Number 64, January 2006

The Island Climate Update

December's climate

- The South Pacific Convergence Zone (SPCZ) extended from the Solomon Islands towards the Southern Cook Islands; high rainfall in parts of Fiji, northern Tonga, and French Polynesia
- Suppressed convection occurred around the Date Line in the central equatorial Southwest Pacific; below average rainfall in New Caledonia and the Southern Cook Islands
- Well above average air temperatures occurred in New Caledonia, Fiji, and central and southern French Polynesia

El Niño/Southern Oscillation and seasonal rainfall forecasts

- The tropical Pacific remains in a neutral state with some features of a weak La Niña
- Enhanced convection expected in the Southern Cook Islands
- Below average rainfall likely in Western and Eastern Kiribati

Collaborators

Australian Bureau of Meteorology

Meteo France

Fiji Meteorological Service

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

SOPAC

SPREP

nzaid

NIWA
Taihoro Nukurangi

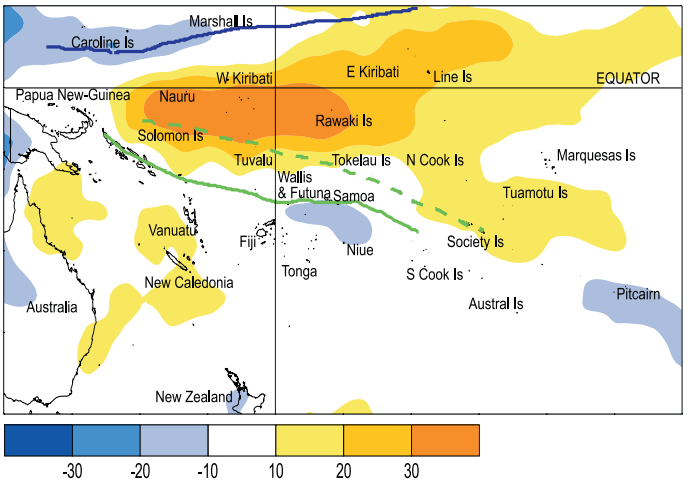
Climate developments in December 2005

A large area of suppressed convection affected the central equatorial Pacific extending to parts of the Northern and Southern Cook Islands, and the Society and Tuamotu Islands of French Polynesia. The South Pacific Convergence Zone (SPCZ) extended from the Solomon Islands to just north of the Southern Cook Islands, resulting in above average rainfall over parts of Fiji, Tonga, and French Polynesia. The Intertropical Convergence Zone was well north of the equator.

Rainfall was less than 50% of normal in the Southern Cook Islands, New Caledonia, Norfolk Island, and southern parts of both Tuvalu and Tonga.

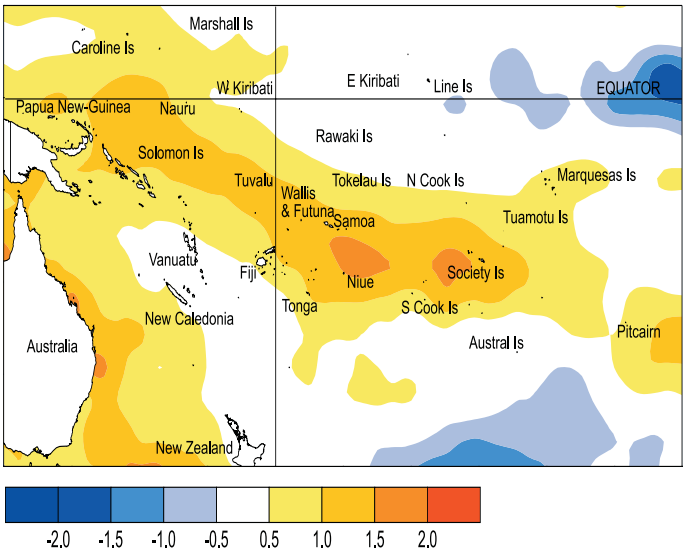
Mean air temperatures were about 1.0 °C above average in central and southern French Polynesia, and at least 0.5 °C above average in Vanuatu, New Caledonia, Tuvalu, and the Southern Cook Islands. Unusually warm December air temperatures were recorded at several sites in parts of New Caledonia, Fiji, and French Polynesia.

