide updates on information relating to further occurrences of tropical cyclones in the region.

\* Dates in GMT

## Tropical Pacific rainfall – January 2007

Territory and station name	January 2007 rainfall total (mm)	January 2007 percent of average
<b>Australia</b>		
Cairns Airport	184.6	47
Townsville Airport	270.6	100
Brisbane Airport	102.2	65
Sydney Airport	45.2	45
<b>Cook Islands</b>		
Penrhyn	680.0	262
Rarotonga Airport	161.7	72
Rarotonga EWS	124.6	55
<b>Fiji</b>		
Rotuma	192.7	54
Udu Point	129.6	41
Nadi	110.1	32
Nausori	101.7	28
Ono-I-Lau	61.2	34
<b>French Polynesia</b>		
Hiva Hoa, Atuona	67.6	43
Bora Bora Motu	411.0	166
Tahiti - Faa'a	665.4	244
Tuamotu, Takaroa	129.8	68
Gambier, Rikitea	120.0	82
Tubuai	357.0	176
Rapa	420.2	176
<b>Niue</b>		
Liku	43.0	17
Hanan	68.6	20

Territory and station name	January 2007 rainfall total (mm)	January 2007 percent of average
<b>New Zealand</b>		
Kaitaia	108.5	132
Whangarei Airport	61.6	73
Auckland Airport	59.8	89
<b>New Caledonia</b>		
Ile Art, Belep	58.8	25
Koumac	54.8	31
Ouloup	143.6	81
Ouanaham	133.8	68
Poindimie	289.8	77
La Roche	105.2	60
La Tontouta	29.8	25
Noumea	49.2	42
Moue	131.0	70
<b>North Tasman</b>		
Lord Howe Island	18.2	16
Norfolk Island	98.8	109
Raoul Island	20.0	15
<b>Samoa</b>		
Faleolo	327.4	84
Apia	578.0	125
<b>Tonga</b>		
Lupepau'u	70.7	25
Salote Pilolevu	12.6	8
Nuku'alofa	31.7	18
Fua'amotu Airport	19.1	10

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: February to April 2007

Even though the El Niño event has weakened in the tropical Pacific, its impact on rainfall in the Pacific region is expected to continue over the coming months.

Enhanced convection is expected over Western and Eastern Kiribati, Tuvalu, Wallis and Futuna, Tokelau, and the Northern Cook Islands.

Near or above rainfall is likely over Society Islands, Solomon Islands, Southern Cook Islands, and the Austral Islands.

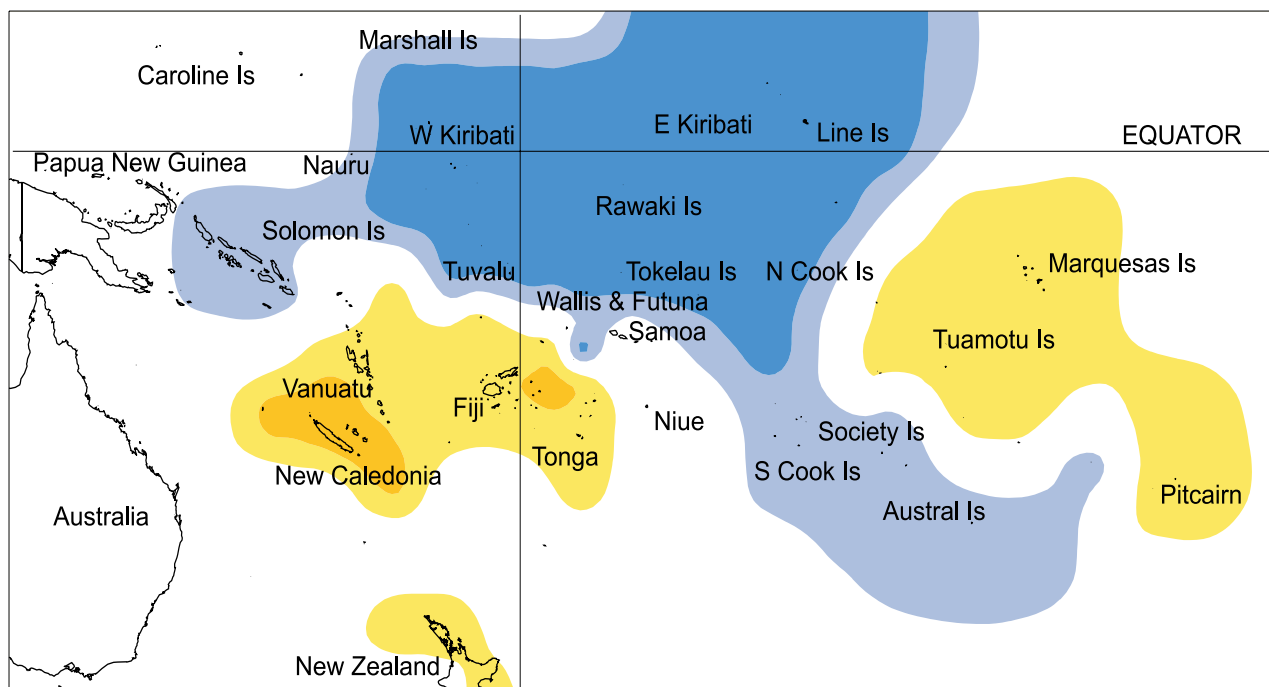
Suppressed convection with near or below average rainfall is expected over Vanuatu, Fiji, Tonga, Tuamotu Islands, Marquesas Islands, and Pitcairn Island. Below average rainfall likely for New Caledonia.

Near average rainfall is forecast for Papua New Guinea, Samoa, and Niue.

Based on the current ENSO conditions and predicability barrier, the forecast model skill for this is time of the year is between low and moderate.

Island group	Rainfall outlook	Outlook confidence
Western Kiribati	20:35:45 (Above)	Moderate
Eastern Kiribati	20:35:45 (Above)	Moderate
Tuvalu	20:35:45 (Above)	Moderate
Wallis and Futuna	20:35:45 (Above)	Moderate
Tokelau	20:35:45 (Above)	Moderate
Northern Cook Islands	20:35:45 (Above)	Moderate
Society Islands	20:40:40 (Near or above)	Moderate
Solomon Islands	20:40:40 (Near or above)	Moderate
Southern Cook Islands	20:40:40 (Near or above)	Moderate
Austral Islands	20:40:40 (Near or above)	Moderate
Papua New Guinea	20:45:35 (Near average)	Moderate
Samoa	35:40:25 (Near average)	Moderate
Niue	35:45:20 (Near average)	Moderate
Vanuatu	40:40:20 (Near or below)	Moderate
Fiji	40:40:20 (Near or below)	Low – moderate
Tonga	40:40:20 (Near or below)	Moderate
Tuamotu Islands	40:40:20 (Near or below)	Moderate
Marquesas Islands	40:40:20 (Near or below)	Moderate
Pitcairn Island	40:40:20 (Near or below)	Moderate
New Caledonia	40:35:25 (Below)	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 February to April 2007.

# The Southwest Pacific climate in 2006

## Stuart Burgess and Dr Jim Salinger, NIWA



This year saw a change from a La Niña to an El Niño climate pattern in the Pacific. The first quarter of the year was dominated by weak La Niña-like (cold episode) characteristics, followed by a neutral period. Weak to moderate El Niño conditions were in place by September, which peaked in December (Fig.1). A higher frequency of surface equatorial westerlies occurred near the Date Line from August through November (the highest persistence since the 2002 El Niño event). Trade winds generally were near normal in strength at other times of the year. There was also a La Niña-like influence on the location of the South Pacific Convergence Zone (SPCZ) which was further south than usual from January through May. It was near its normal location throughout much of the remainder of the year. Below average equatorial sea surface temperatures (SSTs) occurred around Western and Eastern Kiribati with the cold episode (-1 °C anomalies), returning to normal by April. These warmed to a constant +1.5 °C above average from August/September onwards. Negative SST anomalies occurred around New Caledonia from August through December, being more than 1 °C below average in October. From January through June outgoing long-wave radiation (OLR) anomalies showed enhanced convection over the Solomon Islands and Papua New Guinea. Suppressed convection occurred over Western and Eastern Kiribati from January through May, with a reversal to enhanced convection from August through December. Mean sea level pressures were below average east of the Date Line. However, positive anomalies prevailed in the western Pacific over Australia and the Tasman Sea from May onwards.

