Number 52, January 2005

The Island Climate Update

December's climate

- The South Pacific Convergence Zone (SPCZ) extended from the Solomon Islands towards Samoa – Northern French Polynesia also affected
- Tropical Cyclone Judy brought high rainfall to the Tuamotu Islands of French Polynesia
- Below average rainfall over Samoa, the Southern Cook Islands, central French Polynesia, Pitcairn Island, much of New Caledonia, Fiji's Western Division, and Southern Tonga
- Much warmer conditions in Fiji and parts of French Polynesia

El Niño/Southern Oscillation and Seasonal Rainfall Forecasts

- The Tropical Pacific Ocean remains in a weak El Niño state with the December Southern Oscillation Index (SOI) at -1.1
- Above average rainfall is likely in Western and Eastern Kiribati and Tuvalu
- New Caledonia and the Marquesas Islands are expected to experience below average rainfall

Collaborators

Australian Bureau of Meteorology

Meteo France

Fiji Meteorological Service

NOAA National Weather Service

NOAA Climate Prediction Centre (CPC)

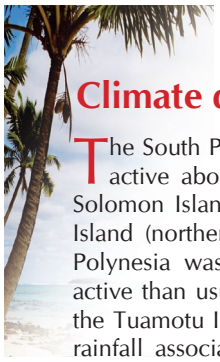
International Research Institute for Climate Prediction

European Centre for Medium Range Weather Forecasts

UK Met Office

World Meteorological Organization

SOPAC SPREP nzaid NIWA Taihoro Nukurangi



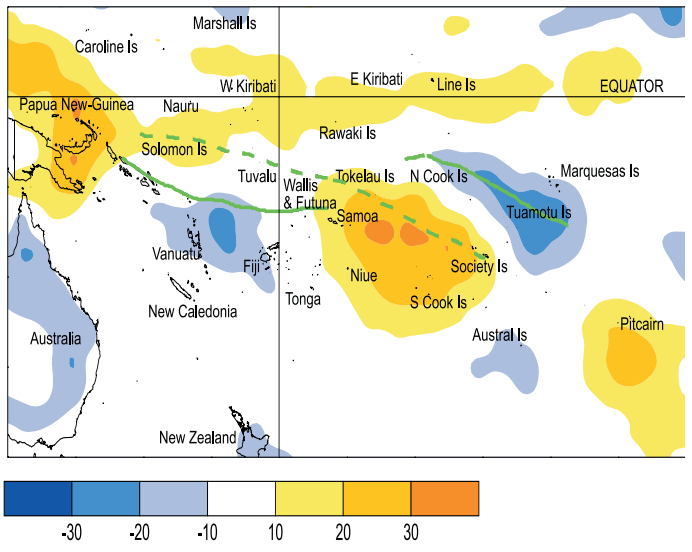
Climate developments in December 2004

The South Pacific Convergence Zone (SPCZ), although not very active about and west of the Date Line, extended from the Solomon Islands east towards Samoa, including Tuvalu, Rotuma Island (northern Fiji), and Wallis and Futuna. Northern French Polynesia was also affected by the SPCZ, where it was more active than usual. Rainfall was well above average at Takaroa, in the Tuamotu Islands of French Polynesia, mainly because of high rainfall associated with tropical cyclone Judy in the third week of December. Rainfall was also above average in the Marquesas and Austral Islands, central and eastern Fiji, and northern New Zealand.

Three regions of suppressed convection with generally less than 50% of average rainfall occurred, one over Papua New Guinea, another over Samoa, the Southern Cook Islands, and central French Polynesia, and a third over Pitcairn Island. Rainfall was also below average over much of New Caledonia, Fiji's Western Division and Southern Tonga.

