

Felicia Pihigia Talagi, Adorra Misikea & Rossylynn Misiepo, Niue Meteorology & Climate Change Department



Climate, climate variability and change of Niue

Introduction

Niue, the smallest (259km²) self-governing state in the world, is located in the South Pacific at ~19°S and 170°W (Figure 1) between Tonga to the west and Samoa to the north. The current population of the island is approximately 1400.

Niue is unique as one of the world's largest and highest coral islands. The highest point on the island is ~ 68m above mean sea level.



Figure 1. Map of Niue http://mappery.com/maps/Niue-Map.gif (top). Figure 2. Typical circulation features of the South-west Pacific (bottom)

Data availability and homogeneity

Hanan Airport, the only operational observation site, is located on the western side of the island. From 1905 to 1971 and 1977 to 1996 observations were taken at Alofi (capital).

Homogeneous data for the Hanan Airport is available from 1905 for rainfall and 1941 for air temperature. Data adjustments are only associated with site changes.







Local primary school visit to the Hanan Airport climate enclosure



Damage and high seas associated with Tropical Cyclone Heta, 4 January 2004

Climate Drivers

The main climatological features that affect Niue's climate are the El Niño Southern Oscillation (ENSO), South Pacific Convergence Zone (SPCZ), sub-tropical high pressure zone and trade winds which blow mainly from the southeast (Figure 2).

Seasonal Cycles

Niue's climate can be defined as 'tropical maritime' with an average mean temperature of 24°C at Hanan Airport and a seasonal range of just over 4°C between the warmest and coolest months of the year (Figure 3).

Niue experiences two distinct seasons: a wet season from November to April when the SPCZ is closest to the island; and dry season from May to October when the SPCZ is occasionally inactive and displaced northeastward. Average annual rainfall for Hanan Airport is 2052 mm. It is likely that average annual rainfall is higher on the windward southeastern slopes of the island and lower on the sheltered leeward side of the island



Figure 3. Hanan Airport mean annual cycle, 1971-2000

Observed inter-annual variability and trends

Year-to-year variability in Niue's climate is strongly associated with ENSO. Severe droughts occur through history. In recent times dry season rainfall less than 400mm (mean ~ 700mm) was received in 1983, 1991 and 1998.

The annual rainfall trend (1905-2010) for Hanan Airport is +16.6 mm/decade (Figure 4). The wet and dry season trend for the same period is -7.2 and +17.9 mm/decade respectively.



Figure 4. Hanan Airport annual rainfall (1905-2010)

The annual mean and dry season mean temperature trend is +0.16 °C/decade. The trend for the wet season is +0.17 °C/decade.

Impacts and extremes

Tropical cyclones and droughts are the more significant climate extremes that affect Niue. Since November 1969, 63 tropical cyclones have passed within 400km of Hanan Airport, an average of 1.5 per season (Figure 5).



Figure 5. Tropical Cyclones within 400km of Hanan Airport and 11-yr moving average (red). Data Source: PCCSP Tropical Cyclone Portal

Niue's economy suffered significantly from high winds, storm surge and intense rainfall associated with TC Heta on 4 January 2004. In all, the storm caused over NZ\$37.7 million damage, three times Niue's GDP.

Agriculture is very important to the lifestyle of Niueans and the economy. Nearly all households have plantations of Taro. These gardens are mainly rain-fed making them prone to El Niño associated drought.

Several months of La Niña associated above normal rainfall can result in outbreaks of yam disease (Yam Anthranose) and mosquitoborne diseases e.g. dengue.

AusAID







> contact: Felicia Pihigia Talagi > phone: +683 4601 > email: Felicia.Pihigia@mail.gov.nu www.pacificclimatechangescience.org

Further information: