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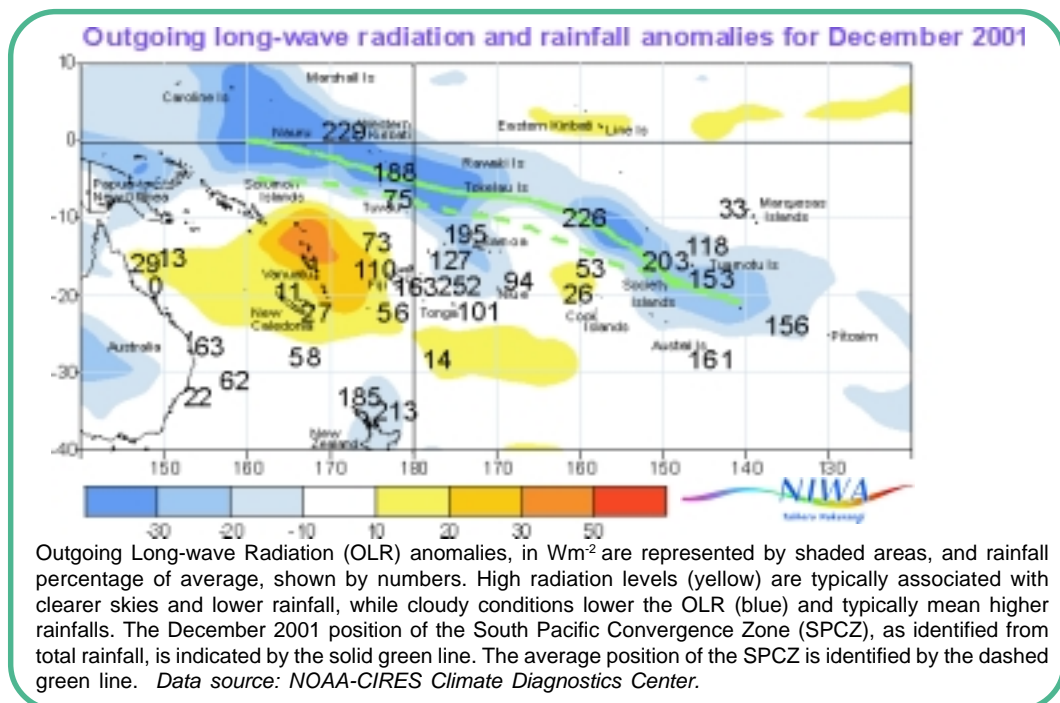
The Island Climate Update



An overview of the present climate in the tropical South Pacific Islands, with an outlook for the coming months, to assist in dissemination of climate information in the Pacific region.

December's climate

The South Pacific Convergence Zone was very active bringing high rainfall to many islands from north of Papua-New Guinea, east through Nauru, Western Kiribati, Tuvalu and Tokelau, and southeast to the Northern Cook Islands and much of French Polynesia. Rainfall was also high over Samoa and northern Tonga. In contrast, well below average rainfall occurred along the Queensland coast of Australia and across the Coral Sea to New Caledonia and Vanuatu. Rainfall was also well below average in the Kermadec's and Southern Cook Islands. Three tropical cyclones, Trina, Vicky, and Waka (the most severe), occurred in the region during the month. *More on Page 2.*



ENSO and sea surface temperatures

The Southern Oscillation Index (SOI) has been quite variable in recent months, but the 3-month mean of -0.3 is still in the neutral range. Trade winds were slightly enhanced in the central Equatorial Pacific, with westerly anomalies in the west. A warmer west – cooler east temperature gradient persists across the Southwest Pacific, but equatorial Sea Surface Temperature (SST) anomalies are weak. Five of the twelve global SST forecast models show indications of a possible evolution towards weak warm ENSO conditions in the months just following the Southern Hemisphere wet season. *Details Page 2.*

The next three months (January to March 2002)

The SPCZ is expected to be more active than usual with average to above average rainfall in western equatorial latitudes from Western Kiribati southeast to Tonga and Niue, including Tuvalu, Wallis and Futuna, and Samoa. Average to below average rainfalls are likely in the equatorial east, including the Society, Marquesas, and Southern Cook islands, and from northern Queensland across to Vanuatu. *More on Page 3.*