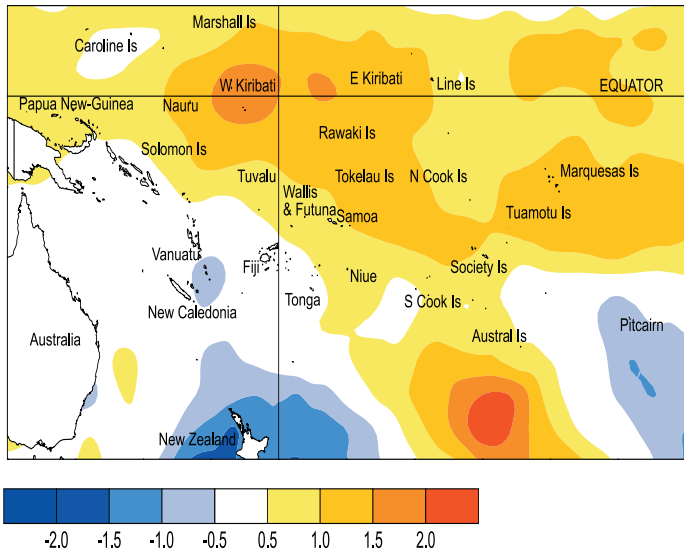
Mean air temperatures were about 1.0ºC above average in Fiji, and northern and southern French Polynesia, and about 0.5ºC above average in Tuvalu, Samoa, and central French Polynesia, consistent with the warm sea surface temperatures (SSTs) affecting these regions. Mean air temperatures were near average in most parts of the region.

Tropical Southwest Pacific mean sea-level pressures continued above average about and west of the Date Line. They were below average in the east, especially over French Polynesia.

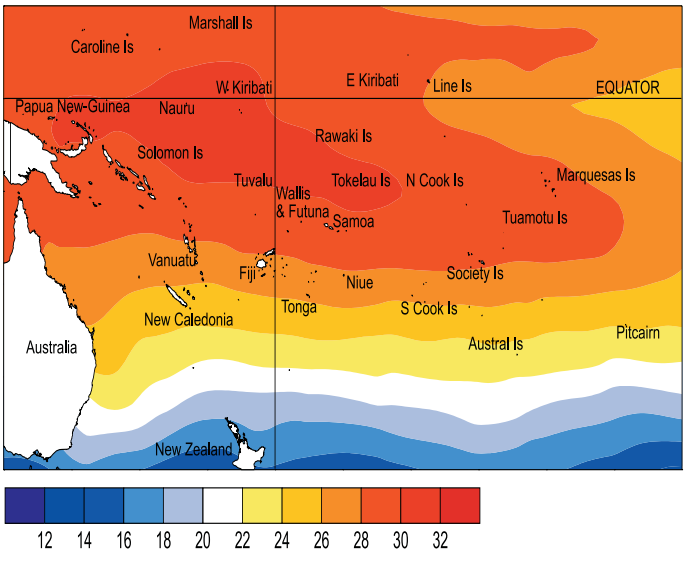


Outgoing Long-wave Radiation (OLR) anomalies, in Wm^{-2}. The December 2004 position of the SPCZ, as identified from total rainfall, is indicated by the solid green line. The average position of the SPCZ is identified by the dashed green line.

Country	Location	Rainfall (mm)	% of average	Comments
French Polynesia	Tuamotu, Takaroa	540	281	Extremely high
Fiji	Nadi	31	17	Well below average
Pitcairn Island	Pitcarin Island	6	4	Extremely low



Sea surface temperature anomalies (°C) for December 2004.



Mean sea surface temperatures (°C) for December 2004.

The tropical Pacific Ocean remains in a weak El Niño state. The NINO3.4 average anomaly was about +0.8°C in December, similar to the October/November values. Subsurface temperature anomalies are positive (up to +3°C) in the top 100 m in the eastern Equatorial Pacific. East-west wind anomalies are positive in the central Pacific, after a period of strong westerly anomalies in the west in early December.

Outgoing longwave radiation and rainfall anomalies show enhanced convection west of the Date Line, especially south of the Equator, and suppressed convection over Indonesia and northern Australia. The Southern Oscillation Index (SOI) remained at –1.1 in December (three-month October to December mean –0.9), indicative of a continued weak El Niño event.

Most available global climate models indicate weak El Niño conditions through the first three months of 2005, but almost all ease to neutral conditions by early winter. All available models indicate neutral conditions by July-September 2005.

The latest US National Center for Environmental Prediction/ Climate Prediction Center statement is for weak El Niño conditions continuing for the next three months. The International Research Institute for Climate Prediction summary describes the present situation as a weak El Niño state, and gives a 75% chance of weak El Niño conditions continuing through March 2005.

