

The Island Climate Update

September's climate

- The South Pacific Convergence Zone (SPCZ) was weakly coherent this past month, and contracted toward northern Papua New Guinea.
- Suppressed convection in the central part of the Southwest Pacific near Tokelau and the Northern Cook Islands.
- Mostly well below normal rainfall for many parts of Vanuatu and New Caledonia.

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
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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

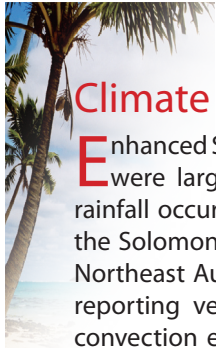
- El Niño conditions exist in the equatorial Pacific. Many dynamical climate models project the continuation of El Niño through 2009 and into 2010.
- Below normal rainfall is forecast for Papua New Guinea. Near or below normal rainfall is forecast for the Northern Cook Islands, Niue, and Tonga.
- Above normal rainfall is expected for Western Kiribati. Near or above normal rainfall is forecast for Eastern Kiribati, the Solomon Islands, and Tuvalu.
- Above normal SSTs are forecast for Eastern Kiribati. Normal or above normal SSTs are forecast for the Northern Cook Islands, Marquesas, the Tuamotu Archipelago, Western Kiribati, the Solomon Islands, and Papua New Guinea. SSTs are expected to be near or below normal around Fiji, and near normal elsewhere in the southwest Pacific.

SOPAC



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Climate developments in September 2009

Enhanced South Pacific Convergence Zone (SPCZ) anomalies were largely absent from the region last month. High rainfall occurred along the Equator near Papua New Guinea, the Solomon Islands and Western Kiribati during September. Northeast Australia was very dry, with Cairns and Townsville reporting very low rainfall during the month. Suppressed convection existed southeast of Western Kiribati last month near Tuvalu, Tokelau, and the Northern Cook Islands. The regional circulation in September was characterised by more frequent low pressure north of the Equator to the east of Eastern Kiribati and higher than normal pressure to the east of New Zealand. This pattern resulted in more frequent easterly anomalies across the southwest Pacific, particularly in the northern Tuamotu Archipelago region and the Marquesas.

Very high rainfall was recorded in the Solomon Islands, with many stations receiving more than 150mm for the month of September. In Western Kiribati, 266mm (211% of normal) of rain fell during the month, and this is the fourth month in a row with considerable rainfall at that location. Positive rainfall anomalies in Western Kiribati are now more pronounced than in central and eastern parts of Kiribati. In Fiji, near well above normal rainfall occurred for 50% of stations that reported. Frontal systems delivered more than 100mm of rainfall on two separate occasions during September, and a daily record was broken at Labasa. Similarly, in the Society Islands and Austral Islands, rainfall was well above normal. Many parts of southern French Polynesia exceeded 125% to 200% of normal rainfall for the month.

Island Group	Location	Rainfall (mm)	% of avg	Comments
Australia	Cairns	3	8	Very low
Society Islands	Tahiti	200	392	Record high
Tonga	Nuku'alofa	357	293	Record high
Vanuatu	Tanna	7	N/A	Very Low
Solomon Islands	Munda	540	221	High

Soil moisture in September 2009

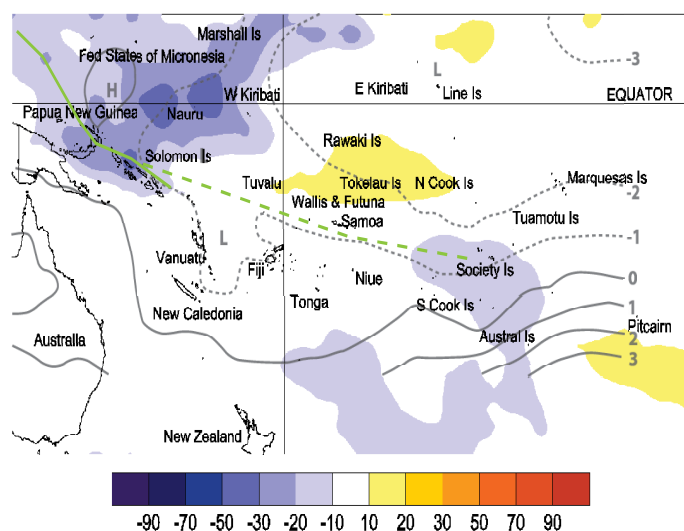
Estimates of soil moisture shown in the map (right) are based on monthly rainfall for one station in each country. Currently there are not many sites in the water balance model, but more stations will be included in the future.