Tropical Southwest Pacific mean sea-level pressures continued the tendency to be below average east of the Date Line, although this was not as marked as in previous months. They were above average over northern Australia, and across New Caledonia toward Fiji. Equatorial surface easterlies were persistent along the equator, occurring in about 92% of observations at Tarawa.

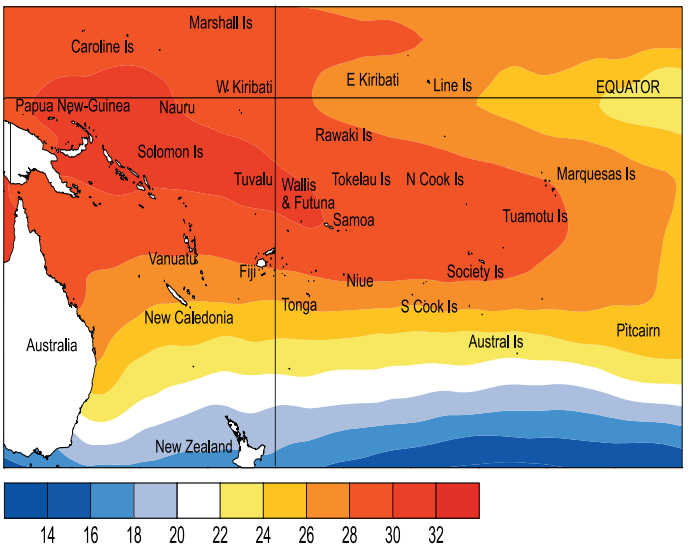


Outgoing Long-wave Radiation (OLR) anomalies, in Wm^{-2}. The December 2005 position of the SPCZ, as identified from total rainfall, is indicated by the solid green line. The average position of the SPCZ is identified by the dashed green line (blue equals high rainfall and yellow equals low rainfall). The December 2005 position of the Intertropical Convergence Zone (ITCZ), as identified from total rainfall, is indicated by the solid blue line.

Country	Location	Monthly Max Temp (°C)	Comments
New Caledonia	Pouembout	37.1	Equal high
Fiji	Labasa Airfield	32.6	Equal high
French Polynesia	Tahiti – Faa'a	28.1	Record high
French Polynesia	Rikitea	25.2	Record high



Sea surface temperature anomalies (°C) for December 2005.



Mean sea surface temperatures (°C) for December 2005.

The tropical Pacific Ocean is in a neutral state with some features of a weak La Niña. Negative sea surface temperature anomalies continue to strengthen off the South American coast, while those near the Date Line have eased to near normal. The NINO3 sea surface temperature (SST) anomaly was about -0.7 °C in December (-0.3 °C for October–December), while NINO4 was about +0.2°C (+0.4°C for October–December). The cold subsurface temperature anomaly has surfaced across from the Date Line eastwards, and further cool anomalies occurred in the subsurface.

The Southern Oscillation Index (SOI) was near neutral in December (-0.1), with the 3-month October–December average at +0.2. The equatorial trade winds have strengthened near the Date Line and across the Pacific. Outgoing longwave radiation (OLR) anomalies indicate suppressed convection near the Date Line, but much enhancement north of Australia into Asia. Although the monsoon trough appears to be becoming organised over north Australia, the Madden-Julian Oscillation (MJO) continues to be weak.

Four of the ENSO forecast models show weak La Niña conditions for the January to March period, with all trending back to neutral conditions through April-September 2006. The latest NCEP/CPC statement calls for neutral conditions or a weak La Niña over the next 6–9 months. The IRICP summary gives a 10% chance of La Niña in the next few months, with neutral conditions most likely through the summer.