Tropical rainfall outlook: January to March 2005

The tropical Pacific Ocean is still in a weak El Niño state and this will continue to influence rainfall patterns in the Pacific region over the next three months.

Enhanced convection is expected in the equatorial region of Western and Eastern Kiribati and Tuvalu where rainfall is forecast to be above average. Rainfall is likely to be near or above average in Tokelau, the Northern Cook Islands, and the Society Islands of French Polynesia.

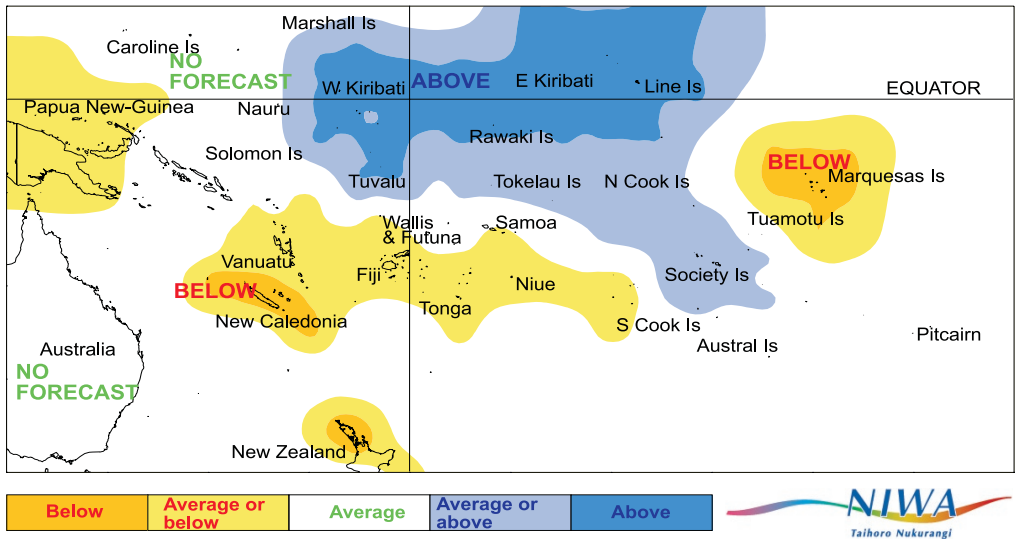
Suppressed convection is expected over New Caledonia and the Marquesas Islands, where rainfall is likely to be below average.

The region of near or below average rainfall is expected to be exceptionally large for the coming three months from Papua New Guinea extending east southeast to the Southern Cook Islands, including Vanuatu, Fiji, Tonga, Niue, and Samoa.

Near average rainfall is likely for the rest of the forecast region.

Island group	Rainfall outlook	Outlook confidence
Western Kiribati	20:20:60 (Above)	High
Eastern Kiribati	20:30:50 (Above)	Moderate – high
Tuvalu	20:30:50 (Above)	Moderate – high
Tokelau	15:40:45 (Near average or above)	Moderate – high
Northern Cook Islands	15:45:40 (Near average or above)	Moderate
Society Islands	15:45:40 (Near average or above)	Moderate
Solomon Islands	35:45:20 (Near average)	Low – Moderate
Wallis and Futuna	35:45:10 (Near average)	Moderate
Austral Islands	30:50:20 (Near average)	Moderate
Tuamotu Islands	20:45:35 (Near average)	Moderate
Pitcairn Island	30:50:20 (Near average)	Moderate
Papua New Guinea	40:40:20 (Near average or below)	Moderate
Vanuatu	40:45:15 (Near average or below)	Moderate
Fiji	40:45:15 (Near average or below)	Moderate
Tonga	40:45:15 (Near average or below)	Moderate
Niue	40:40:20 (Near average or below)	Moderate
Samoa	40:45:15 (Near average or below)	Low – moderate
Southern Cook Islands	40:45:15 (Near average or below)	Low – moderate
New Caledonia	50:35:15 (Below)	Moderate
Marquesas Islands	50:30:20 (Below)	Moderate