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.

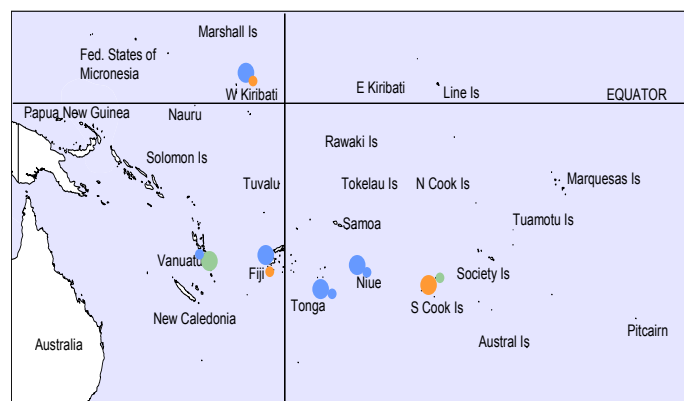
Hanan (Niue), Nadi (Fiji), Tarawa (Western Kiribati) and Fua'amotu (Tonga) project moist soil moisture conditions. Raratonga (Southern Cook Islands) project dry soil moisture, while Vila (Vanuatu) is moderate at this time.

In contrast, dry conditions occurred over most of Vanuatu during September, with many stations stating less than 40% of normal rainfall had occurred. Northern New Caledonia and northern Australia were also very dry. Niue received between 40–60% of normal rainfall for the month, which was in contrast to neighboring Tonga, which had stations that received in excess of 250% of normal rainfall during September.

Warmer than normal conditions occurred as a whole across French Polynesia during September, with +1.0°C above normal temperatures registered in the Marquesas. Elsewhere in the southwest Pacific, temperatures were also above normal, with an average anomaly of +0.7°C for New Caledonia, and up to +3°C above normal in northern Queensland.



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 September 2009 position of the South Pacific Convergence Zone (SPCZ) was near normal and contracted toward Papua New Guinea. The average position of the SPCZ 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.



September 2009 September 2008

- Wet
- Moderate
- Dry

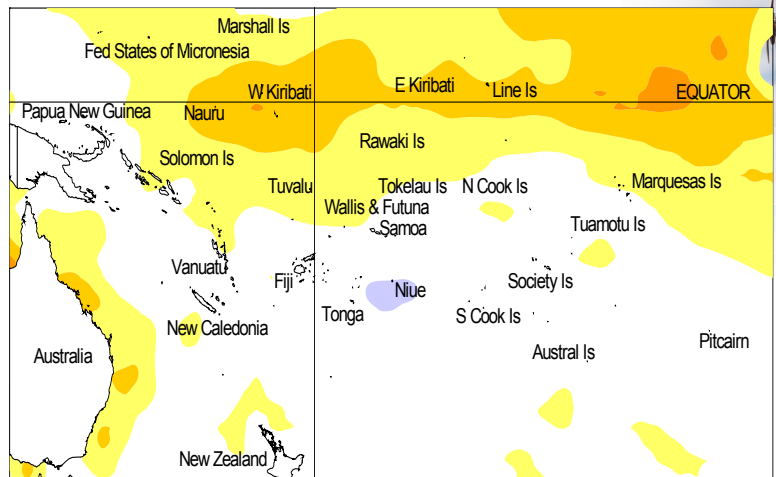
Estimated soil moisture conditions at the end of September 2009, using monthly rainfall data. Soil moisture projections for individual Pacific Island countries are dependent on data availability at the time of publication.

