

Summary: Climate Change in Niue 2022

Historical and Recent Variability, Extremes and Change



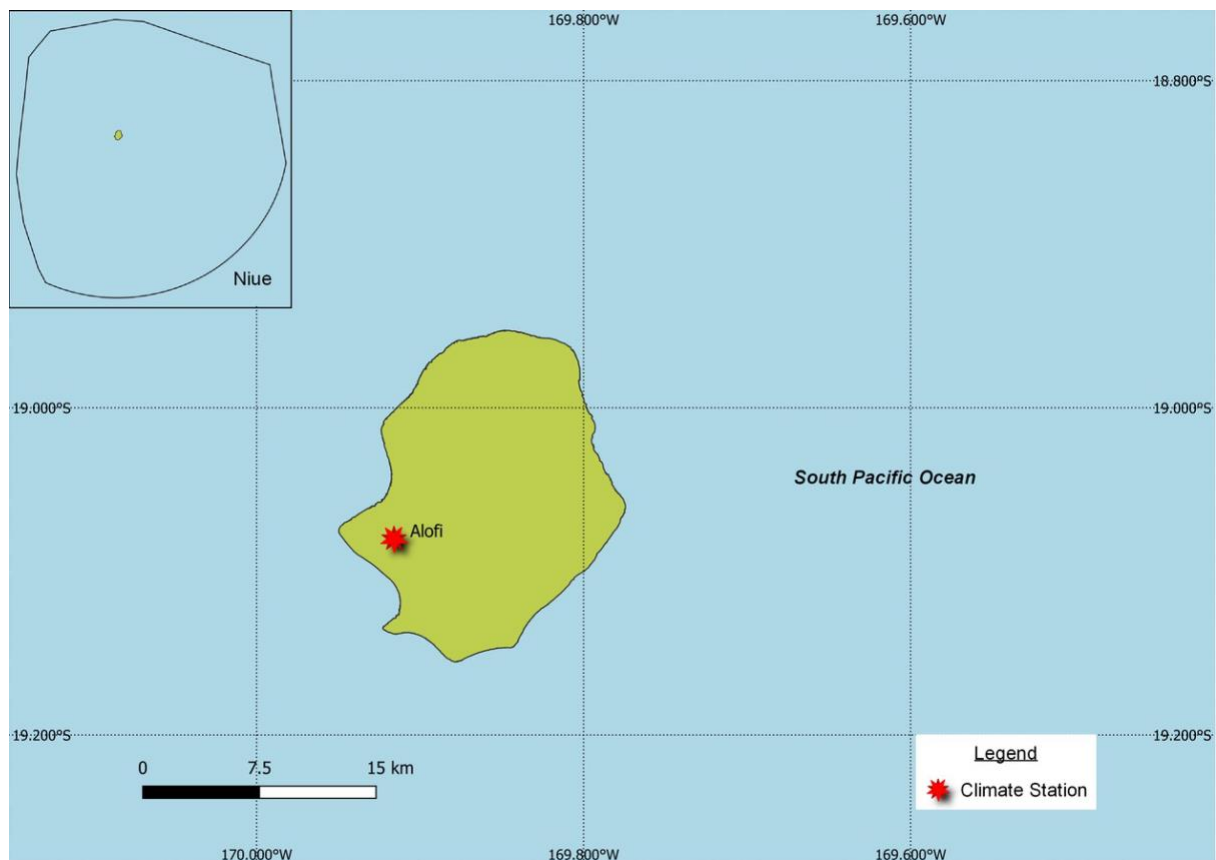
COSPPac
Climate and Oceans Support
Program in the Pacific

This brochure provides a snapshot of key long-term changes in climate and ocean variables in Niue. Long-term changes were determined by analysing trends in historical climate and ocean data. Trends provide information about climate change in Niue 'to date'.

Climate variability strongly influences extreme events in Niue. The brochure also provides up-to-date scientific information on climate variability and its influence on extreme events.

Figure 1:

Niue and the location of the Alofi-Hanan Airport climate station used in Climate Change in the Pacific 2022 report.



