Summary: Climate Change in the Federated States of Micronesia 2022

Historical and Recent Variability, Extremes and Change

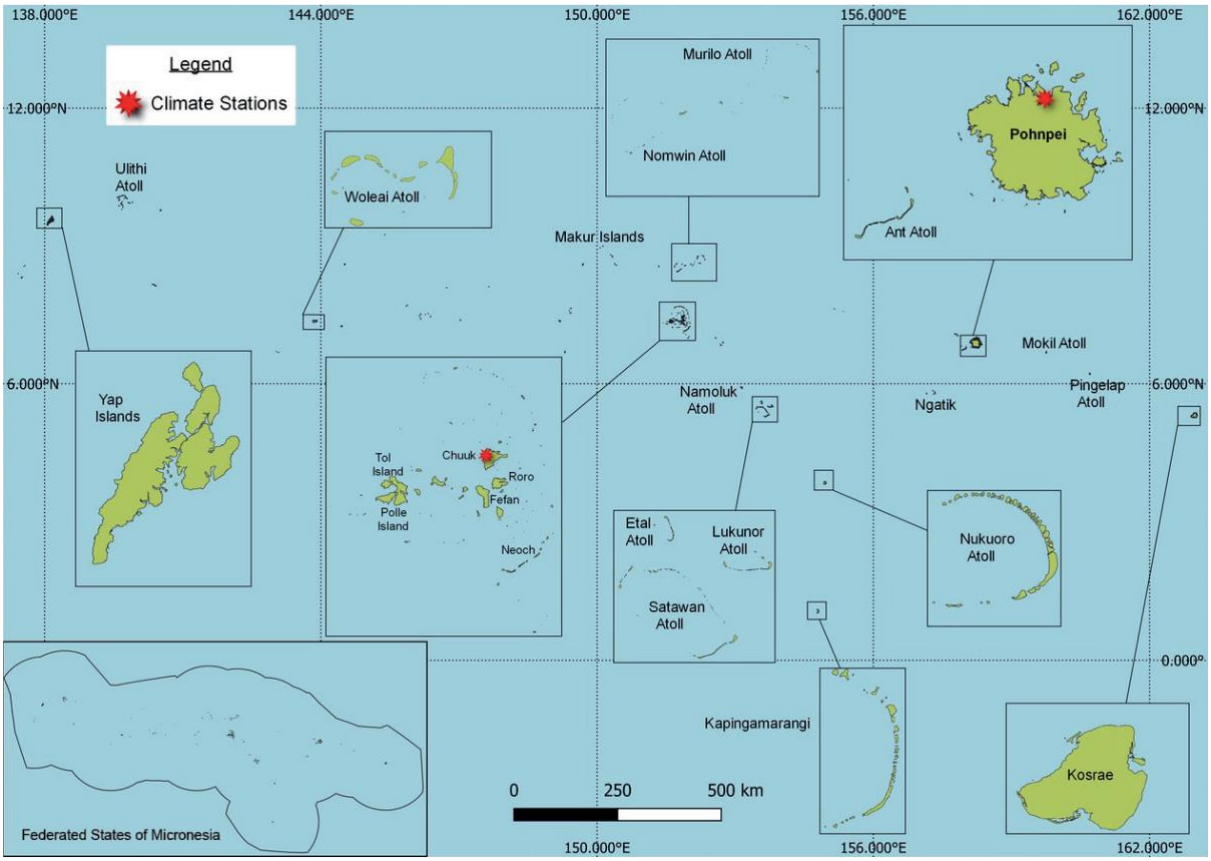
COSPPac
Climate and Oceans Support Program in the Pacific

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

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

Figure 1:

FSM and the location of the climate stations used in Climate Change in the Pacific 2022 report.