NOTE: Rainfall estimates for Pacific Islands for the next three months are given in the above 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 January to March 2005

Forecast validation: October to December 2004

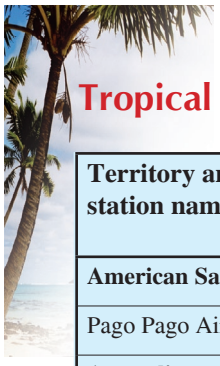
Enhanced convection was expected with above average rainfall over Eastern and Western Kiribati, and areas of above or average rainfall extending to the Solomon Islands, Tuvalu, and Tokelau, as well as Pitcairn and the Austral Islands. Areas of suppressed convection with average or below average rainfall were expected in Papua New Guinea, New Caledonia, Vanuatu, Samoa, Tonga, the Southern Cook Islands, and the Marquesas Islands. Rainfall was expected to be near average elsewhere.

Rainfall was above average over the Solomon Islands, Tuvalu, and the Austral Islands (all as expected), and in Niue and the Marquesas Islands (both higher than expected). Below average rainfall occurred in Tonga and the Southern Cook Islands (both as expected), and in Western Kiribati, Tokelau, Fiji, and Wallis and Futuna (all lower than predicted). Totals were near average elsewhere. The overall 'hit' rate for the October to December 2004 rainfall outlook was about 55%.

Tropical cyclone update

Tropical cyclone 'Judy' affected the Tuamotu Islands of French Polynesia, with central pressures falling to 989 hPa, and maximum sustained wind speeds of 74 km/h on Christmas Day. It caused high rainfall, totalling 370 mm over 3 days, at Takaroa. Tropical cyclone 'Kerry', the second tropical cyclone of this season, developed northeast of Vanuatu on 6 January, passed over the Pentecost and Malekula Islands on 7 January, and was northwest of New Caledonia at the time of writing. Central pressures were as low as 987 hPa with estimated maximum sustained winds speeds of 140 km/h. The tropical cyclone season is now 'active', with occurrences normally peaking during January, February, and March.

The February issue of the ICU will provide an update on tropical cyclones affecting or likely to affect our forecast region.



Tropical Pacific rainfall – December 2004

Territory and station name	December 2004 rainfall total (mm)	Long-term average (mm)	December 2004 percent of average	Lowest on record (mm)	Highest on record (mm)	Records began
American Samoa						
Pago Pago Airport	*263.9*	364	73			1966
Australia						
Cairns Airport	252.6	184	137	9	919	1941
Townsville Airport	112.8	131	86	0	458	1940
Brisbane Airport	255.6	126	203	30	438	1929
Sydney Airport	91.6	76	121			1929
Cook Islands						
Rarotonga Airport	71.5	188	38	11	653	1929
Fiji						
Rotuma	327.2	285	115	27	664	1912
Udu Point	286.9	263	109	38	505	1946
Nadi	30.7	178	17	21	562	1942
Nausori	307.2	266	115	70	620	1956
Ono-i-Lau	41.9	149	28	9	523	1943
French Polynesia						
Hiva Hoa, Atuona	130.6	78	167	7	297	1951
Tahiti - Faaa	210.6	268	79	20	759	1919
Tuamotu, Takaroa	539.8	192	281	31	525	1953
Tuamotu, Hereheretue	281.2	210	134	38	491	1962
Gambier, Rikitea	74.4	202	37	36	440	1952
Tubuai	253.6	208	122	14	603	1953
Rapa	273.4	216	127	45	510	1951
Kiribati						
Tarawa	*215.6*	210	103	14	491	1946
New Caledonia						
Ile Art, Belep	40.0	149	27	29	363	1962
Koumac	49.4	101	49	6	489	1951
Ouanaham	124.8	154	81	18	613	1961
Poindimie	181.6	222	82	41	905	1965
La Roche	95.4	154	62	5	584	1956
La Tontouta	36.2	81	45	3	310	1949
Noumea	144.2	76	190	0	290	1863
Moue	131.2	125	105	12	630	1972
Niue						
Hanan Airport	*242.7*	169	144	66	274	1996