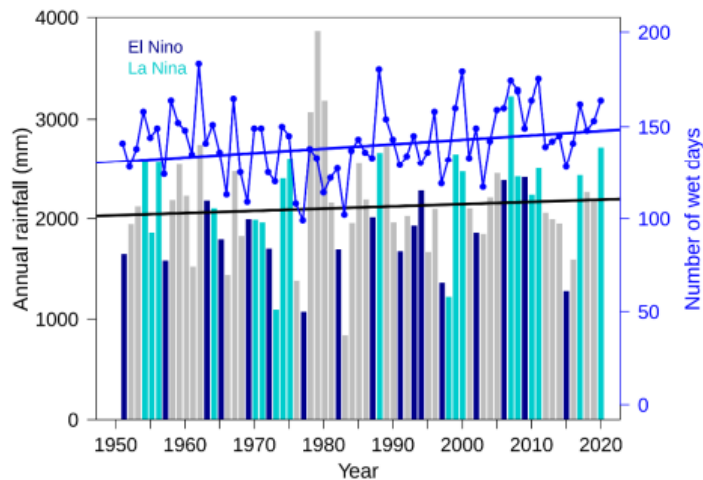
Little change in annual and seasonal rainfall

A band of high rainfall known as the South Pacific Convergence Zone (SPCZ) is most active and closest to Niue during the wet season (November–April). Wet season rainfall provides two-thirds of Niue's annual rainfall.

El Niño–Southern Oscillation (ENSO) – a natural mode of climate variability – influences rainfall variability from year to year in Niue. Annual rainfall at Hanan Airport varies from approximately 800 to 3900 mm. There has been little change in annual and seasonal rainfall since 1951 at Alofi-Hanan Airport (Figure 2).

Figure 2:

Annual rainfall (bar graph) and number of wet days (where rainfall is at least 1 mm; line graph) at Hanan Airport. Straight lines indicate linear trends for annual rainfall (in black) and number of wet days (in blue).



There has been little change in extreme rainfall and meteorological drought at Alofi-Hanan Airport since 1951. La Niña years typically bring more rain than El Niño years.

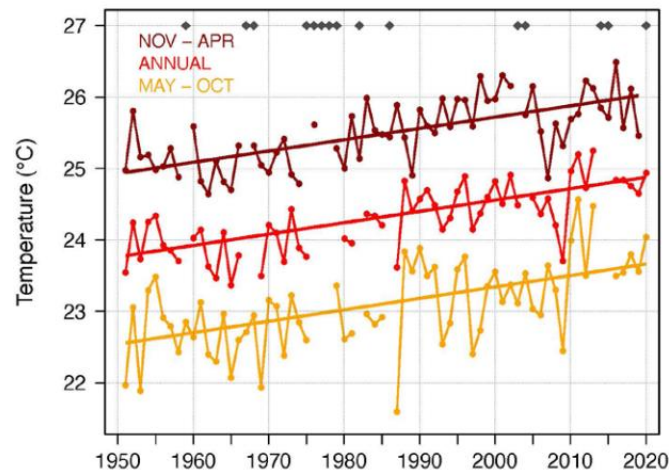
Air Temperature has increased

Average annual temperatures at Hanan Airport have increased by 0.16 °C per decade since 1951. Average wet season (November–April) and dry season (May–October) temperatures warmed at a similar rate. Daytime maximum temperatures warmed faster than night-time minimum temperatures (Figure 3).

The daily temperature record at Hanan Airport shows that most years since 2010 have experienced over twice as many hot days compared with the beginning of the record.

Figure 3:

Average annual, November–April and May–October temperatures for Hanan Airport. Straight lines indicate linear trends. Diamonds indicate years with insufficient data for one or more variables.



Long-term increases in both average temperature and temperature extremes in the Pacific are likely driven by human-associated climate change due to the rate of the observed changes and consistency with global trends that have been attributed to climate change (PCCM, 2021).



Tropical cyclone severity has decreased

In the greater Southwest Pacific, the total number of **severe** tropical cyclones¹ has decreased over the last 40 seasons. There has been little change in the total number of tropical cyclones of any category in the southwest Pacific. The number of tropical cyclones that became severe events has marginally declined.

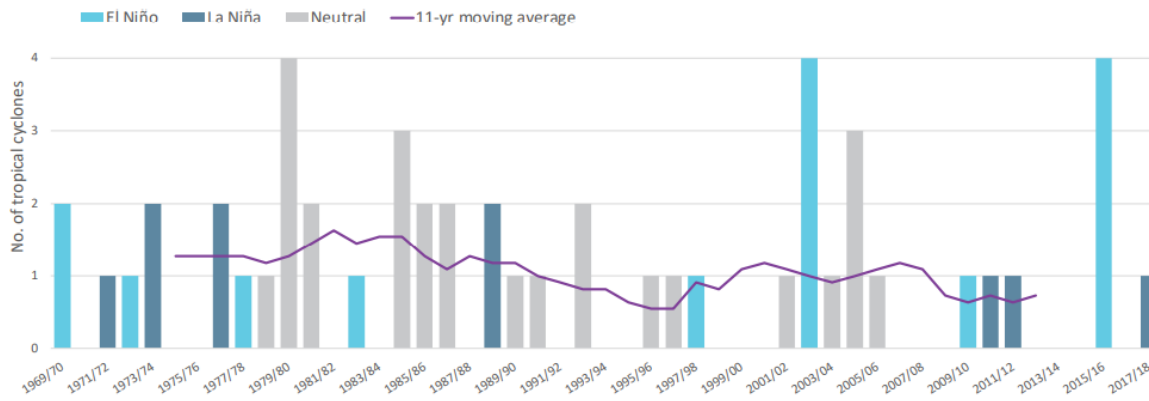
Tropical cyclones usually affect Niue during the southern hemisphere tropical cyclone season, which is from November to April, but also occasionally occur outside the tropical cyclone season.

