

The Island Climate Update

December's climate

- The South Pacific Convergence Zone (SPCZ) was displaced slightly southwest of normal near the Solomon Islands.
- Suppressed convection in the central part of the Southwest Pacific near the Northern Cook Islands and French Polynesia.
- Mostly well below normal rainfall for many parts of New Caledonia and the North Tasman region.

Collaborators

Pacific Islands National
Meteorological Services

Australian Bureau of
Meteorology

Meteo France

NOAA National Weather
Service

NOAA Climate Prediction
Centre (CPC)

International Research
Institute for Climate and
Society

European Centre for
Medium Range Weather
Forecasts

UK Met Office

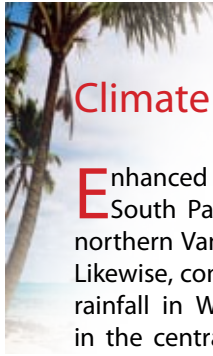
World Meteorological
Organization

MetService of
New Zealand

El Niño/Southern Oscillation (ENSO), seasonal rainfall, and sea surface temperature forecasts

- El Niño conditions exist in the equatorial Pacific. Many dynamical climate models project the continuation of El Niño into early autumn 2010.
- Below normal rainfall is forecast for the Marquesas, Fiji, Vanuatu, Niue, and Tonga.
- Above normal rainfall is expected for Western Kiribati, Eastern Kiribati, Tuvalu and the Society Islands.
- Above normal SSTs are forecast for Eastern Kiribati and Western Kiribati. Normal or above normal SSTs are forecast for the Northern Cook Islands, Tuvalu, Tokelau, and all of French Polynesia. SSTs are expected to be near or below normal around Fiji, Niue, Tonga and Pitcairn Island.





Climate developments in December 2009

Enhanced convection along a partially southwest displaced South Pacific Convergence Zone (SPCZ) were seen near northern Vanuatu and near Pitcairn Island during December. Likewise, convection along the Equator generated significant rainfall in Western Kiribati. Suppressed convection existed in the central portion of the southwest Pacific, particularly around the Northern Cook Islands and in French Polynesia. The regional circulation in December was characterised by more frequent low pressure in the northeast sector of French Polynesia, and higher than normal pressure to the northwest of New Zealand in the Tasman Sea. This pattern resulted in more frequent easterly and southeasterly anomalies across the much of southwest Pacific, except in the Marquesas. Some southerly flow entered the region from the east of New Zealand, and easterly anomalies were particularly evident across Fiji, Vanuatu, and New Caledonia.

Very high rainfall was recorded at only a few stations in the region this past month, either due to convection associated with the Intertropical Convergence Zone (ITCZ) or TC Mick. In Western Kiribati, 555mm (185% of normal) of rain fell during December at Tarawa, and this was a record high. It is the sixth month in a row with considerable rainfall at Tarawa. Positive rainfall anomalies in Western Kiribati are still more pronounced than in central and eastern parts of Kiribati. In Futuna, more than one meter of rainfall was recorded at Maopopo, with two consecutive days of having received 200mm or more. High rainfall was also recorded in Rotuma and northern Tonga due to TC Mick passing through during the middle of December.

Island Group	Location	Rainfall (mm)	% of avg	Comments
Futuna	Maopopo	1177	N/A	Highest total in the region
Western Kiribati	Tarawa	555	264	Record High
French Polynesia	Tuamotu	17	8	Record Low
Fiji	Rotuma	560	196	Very High
North Tasman	Norfolk	15	18	Very Low

Soil moisture in December 2009

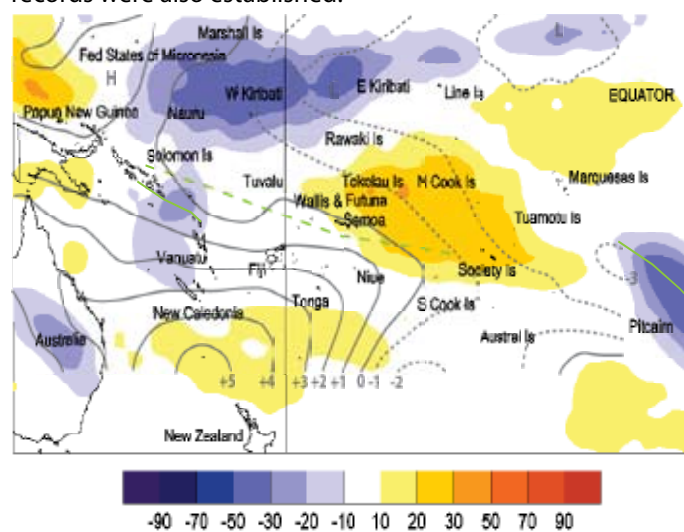
Estimates of soil moisture shown in the map (right) are based on monthly rainfall for one station in each country. Currently there are not many sites in the water balance model, but more stations will be included in the future.

The information displayed is based on a simple water balance technique to determine soil moisture levels. Addition of moisture to the 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. These soil moisture calculations were made at the end of the month, and for practical purposes, generalisations were made about the available water capacity of the soils at each site.

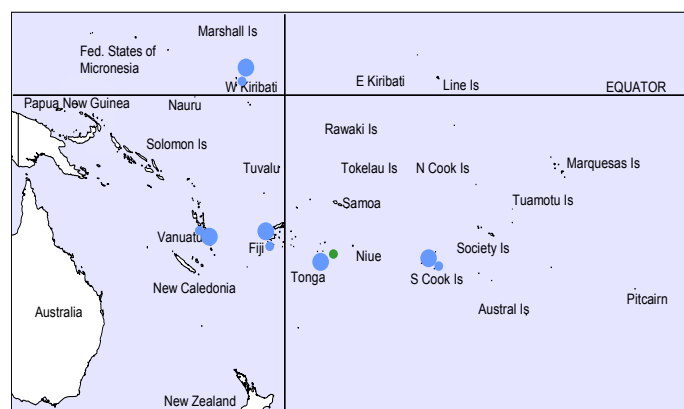
Aitutaki (Southern Cook Islands), Nadi (Fiji), and Fua'amotu (Tonga), Tarawa (Western Kiribati), and Vila (Vanuatu) project moist soil moisture at this time. It is important to note that the situation in Vanuatu and Fiji could change with continuation of El Niño.

As a whole, the regional rainfall developments were largely characterised by drier than normal conditions for many island groups as a result of the continuation and strengthening of El Niño during December. Well below normal rainfall occurred over most of Tuvalu, New Caledonia, and especially French Polynesia last month. Particularly dry conditions were observed in the Society Islands, Marquesas and Gambier with up to 25% of normal rainfall recorded in that area.

Warm conditions also affected all of French Polynesia during December, with anomalies of more than 2°C in Tahiti (the warmest December since 1957). Mean maximum monthly temperature (29°C) and a maximum daily temperature (33.2°C) records were also established.



Outgoing Long-wave Radiation (OLR) anomalies, in Wm^2 are represented by hatched areas. High radiation levels (yellow) are typically associated with clearer skies and lower rainfall, while cloudy conditions lower the OLR (blue) and typically result in higher rainfall. The December 2009 position of the South Pacific Convergence Zone (SPCZ) southwest of normal near the Solomon Islands, but was incoherent west of Fiji and slightly northeast of normal to the north of Pitcairn Island. The average SPCZ position is identified by the dashed green line, which is based on mean January rainfall for the South Pacific. Mean sea level (MSL) pressure anomalies (in hPa) are shown as solid and dashed black lines.



