Number 75, December 2006

The Island Climate Update

November's climate

- 'Yani', the second tropical cyclone of the season
- Moderate El Niño persists in the Pacific
- Enhanced convection persists west of the Date Line, suppressed convection between the Northern Cook Islands and the Pitcairn Island
- Warmer than normal in parts of Fiji and New Caledonia, cooler in parts of southern French Polynesia

El Niño/Southern Oscillation (ENSO) and seasonal rainfall forecasts

- El Niño expected to continue into early 2007
- Below average rainfall likely for New Caledonia and Fiji
- Above average rainfall forecast for Western and Eastern Kiribati, Tuvalu, and Tokelau

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

SOPAC

SPREP

nzaid

NIWA Taihoro Nukurangi

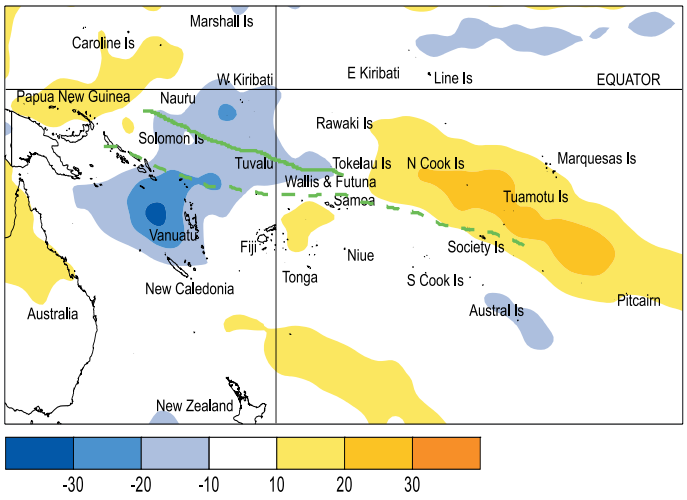
Climate developments in November 2006

Enhanced convection occurred during November, mainly west of the Date Line, from the north of New Caledonia north east to Western Kiribati, including Vanuatu, the southeast of the Solomon Islands, and Tuvalu, although not as strong as in October. Some of the convection over the Solomon Islands and Vanuatu was associated with the passage of tropical cyclone "Yani", the second tropical cyclone this season. The South Pacific Convergence Zone (SPCZ) was north of its normal location, with some enhancement west of the Date Line. Convection in the Southwest Pacific was quite suppressed in the east between the Northern Cook Islands and Pitcairn Island.

Rainfall was above average (at least 125% of normal) in a few areas in northern parts of New Caledonia and the Austral Islands. Rainfall was 50% or less of normal in parts of Fiji, Northern and central French Polynesia, and less than 25% of normal in the Kermadec Islands, and areas of the Queensland coast of Australia.

Mean air temperatures were 0.5 ºC or more above average in parts of New Caledonia, Fiji, and 0.5 ºC or more below average in parts of Southern French Polynesia.

Tropical Southwest Pacific mean sea-level pressures were above average over the northern half of Australia and to the northeast of New Zealand to the region south of the Southern Cook Islands. Pressures tended to be below average in equatorial areas east of the Date Line.