Tropical rainfall outlook: January to March 2006

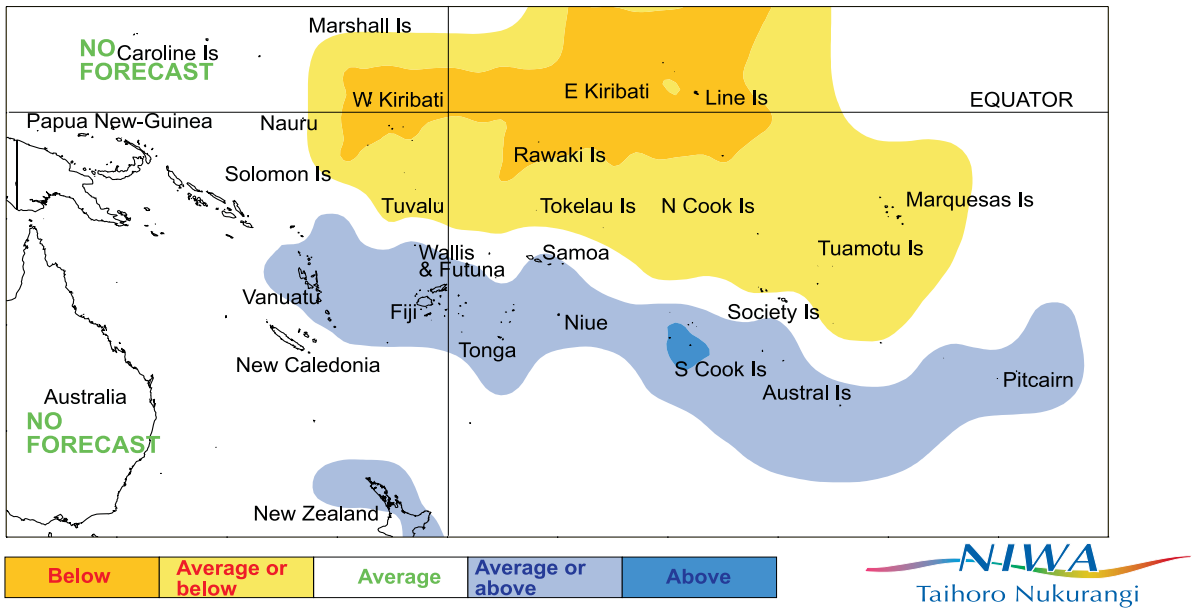
A large area of enhanced convection is expected from Vanuatu east southeast to Pitcairn Island, including Samoa, Fiji, Tonga, Niue, and the Society and Austral Islands, where rainfalls are likely to be near or above average. The Southern Cook Islands is expected to experience above average rainfall.

Near or below average rainfall is likely from Tuvalu east to the Marquesas Islands, including Tokelau, the Northern Cook Islands, and the Tuamotu Islands. Below average rainfall is expected over Western and Eastern Kiribati. Near average rainfall is expected elsewhere in the region.

The Southwest Pacific tropical cyclone season is well underway, although there have been no occurrences to date. In both January and February, risk increases, as there are usually two to three tropical cyclone occurrences per month. About nine tropical cyclones can be expected on average, for the complete season over the entire Southwest Pacific region in ENSO–neutral seasons similar to the present. The February issue of the ICU will provide information on any occurrences of tropical cyclones in the region.

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

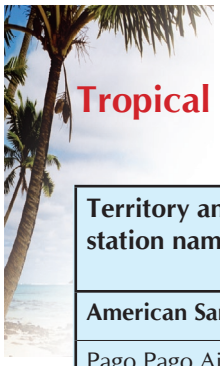


Rainfall outlook map for January to March 2006.

Forecast validation: October to December 2005

Enhanced convection, with average or above average rainfall, was expected over Papua New Guinea and the Solomon Islands, as well as from Samoa to central and southern French Polynesia, including Niue and the Northern and Southern Cook Islands. Suppressed convection was expected over the equatorial region of Eastern Kiribati with below average rainfall. Near or below average rainfall was expected in Western Kiribati and Tuvalu. Near average rainfall was expected elsewhere in the region.

Areas of average or above average rainfall affected Papua New Guinea and the Solomon Islands, as well as Fiji, Tonga, American Samoa, and the Marquesas Islands. Suppressed convection, or below average rainfall, occurred over Western and Eastern Kiribati, extending to Vanuatu and New Caledonia, as well as the Northern Cook Islands and central French Polynesia. Rainfall was higher than expected in Tonga and the Marquesas Islands, and lower than forecast in New Caledonia, Vanuatu, Wallis and Futuna, and the Society Islands. The overall 'hit' rate for the October to December 2005 rainfall outlook was about 70%. Outcomes for the Solomon Islands (based on OLR anomalies) have been consistent with forecasts for 11 consecutive months.