December 2009 December 2008

- Wet
- Moderate
- Dry

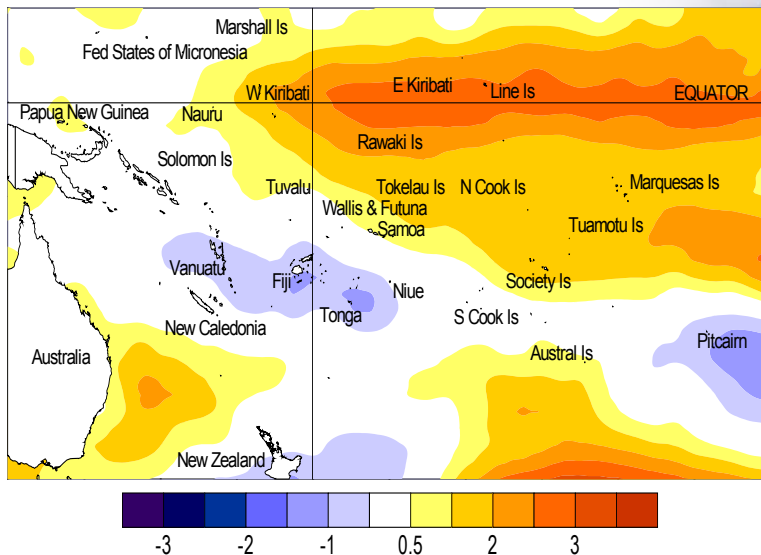
Estimated soil moisture conditions at the end of December 2009, using monthly rainfall data. Soil moisture projections for individual Pacific Island countries are dependent on data availability at the time of publication.

El Niño/Southern Oscillation (ENSO)

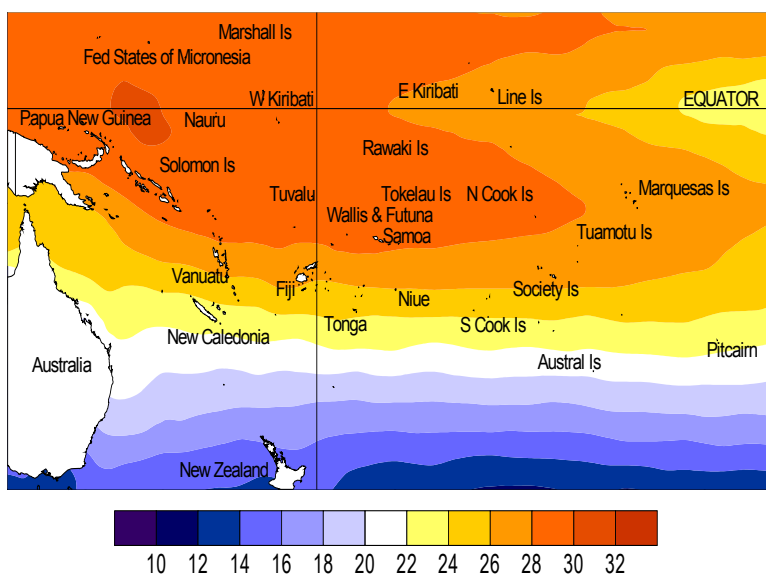
During December, El Niño conditions in the equatorial Pacific were well established. Equatorial sea surface temperature anomalies continued to increase in December, associated with continued Equatorial westerly wind anomalies. In December, the NINO3 SST anomaly was +1.8°C and the NINO4 anomaly was +1.5°C (3-month OND means were +1.5°C for both regions). Upper-ocean equatorial heat content anomalies are still strongly positive east of the Date Line, with a large positive subsurface temperature anomaly of above +4°C east of 130°W.

In the atmosphere, the SOI for December was -1.0 (OND mean -1.1), associated with positive zonal wind anomalies (weakened Trade Winds) across the western and central Equatorial Pacific. Tropical OLR anomalies in December were consistent with El Niño conditions, showing strongly enhanced convection centred near the Date Line, and suppressed convection over the Indonesian region (but not northern Australia). The TRMM ENSO precipitation index was +0.61 for the 30 days to 4 January. An MJO event got under way in mid-December and had propagated over the eastern Indian Ocean by early January. The event was expected to continue eastwards, with enhanced convection over Indonesia and northern Australia. The MJO influence may account for some weakening in the SOI.

