Number 101, February 2009

The Island Climate Update

January's climate

- The South Pacific Convergence Zone (SPCZ) was displaced southwest of its normal position and was very active.
- Very suppressed convection near Western Kiribati and south of the Equator from Nauru east to northern French Polynesia.
- Normal to well above normal rainfall for many areas in the South Pacific, with many new records established in Fiji.

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

- La Niña-like conditions exist in the tropical Pacific. Many climate models project continuation of La Niña through to the end of summer 2009.
- Below normal rainfall is forecast for Western Kiribati, Tuvalu, Tokelau, the Northern Cook Islands, and the Society Islands.
- Above normal rainfall is expected for New Caledonia, Niue, Tonga, and Papua New Guinea.
- Normal to above normal SSTs are forecast for the southwestern half of the southwest Pacific region. Normal to below normal SSTs are forecast for the northeast half of the southwest Pacific.

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

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Climate developments in January 2009

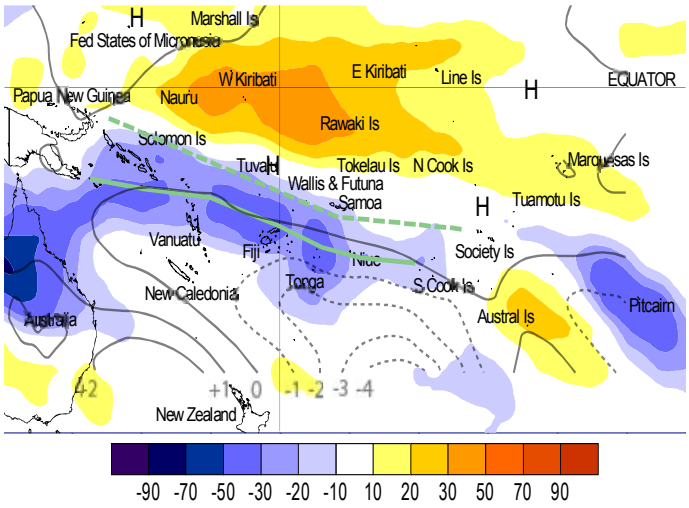
The South Pacific Convergence Zone (SPCZ) activity was displaced south and west of normal during January, and was more consolidated than last month. A region of enhanced rainfall due to intensified convection was observed during January 2009 over northeast Australia, and in the south Pacific extending from the Solomon Islands southeast to the Southern Cook Islands. Very high amounts of rainfall occurred within this band, and are highlighted in this issue. Suppressed convection intensified during the month near the Equator, and encompassed the region northeast of the Solomon Islands that included Nauru and Western Kiribati, and extended across the southwest Pacific to the Marquesas. The regional circulation for the month was characterised by more frequent high pressure across the northeastern half of the South Pacific; and lower than normal pressures east of northern New Zealand and south of the Southern Cook Islands.

Many rainfall records were shattered in Fiji in January 2009 (see back page highlight article), with most stations receiving 140–450% of normal rainfall. Similarly, northeastern Australia (220–250% or normal), Vanuatu (135–200% of normal), and Tonga (120–340% of normal) received well above normal rainfall for many stations. Enhanced rainfall was also localised near Pitcairn Island. All of the reporting stations for Tonga received greater than 300mm rainfall in January, and two of those stations were close to or exceeded previous monthly record highs.

Lower than normal rainfall was recorded at many stations in French Polynesia, with Hiva Hoa in the Marquesas Islands receiving 34 mm of rainfall (22% of normal). Elsewhere in the eastern half of the southwest Pacific, the stations in the Tuamotu archipelago and the Austral Islands all recorded normal or below normal rainfall, except Rikitea, which received a record high total of 433 mm (297% of normal).

Continuing the trend from last month, many stations in New Caledonia received well below normal rainfall (30–60%) during January. Northern New Zealand also experienced a relatively dry month, with the northern part of the country recording well below normal rainfall (20–60% of normal). The Solomon Islands also had a relatively normal month, except at Honiara and Henderson, which received 170–190% of normal rainfall.