Tropical Pacific rainfall – December 2005

Territory and station name	December 2005 rainfall total (mm)	Long-term average (mm)	December 2005 percent of average	Lowest on record (mm)	Highest on record (mm)	Records began
American Samoa						
Pago Pago Airport	571.5	364	157			1966
Australia						
Cairns Airport	34.2	184	19	9	919	1941
Townsville Airport	57.6	131	44	0	458	1940
Brisbane Airport	120.2	126	95	30	438	1929
Sydney Airport	21.4	76	28			1929
Cook Islands						
Rarotonga Airport	104.4	188	56	11	653	1929
Rarotonga EWS	92.2	188	49	53	204	2000
Fiji						
Rotuma	330.8	285	116	27	664	1912
Udu Point	308.7	263	117	38	505	1946
Nadi	262.7	178	148	21	562	1942
Nausori	219.7	266	83	70	620	1956
Ono-I-Lau	44.2	149	30	9	523	1943
French Polynesia						
Hiva Hoa, Atuona	128.4	78	165	7	297	1951
Tahiti - Faa'a	280.4	268	105	20	759	1919
Tuamotu, Takaroa	120.8	192	63	31	540	1953
Gambier, Rikitea	426.7	202	211	36	440	1952
Tubuai	197.6	208	95	14	603	1953
Rapa	225.4	216	104	45	510	1951
Kiribati						
Tarawa	141.2	210	67	14	491	1946
New Caledonia						
Koumac	11.6	101	11	6	489	1951
Ouloup	50.8	138	37	4	391	1966
Ouanaham	17.4	154	11	18	613	1961
Poindimie	59.6	222	27	41	905	1965
La Roche	53.8	154	35	5	584	1956
La Tontouta	8.6	81	11	3	310	1949
Noumea	23.2	76	31	0	290	1863
Moue	6.8	125	5	12	630	1972

Tropical Pacific rainfall – December 2005

Territory and station name	December 2005 rainfall total (mm)	Long-term average (mm)	December 2005 percent of average	Lowest on record (mm)	Highest on record (mm)	Records began
New Zealand						
Kaitaia	130.0	97	134	18	185	1985
Whangarei Aiport	45.6	91	50	9	249	1937
Auckland Airport	59.6	83	72	22	202	1962
Niue						
Hanan Airport	124.3	169	74	66	274	1996
North Tasman						
Lord Howe Island	85.0	121	70	17	339	1886
Norfolk Island	26.2	82	32	14	295	1921
Raoul Island	88.8	135	66	1	571	1937
Tonga						
Queen Lavinia	510.9	271	189	69	608	1971
Nuku'alofa	38.1	162	24	3	783	1944
Lupepau'u	166.2	244	68	61	591	1995
Salote Pilolevu Airport	38.5	154	25	4	613	1947
Fua'amotu Airport	48.7	159	31	11	391	1980
Tuvalu						
Nui Island	350.7	388	90	94	762	1941
Funafuti	334.7	392	85	130	837	1927
Nanumea	26.3	344	8	53	687	1941
Vanuatu						
Pekoa	*142.0*	271	52	38	644	1951
Lamap	*108.8*	155	70	46	458	1960
Bauerfield	*168.2*	180	93	13	420	1985
Tanna/Burtonfield	*82.6*	102	81	10	297	1961
Aneityum	*192.9*	169	114	8	726	1958
Wallis & Futuna						
Wallis island, Hififo	*274.0*	314	87	93	519	1951
Maopoopo, Futuna Island	*140.2*	270	52			

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. 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.

PI-GOOS Case Study: Ocean Monitoring and Economic Benefits to the Cook Islands' Black Pearl Industry

Aarti V Naidu, SOPAC

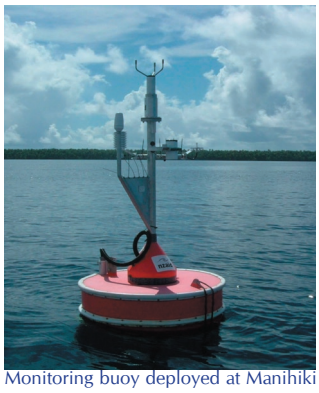
The Pacific Island Global Ocean Observing System (PI-GOOS) is dedicated to acquiring oceanographic and related climate data and developing this into information and products useful for sustainable coastal and marine management in the Pacific. The provision of scientific information and advice to the Pacific Island Countries (PICs) will ultimately assist their self-empowerment and decision-making pertaining to their ocean environment, with direct positive implications for the region's economic and social development.