Climate developments in December 2001

Very active SPCZ brings high rainfall to many islands

Low rainfall from Queensland in Australia across to Vanuatu

A very strong El Niño-like OLR/rainfall anomaly pattern was evident in December in the west of the region, as a broad band of enhanced convection occurred in equatorial regions from north of Papua-New Guinea east through Nauru, Western Kiribati, Tuvalu and Tokelau, and southeast to the Northern Cook Islands and much of French Polynesia. Convection was also enhanced over Samoa, northern Tonga, and the North Island of New Zealand. Most locations within these regions recorded 150-200% of their average December rainfall. The very high tropical rainfalls (many of at least 500 mm) were associated with a very active SPCZ, which was slightly north of its average position, from the Solomon Islands across to Tokelau and east to French Polynesia. Nanumea in Tuvalu experienced rainfall every day of the month, while Tarawa in Western Kiribati recorded 28 days with rainfall.

Seas continue warming in the west

SST anomalies were still weak across the Equatorial Pacific, but the cooler east - warmer west temperature gradient remained. SST models showed positive anomalies building in the west around the Solomon Islands and Vanuatu (to at least 1.0°C above average), and particularly around New Caledonia (at least 1.5°C above average). Anomalies continued above average east of the Tuamotu Islands and around Pitcairn Island. The warmest surface waters (30-31°C) occurred around the Solomon Islands. Significant cooling occurred between Tonga and the Austral Islands, with SST anomalies more than 1.5°C below average around the Southern Cooks. Although equatorial SST anomalies are generally weak and are expected to stay in the neutral range for a few more months, five of twelve global SST forecast models show indications of an evolution towards weak warm ENSO conditions in the months just following the southern hemisphere wet season, although forecast confidence is presently low. The December SOI fell to -1.2 (because of negative pressure anomalies over Tahiti); the 3-month mean was -0.3, still in the neutral range. The trade winds are now only slightly enhanced in the central Equatorial Pacific, with westerly anomalies in the west.



Forecast validation

Forecast period: October to December 2001

Areas of average to above average rainfall were expected from Papua New Guinea southeast to the Austral Islands of French Polynesia, as well as western Kiribati. Average to below average rainfalls were forecast for Tuvalu to the Marquesas, including the Samoa, Tokelau, Eastern Kiribati, the Northern Cooks, and Pitcairn Island. Near average rainfalls were expected in most other parts of the tropical Southwest Pacific.

High OLR anomalies and well below average rainfall (less than 50% of average) occurred along the Queensland coast across the Coral Sea to New Caledonia and Vanuatu. Rainfall was also well below average in the Kermadec's, Southern Cook Islands and Marquesas Islands.

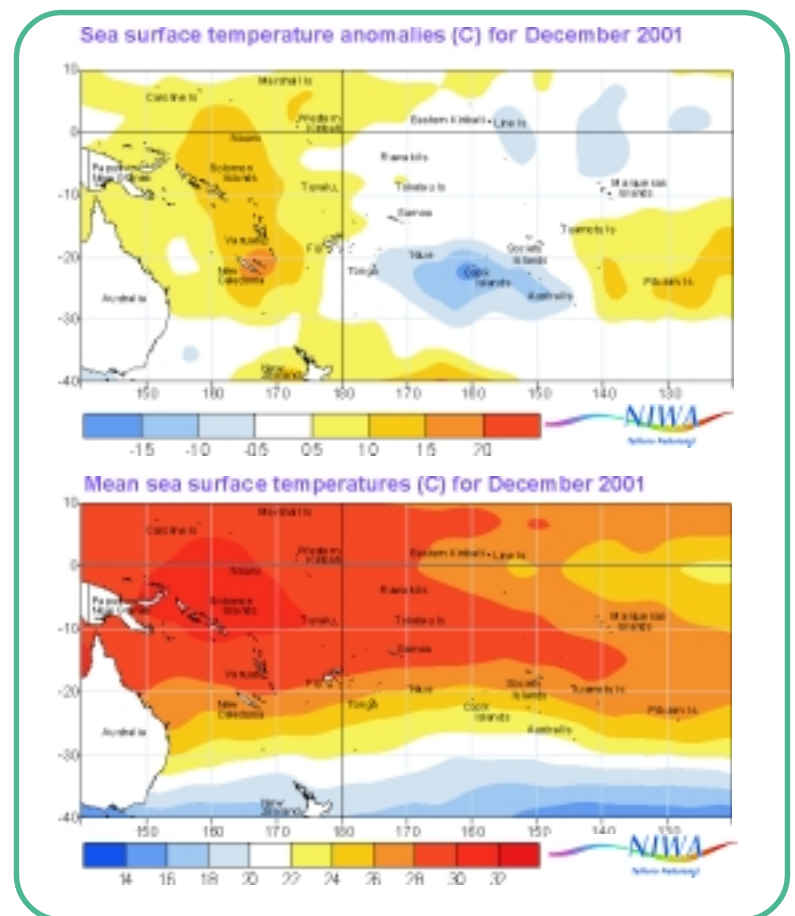
Unusually high December rainfall was recorded at:

