



Cook Islands

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Climate variability and future climate

Introduction

The Cook Islands consists of 15 islands, with Mangaia to the far South and Penrhyn to the far North spread over the South Pacific ocean between 9°S and 22°S and 157°W and 166°W. The Cook Islands are divided geographically into the Northern Group and the Southern Group. The Northern Group consists of six atolls (most of which are about one to two metres above mean sea level), while the Southern Group comprises nine elevated islands, including volcanic islands and raised atolls.

The main presentation for this poster is based on the projections of the future climate of the Cook Islands over the course of the 21st Century. The impacts of these projections are a concern to the economic, social and cultural livelihood of the population of the Cook Islands.

Knowing the future projection of weather events will enhance the adaptation capability, decision making and future developments of these islands in the areas of business development, coastal protection management and innovative agricultural practices.

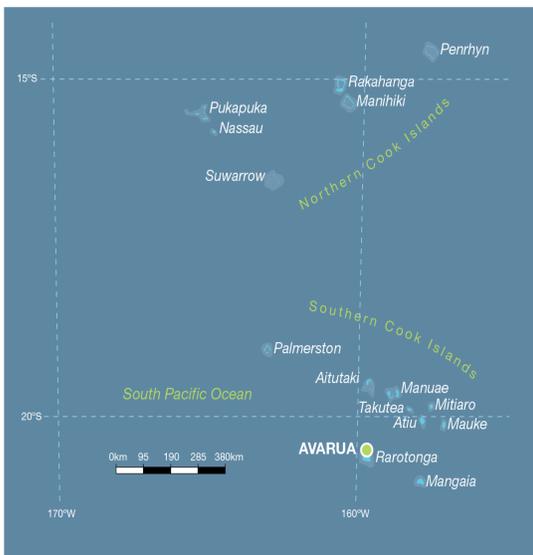


Figure 1: Map of the Cook Islands.

Observed climate of the Cook Islands

- The Climate of the Cook Islands is sub-tropical to tropical and lies within the extensive and persistent trade wind zone of the South Pacific.
- It is relatively free from the influences of large land masses or continents.
- It has two dominant seasons, a warmer wet season (November to April) and a cooler dry season (May to October) as indicated in Figure 2
- The climate is largely dependent on the position and intensity of the South Pacific Convergence Zone (SPCZ).
- Tropical cyclones, generally form on the SPCZ (Figure 3)

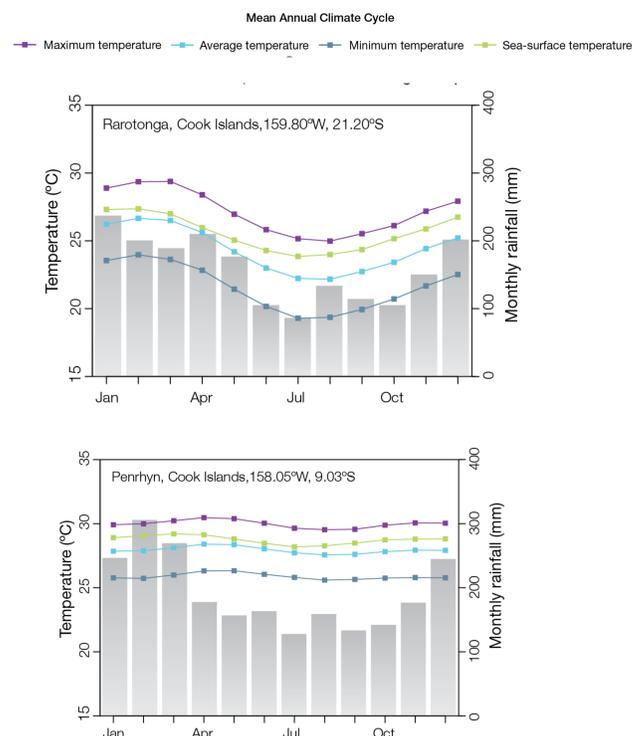


Figure 2: Observed Mean Annual Climate of the Cook Islands. (Rarotonga – Southern Cook Islands, Penrhyn - Northern Cook Islands). Grey bars show rainfall, dots show temperature



High seas - on a fine day caused by a deepening low pressure to the north of Rarotonga.



Damage from tropical cyclone storm surges.



Atoll agriculture areas inundated by sea flooding.

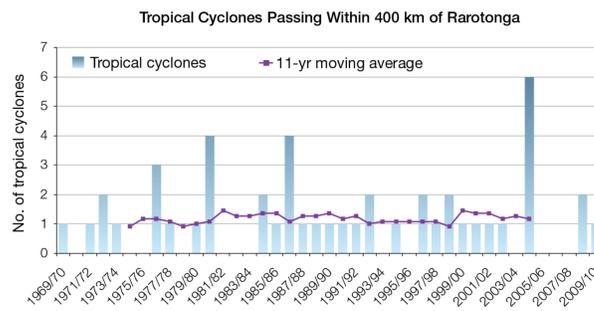


Figure 3: Tropical cyclones passing within 400km of Rarotonga

Changing climate of the Cook Islands

Annual maximum and minimum temperatures have increased in both Rarotonga and Penrhyn. In Rarotonga, maximum temperatures have increased at a rate of 0.04°C per decade (Figure 4).