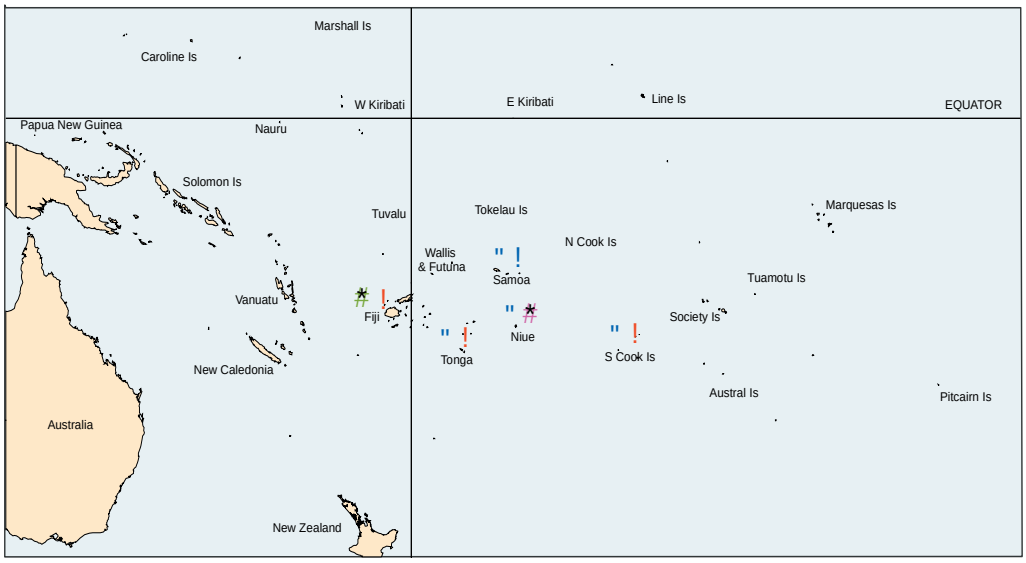


Outgoing Long-wave Radiation (OLR) anomalies, in Wm^{-2} (blue equals high rainfall and yellow equals low rainfall). The November 2006 position of the SPCZ, as identified from total rainfall, is indicated by the solid green line. The average position of the SPCZ is identified by the dashed green line..

Equatorial surface westerlies occurred in about 35% of observations at Tarawa, about 10% less than in October.

Country	Location	Rainfall (mm)	% of average	Comments
Australia	Townsville	< 1	1	Extremely low
Kermedec Is	Raoul	3	3	2nd lowest on record
French Polynesia	Tahiti - Faaa	37	29	Well below normal

Soil moisture in November 2006



Estimated soil moisture conditions at the end of November 2006, using monthly rainfall data.

Estimates of soil moisture shown in the map (above) are based on monthly rainfall for one station in each country. Currently there are not many sites in the water balance model. It is planned to include more stations in the future.

The information displayed is based on a simple water balance technique to determine soil moisture levels. Addition of moisture to 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.

Please note that these soil moisture calculations are made at the end of the month. For practical purposes, generalisations were made about the available water capacity of the soils at each site.

At the end of November 2006, Apia soils were at field capacity (full) while Nadi, Nukualofa, and Rarotonga soils were at a dry soil moisture level. Hanan soil moisture levels were moderate.

El Niño/Southern Oscillation (ENSO)

The tropical Pacific atmosphere and ocean have developed into a clear El Niño state.

Sea surface temperature anomalies have steadied in the eastern Equatorial Pacific and continued to rise slightly near the Date Line, while the near-normal anomalies in the Western Pacific display the typical "horse shoe" pattern, associated with an El Niño in the subtropics. The NINO3 anomaly steadied around +1.3°C in December, with NINO4 rising slightly to +1.4°C (up from 1.1°C in October). The respective 3-month means are +1.3°C and 1.2°C.

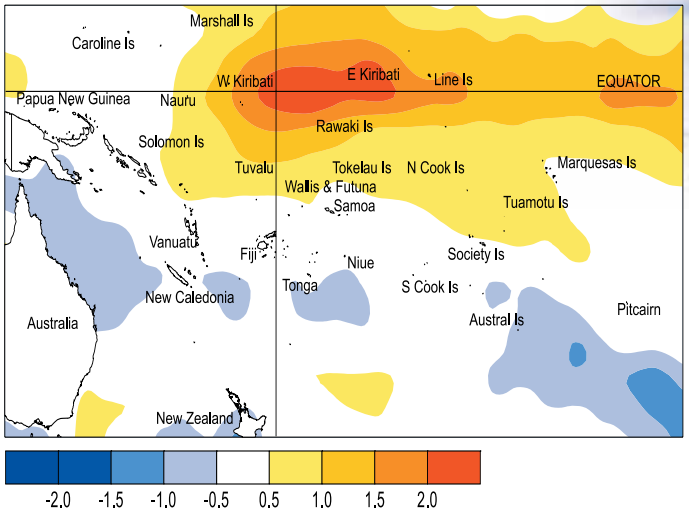
Zonal wind anomalies weakened during November from maximum positive values in October, and are near normal for the time of year.

Continued sub-surface warming along the Equatorial thermocline occurred during November with an extensive area of +4°C isotherm at 100-150m from the Date Line eastwards. The latest 5-day average showed a strong thermocline depression in the central Pacific associated with a +6°C temperature anomaly at 100-150m depth near 120°W.

