

The Island Climate Update

July's climate

- The South Pacific Convergence Zone (SPCZ) was not as well-defined in July as in previous months.
- Very suppressed convection from Western Kiribati to Eastern Kiribati and south of the Equator from the Solomon Islands to the Northern Cook Islands.
- Below normal rainfall for Tonga, Niue, the Southern Cook Islands, and New Caledonia.

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

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

- The strong La Niña episode present in the Pacific during past months has gone and neutral conditions exist. Most climate models project neutral ENSO conditions into early 2009.
- Average or below average rainfall is very likely in the southwest Pacific encompassing the Northern Cook Islands, Tuvalu, Tuamotu, the Society Islands, the Austral Islands, and the Marquesas.
- Enhanced convection is likely from Papua New Guinea extending southeastward toward Vanuatu, through to the Southern Cook Islands, including Fiji, Niue, and Tonga, with above normal rainfall expected.
- Normal to above normal sea surface temperatures (SSTs) are expected to extend southeast from Vanuatu through to Pitcairn Island, with above average temperatures in the area surrounding Fiji, Tonga, and Niue. Below normal sea surface temperatures are forecast from Tuvalu southeast to French Polynesia.



Climate developments in July 2008

The South Pacific Convergence Zone (SPCZ) exhibited diminished activity in July relative to previous months. Only a small region of enhanced rainfall was observed in satellite data during July 2008, centred near Papua New Guinea and the Solomon Islands. A region of suppressed convection expanded along the Equator relative to last month, and extends from Western Kiribati to Eastern Kiribati including Tuvalu, Tokelau, and the Northern Cook Islands. The regional circulation was characterised by more frequent anticyclones to the northeast of New Zealand and lows to the southwest of Pitcairn Island.

Rainfall was well above average in northern New Zealand and in northeastern Australia. A near-high monthly rainfall total was recorded at Townsville, with 95 mm (680% of normal) while a rainy end of the month created 150–200% normal rainfall in the northern North Island of New Zealand. Honiara and Henderson, Solomon Islands, also received significant rainfall, recording 204 mm and 188 mm for July, respectively.

French Polynesia experienced low rainfall totals in the northeastern island groups, with Bora Bora recording 47% normal rainfall and 76% of normal recorded in Tuamotu. In Tahiti, 66 mm of rain fell in two days, and this accounted for 94% of the monthly total. In New Caledonia, many locations also had below normal rainfall, with many stations recording 25–75% of normal precipitation. Record low rainfall was

Country	Location	Rainfall (mm)	% of avg	Comments
Tonga	Lupepau'u	5	5	Record low
Niue	Hanan	26	22	Very low
New Caledonia	Ouanaham	29	27	Very low
Vanuatu	Lamap	31	33	Very low
Australia	Townsville	95	680	Very high
New Zealand	Whangarei	300	185	Very high

Soil moisture in July 2008

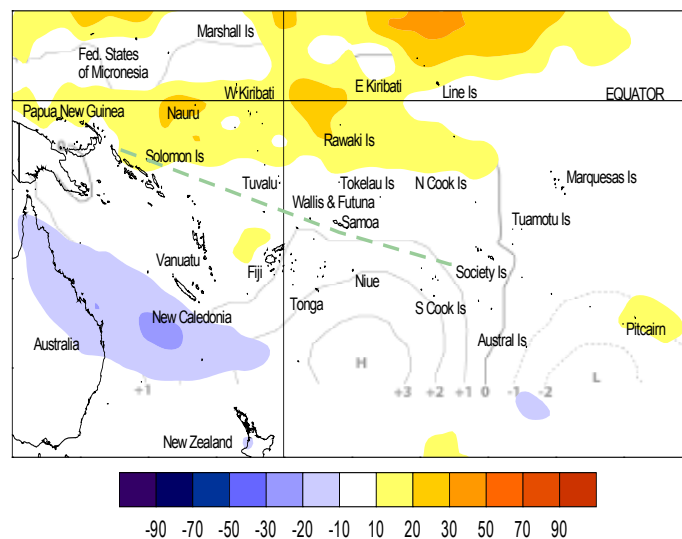
Estimates of soil moisture shown in the map (right) are based on monthly rainfall for one station in each country. Currently there are not many sites in the water balance model, but it is planned to include more stations in the future.