Cover image: Federation States of Micronesia. Photo: Asian Development Bank

May to October rainfall has decreased

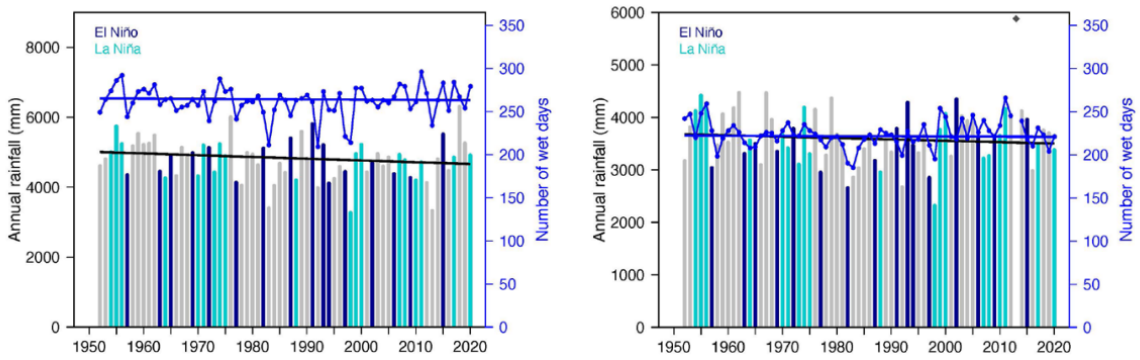
May to October wet season rainfall has decreased since 1952 at Pohnpei, by 44.32 mm/decade. There has been little change in long-term annual and seasonal rainfall at Pohnpei and at Chuuk over the same period (Figure 2).

The location of FSM near the Intertropical Convergence Zone (ITCZ) drives rainfall variability throughout the country, with the West Pacific Monsoon bringing additional rainfall during the wet season months in the middle of the year, particularly to islands further west.

There has been little long-term change in extreme rainfall at Pohnpei or Chuuk.

Figure 2:

Annual rainfall (bar graph) and number of wet days (where rainfall is at least 1 mm; line graph) at Pohnpei (left) and Chuuk (right). Straight lines indicate linear trends for annual rainfall (in black) and number of wet days (in blue). Diamonds indicate years with insufficient data for one or both variables.



Air Temperature has increased

Since 1952, average annual temperatures have increased by 0.17 °C per decade at Pohnpei and 0.14 °C per decade at Chuuk. Both wet season (May to October) and dry season (November to April) maximum and minimum temperatures have increased. At Pohnpei, the increase in May to October temperatures was greater than the increase in November to April temperatures.

The number of hot days and warm nights has increased, and the number of cool days and cold nights has decreased at Pohnpei and Chuuk. Year to year, there is large variability in the number of hot days. For example, some years experienced fewer than 20 hot days while others experienced over 100 hot days.

The number of days where air conditioning is required to cool a building down to 25 °C has increased by 61 days per decade at Pohnpei and 49 days per decade at Chuuk, indicating that energy demand for cooling has increased since 1952.

Long-term increases in both average temperature and temperature extremes in the Pacific are likely driven by anthropogenic 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 not changed

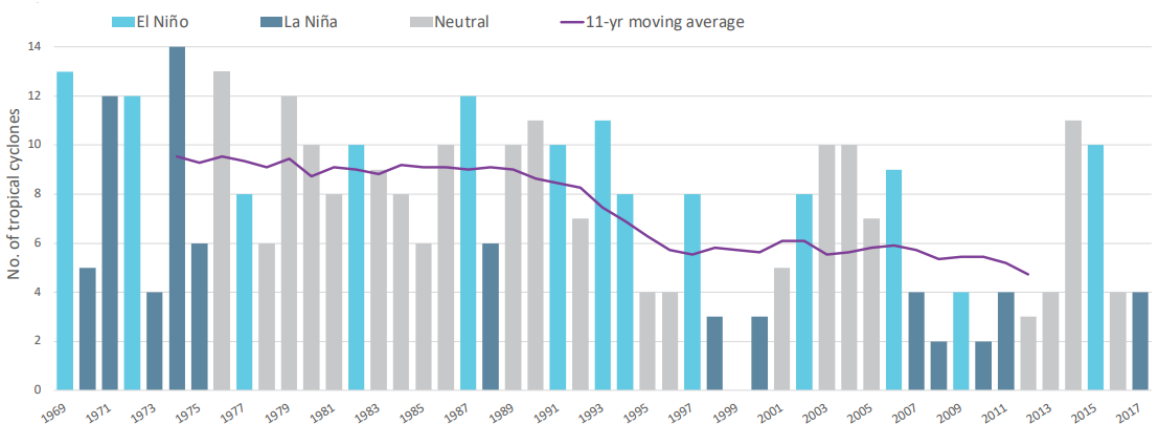
In the western North Pacific, there has been little change in the total number of tropical cyclones or the number of **severe** tropical cyclones[1] over the last 41 seasons.