Island Group	Location	Rainfall (mm)	% of avg	Comments
Fiji	Lautoka	1291	348	Record high; Highest monthly total in the region
Tonga	Fua'amotu	570	284	Record high
Fiji	Penang	1228	310	Record high
Tuamotu	Rikitea	433	297	Record high
Marquesas	Hiva Hoa	34	22	Very low
New Caledonia	Belep	60	25	Very low



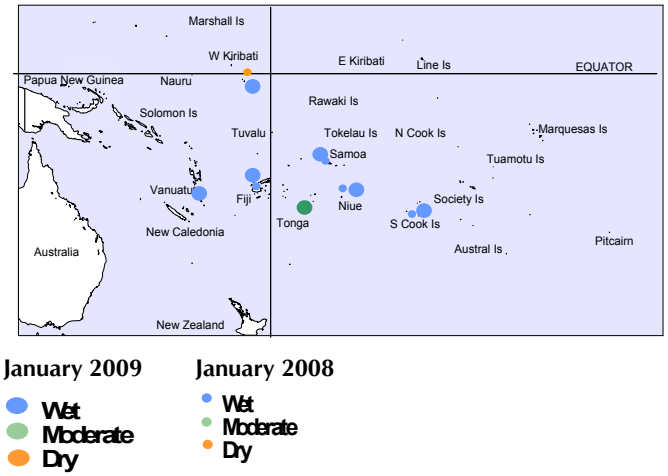
Outgoing Long-wave Radiation (OLR) anomalies, in Wm^2 are represented by hatched areas. High radiation levels (yellow) are typically associated with clearer skies and lower rainfall, while cloudy conditions lower the OLR (blue) and typically result in higher rainfall. The January 2009 position of the South Pacific Convergence Zone (SPCZ) was displaced southwest of its normal position, and much more coherent than last month. 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 grey lines.

Soil moisture in January 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.

Nadi (Fiji), Hanan (Niue), Port Vila (Vanuatu), Rarotonga (Southern Cook Islands), and Apia (Samoa) project moist (at or near field capacity) soil moisture conditions. Soils are moderate for the time of year at Nuku'alofa (Tonga).



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

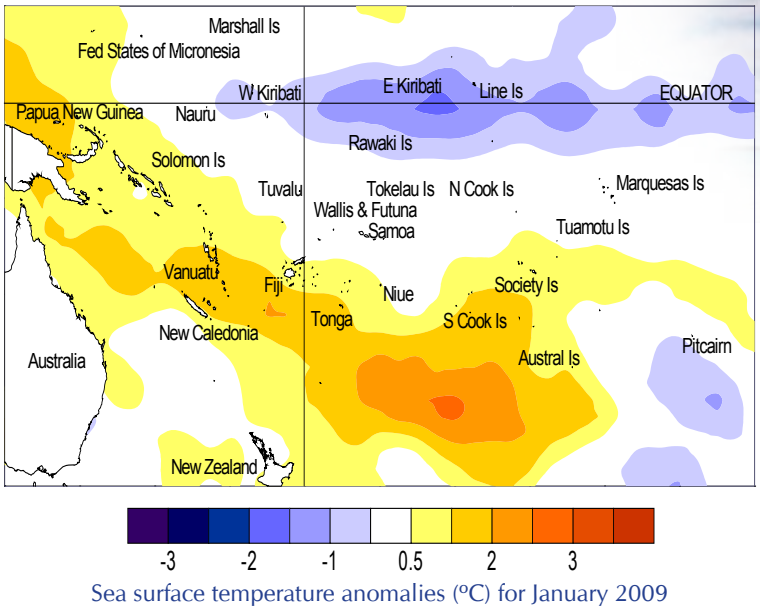
El Niño/Southern Oscillation (ENSO)

During January, La Niña conditions were established in the equatorial Pacific Ocean, with the tropical Pacific atmosphere exhibiting moderate La Niña characteristics. The SOI remained positive with a January value of +0.9 (NDJ mean +1.3),. The easterly trade winds remained strong during December about and west of the Date Line, now have weaken slightly across the tropical Pacific, but still appear to strongest around 160°E.