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

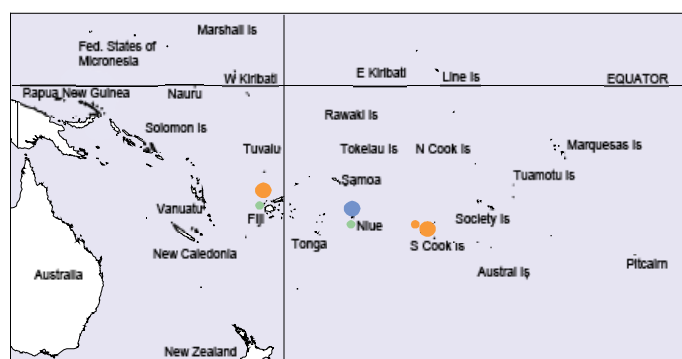
French Polynesia reports there are still important soil moisture deficits in the Marquesas Islands. Nadi (Fiji) projects dry soil moisture conditions which is a contrast to last year at this time. Soils continued to be moist (at field capacity) for the time of year at Hanan Airport (Niue), while below normal soil moisture was recorded at Rarotonga Airport.

recorded at Lupepau'u, Tonga (5 mm, 5% of normal), and very low rainfall also occurred across the rest of the country and to the east in Niue. Low rainfall also occurred in the Southern Cook Islands, with 30 mm (29% of normal) recorded at Rarotonga Airport.

Fiji also had a drier than normal conditions, due to deterioration and northward displacement of the SPCZ coupled with ridges of high pressure that frequently occurred during the month. Parts of the country received 28 - 70% of normal rainfall during July; however the western parts of Viti Levu and the outer of island of Rotuma experienced above normal to well above normal rainfall (140 to 249% of normal).



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 July 2008 position of the South Pacific Convergence Zone (SPCZ), could not be identified from the OLR anomalies this past month. However, the TRIMM satellite rainfall observation of 27 July suggested it was still present, southwest of its normal position, but contracted toward Papua New Guinea relative to previous months. The average position of the SPCZ is identified by the dashed green line, which is based on mean January rainfall for the South Pacific (after Linacre and Geerts, 1998). Mean sea level (MSL) pressure anomalies (in hPa) are shown as grey solid (high pressure) and dashed (low pressure) lines (adapted from Bureau of Meteorology, Australia).



July 2008
 ● Wet
 ● Moderate
 ● Dry

July 2007
 ● Wet
 ● Moderate
 ● Dry

Estimated soil moisture conditions at the end of July 2008, using monthly rainfall data. Soil moisture projections for individual Pacific Island countries are dependent on data availability at the time of publication.

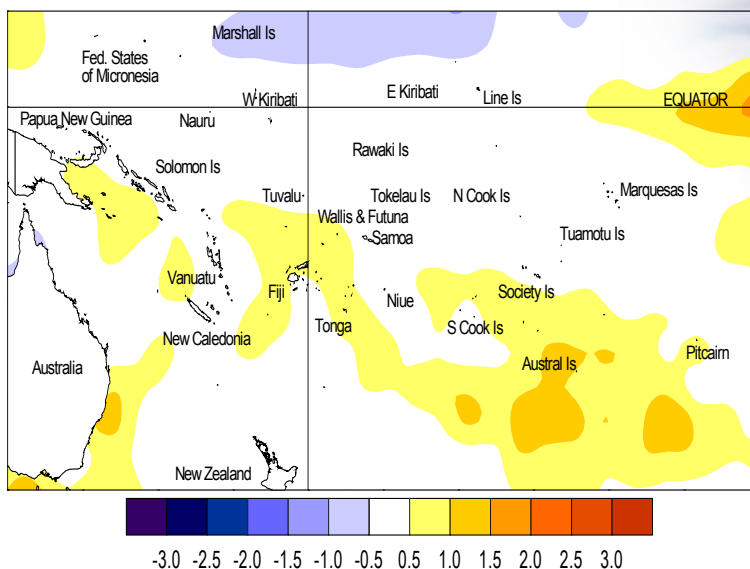
El Niño/Southern Oscillation (ENSO)

During July, ENSO conditions continued to remain near neutral in the equatorial Pacific. Overall the tropical Pacific temperatures are close to neutral, although some remnants of La Niña persist west of the Date Line. A warm water tongue off the coast of Ecuador that developed last month is still prominent.