Data since 1950 show a clear increasing trend in annual rainfall at Penrhyn (Figure 5) but no trend in seasonal rainfall. There are no clear trends in annual or seasonal rainfall at Rarotonga.

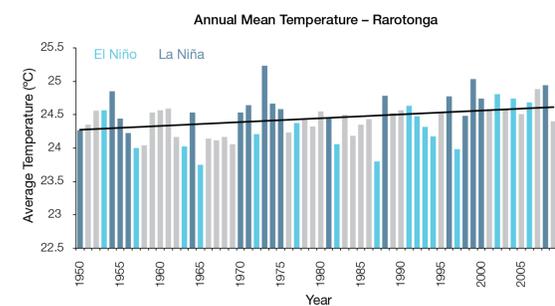


Figure 4: Annual average temperature for Rarotonga. Light blue bars indicate El Niño years, dark blue bars indicate La Niña and grey bars indicate neutral years

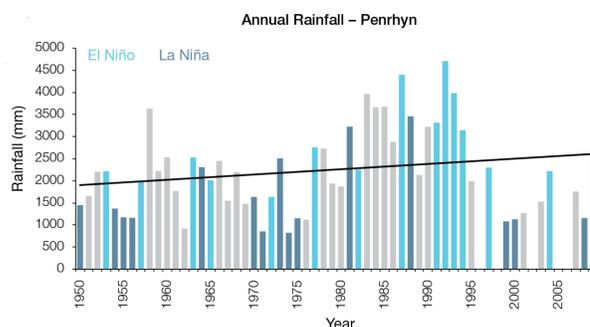


Figure 5: Annual rainfall for Penrhyn. Light blue bars indicate El Niño years, dark blue bars indicate La Niña and grey bars indicate neutral years

Climate projections

The projections indicate that there will be changes in the current climate of the Cook Islands in the parameters undertaken in this study. These will have major impact economically, socially, culturally and politically for this small island developing state.

The climate projections have been derived from up to 18 global climate models, from the CMIP3, database. These models were selected based on their ability to reproduce important features of the current climate. These projections refer to an average change of climate elements over the broad geographic region encompassing the Cook Islands and the surrounding ocean.

Projections summary

Temperature: Surface air temperature and sea-surface temperatures are projected to continue to increase (*very high confidence*)

Rainfall: Annual average rainfall is projected to increase over the Northern Cook Islands with a decrease for the Southern Cook Islands (*moderate confidence*)

Sea level: Mean sea level rise is projected to continue (Figure 6) (*very high confidence*)

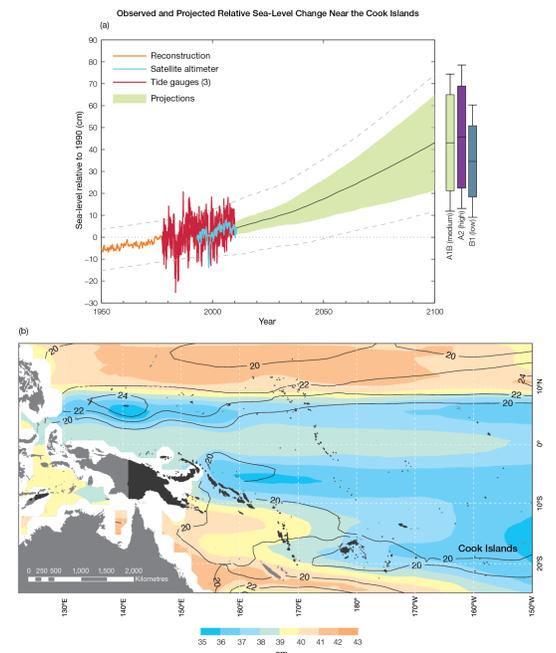


Figure 6: Observed and projected relative sea-level change near the Cook Islands (a) For one observational location (b) The projections for the A1B emissions scenario for the average over 2081-2100 relative to 1981-2000 are indicated by the shading, with estimated uncertainty in the projections indicated by the contours (in cm)



Figure 7: Atoll threat from sea level change and storm surges in the Cook Islands

Extreme Events

Temperature: The intensity and frequency of days of extreme heat are projected to increase with the gradual increase in annual temperature more so in the Southern Cook Islands (*very high confidence*)

Rainfall: The intensity and frequency of days of extreme rainfall are projected to increase, (*high confidence*)

Tropical cyclones: Tropical cyclone numbers are projected to decline, however intensification storms are projected to increase (*moderate confidence*)

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