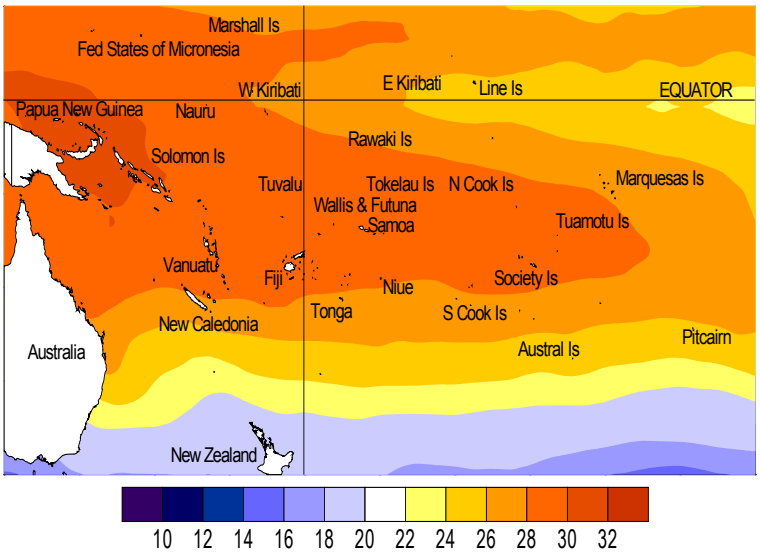
SST anomalies in December were below average across the Equatorial Pacific: the NINO3 anomaly for strengthened in January to –0.7°C (3-month mean –0.3°C), as did the NINO4 anomaly which is –0.7°C (OND mean 0.4°C). Equatorial subsurface anomalies that strengthened at the thermocline in December (with a –4°C anomaly centred near 140°W below 100m) now appear to be weakening somewhat in the eastern equatorial Pacific with some weak warming at the surface near South American Coast. West of the dateline sub-surface warming appears to be occurring and intensifying towards 160°W.

Tropical Pacific precipitation patterns continue to exhibit La Niña characteristics, with the TRMM ENSO precipitation index at -0.82 for January (up from -1.34 in December). OLR anomalies show extremely suppressed equatorial convection about and west of the Date Line and the eastern Indian Ocean for January as a whole, with enhanced convection over the maritime continent and northern Australia. The MJO in the Indian Ocean is weak and is expected to remain so into the second week of February.

Several climate models assessed by NIWA predict weakening La Niña conditions over the next three-months (FMA). The majority indicate ENSO-neutral conditions during late autumn and early winter 2009. The NCEP discussion of 8 January indicates a continuation of below average sea surface temperatures and continuation of La Niña through early 2009. The IRI summary of 14 January indicates a 55% chance of La Niña conditions persisting over the coming season, and 45 – 50 % chance of a return to ENSO-neutral conditions.



Sea surface temperature anomalies (ºC) for January 2009



Mean sea surface temperatures (ºC) for January 2009

Tropical Cyclone Activity and Guidance

Tropical cyclone Hettie, the first to form in the southwest Pacific during the 2008–09 season, developed on 28th January to the southeast of Fiji. The system brought southerly winds and heavy rain to the central region of Fiji on the 28–29 January, and then tracked to the southwest before dissapating on 30 January. Conditions in the tropical Pacific are still likely to affect the chances of tropical cyclone (TC) activity for several countries between January and May 2009. There is an increased risk of TC occurrence for countries west of the Date Line, including Vanuatu, the Solomon Islands, and New Zealand, and a slight risk increase for New Caledonia. Reduced risk is expected for Samoa, Tonga, and Niue.

Forecast validation: November 2008 to January 2009

A region of suppressed convection was expected to encompass the central and eastern Southwest Pacific, in a region extending from Western Kiribati to the Marquesas Islands and the Society Islands, including Tuvalu, Tokelau, Wallis & Futuna, Samoa, the Northern Cook Islands, and the Tuamotu archipelago. Below normal or near–to–below normal rainfall was expected for those countries. Enhanced convection was expected to be focused near Papua New Guinea, and also near Vanuatu, New Caledonia, Tonga, Fiji, and Niue with above average rainfall. Near–to–above average rainfall was forecast for the Southern Cook Islands, the Austral Islands, and Pitcairn Island, while no clear precipitation forecast was offered for the Solomon Islands.

The rainfall outlook for the November 2008–January 2009 period was calculated for 17 island groups (one island had a forecast of 'climatology', which is unscoreable, and three did not report values). The global station 'hit' rate was 71%, 7% higher than average for forecasts made during November and 10% higher than the average for all months combined. Rainfall was overprojected for Vanuatu and New Caledonia, and either over– or under– projected for parts of French Polynesia.