The global climate model ensemble assessed by NIWA show all dynamical models (and all but one statistical model) forecasting warm conditions (El Niño) through to the end of March 2010, but all models show a weakening towards neutral conditions in Austral autumn. The NCEP ENSO discussion from 10 December suggests the El Niño is expected to persist into the southern autumn. The IRI summary (17 November) indicates a 98% probability of continued El Niño conditions through February, and above 90% through April.



Sea surface temperature anomalies (°C) for December 2009



Mean sea surface temperatures (°C) for December 2009

Tropical Cyclone guidance and activity: November 2009 to April 2010

Tropical cyclone (TC) "Mick" was the second TC to form in the Southwest Pacific region for the 2009/2010. The system originated from a weak area of low pressure northeast of Vanuatu, and gradually strengthened into a Tropical Depression on December 11. Mick was located 225 kilometres west of Rotuma when it became a TC, and accelerated south-southeast while intensifying into a Category 2 cyclone as it approached Fiji. At landfall, Mick had average winds estimated at 60 knots (110km/hr) and gusts of up to 90 knots (165km/hr). Heavy rainfall associated with TC Mick caused flooding over most low-lying areas of Viti Levu, and the damages have been estimated to cost over 25 million Fijian dollars. More details about TC Mick the 2009-10 TC outlook can be found at <http://www.niwa.co.nz/news-and-publications/news/all/tropical-cyclone-outlook-normal>

Forecast validation: October to December 2009

A region of suppressed convection was forecast for the southwest Pacific encompassing Niue, the Northern Cook Islands, Tonga, and Papua New Guinea. Near to below average rainfall was expected for all of those islands, except below average rainfall was forecast for Papua New Guinea. Near normal rainfall was forecast for the Austral Islands and Pitcairn Island. Enhanced convection was projected along the Equator extending from Western to Eastern Kiribati, and also near the Solomon Islands and Tuvalu. These regions were expected to receive near or above normal rainfall, with Western Kiribati forecast to receive above normal rainfall. No

clear precipitation guidance was offered for Vanuatu, Fiji, Tuamotu Archipelago, Samoa, Tokelau, the Southern Cook Islands, New Caledonia, Wallis and Futuna, and the Society Islands.

The October-December 2009 forecast validation was calculated for 10 island groups (ten Pacific Islands were forecast as climatology and were unscorable). The global island group 'hit' rate was 72%, 8% higher than average for October forecasts, and 11% higher than the average for all months combined. Rainfall was underprojected for Papua New Guinea. .