El Niño/Southern Oscillation (ENSO)

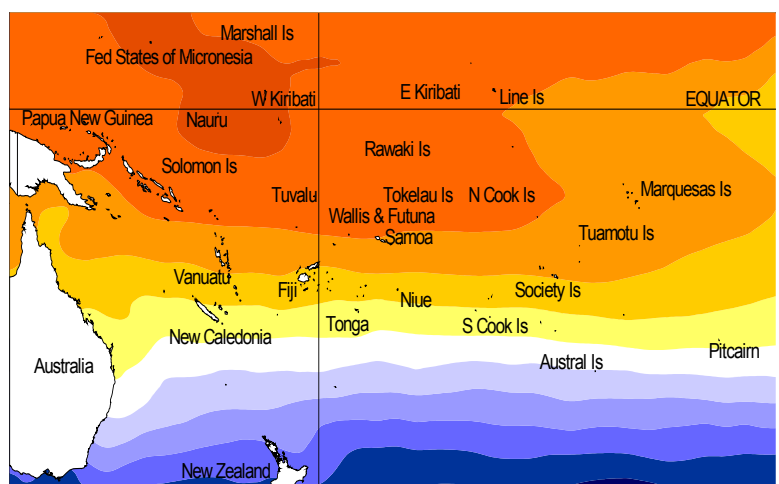
During September, the equatorial Pacific Ocean was in an El Niño state, but the atmosphere continued to display only weak El Niño conditions. Sea surface temperatures were above normal across most of the equatorial Pacific, and intensified slightly in September. NINO 3 & 4 anomalies were +1.2°C and +1.0°C in September, with the 3-month means for July–September at +1.2°C and +0.9°C. Subsurface oceanic heat content remains above average, but the positive anomaly is centred more towards the central Pacific rather than in the east.

The atmospheric circulation still is not well coupled with the ocean: in September the SOI reverted to positive values (+0.3 for the month), resulting in a near-zero three-month mean. Westerly wind anomalies continue west of the Date Line, as they have done since May, but have only sporadically penetrated to the east. The trade winds are generally slightly stronger than normal east of the Date Line. Convection was enhanced in September over the Equatorial Pacific, west of the Date Line, and somewhat suppressed over the Maritime Continent and Australia. Equatorial OLR anomalies remain weak east of the Date Line. The TRMM ENSO precipitation index is positive at +0.30, but well short of the +1 threshold for a moderate El Niño. An MJO event has developed during September, with enhanced convection north of Australia, but it appears to be slow-moving and is predicted to weaken *in-situ* during the first half of October.

The global climate model ensemble assessed by NIWA show all dynamical models (and all but one statistical model) indicating warm conditions through the end of the year. Most models show El Niño persisting to the end of the southern summer, with some strengthening between now and the end of the year, and a decline in the autumn. The NCEP ENSO discussion from 10 September suggests further strengthening of El Niño conditions and persistence through summer. The IRI summary indicates an 85–90% probability for El Niño persisting through to the end of southern summer.



Sea surface temperature anomalies (°C) for September 2009



Mean sea surface temperatures (°C) for September 2009

Tropical Cyclone guidance: November 2009 to April 2010

Tropical cyclone (TC) activity in the southwest Pacific is expected to be near normal for the 2009–10 season. On average, nine TCs occur in the region each year between November and April. Countries east of the date line, including Niue and Tonga, are at higher risk than normal because of the current weak El Niño. French Polynesia (Society and Austral Islands) and the southern Cook Islands can also be affected by TCs during El Niño, so these islands should also remain vigilant. More details about 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: July to September 2009