Tropical Pacific rainfall – January 2009

Territory and station station name	January 2009 rainfall total (mm)	January 2009 percent of average
Australia		
Cairns Airport	882	223
Townsville Airport	664	245
Brisbane Airport	77	49
Sydney Airport	25	25
Cook Islands		
Penrhyn	28	11
Aitutaki	221	86
Rarotonga Airport	137	61
Fiji		
Rotuma Island	500	141
Udu Point	700	224
Nadi Airport	1181	344
Nausori	652	179
French Polynesia		
Hiva Hoa, Atuona	34	22
Bora Bora	201	81
Tahiti – Faa'a	261	96
Tuamotu, Takaroa	123	64
Gambier, Rikitea	433	297
Tubuai	67	33
Rapa	110	46
Kiribati		
Tarawa	N/A	N/A
Kanton	N/A	N/A
New Zealand		
Kaitaia	20	12
Whangarei Airport	12	14
Auckland Airport	32	48
New Caledonia		
Ile Art, Belep	60	25
Koumac	96	54
Ouloup	72	41
Ouanaham	85	43
Poindimie	235	63
La Roche	215	122
La Tontouta	77	64
Noumea	75	65
Moue	150	81

Territory and station station name	January 2009 rainfall total (mm)	January 2009 percent of average
Niue		
Hanan Airport	388	114
Liku	255	103
North Tasman		
Lord Howe Island	46	40
Norfolk Island	64	70
Raoul Island	19	15
Samoa		
Faleolo Airport	302	123
Apia	386	79
Nafanua	607	123
Afiamalu	955	120
Maota	207	50
Solomon Islands		
Taro	240	100
Munda	401	104
Auki	435	121
Honiara	509	187
Henderson	406	171
Kira Kira	377	110
Santa Cruz, Lata	491	117
Tonga		
Niuafo'ou	N/A	N/A
Mata'aho Airport	326	118
Lupepau'u	392	136
Salote Airport	559	341
Nuku'alofa	346	199
Fua'amotu Airport	570	284
Tuvalu		
Nanumea	4	1
Nui Island	96	23
Funafuti	445	115
Nuilakita	337.0	90
Vanuatu		
Sola	557	141
Pekoa	539	166
Lamap	340	135
Port Vila	420	152
Tanna/Whitegrass	79	N/A
Aneityum	183	66

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.

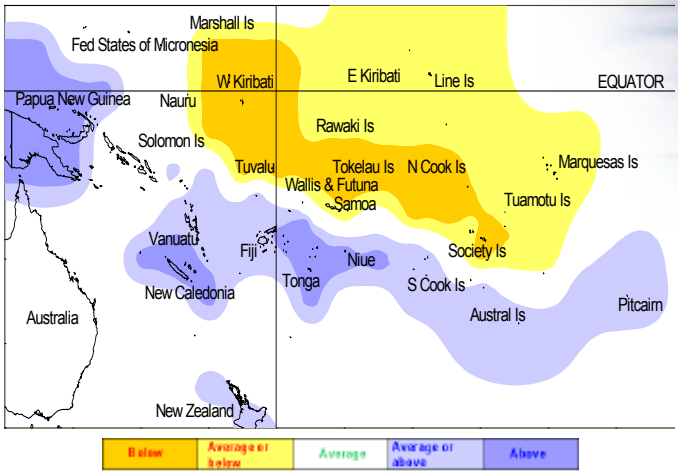
Tropical rainfall and SST outlook: February to April 2009

During the February–April 2009 forecast period, a region of suppressed convection is likely to encompass the central and eastern Southwest Pacific, extending to the southeast from Western Kiribati and including Tuvalu, Tokelau, the Northern Cook Islands, and the Society Islands, where below normal rainfall is expected. Near–to–below normal rainfall is expected for Samoa, Eastern Kiribati, the Tuamotu archipelago, and the Marquesas Islands.