Tropical Pacific rainfall – December 2009

Territory and station name	December 2009 rainfall total (mm)	December 2009 percent of average	Territory and station name	December 2009 rainfall total (mm)	December 2009 percent of average
Australia			North Tasman		
Cairns Airport	76	41	Lord Howe Island	23	19
Townsville Airport	269	205	Norfolk Island	15	18
Brisbane Airport	172	137	Raoul Island	13	10
Sydney Airport	67	88	Samoa		
Cook Islands			Faleolo Airport	N/A	N/A
Penrhyn	75	23	Apia	N/A	N/A
Aitutaki	N/A	N/A	Nafanua	N/A	N/A
Rarotonga Airport	65	35	Afiamalu	N/A	N/A
Fiji			Alafua	N/A	N/A
Rotuma Island	560	196	Solomon Islands		
Udu Point	309	117	Taro	241	116
Nadi Airport	285	160	Munda	333	119
Nausori	220	83	Auki	226	79
French Polynesia			Honiara	72	32
Hiva Hoa, Atuona	25	25	Henderson	109	52
Bora Bora	110	41	Kira Kira	146	48
Tahiti – Faa'a	85	24	Santa Cruz, Lata	618	167
Tuamotu, Takarua	17	8	Tonga		
Gambier, Rikitea	84	40	Niufo'ou	431	159
Tubuai	207	114	Mata'aho Airport	N/A	N/A
Rapa	156	74	Lupepau'u	118	48
Kiribati			Salote Airport	56	36
Tarawa	555	264	Nuku'alofa	172	106
Kanton	224	236	Fua'amotu Airport	189	119
New Zealand			Tuvalu		
Kaitaia	28	29	Nanumea	259	75
Whangarei Airport	23	25	Nui Island	262	68
Auckland Airport	83	100	Funafuti	224	57
New Caledonia			Nuilakita	165	54
Ile Art, Belep	95	72	Vanuatu		
Koumac	22	22	Sola	437	113
Ouloup	34	24	Pekoa	175	65
Ouanaham	72	41	Lamap	161	104
Poindimie	187	83	Port Vila	N/A	N/A
La Roche	38	21	Tanna/Whitegrass	29	N/A
La Tontouta	16	22	Aneityum	169	100
Noumea	19	24	Papua New Guinea		
Moue	32	22	Port Moresby	44	35
Niue			Wewak	73	N/A
Hanan Airport	77	46	Kavieng	275	N/A
Liku	106	N/A			

Rainfall totalling 200% or more is considered well above average. Totals of 40% 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. N/A denotes data unavailability at the time of publishing, and * denotes synoptic values.

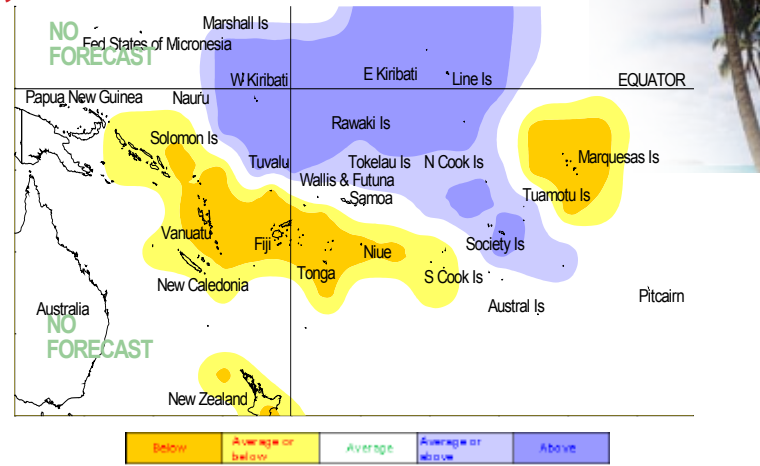
Tropical rainfall and SST outlook: January to March 2010

During January – March 2010, a region of suppressed convection is likely in the southwest Pacific encompassing The Marquesas, Niue, Fiji, Tonga and Vanuatu. Below average rainfall is expected for all of those island groups. Near or below normal rainfall is expected for Wallis & Futuna, New Caledonia, the Southern Cook Islands, and the Solomon Islands. Enhanced convection is likely along the Equator extending from Western to Eastern Kiribati, and also near Tuvalu and the Society Islands, with an expectation of above average rainfall for those islands. Near or above average rainfall is forecast for the Northern Cook Islands, the Tuamotu Archipelago and Tokelau. Near normal rainfall is forecast for Papua New Guinea, Pitcairn Island, Samoa, and the Austral Islands.