For 2006, above average SSTs occurred throughout much of the tropical Southwest Pacific (Fig. 2). These were at least +0.7 °C above average throughout Central and Southern French Polynesia, the Southern Cook Islands and Pitcairn Island. SSTs were at least +0.5 °C above average in many other tropical island nations, and near average between Papua New Guinea and New Zealand, including New Caledonia.

Southwest Pacific island surface air temperature anomalies for 2006 were consistent with the SST anomalies. It was an extremely warm year in Fua'amotu, Tonga (warmest since measurements commenced in 1980) and Tahiti-Faaa, with mean temperatures of 24.6 and 26.9°C, 0.8 °C and 0.7°C respectively above average.

2006 OLR anomalies (Fig.3) showed a region of enhanced convection over Papua New Guinea, extending southeast to the Solomon Islands and northern part of Vanuatu. Enhanced convection also occurred over Niue and the Southern Cook Islands. Convection was suppressed in a horse-shoe like pattern over Eastern Kiribati and parts of Western Kiribati, extending to the Northern Cook Islands and southeast over the Tuamotu Islands of French Polynesia to Pitcairn Island.

The year's rainfall anomalies were similar to those of the OLR, with above average (at least 110% of normal) rainfall over the much of the Solomon Islands, northern Vanuatu, Niue and the Southern Cook Islands, and parts of central and southern French Polynesia. Rainfall was below average (less than 90% of normal) in the North Tasman and over New Caledonia, and parts of Eastern Kiribati and the Northern Cook Islands. One location, Rotuma Island, Fiji, recorded an extremely high 2006 rainfall of 4378 mm (128% of normal). Two locations recorded well below average annual totals. These were Noumea, New Caledonia, with 735 mm (75% of normal), and Raoul Island, New Zealand, with 948 mm (61% of normal).

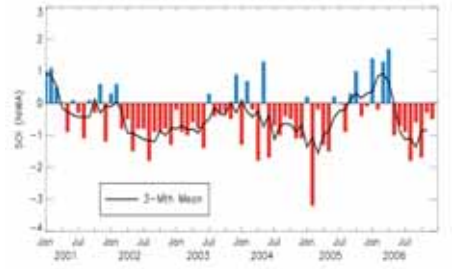


Figure 1. The Southern Oscillation Index (SOI). The index displayed briefly positive values for the first four months then trended negative into the weak-moderate El Niño range during the second half of 2006.

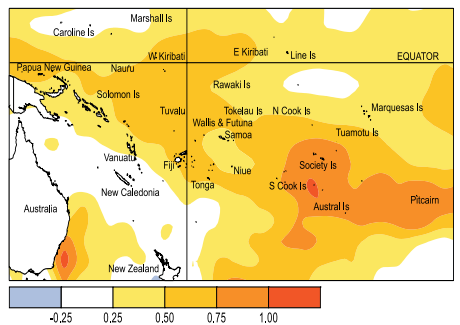


Figure 2: Sea Surface temperature (SST) anomalies (departure from average, °C). Yellow or orange areas represent a warmer than average sea surface.

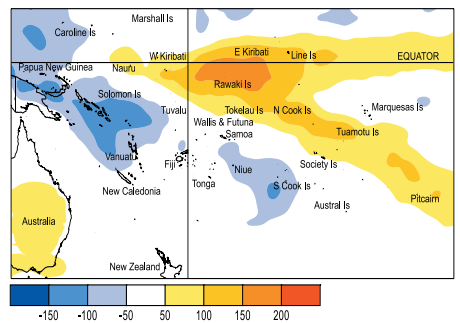


Figure 3. Outgoing Long-wave Radiation (OLR) anomalies (departure from average), in Wm-2 are represented by coloured areas. High radiation levels (yellow or orange) are typically associated with clearer skies and lower rainfall, while cloudy conditions lower the OLR (blue) and typically mean higher rainfall.

### The Island Climate Update

Cover Photo:  
Wendy St George,  
NIWA

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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, Wallis and Futuna**

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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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