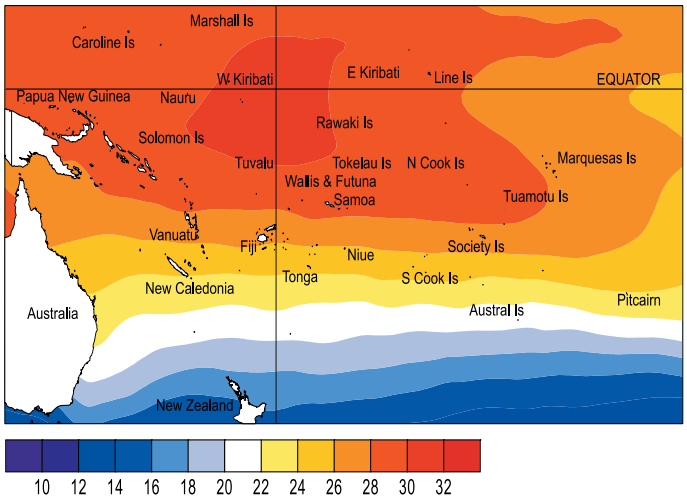
The Southern Oscillation Index (SOI) weakened during November to average at -0.3 with a 3-month mean at -0.9. OLR and tropical rainfall anomalies also reflect an El Niño-like pattern, but with the east-west dipole associated with ENSO events still displaced to the west. An area of enhanced convection is mostly between Papua-New Guinea and the Date Line, with a corresponding suppressed convection area over Indonesia.

OLR anomalies associated with Madden-Julian Oscillation (MJO) developed in early-mid September over the eastern Indian Ocean. The MJO is active but weak, and is expected to propagate into the Western Pacific in the first two weeks of December 2006.

Most models show an El Niño state through to the end of February, consistent with last month's predictions. Seven out of the eleven models predict an easing to neutral during the southern hemispheric autumn 2007: the remaining four model predictions retain El Niño conditions into autumn.



Sea surface temperature anomalies (°C) for November 2006.



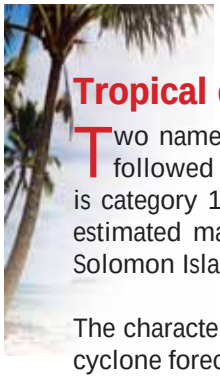
Mean sea surface temperatures (°C) for November 2006.

The International Research Institute for Climate and Society (IRI) give a 90% chance of maintaining El Niño conditions "through the next several running 3-month periods" (into early 2007), with a less than 10% chance of becoming neutral during that time. National Center for Environmental Predictions (NCEP) predict continuation of El Niño conditions into early 2007.

Forecast validation: September to November 2006

Suppressed convection with average or below average rainfall was expected over New Caledonia, and also the Marquesas Islands. Enhanced convection with near or above average rainfall was expected to extend from Western Kiribati to Pitcairn Island, including the Solomon Islands, Samoa, the Southern Cook Islands, the Society, and the Austral Islands. Near average rainfall was expected elsewhere in the region.

A large region of enhanced convection and/or above average rainfall affected the region between the Solomon Islands and the Dateline, including Vanuatu and Western Kiribati. Convection was also enhanced, with above average rainfall, in the Tuamotu Islands. Rainfall tended below average from New Caledonia to Niue, including Tonga. Seasonal rainfall anomalies turned out as forecast for many Islands, but was lower than expected in Niue. The 'hit' rate for the September-November 2006 outlook was just over 70%.



Tropical cyclones

Two named tropical cyclones have occurred so far this season. 'Xavier' was the first occurrence over 22-25 October, followed by 'Yani' over 22-25 November. 'Yani' had estimated maximum sustained wind speeds of 120 km/h, which is category 1 on the Saffir-Simpson scale. An unnamed tropical storm occurred over 30 November – 1 December with estimated maximum sustained wind speeds of 65 km/h. All three of these events occurred over the seas between the Solomon Islands and Fiji.

The characteristics of the El Niño conditions presently affecting in the Pacific are giving a higher confidence in the tropical cyclone forecast for the Southwest Pacific produced in October's issue of the ICU, in that above average numbers of tropical cyclones are likely to be seen in several parts of the South Pacific near and east of the Date Line this season, with a normal rate of occurrence in Islands west of the Date Line.

Future issues of the ICU will provide updates on information relating to further occurrences of tropical cyclones in the region.