Tropical Pacific rainfall – December 2004

Territory and station name	December 2004 rainfall total (mm)	Long-term average (mm)	December 2004 percent of average	Lowest on record (mm)	Highest on record (mm)	Records began
New Zealand						
Kaitaia	150.3	97	155	18	185	1985
Whangarei Aiport	114.4	91	126	9	249	1937
Auckland Airport	133.2	83	160	22	202	1962
North Tasman						
Lord Howe Island	139.8	121	116	17	339	1886
Norfolk Island	28.2	82	34	14	295	1921
Raoul Island	30.0	135	22	1	571	1937
Pitcairn Island	*6.4*	166	4	22	619	1940
Samoa						
Faleolo	170.5	308	55	117	759	1951
Apia	232.3	373	62	63	931	1890
Tokelau						
Nukunonu	*168.2*	286	59	57	607	1948
Tonga						
Lupepau'u	*145.3*	244	60	61	591	1995
Fua'amotu Airport	*51.0*	159	32	11	391	1979
Tuvalu						
Nanumea	486.1	344	141	53	687	1941
Nui Island	427.6	388	110	94	762	1941
Funafuti	229.4	392	59	130	837	1927
Nuilakita Island	370.5	305	121	77	658	1941
Vanuatu						
Sola	410.6	387	106	109	879	1958
Pekoa	103.8	271	38	38	644	1951
Lamap	105.5	155	68	46	458	1960
Bauerfield	85.1	180	47	13	420	1985
Port Vila	85.3	190	45	5	404	
Aneityum	208.7	169	123	8	726	1958
Wallis & Futuna						
Wallis Island, Hihifo	*122.6*	314	39	93	519	1951
Maopoopo, Futuna Island	*177.2*	270	66			

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 subjected to change after undergoing quality control checks. The data in italics are obtained from synoptic weather reports. These can sometimes differ from the true values, due to communications or station outage, etc.

Facing weather and climate variability with indigenous knowledge

P.F. Lefale and D.N.T. King, NIWA

In the tropical southwest Pacific, measurements of weather and climate conditions by European scientists began in the late 1800s, with the first observing stations established in New Caledonia in 1863 and Samoa in 1890. Since then, scientific observations and research into understanding the weather and climate of the region have advanced at a rapid pace in line with the information and technological era. Despite these advances, however, there remain difficulties in forecasting weather and climate changes across time and space. General circulation models, for example, are often too coarse and far too expensive for many Pacific Islands to afford. These challenges have led to interest in local weather and climate knowledge developed by indigenous communities. Two recent projects carried out in New Zealand and Samoa, by Te Kuwaha (Maori Research Unit) of the National Institute of Water and Atmospheric Research Ltd (NIWA), and the NIWA climate programme, respectively, are part of a growing number of projects related to indigenous environmental knowledge of weather and climate.

The principal objective of these two projects was to examine and document traditional indigenous knowledge of weather and climate in New Zealand and Samoa and to report back to participating communities on the findings. Preliminary findings from these projects show that indigenous communities in New Zealand and Samoa have an intimate understanding of local weather and climate conditions. Birds, insects, plants, and other natural environmental changes are often used as indicators to monitor and forecast weather and climate conditions.

This knowledge has been used for hundreds of years by indigenous people and has been integral to their survival. Other forms of indigenous knowledge include the use of a vast nomenclature pertaining to weather and climate phenomena, as well as the oral recording of historical weather- and climate- based events and trends. Samoans and Maori also have their own seasonal calendars, based upon long-term observations of local environmental change.

From this local knowledge, opportunities exist to understand what has helped indigenous people to successfully adapt to climate variability in the past – particularly extreme events. This also provides clues on how adaptation strategies to climate variability and human induced climate change might be tailored in the future. However, it is not only at the local level that the applicability of indigenous knowledge is so valuable. Rather, when indigenous knowledge is used in conjunction with the information derived from western-eastern science, a strong basis for improved problem solving and decision making can emerge.

For further information on the two research projects, contact the authors at NIWA Auckland. Emails: p.lefale@niwa.co.nz, d.king@niwa.co.nz

The Island Climate Update

Cover Photo: Wendy St George, NIWA

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Sources of South Pacific rainfal 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

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

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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.