A region of suppressed convection was forecast for the southwest Pacific encompassing Tokelau, the Northern Cook Islands, Tonga, Fiji, New Caledonia, and Papua New Guinea. Near to below average rainfall was expected for those areas. Below average rainfall was forecast for the Marquesas. Near normal rainfall was forecast for Niue, Southern Cook Islands, Wallis & Futuna, the Austral Islands and Pitcairn Island. Enhanced convection was expected along the Equator extending from Western to Eastern Kiribati, and also near the Solomon Islands. These regions were expected to receive near or above normal rainfall, with Western Kiribati and the

Solomon Islands forecast to receive above normal rainfall. No clear precipitation guidance was offered for Vanuatu, Tuamotu Archipelago, Samoa, and the Society Islands.

The July–September 2009 forecast validation was calculated for 12 island groups (three countries did not report rainfall values; five were forecast as climatology and were unscorable). The global island group ‘hit’ rate was 72%, 8% higher than average for July forecasts, and 11% higher than the average for all months combined. Rainfall was over projected for the Southern Cook Islands and Society Islands.

Tropical Pacific rainfall – September 2009

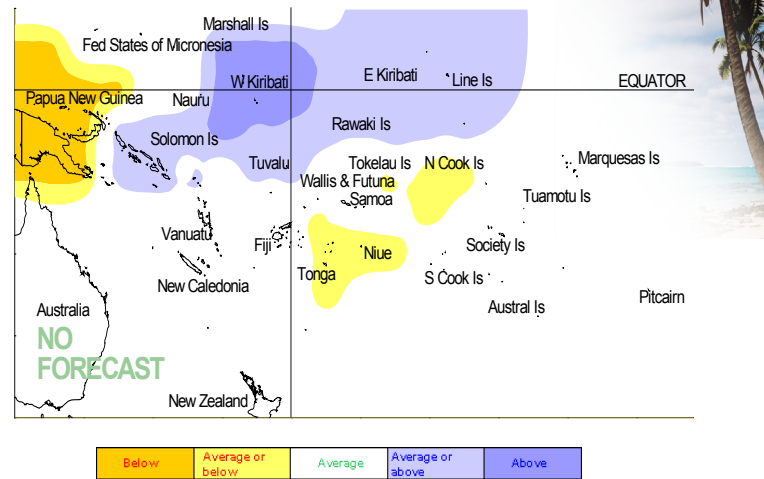
Territory and station name	September 2009 rainfall total (mm)	September 2009 percent of average	Territory and station name	September 2009 rainfall total (mm)	September 2009 percent of average
Australia			North Tasman		
Cairns Airport	3	8	Lord Howe Island	61	43
Townsville Airport	4	36	Norfolk Island	117	129
Brisbane Airport	23	66	Raoul Island	266	242
Sydney Airport	105	167	Samoa		
Cook Islands			Faleolo Airport	N/A	N/A
Penrhyn	N/A	N/A	Apia	N/A	N/A
Aitutaki	N/A	N/A	Nafanua	N/A	N/A
Rarotonga Airport	104	95	Afiamalu	N/A	N/A
Fiji			Alafua	N/A	N/A
Rotuma Island	198	83	Solomon Islands		
Udu Point	198	175	Taro	383	133
Nadi Airport	197	281	Munda	540	221
Nausori	313	190	Auki	253	114
French Polynesia			Honiara	146	143
Hiva Hoa, Atuona	47	64	Henderson	149	146
Bora Bora	147	226	Kira Kira	235	86
Tahiti – Faa'a	200	392	Santa Cruz, Lata	344	92
Tuamotu, Takarua	174	212	Tonga		
Gambier, Rikitea	38	28	Niufo'ou	357	250
Tubuai	200	211	Mata'aho Airport	N/A	N/A
Rapa	209	127	Lupepau'u	91	75
Kiribati			Salote Airport	103	93
Tarawa	266	211	Nuku'alofa	357	293
Kanton	46	54	Fua'amotu Airport	323	274
New Zealand			Tuvalu		
Kaitaia	140	105	Nanumea	222	128
Whangarei Airport	85	67	Nui Island	301	164
Auckland Airport	74	76	Funafuti	165	80
New Caledonia			Nuilakita	232	119
Ile Art, Belep	70	132	Vanuatu		
Koumac	23	61	Sola	34	13
Ouloup	22	34	Pekoa	26	18
Ouanaham	35	41	Lamap	29	39
Poindimie	121	134	Port Vila	34	39
La Roche	49	66	Tanna/Whitegrass	7	N/A
La Tontouta	59	190	Aneityum	55	69
Noumea	81	198	Papua New Guinea		
Moue	84	142	Port Moresby	N/A	N/A
Niue			Wewak	N/A	N/A
Hanan Airport	46	40	Kavieng	N/A	N/A
Liku	59	60			