Tropical Pacific rainfall – November 2006

Territory and station name	November 2006 rainfall total (mm)	November 2006 percent of average
Australia		
Cairns Airport	28.0	29
Townsville Airport	0.4	1
Brisbane Airport	56.4	58
Sydney Airport	29.2	35
Cook Islands		
Penrhyn	187.6	83
Rarotonga Airport	93.9	69
Fiji		
Rotuma	456.7	162
Udu Point	58.3	29
Nadi	120.1	91
Nausori	277.0	113
Ono-I-Lau	32.2	28
French Polynesia		
Hiva Hoa, Atuona	28.8	30
Bora Bora Motu	152.8	84
Tahiti - Faa'a	37.4	29
Tuamotu, Takaroa	98.4	47
Gambier, Rikitea	79.2	35
Tubuai	58.4	45
Rapa	282.8	163
New Zealand		
Kaitaia	76.1	75
Whangarei Airport	42.0	47
Auckland Airport	89.3	108
Niue		
Hanan	69.0	40

Territory and station name	November 2006 rainfall total (mm)	November 2006 percent of average
Niue		
Liku	113.6	74
New Caledonia		
Ile Art, Belep	88.8	81
Koumac	94.2	178
Ouloup	61.4	64
Ouanaham	81.0	74
Poindimie	132.2	71
La Roche	99.4	86
La Tontouta	64.4	111
Noumea	37.0	63
Moue	37.8	37
North Tasman		
Lord Howe Island	52.2	45
Norfolk Island	59.0	86
Raoul Island	2.6	3
Samoa		
Faleolo	315.1	136
Apia	430.2	164
Tonga		
Lupepau'u	67.4	47
Salote Pilolevu	122.9	108
Nuku'alofa	72.1	64
Fua'amotu	42.8	43
Tuvalu		
Niu Island	191.6	71
Funafuti	207.4	88
Nuilakita	343.0	123

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.

Tropical rainfall outlook: December 2006 to February 2007

Rainfall forecasts for the Pacific region clearly exhibit El Niño patterns for the coming three months, December 2006 to February 2007.

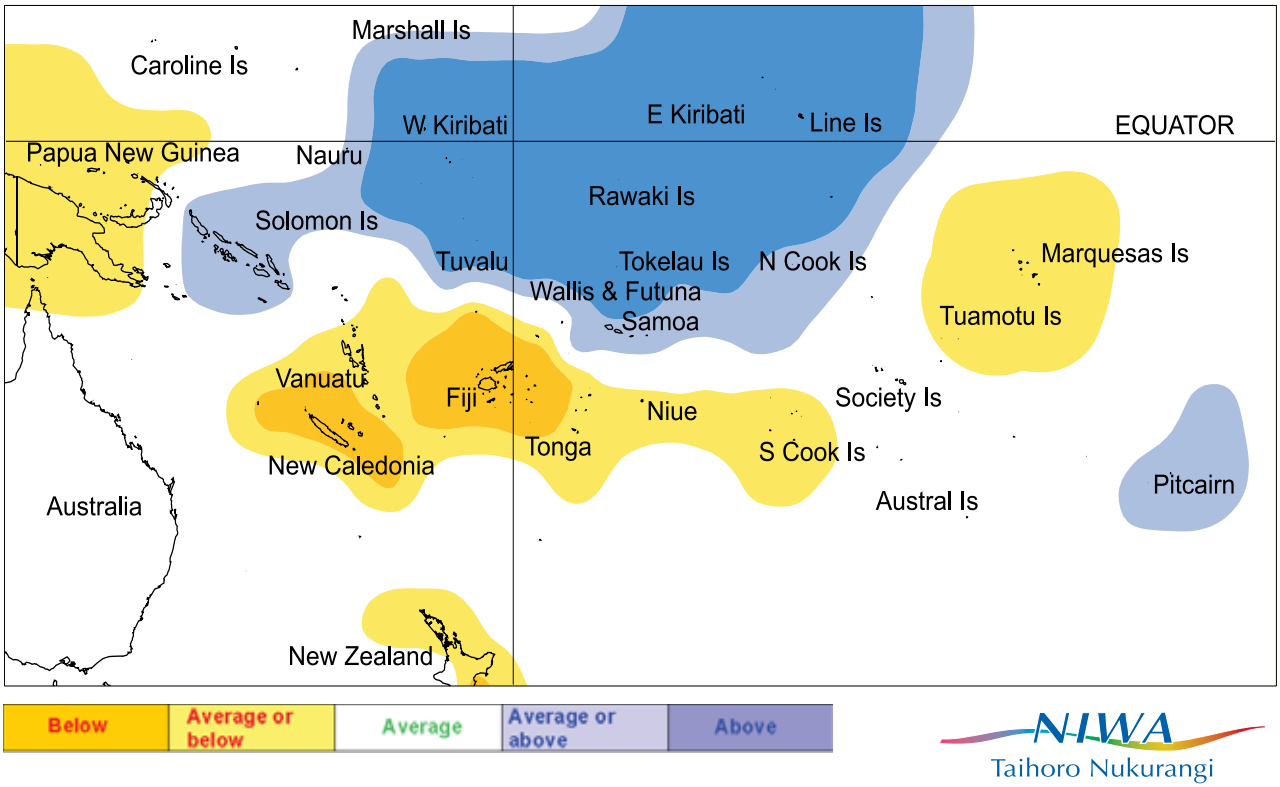
Enhanced convection is expected in the equatorial region of Western and Eastern Kiribati, Tuvalu, and Tokelau where rainfall is forecast to be above average. Enhanced convection is also expected from the Solomon Islands eastwards to Northern Cook Islands including Wallis and Futuna, and Samoa, and Pitcairn Island.