The number of tropical cyclones occurring in Niue's Exclusive Economic Zone (EEZ) varies considerably from one year to the next and this variability is influenced by ENSO (Figure 4). Tropical cyclones were most frequent in neutral or El Niño years (12 cyclones per decade) and least frequent in La Niña years (7 cyclones per decade).

¹ A 'severe' tropical cyclone is defined as having a minimal central pressure of <970 hectopascals (hPa). Pressure is often used when comparing intensity of tropical cyclones.

Figure 4:

Number of tropical cyclones passing within Niue's EEZ per season. Each season is defined by the ENSO status, with light blue being an El Niño year, dark blue a La Niña year and grey showing a neutral ENSO year. The 11-year moving average is presented as a purple line and considers all years.



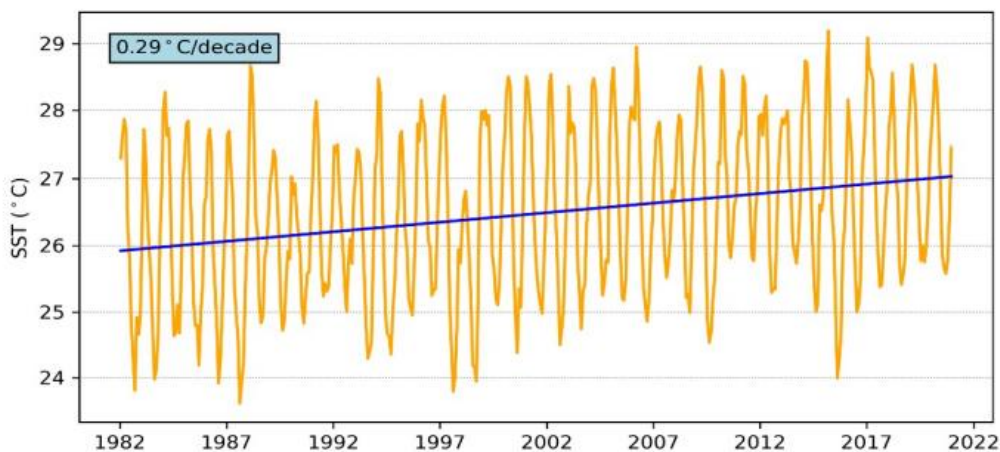
Due to this high interannual variability and the relatively small number of tropical cyclones passing through any country's EEZ since reliable records began, individual country analysis of long-term trends in frequency and intensity is not possible.

Sea surface temperature has increased

Sea surface temperatures averaged across Niue's EEZ increased by 0.29 °C per decade since 1982 (Figure 5).

Figure 5:

Sea surface temperature from satellite observations averaged across Niue's EEZ, shown as the orange line. The blue line shows the linear regression trend.



Globally, sea surface temperature is one of the most widely used indicators used to monitor human-associated climate change. Modes of climate variability influence sea surface temperatures on an interannual and decadal/multi-decadal basis; however, human-associated climate change is a driver of the long-term positive trend (PCCM, 2021).

Sea surface temperatures in Niue tend to be warmest in March, reaching, on average, a maximum of 28.2 °C and coolest in August, reaching, on average, a minimum of 25.2 °C. Daily temperatures can be up to 2 °C higher or lower than these monthly averages.