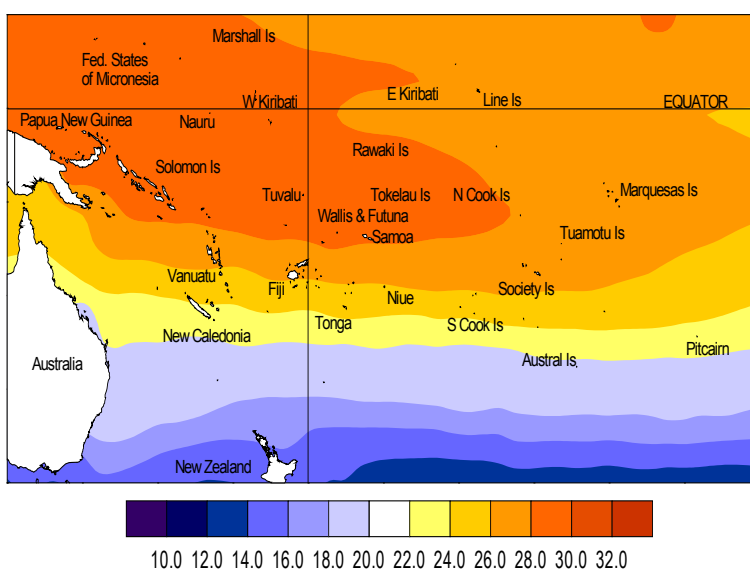
Across the equatorial Pacific, ocean surface temperature anomalies have continued to ease from previous months. The SST anomaly in the NINO3 region rose sharply in July to around $+0.9^{\circ}\text{C}$ (3-month mean $+0.5^{\circ}\text{C}$), while the NINO4 anomaly remains slightly negative at -0.2°C (3-month mean around -0.5°C). At the subsurface, a region of strong positive anomalies persists in the top 100 m near the South American coast, but the positive anomalies below 100 m depth in the western Pacific have all but died out.

The near-equatorial trade winds are slightly enhanced about and west of the Date Line but are near normal elsewhere. The OLR anomaly field has lost the La Niña signature it displayed in past months and lacked coherence in the Pacific in July, though convection remains weakly suppressed near the Date Line. However, the TRMM ENSO precipitation index is still around -1 , suggesting La Niña-like rainfall anomalies persist in the Equatorial Pacific. The Madden - Julien Oscillation remains weak at present.

All ENSO models except one (UKMO) indicate neutral conditions until the end of October. The LDEO5 model shows a warming over the austral summer, but all other models remain in the neutral range through to austral autumn 2009. The NCEP discussion of 10 July indicates ENSO-neutral conditions continuing through November. The IRI summary of 16 July projects a 75% chance of ENSO-neutral conditions continuing through September (15% chance of El Niño, 10% for La Niña). The Australian weekly tropical summary of 22 July suggests ENSO-neutral conditions persisting through the November and into 2009.



Sea surface temperature anomalies ($^{\circ}\text{C}$) for July 2008



Mean sea surface temperatures ($^{\circ}\text{C}$) for July 2008

Forecast validation: May to July 2008

A La Niña-like pattern was expected, with a large region of suppressed convection forecast in the southwest Pacific, encompassing the Northern Cook Islands, Tuamotu, the Society Islands, the Austral Islands, and the Marquesas. Average rainfall was expected for New Caledonia and Samoa. Enhanced convection was forecast from Papua New Guinea extending southeastward toward Vanuatu, through to the Southern Cook Islands, including Fiji, Niue, and Tonga. Above average rainfall was expected in those countries for May–July period. No clear precipitation guidance was offered

for Eastern Kiribati, Pitcairn Island, the Solomon Islands, and Wallis & Futuna.

The rainfall outlook for the May–July 2008 period was very similar to what was forecast, the ‘hit’ rate being 61%, 8% higher than average. Rainfall totals were overestimated for New Caledonia and the Southern Cook Islands, and slightly overestimated for the southwestern fringe of French Polynesia.