Country	Location	Rainfall (mm)	% of normal	Comments
Northern Cook Is.	Manihiki	659	226	Very high
Fiji	Lakeba	530	291	Extremely high
Samoa	Faleolo	632	205	Very high
Samoa	Apia	729	195	Very high
Western Kiribati	Tarawa	463	229	3rd highest
Tuvalu	Nanumea	604	188	Very high
French Polynesia	Tahiti-Faaa	545	203	Very high

Unusually low December rainfall was recorded at:

Country	Location	Rainfall (mm)	% of normal	Comments
Australia	Townsville Airport	<1	<1	Record low
New Zealand	Raoul Island	19	14	Very low

Record high overnight minimum air temperatures, as high as 28°C, were measured at several Fiji locations (Navua and Viwa) on 28 and 29 December.



This scenario was correct for Papua-New Guinea, the Solomon Islands, Western Kiribati, Fiji, Wallis and Futuna, and the Marquesas and Austral Islands. Rainfall was lower than expected for most islands south of 15°S, but higher than forecast for Tuvalu, Samoa, Eastern Kiribati, the Society and Tuamotu islands, and Pitcairn Island.



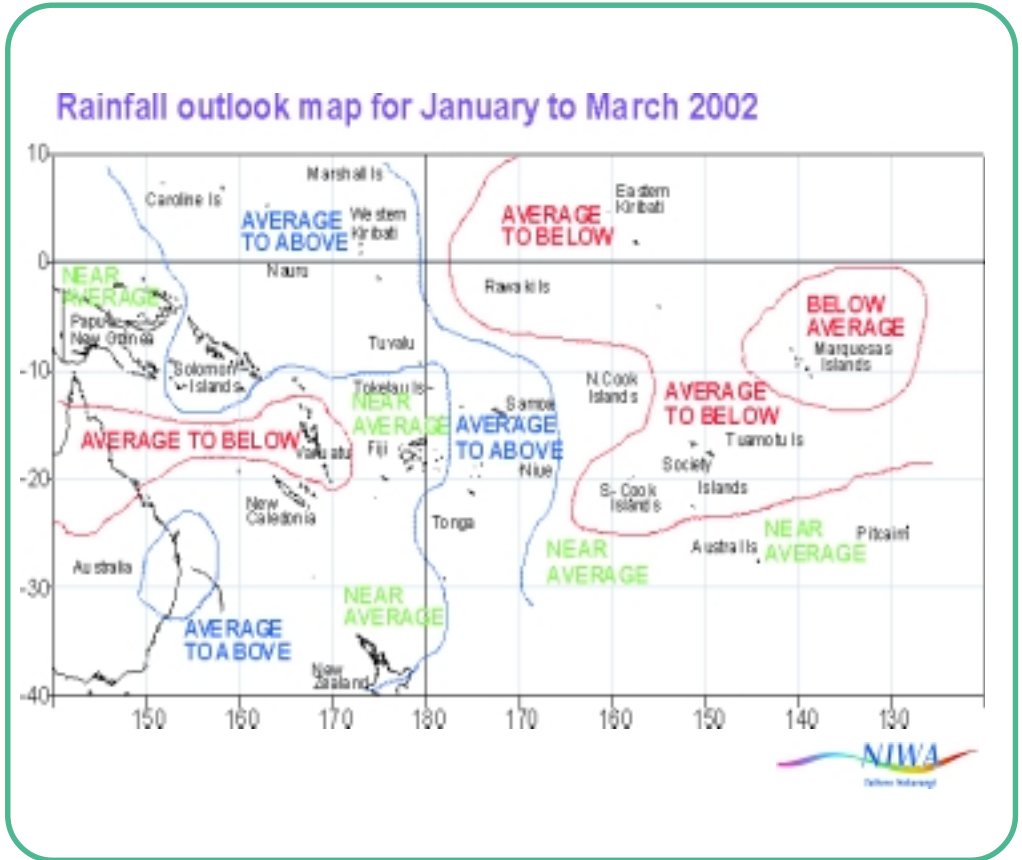
Rainfall outlook: January to March 2002

SPCZ more active than usual

Above average to average rainfall in western equatorial latitudes southeast to Samoa, Tonga and Niue