Suppressed convection is expected from Papua New Guinea eastwards to the Marquesas Islands including, Vanuatu, Tonga, Niue, the Southern Cook Islands and Tuamotu Islands, where rainfall is forecast to be near or below average. Below average rainfall is expected over New Caledonia and Fiji.

Society and Austral Islands are expected to experience near average rainfall.

Island group	Rainfall outlook	Outlook confidence
Western Kiribati	20:30:50 (Above)	Moderate – high
Eastern Kiribati	20:30:50 (Above)	Moderate – high
Tuvalu	20:30:50 (Above)	Moderate – high
Tokelau	20:30:50 (Above)	Moderate – high
Solomon Islands	20:40:40 (Near average or above)	Moderate – high
Wallis and Futuna	20:40:40 (Near average or above)	Moderate – high
Samoa	20:40:40 (Near average or above)	Moderate
Northern Cook Islands	20:40:40 (Near average or above)	Moderate
Pitcairn Island	20:40:40 (Near average or above)	Moderate – high
Society Islands	25:45:30 (Near average)	Moderate – high
Austral Islands	25:45:30 (Near average)	Moderate – high
Papua New Guinea	40:40:20 (Near average or below)	Moderate – high
Vanuatu	50:30:20 (Near average or below)	Moderate – high
Tonga	40:40:20 (Near average or below)	Moderate – high
Niue	40:40:20 (Near average or below)	Moderate
Southern 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
New Caledonia	45:35:20 (Below)	Moderate
Fiji	50:30:20 (Below)	Moderate – high

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 December 2006 to February 2007.

The Brief La Niña of 2005-06 and the El Niño of 2006-07

Anthony G. Barnston, International Research Institute for Climate and Society (IRI)

The Brief La Niña of 2005-06

Historically since 1950, ENSO episodes have tended to occur with approximately one-year duration, often beginning near April-July of one year and ending near March-May of the following year. Exceptions have occurred. Until 2005, however, there was never a decrease from a near-zero Nino3.4 SST anomaly in SON to an anomaly in DJF sufficient to be considered a La Niña, such as -0.5ºC or stronger. This happened in 2005-06 for the first time. What caused the rare cold event development in late 2005 at a time of year when the ENSO state is normally stable?

During early September 2005, negative SST anomalies began to develop off the west coast of South America and extended west. A high pressure anomaly centered over northern Argentina and Chile led to strong southeast trades and cross-equatorial flow, and increased coastal and equatorial upwelling. Larger-scale easterly wind anomalies subsequently developed along the equator in middle to late November in response to the anomalous east-to-west SST anomaly gradient. In December the spatial extent became sufficient to impact the Nino3 and then even the Nino3.4 SST anomalies, leading to a more basin-wide coupling with the atmosphere. La Niña SST conditions became established by early December, and continued for three to four months. There were no obvious precursors to the event from 100ºW westward (Fig. 1), as the winds and SSTs began their cold phase behavior approximately concurrently, and eased back to neutral in much the same way nearly four months later.

