Cook Islands

Pacific Climate Change Science Program

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Climate, climate variability and change of Cook Islands

Introduction

The Cook Islands, consisting 12 inhabited, 2 uninhabited, and 1 partially inhabited islands, is spread over 850,000 square miles¹ (2.2 million square kilometres) of ocean, in the middle of the South Pacific with Tonga to the West, New Zealand to the South-West and French Polynesia to the East.

The Cook Islands consists of two main groups: the Northern Cooks (six low lying atoll islands); and the Southern Cooks (9 islands mainly of volcanic origin). The capital is Rarotonga and the furthest islands are Penrhyn (1185km to the north) and Mangaia (177km south).



Pacific (above) and locations of

Data Availability and homogeneity The longest data records are:

Rarotonga Island [Southern Cook Is] - 21.11°S 159.48°W

Annual Rainfall 1929–2010 = 81 years

Penrhyn Island [Northern Cook Is.] - 09.00°S 158.03°W

Annual Rainfall 1940–1995 = 50 years

Homogeneity tests were carried out for both stations and corrections made because of site changes.



and temperatures at Rarotonga station







Climate Drivers

The main influences on Cook Islands' climate are the El Niño -Southern Oscillation (ENSO) and the South Pacific Convergence Zone (SPCZ).

The position of the SPCZ is of importance to the Cook Islands as it brings enhanced rainfall, especially when it is in its active phase.

During La Niña events rainfall increases during the wet season (November to April), when the SPCZ lies northwest to southeast over the island group. During El Niño years the SPCZ moves more to the northeast of the Southern Cooks causing lower than normal rainfall, drought like conditions and stronger south-east trade winds.

Other influences on Cook Islands' climate come from the subtropics, such as sub-tropical high pressure systems.

Seasonal Cycles

The Cook Islands have 2 distinct seasons, which can be seen in Figure 2 for Rarotonga:

Wet Season: November to April when 2/3 of the rainfall is recorded. Also, the Tropical Cyclone Season, Summer when it is hot and humid.

Dry Season: May to October, when 1/3 of the rainfall is recorded, also the windiest time of the year but with mild and cooler temperatures.

The Northern Cooks depend entirely on convective rainfall as these small islands do not have mountains and rivers to store rainwater. Penrhyn receives on average 2300mm during the wet season and 1400mm during the dry season. The Southern Cook Islands on the other hand have a fairly uniform rainfall distribution throughout the year. The average annual rainfall for Rarotonga Airport, which is on the driest side of the Island, is 1900mm.

The Cook Islands show little seasonal variations in maximum and minimum temperatures, with monthly averages varying by about 1°C at Penrhyn and by about 5°C at Rarotonga.



Observed inter-annual variability and trends

High year to year variations in rainfall in Rarotonga can be seen in Figure 3, due to the influence of ENSO. Over the period 1930 to present a decrease in rainfall has been observed at a rate of 39.2 mm per decade.

Temperatures have been increasing since 1930 at the rate of 0.07°C per decade (see Figure 3).

Impacts and extremes

Droughts

Prolonged El Niño enhances drought like conditions for both North and South Island groups. La Niña on the other hand often brings above average rainfall that can cause inland flooding and water borne diseases [dengue fever] and crop diseases [taro leaf moths]

Extreme years: 1981/82, 1997/98

Tropical Cyclones

Tropical Cyclones (TCs) are the most significant extreme events to affect the Cook Islands. During El Niño years TCs are more frequent and intense with on average 3-4 affecting the Cook Islands and less than 3 during La Niña events.

Nov 2004 - Apr 2005 - extreme year (6 TCs)

3 x Category 5 Tropical Cyclones: • Percy devastated Pukapuka Island, Meena and Nancy devastated Rarotonga and Mangaia Islands

Nov 2009 - Apr 2010

1 x Category 4 Tropical Cyclone: Pat

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Devastated Aitutaki Island north of Rarotonga

Figure 4 (to left): Number of recorded tropical cyclones per season passing within 400km of Rarotonga station. 2004-5 stands out as an extreme cyclone season with 6 TCs near the Cooks.

TC Season Further information: >contact: Maara Vaiimene > phone: +00 682 20603/ 25920

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