Average to below average rainfall in the equatorial east, and from northern Queensland across to Vanuatu

The trade winds are now only slightly enhanced east of the dateline, having weakened to the west with westerly wind anomalies. Thus the SPCZ is now displaced further north of its normal location for the time of year, and is expected to be active during the next few months. Rainfall is projected to be average to above average in equatorial latitudes from Western Kiribati southeast to Tonga and Niue, including Tuvalu, Wallis and Futuna, and Samoa. Average rainfall is expected in Papua-New Guinea, New Caledonia, Fiji, and across southern French Polynesia, to Pitcairn Island.



Areas of below average rainfall are likely in Vanuatu, Eastern Kiribati, the Society Islands, and Southern Cooks, with below average rainfall predicted for the Marquesas.

Probabilities of rainfall departures from average

Broad-scale rainfall patterns and anomalies in the southern tropical Pacific area are estimated from the state of large-scale regional climate factors, such as La Niña or El Niño, their effect on the South Pacific and Tropical Convergence Zones, surface and sub-surface sea temperatures, and computer models of the global climate.

Rainfall estimates for the next three months for Pacific Islands are given in the adjacent 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.

The probabilities shown express the expected shift in the distribution from the long-term average, based on predictions of oceanic and atmospheric conditions. The amount of inter-model forecast consistency is indicated by the levels of confidence expressed in the table.

TROPICAL PACIFIC RAINFALL OUTLOOK TABLE (JANUARY - MARCH 2002)		
Island Group	Rainfall Outlook	Confidence in the Outlook
Solomon Islands	20:40:40 (Average to above average)	Moderate
Western Kiribati	20:35:45 (Average to above average)	Low
Tuvalu	20:35:45 (Average to above average)	Low
Wallis and Futuna	20:35:45 (Average to above average)	Low
Samoa	20:35:45 (Average to above average)	Low
Tonga	10:50:40 (Average to above average)	Moderate
Niue	20:35:45 (Average to above average)	Low
Papua-New Guinea	10:60:30 (Near average)	Moderate
New Caledonia	30:40:30 (Near average)	Low
Fiji	10:60:30 (Near average)	Moderate
Tokelau	25:65:10 (Near average)	Moderate
Northern Cook Islands	35:55:10 (Near average)	Moderate
Austral Islands	35:55:10 (Near average)	Moderate
Pitcairn Island	25:65:10 (Near average)	Moderate
Vanuatu	40:40:20 (Average to below average)	Low
Eastern Kiribati	40:40:20 (Average to below average)	Moderate
Southern Cook Islands	40:40:20 (Average to below average)	Low
Society & Tuamotu Islands	40:50:10 (Average to below average)	Moderate
Marquesas	65:25:15 (Below)	Moderate