Tropical Pacific rainfall – July 2008

Territory and station name	July 2008 rainfall total (mm)	July 2008 percent of average
Australia		
Cairns Airport	52	179
Townsville Airport	95	680
Brisbane Airport	91	145
Sydney Airport	90	71
Cook Islands		
Penrhyn	112	80
Aitutaki	N/A	N/A
Rarotonga Airport	30	29
Fiji		
Rotuma Island	453	195
Udu Point	101	114
Nadi Airport	73	159
Nausori	99	85
French Polynesia		
Hiva Hoa, Atuona	125	80
Bora Bora	35	47
Tahiti – Faa'a	70	133
Tuamotu, Takaroa	62	76
Gambier, Rikitea	157	101
Tubuai	143	99
Rapa	367	146
Kiribati		
Tarawa	108	69
Kanton	63	84
New Zealand		
Kaitaia	251	151
Whangarei Airport	300	185
Auckland Airport	204	155
New Caledonia		
Ile Art, Belep	39	27
Koumac	40	76
Ouloup	39	43
Ouanaham	29	27
Poindimie	75	58
La Roche	34	35
La Tontouta	39	61
Noumea	32	46
Moue	83	98

Territory and station name	July 2008 rainfall total (mm)	July 2008 percent of average
Niue		
Hanan Airport	26	22
Liku	35	27
North Tasman		
Lord Howe Island	158	84
Norfolk Island	170	115
Raoul Island	150	89
Samoa		
Faleolo Airport	64	76
Apia	85	74
Nafanua	107	N/A
Afiamalu	114	N/A
Maota	284	113
Solomon Islands		
Taro	N/A	N/A
Munda	71	N/A
Auki	65	N/A
Honiara	204	N/A
Henderson	188	N/A
Kira Kira	N/A	N/A
Santa Cruz, Lata	153	N/A
Tonga		
Niuafoo'o	48	35
Mata'aho Airport	18	17
Lupepau'u	5	5
Salote Airport	34	38
Nuku'alofa	N/A	N/A
Fua'motu Airport	97	88
Tuvalu		
Nanumea	115	55
Nui Island	215	88
Funafuti	172	68
Nuilakita	152	76
Vanuatu		
Sola	195	80
Pekoa	60	71
Lamap	31	33
Port Vila	62	92
Tanna/Whitegrass	75	N/A
Bauerfield	57	74
Aneityum	168	157

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: August to October 2008

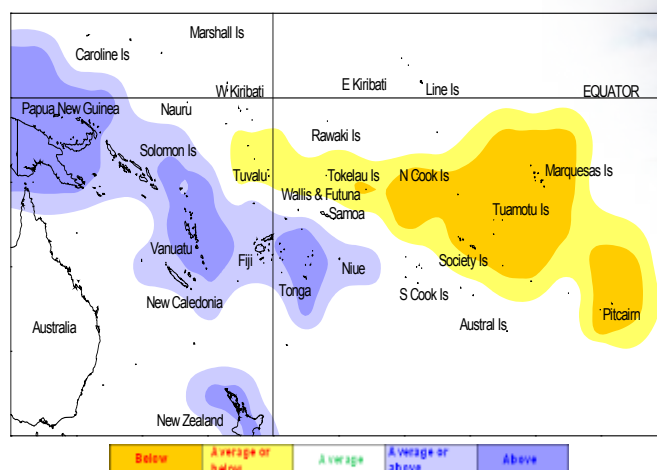
La Niña conditions have dissipated in the equatorial and subtropical southwest Pacific. During the August–October 2008 forecast period, a large region of suppressed convection is likely to encompass Tuvalu, Tokelau, the Northern Cook Islands, Tuamotu, the Society Islands, Pitcairn Island, and the Marquesas, with average-to-below or below average rainfall expected for those countries.

Enhanced convection is likely from Papua New Guinea extending in a band southeast toward Vanuatu and through Tonga, with above average rainfall expected in those countries. Near-to-above average rainfall is forecast for Fiji, Niue, the Solomon Islands and New Caledonia for the coming three-month period. No clear precipitation guidance is offered for Eastern Kiribati, Western Kiribati, the Southern Cook Islands or the Austral Islands.