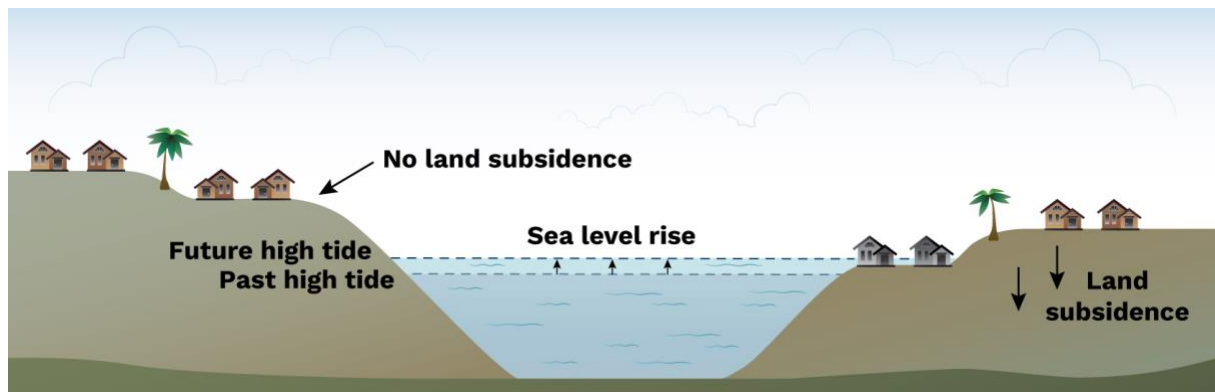
Sea level has increased

Sea level has increased across Niue's entire EEZ at a rate of 3–5 mm per year since 1993 (Figure 6). In the south, this trend is higher than the global average sea level trend (3.1 ± 0.4 mm per year).

Peak sea levels typically occur between November and February.

Figure 6:

The effect of sea level rise and land subsidence on local sea level.



Niue coastline

The rise in Pacific mean sea level since 1993 is primarily attributable to global warming. Naturally-occurring modes of climate variability in the Pacific region - for example, the El Niño–Southern Oscillation (ENSO) on interannual time scales, and the IPO (Interdecadal Pacific Oscillation)/PDO (Pacific Decadal Oscillation) on decadal to multi-decadal time scales - influence sea level and can amplify or dampen the underlying trends arising from global warming (PCCM, 2021).



Waves

Waves at Niue come from the southeast to the southwest. On average, Niue experiences 3.1 extreme wave events – defined as reaching or exceeding a wave height of 3.65 m - per year.

There has been no long-term change in average annual wave height since 1979. Wave height, wave period (the time interval between two waves) and wave direction changes from month to month with the seasons and, to a lesser degree, year to year with climate variability modes. The highest waves usually occur between May and August, and the longest wave periods occur in September/October.

Further reading

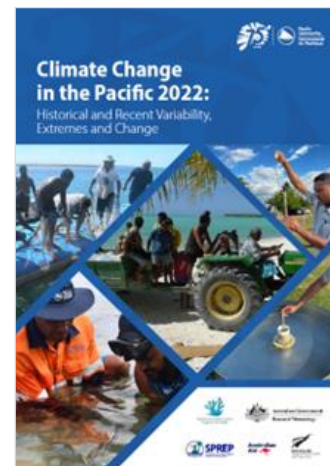
For more information, refer to Climate Change in the Pacific 2022: Historical and Recent Variability, Extremes and Change. Climate and Oceans Support Program in the Pacific. Fifteen country chapters are available at <https://purl.org/spc/digilib/doc/kskiv>

For more information on Pacific-wide observed and future trends in climate indicators, see the Pacific Islands Climate Change Monitor 2021, available at

https://www.pacificmet.net/sites/default/files/inline-files/documents/PICC%20Monitor_2021_FINALpp_0.pdf

Historical climate trends and basic climate information from observation sites across the Pacific Islands are available through the web-based Pacific Climate Change Data Portal at www.bom.gov.au/climate/pccsp

Information about future climate change can be found in the 'NextGen' Projections for the Western Tropical Pacific country reports <https://www.csiro.au/en/research/environmental-impacts/climate-change/pacific-climate-change-info>





Niue sunset

The content of this brochure is an outcome of the high degree of cooperation and collaboration that exists between the implementing partners of the Australian Aid funded Climate and Oceans Support Program in the Pacific (COSPPac), specifically the Bureau of Meteorology (the Bureau), the Pacific Community (SPC) and Pacific Regional Environmental Programme (SPREP), together with the valuable ongoing support from the national meteorological services in the 15 partner countries and territories. Publication support has been provided through New Zealand Aid Programme.



For more detailed information on the climate of Niue and the Pacific, see: *McGree, S., G. Smith, E. Chandler, N. Herold, Z. Begg, Y. Kuleshov, P. Malsale and M. Ritman. 2022. Climate Change in the Pacific 2022: Historical and Recent Variability, Extremes and Change. Climate and Oceans Support Program in the Pacific. Pacific Community, Suva, Fiji.*



Niue Meteorological Service
Hanan Airport
Alofi
Niue Island

Facebook: Niue Meteorology
(<https://www.facebook.com/profile.php?id=100090179132669>)

Phone: Office +683 4601
Director +683 4600