Tropical cyclones

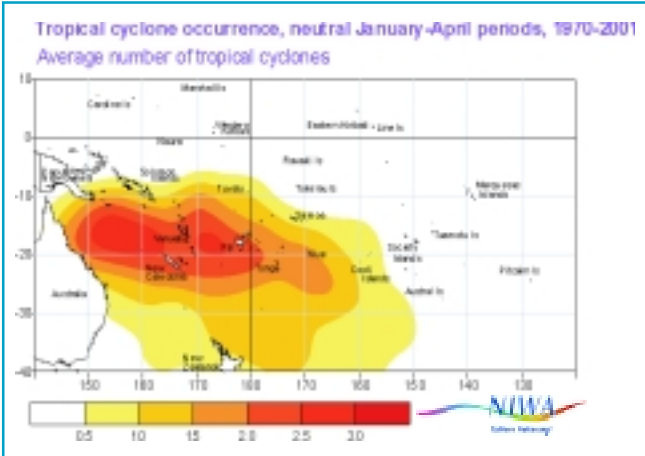
Three tropical cyclones so far

By Stuart Burgess, Dr Jim Renwick and Dr Jim Salinger, NIWA

The tropical cyclone season is now well underway, with three cyclones having occurred so far this season. 'Trina' occurred from 30 November through 2 December, affecting the Southern Cook Islands. Winds gusted to 104 km/h at Rarotonga Airport, and floods resulted because of heavy rainfall. 'Vicky' formed on 22 December near the Northern Cooks, eventually tracking south between the Southern Cooks and French Polynesia on 28 December. 'Waka' was the latest and was very destructive, developing northwest of Samoa at 11°S 174°W on 29 December. Waka reached hurricane force (with estimated maximum sustained winds of 185 km/h) as it tracked south. Mean wind speeds reached 158 km/h at Niuafu'u in Northern Tonga at 1800 UTC 30 December, with mean sea level pressure as low as 976 hPa. This was the worst cyclone to hit the northern islands of Vava'u and Niuatoputapu in recent times, destroying 300 houses and six schools. Trees were uprooted and electricity and telecommunications cut. It also wiped out crops and affected water supplies. Fortunately no lives were lost.

We are now in the usual period of peak tropical cyclone occurrence for the Southwest Pacific, with an average of three tropical cyclones in January, two in February, two in March, and one in April, for the whole region in seasons similar to the present. On average, the highest frequencies occurred over the Coral Sea east to Fiji, including Vanuatu and New Caledonia.

The cyclone occurrence diagram (below) and table (right) show the average number of tropical cyclones that passed near each island group in the Southwest Pacific when ENSO conditions were neutral during the January through April period. For the remainder of this season the chances of tropical cyclone activity are average or slightly lower than normal for much of the Southwest Pacific. The exceptions are Fiji and the Coral Sea where chances are slightly higher than average.



The February issue of the ICU will provide an update on information relating to any occurrences of tropical cyclones in our forecast region of the Southwest Pacific.

Major tropical cyclones bring extremes of wind, rainfall and sea surges, resulting in river and coastal flooding, landslides, and extensive damage to crops, trees, houses, power lines, ports and roads. Many lives can be lost. For a small South Pacific island country the whole economy can be severely affected. Individual tropical cyclones are, however, rather unpredictable; so most South Pacific islands are exposed to some degree of risk every year and must be always prepared.

The following table shows the average number of tropical cyclones passing near the main island groups of the Southwest Pacific over the January through April period (based on 31 years of data, and for tropical cyclones having mean wind speeds over 34 knots*).

Area	Average for all years	Average for Neutral ENSO years	Comments
S. Papua-New Guinea	0.4	0.5	Average
Solomon Islands	1.0	1.0	Average
Tuvalu	0.8	0.8	Average
Tonga	1.6	1.8	Average
New Caledonia	2.5	2.2	Below average
Vanuatu	2.7	2.4	Below average
Fiji	1.9	2.2	Above average
Wallis and Futuna	1.4	1.1	Below average
Samoa	1.1	0.8	Below average
Tokelau	0.5	0.2	Below average
Niue	1.4	1.6	Average
Southern Cook Islands	1.2	1.0	Average
Northern Cook Islands	0.6	0.3	Below average
Society Islands/Tahiti	0.5	0.3	Average
Austral Islands	0.6	0.3	Below average
Northern New Zealand	0.9	1.0	Average

*For the southwest Pacific, "tropical cyclone" is a tropical low-pressure system intense enough to produce sustained gale force winds (at least 34 knots or 63 km/h). A "severe tropical cyclone" produces sustained hurricane force winds (at least 64 knots or 118 km/h), and corresponds to the hurricanes or typhoons of other parts of the world. In the French language, the term "Cyclone tropicaux" refers to the hurricane phase (64 knots or 118 km per hour or more) but the "Island Climate Update" publication follows the English language definition of "Tropical cyclone" as defined in the World Meteorological Organisation Tropical Cyclone Operational Plan for the South Pacific and South-East Indian Ocean as follows "A non-frontal cyclone of synoptic scale developing over tropical waters and having a definite organised wind circulation with maximum 10-minute average wind speed of 34 knots (63 km per hour) or greater".



Visit The Island Climate Update website at: www.niwa.cri.nz/NCC/ICU.

Your comments and ideas about The Island Climate Update are welcome. Please contact:

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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 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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DISCLAIMER: 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 meteorological services. 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 contents.

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