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.

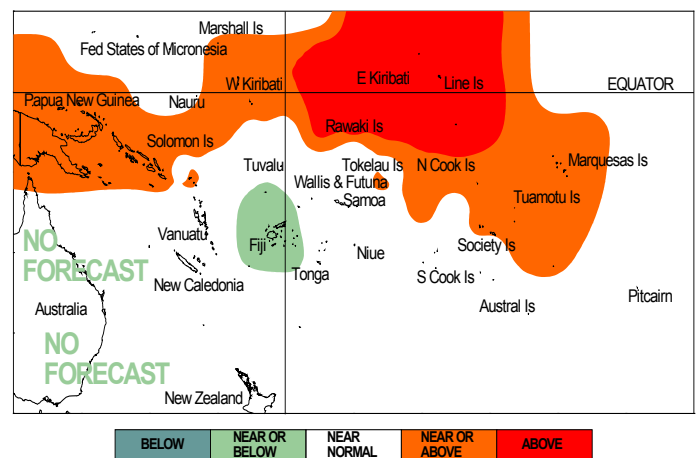
Tropical rainfall and SST outlook: October to December 2009

During October – December 2009, a region of suppressed convection is likely in the southwest Pacific encompassing Niue, the Northern Cook Islands, Tonga, and Papua New Guinea. Near to below average rainfall is expected for all of those islands, except below average rainfall is forecast for Papua New Guinea. Near normal rainfall is forecast for the Austral Islands and Pitcairn Island. Enhanced convection is likely along the Equator extending from Western to Eastern Kiribati, and also near the Solomon Islands and Tuvalu. These regions are expected to receive near or above normal rainfall, with Western Kiribati forecast to receive above normal rainfall. No clear precipitation guidance is offered for Vanuatu, Fiji, Tuamotu Archipelago, Samoa, Tokelau, the Southern Cook Islands, New Caledonia, Wallis and Futuna, and the Society Islands.



Rainfall outlook map for October to December 2009

The global models are continuing to show elevated temperatures in the near equatorial Pacific sea surface for the northwest corner of the Southwest Pacific. Some SST anomalies have strengthened in the projections from past months. Above average sea surface temperatures are forecast for Eastern Kiribati. A region of near or above average sea surface temperatures is forecast around Papua New Guinea, the Solomon Islands, Western Kiribati, the Northern Cook Islands, the Marquesas and the Tuamotu archipelago. Near normal SSTs are forecast for the remainder of the southwest Pacific, except for Fiji, with near or below average SSTs.

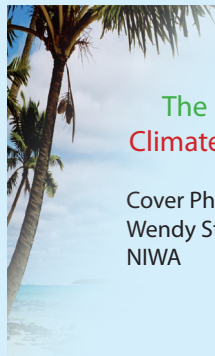


SST outlook map for October to December 2009

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 October is 64%, 3% higher than the long-term average for all months combined. The SST forecast confidence is mostly high, but the greatest uncertainty is localised around the Marquesas and Eastern Kiribati.

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.

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



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Cover Photo:
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Your comments and ideas about The Island Climate

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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.

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/>

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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/>