The Cook Islands' black pearl industry is benefiting from such PI-GOOS initiatives. The Black Pearl farms in Manihiki Lagoon provide a prominent export commodity for the Cook Islands (being the second biggest economic sector after tourism). The pearl industry earned approximately $18.4 million of export revenue in 2000. However, this value declined dramatically to $2.8 million in 2003 (Cook Islands Statistical Bulletin 2003).

The decline in export revenue was caused by two main factors including a general fall in international pearl prices. This was primarily because of a rapid increase in the supply of French Polynesian black pearls on the world market. The second factor affecting the Cook Islands' black pearl export was a disease outbreak in Manihiki causing high levels of sick oysters, and often death. Overstocking, poor farming practices, and adverse environmental conditions caused the disease (McKenzie 2004). Collaborative efforts between the Cook Islands' Ministry of Marine Resources, the South Pacific Community (SPC), the South Pacific Applied Geoscience Commission (SOPAC), and NZAID have led to the instigation of various projects to stabilise and assist strengthening the Cook Islands' black pearl industry.

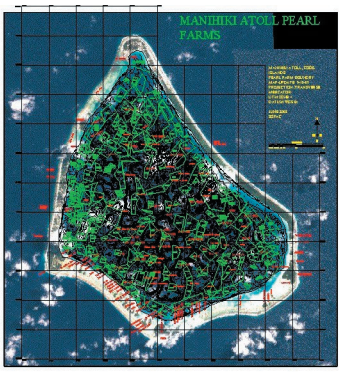
These included the initiation of oceanographic monitoring and bathymetric mapping in order to understand the lagoon conditions and thereby improve the ability to farm and sustainably manage the industry at Manihiki (Smith 2003).

The data and information obtained from oceanographic monitoring and bathymetric mapping have been and are still being used for:



Monitoring buoy deployed at Manihiki Lagoon in Nov 2003

- an early warning system of environmental conditions that may cause oyster disease outbreak, allowing farmers to adjust farming practices;
- estimations of carrying capacity of the lagoon;
- information on the lagoon response to intense commercial mariculture;
- baseline data to assess pearl farming potential of other lagoons in the Cook Islands, and across the South Pacific;
- contribution to international research activities, including other black pearl industries; and
- drafting the Manihiki Pearl Management Plan.



Manihiki Atoll Pearl Farm Map determined by bathymetric mapping and interviews with the local community

Continued oceanographic monitoring, and the implementation of the Draft Manihiki Pearl Management Plan, have the potential to reap substantial economic rewards for the Cook Islands through generation of pearl revenue to the value of NZ$40 million, with additional indirect secondary benefits (based on estimates between 2004 and 2019) (McKenzie 2004). Without implementation of the Pearl Farming Management Plan, there would be incentives for individual farmers, using a communally owned and unregulated lagoon, to increase oyster stocks beyond the biological and economic optimum, leading to repeated disease outbreaks, and reduced profits for all farmers: most notably the net present value of the export pearl revenue (2004–2014) is estimated to become negative, falling to NZ$-2.8 million (McKenzie 2004).

The Manihiki Case Study exemplifies the role that PI-GOOS plays in retrieving, storing, and using longer-term sustained marine data for the improved management of coastal and marine areas, and major marine-related industries in the Pacific region, such as fisheries, mariculture, and tourism Ultimately, this helps to maintain the health of ocean, coastal and atoll ecosystems for the longer-term benefit of the local Pacific Island community.

Further information is available on the new PI-GOOS website – the first ocean information portal developed for the region in mid 2005, accessible via the SOPAC Home Page (www.sopac.org). For other queries, or to discuss ocean/climate monitoring issues and potential projects in the South Pacific, contact the PI-GOOS Co-ordinator, Dr Sarah Grimes based at the PI-GOOS Secretariat in SOPAC, Fiji (sarahg@sopac.org) or PI-GCOS Co-ordinator, Mr Dean Solofa, based at the PI-GCOS Secretariat in the South Pacific Regional Environmental Program (SPREP), Samoa (deans@sprep.org.ws).

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McKenzie, E. December 2004. A Cost-Benefit Analysis of Projects Implemented to Assist the Black Pearl Industry in Manihiki Lagoon, Cook Islands, SOPAC Technical Report 371, South Pacific Applied Geoscience Commission.

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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:

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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.