None of the statistical ENSO prediction models, and only a few of the dynamical models anticipated the event even by November. By January 2006, most models recognized the cooled initial conditions and cooled their early 2006 predictions accordingly. Based on the Niño 3.4 SST index, La Niña SST conditions endured from early December through mid-March. La Niña-like climate responses were evident during DJF, when there were positive rainfall anomalies in most of Indonesia, southeast Asia, the Philippines, part of southern Africa, and northwestern U.S.; and negative anomalies in the central and eastern tropical Pacific, and southern U.S. This supports the notion that ENSO conditions need not endure for multiple seasons in order to have significant impacts on the climate. Interestingly, maps of OLR (not shown) suggested La Niña-like anomalous convection patterns several months earlier than when the SST anomaly in the Niño3.4 region became negative.

The El Niño of 2006-07

Upon return to near-neutral ENSO conditions in April 2006, the ENSO state remained neutral, but moved toward warmer conditions through most of August both in terms of SST and subsurface equatorial Pacific heat content. Because El Niño episodes typically begin before September, during August it was assumed by many climate forecasters that neutral conditions were most likely for the rest of 2006 and into early 2007.Two significant westerly wind bursts that occurred in August and October, respectively, were thought to have occurred too late to tip the balance defined by the "slower" processes. However, by mid-September it became clear that the neutral-to-warmish conditions had edged into the weak El Niño range, and the observed September Niño3.4 SST anomaly from the NOAA OI-SST dataset was 0.70, close to the 75 percentile for that month historically. The models began "predicting" El Niño more clearly once El Niño levels of SST were recognized in the observed initial conditions. Although the El Niño was late starting, this was not unprecedented (e.g. 1986).

The westerly wind events in the western tropical Pacific (Fig. 1) played an essential role in the initiation of the late 2006 El Niño—one in August of moderate strength and a second one from late September to early November of greater strength, duration, and eastward extent. Both wind events were followed by SST increases near and east of the dateline related to the movement of warmer surface water eastward. Anomalously warm SST emerged in a separate region much farther east, near 100ºW in the eastern part of the Niño3 region. During November, the SST anomaly in between the two separately warmed regions increased as the warming pattern became somewhat more uniform from the Date Line eastward. This event appears to be more like those of earlier decades, with warming throughout much of the central and eastern tropical Pacific.

Some expected climate effects have developed, such as excessive rainfall in eastern equatorial Africa and deficient rainfall over Indonesia, southeastern Australia, and parts of southeast Asia. El Niño-related climate effects normally expected between December and April, including those in the Pacific region, should not be taken lightly in current risk management decisions during this weak to moderate El Niño episode.

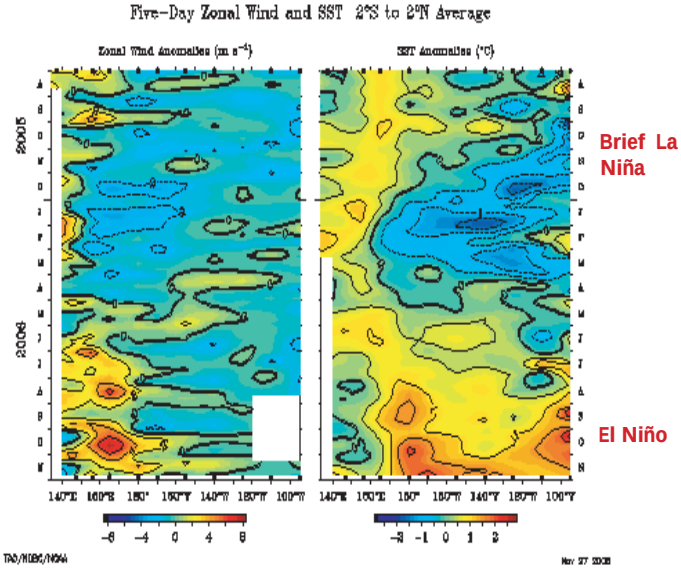


Figure 1. Time-longitude section of zonal wind anomaly and SST anomaly across the equatorial Pacific, averaged over 5ºN-5ºS, from August 2005 to November 2006.

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

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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.

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