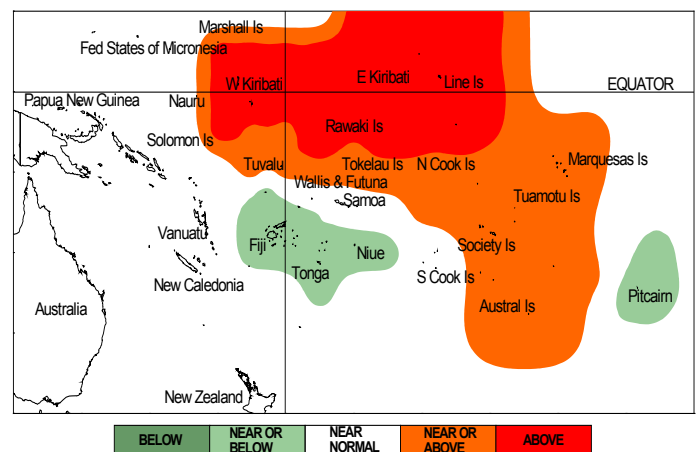
The global models are continuing to show elevated temperatures in the near equatorial Pacific and the northeast part of the Southwest Pacific. Some anomalies have strengthened from past months, and a warming pattern is seen in many models for French Polynesia. Cold anomalies have appeared to strengthen around Fiji in many models. Above average sea surface temperatures are forecast for Eastern and Western Kiribati. A region of near or above average sea surface temperatures is forecast around Tokelau, Tuvalu, the Northern Cook Islands, and all of French Polynesia. Average or below average SSTs are forecast for Fiji, Niue, Tonga, and Pitcairn Island. Near normal SSTs are forecast for the remainder of the southwest Pacific.

The confidence in the multi-model ensemble forecast skill for this seasonal rainfall outlook is moderate to moderately high. In the past, the average region-wide hit rate for rainfall forecasts issued in January is 57%, 4% lower than the long-term average for all months combined. The SST forecast confidence is mostly high, but the greatest uncertainty is

NOTE: Rainfall and sea surface temperature estimates for Pacific Islands for the next three months are given in the tables below. The tercile probabilities (e.g., 20:30:50) are derived from the averages of several global climate models. They correspond to the odds of the observed rainfall or sea surface temperatures being in the lowest one third of the distribution, the middle one third, or the highest one third of the distribution. For the long term average, it is equally likely (33% chance) that conditions in any of the three terciles will occur. *If conditions are climatology, we expect an equal chance of the rainfall being in any tercile.



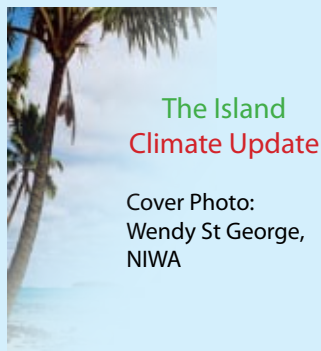
Rainfall outlook map for January to March 2010



SST outlook map for January to March 2010

localised around the Marquesas..

Island Group	Rainfall Outlook	Outlook confidence	Island Group	SST Outlook	Outlook confidence
Kiribati (Eastern)	15:30:55 (Above)	High	Kiribati (Eastern)	15:30:55 (Above)	Moderate
Kiribati (Western)	15:30:55 (Above)	Moderate-High	Kiribati (Western)	20:30:50 (Above)	Moderate-High
Tuvalu	15:30:55 (Above)	Moderate-High	Cook Islands (Northern)	25:35:40 (Near or Above)	High
Society Islands	20:35:45 (Above)	Moderate	Marquesas	25:35:40 (Near or Above)	Moderate
Cook Islands (Northern)	25:35:40 (Near or Above)	Moderate-High	Tokelau	20:40:40 (Near or Above)	High
Tokelau	25:35:40 (Near or Above)	Moderate	Austral Islands	25:40:35 (Near or Above)	High
Tuamotu Islands	20:40:40 (Near or Above)	Moderate	Society Islands	25:40:35 (Near or Above)	High
Austral Islands	30:40:30 (Near normal)	Moderate-High	Tuamotu Islands	25:40:35 (Near or Above)	High
Papua New Guinea	30:40:30 (Near normal)	Moderate-High	Tuvalu	25:40:35 (Near or Above)	Moderate-High
Pitcairn Island	30:40:30 (Near normal)	Moderate	Cook Islands (Southern)	30:40:30 (Near normal)	High
Samoa	30:40:30 (Near normal)	Moderate	New Caledonia	30:40:30 (Near normal)	High
Solomon Islands	35:40:25 (Near or Below)	Moderate	Papua New Guinea	30:40:30 (Near normal)	High
Cook Islands (Southern)	40:35:25 (Near or Below)	Moderate	Samoa	30:40:30 (Near normal)	High
New Caledonia	40:35:25 (Near or Below)	Moderate	Solomon Islands	30:40:30 (Near normal)	High
Wallis & Futuna	40:35:25 (Near or Below)	Moderate	Vanuatu	30:40:30 (Near normal)	High
Marquesas	45:35:20 (Below)	Moderate	Wallis & Futuna	30:40:30 (Near normal)	High
Niue	50:30:20 (Below)	Moderate-High	Fiji	35:40:25 (Near or Below)	Moderate-High
Vanuatu	50:30:20 (Below)	Moderate	Niue	35:40:25 (Near or Below)	High
Fiji	50:30:20 (Below)	Moderate-High	Pitcairn Island	35:40:25 (Near or Below)	High
Tonga	50:30:20 (Below)	Moderate-High	Tonga	35:40:25 (Near or Below)	Moderate-High