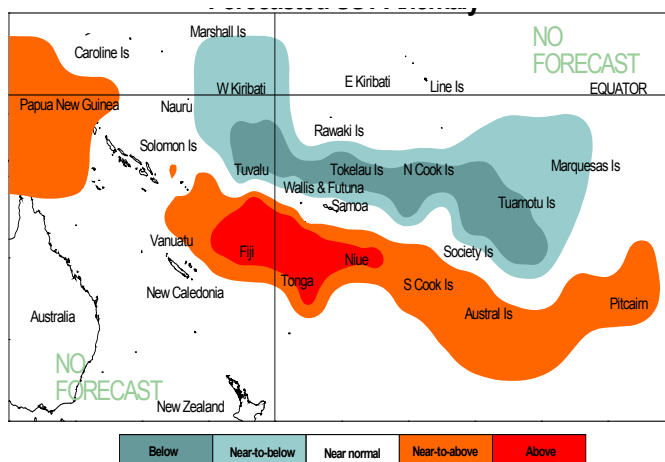
SSTs are expected to be normal to above normal near Papua New Guinea, and within a region extending from Vanuatu southeast to the Austral Islands and Pitcairn Island. Fiji, Tonga, and Niue are expected to have above average SSTs. Below normal SSTs are forecast for the region extending from Tuvalu southeast to the Society Islands, while normal to above normal SSTs are forecast for Western Kiribati and the Marquesas Islands.

The confidence in the forecast model skill for this seasonal rainfall outlook is moderate to moderately high for most Pacific Island countries. In the past, the average region-wide hit rate for forecasts issued in August is 58%, 3% lower than the long-term average for all months combined. The SST forecast confidence is moderately-high to high.

NOTE: Rainfall and sea surface temperature 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.



Rainfall outlook map for August to October 2008



Sea surface temperature outlook map for August to October 2008

Island Group	Rainfall Outlook	Outlook confidence	Island Group	SST Outlook	Outlook confidence
Vanuatu	15:30:55 (Above)	Moderate-High	Fiji	20:35:45 (Above)	Moderate-High
Tonga	15:35:50 (Above)	Moderate	Niue	20:35:45 (Above)	Moderate-High
Papua New Guinea	20:30:50 (Above)	Moderate-High	Tonga	20:35:45 (Above)	Moderate-High
Niue	20:35:45 (Near to Above)	Moderate-High	Papua New Guinea	20:40:40 (Near to above)	High
Solomon Islands	20:35:45 (Near to Above)	Moderate-High	Austral Islands	25:35:40 (Near to Above)	Moderate-High
Fiji	25:35:45 (Near to Above)	Moderate	Cook Islands (Southern)	25:35:40 (Near to Above)	Moderate
Wallis & Futuna	25:35:40 (Near to Above)	Moderate-High	Vanuatu	25:35:40 (Near to Above)	Moderate-High
New Caledonia	25:40:35 (Near to Above)	Moderate-High	Pitcairn Island	25:40:35 (Near to Above)	High
Austral Islands	30:45:25 (Near normal)	Moderate	Kiribati (Eastern)	30:40:30 (Near normal)	Moderate-High
Kiribati (Eastern)	30:35:35 (Climatology)	Moderate	Wallis & Futuna	30:40:30 (Near normal)	High
Samoa	30:35:35 (Climatology)	Moderate	New Caledonia	30:35:35 (Climatology)	High
Kiribati (Western)	35:35:30 (Climatology)	Moderate	Solomon Islands	30:35:35 (Climatology)	Moderate-High
Cook Islands (Southern)	30:35:35 (Climatology)	Moderate-High	Samoa	35:35:30 (Climatology)	High
Pitcairn Island	45:30:25 (Near to Below)	Moderate	Society Islands	35:35:30 (Climatology)	High
Society Islands	45:35:20 (Near to Below)	Moderate-High	Kiribati (Western)	35:40:25 (Near to Below)	High
Tokelau	45:35:20 (Near to Below)	Moderate-High	Marquesas	40:35:25 (Near to Below)	Moderate-High
Tuvalu	45:35:20 (Near to Below)	Moderate-High	Cook Islands (Northern)	45:35:20 (Below)	Moderate-High
Cook Islands (Northern)	50:30:20 (Below)	Moderate-High	Tokelau	45:35:20 (Below)	Moderate-High
Marquesas	55:30:15 (Below)	Moderate-High	Tuamotu Islands	45:35:20 (Below)	Moderate-High
Tuamotu Islands	55:30:15 (Below)	Moderate-High	Tuvalu	45:35:20 (Below)	Moderate-High

Pacific Intertropical Convergence Zones during 2007

Dr. A. Brett Mullan, National Institute of Water & Atmospheric Research, New Zealand

There are two prominent convergence zones in the Pacific: the ITCZ in the Northern Hemisphere between 5°N–10°N, and the South Pacific Convergence Zone (SPCZ) that extends southeastward from near the Solomon Islands (10°S, 160°E) to near 30°S, 140°W. The Southern Hemisphere counterpart to the ITCZ also occurs near 5°S, but is seen mainly during February through April and east of the Date Line. This feature is suppressed or absent during El Niño years when warmer waters near the Equator disrupt the seasonal convergence patterns. During 2007, the Pacific convergence zones reflected the transition from weak El Niño conditions early in the year to a moderate La Niña by the end of the year.