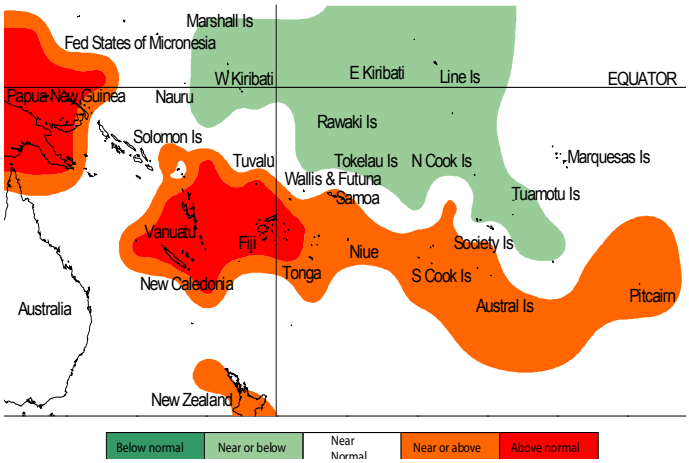
Enhanced convection is expected to extend southeast from, Papua New Guinea, and includes New Caledonia, Tonga and Niue, where above normal rainfall is forecast. Near or above normal rainfall is forecast for the Austral Islands, Fiji, the Southern Cook Islands, and Pitcairn Island. No clear precipitation guidance is offered for the Solomon Islands or Wallis & Futuna for the three-month forecast period.

SSTs are expected to be above normal around eastern Papua New Guinea, and surrounding Vanuatu, Fiji and New Caledonia. Near normal or above normal SSTs are also expected for Niue, Tonga, Wallis & Futuna, the Southern Cook Islands, the Society Islands, Austral Islands, and Pitcairn Island. Near normal or below normal SSTs are forecast for the Tuamotu archipelago, the Northern Cook Islands, Tuvalu, Tokelau, and Eastern & Western Kiribati.

The confidence in the forecast model skill for this seasonal rainfall outlook is moderately high for most Pacific Island countries. In the past, the average region-wide hit rate for forecasts issued in February is 63%, 1% lower than the long-term average for all months combined. The SST forecast confidence is moderate–to–high for this period.



Rainfall outlook map for February to April 2009



SST outlook map for February to April 2009

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

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

Extreme rainfall and new records in the Fiji Islands, January 2009

Fiji Meteorological Service

January 2009 was the wettest first month of the year in more than a century at several locations in Fiji. The total monthly rainfall was equivalent to or above 200% of normal at more than 75% of reporting stations in the Western, Central and Eastern Divisions of the country. Fourteen monthly rainfall totals and seven 24hr daily rainfall records were broken during the month. The considerable amount of rainfall was due to a number of intense synoptic scale weather features that impacted the Fiji region, including an active monsoonal trough, an enhanced South Pacific Convergence Zone (SPCZ), two Tropical Depressions, and Tropical Cyclone (TC) Hettie.

The hovering of the monsoonal trough and SPCZ over Fiji during the early to middle part of January resulted in severe flooding that claimed 12 lives and caused major damage in many parts of Viti Levu and Vanua Levu. Many roads and bridges including the Sigatoka old bridge were destroyed. There was significant damage to agricultural crops along the major floodplains. Ba, Nadi, and parts of Sigatoka town were flooded. In the case of Ba and Nadi, flooding was the worst in over 75 years. School facilities and homes in these areas were without water and electricity for several days due to broken water pipes. As of 30 January, the flood related damage cost is F$76.1M.

A flooded house in Nadi, Fiji that resulted from high rainfall during January 2009.

The January 2009 floods are the worst natural disaster 'economically' to affect Viti Levu since the drought of 1998. The title of 'worst natural disaster' should probably continue to apply to the TC(s) and flooding in late February 1931 when flooding similar in magnitude to the 2009 event (but including the Rewa River) claimed more than 200 lives. There were statements in the media soon after the recent flood that the 2009 event was higher than the 1931, 8.37 m above mean sea level record at the Rarawai Mill.

A badly damaged bridge in Nadi, Fiji

Highlights of the month include:

- Seven sites receiving more than 200 mm rainfall in 24 hours
- A daily rainfall total of 378 mm on the 13th at Nabouwalu, breaking the record from 1932
- Fourteen stations recording more than 700 mm rainfall
- Seven sites receiving more than 1m of rainfall
- A total monthly rainfall of 1545.1 mm recorded at Monasvu, the highest since records began there in 1980

A complete accounting of the month's events, climate statistics, an explanation of the cause of the January flooding, and photographs from across Fiji of the flood damage can be found on the Fiji Meteorological Services website (www.met.gov.fj/index.php).

Further enquiries about the floods can also be directed to the Fiji Meteorological Services by emailing climate@met.gov.fj.

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.