The Island Climate Update

Cover Photo:
Wendy St George,
NIWA

Visit The Island Climate Update at:
www.niwascience.co.nz/ncc/icu

Your comments and ideas about The Island Climate

Update are welcome. Please contact:
Dr Andrew Lorrey, NIWA,
41 Market Place, Auckland, New Zealand
E-mail: a.lorrey@niwa.co.nz

Forecasts:

Dr. Andrew Lorrey (South Pacific rainfall and SST forecasts) and the NIWA National Climate Centre (ENSO wrap)

ICU Editors:

Andrew Lorrey Email: a.lorrey@niwa.co.nz
James Renwick Email: j.renwick@niwa.co.nz
Harriet Palmer Email: h.palmer@niwa.co.nz

Acknowledgements

This bulletin is produced by NIWA and made possible with financial support from the New Zealand Agency for International Development (NZ Aid), with additional support from the Pacific Islands Applied Geosciences Commission (SOPAC) and the Secretariat for the Pacific Regional Environmental Programme (SPREP).

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.

The contents of The Island Climate Update may be freely disseminated, provided the source is acknowledged.

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

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.**

Web links to ICU partners:

South Pacific Meteorological Services:

Cook Islands
<http://www.cookislands.pacificweather.org/>

Fiji
<http://www.met.gov.fj>

Kiribati
<http://pi-gcos.org/index.php> (follow link to PI Met Services then Kiribati Met Service)

New Zealand
<http://www.metservice.co.nz/>

Niue
<http://pi-gcos.org/index.php> (follow link to to PI Met Services then Niue Met Service)

Papua New Guinea
<http://pi-gcos.org/index.php> (follow link to to PI Met Services then Papua New Guinea Met Service)

Samoa
<http://www.mnre.gov.ws/meteorology/>

Solomon Islands
<http://www.met.gov.sb/>

Tonga
<http://www.met.gov.to/>

Tuvalu
<http://tuvalu.pacificweather.org/>

Vanuatu
<http://www.meteo.gov.vu/>

International Partners

Meteo-France
New Caledonia: <http://www.meteo.nc/>
French Polynesia: <http://www.meteo.pf/>

Bureau of Meteorology (Australia)
<http://www.bom.gov.au/>

National Oceanographic and Atmospheric Administration (USA)
National Weather Service: <http://www.nws.noaa.gov/>
Climate Prediction Center: <http://www.cpc.noaa.gov/>

The International Research Institute for Climate and Society (USA):
<http://portal.iri.columbia.edu/portal/server.pt>

The UK Met Office
<http://www.metoffice.gov.uk/>

European Centre for Medium-term Weather Forecasts
<http://www.ecmwf.int/>