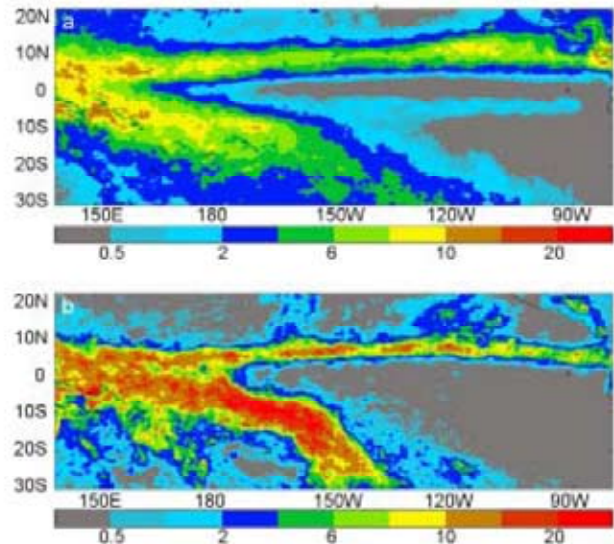
ITCZ activity during 2007

The ITCZ appears as a fairly broad feature in the annual mean pattern of tropical rainfall due to its normal meridional movement throughout the year. However, in 2007 the ITCZ was closer to the Equator than normal at the beginning of the year in association with El Niño, and further poleward than normal later in the year due to La Niña. A double ITCZ was present from the second half of February through April and, although it appears weak in the annual mean, was nearly as intense as the northern branch during March 2007. West of the Date Line where the ITCZ and SPCZ tend to merge, the annual rainfall totals were comparable to the 1998–2006 Tropical Rainfall Measuring Mission (TRMM) climatology.

SPCZ activity during 2007

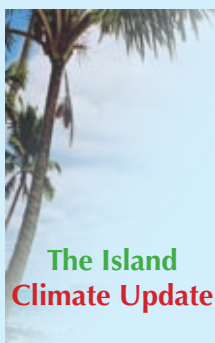
The SPCZ was shifted equatorward and eastward of normal in January consistent with El Niño, and produced enhanced convection from north of the Solomon Islands to central French Polynesia. Penrhyn, in the Northern Cook Islands, recorded its second highest January rainfall on record (262% of normal). At the same time, the Caroline Islands of northern Micronesia experienced dry conditions through March 2007. The SPCZ was particularly active in March between 180–150°W, producing record rainfall in Niue, Tonga, and some of the Northern Cook Islands.

Although the NASA ENSO Precipitation Index was persistently negative and consistent with La Niña from March–December 2007, the convergence zones did not stray from their climatological positions until July. The northward displacement of the ITCZ first occurred in the far eastern equatorial Pacific (120–90°W) in July and then extended to the central Pacific during September.



Average rainfall rate (mm day⁻¹) during (top) all of 2007 and (bottom) January 2007. Note the uneven contour intervals (0.5, 1, 2, 4, 6, 8, 10, 15, and 20 mm/day). Data are NASA TRMM estimates provided on a 0.25 degree latitude-longitude grid.

Information for this article was sourced from “Chapter 4: The Tropics” in “The State of the Climate - 2007”, which is an annual report produced by NOAA/NCDC. The report was published as a supplement to the Bulletin of the American Meteorological Society in July 2008, and was contributed to by over 150 climate scientists from more than 33 institutions worldwide.



The Island Climate Update

Cover Photo:
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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.**

Acknowledgements

This bulletin is produced by NIWA and made possible with financial support from the New Zealand Agency for International Development (NZAID), with additional support from the Pacific Islands Applied Geosciences Commission (SOPAC) and the Secretariat for the Pacific Regional Environmental Programme (SPREP).

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.

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