Tropical cyclones usually affect FSM year-round. Year to year, there is large variability in the number of tropical cyclones in FSM's Exclusive Economic Zone (EEZ), ranging from, no tropical cyclones in 1999 to 14 tropical cyclones in 1974.

The number of tropical cyclones occurring in FSM's EEZ varies considerably from one year to the next (Figure 2). Tropical cyclones were most frequent in El Niño years (95 cyclones per decade), followed by neutral years (78 cyclones per decade) and least frequent in La Niña years (46 cyclones per decade).

Figure 3:

Number of tropical cyclones passing within FSM 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.

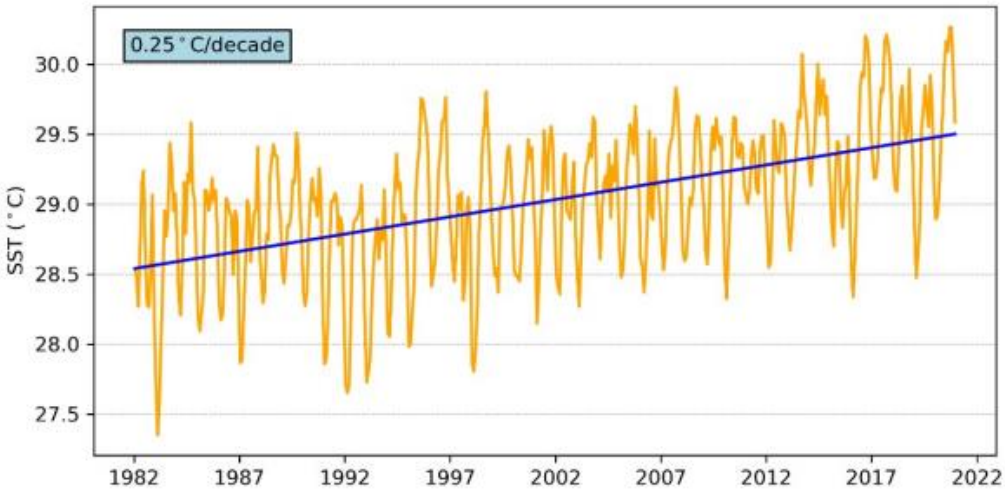
[1] A 'severe' tropical cyclone is defined as having a minimal central pressure of <970 hectopascals (hPa). Pressure is often used when comparing intensity of tropical cyclones.

Sea surface temperature has increased

Sea surface temperatures averaged across FSM's EEZ increased by 0.25 °C (0.45 °F) per decade since 1981 (Figure 3).

Figure 4:

Sea surface temperature from satellite observations averaged across FSM 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, climate change is a driver of the long-term positive trend (PCCM, 2021).

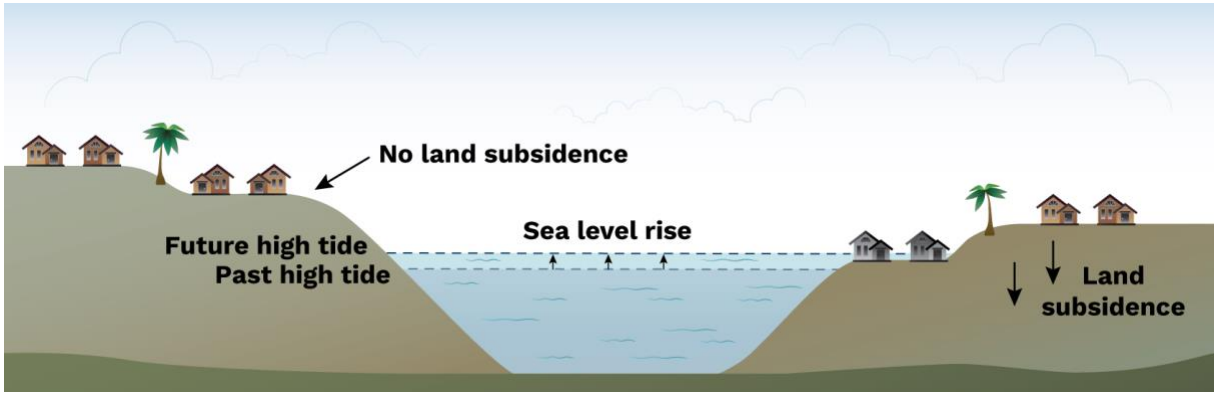
Sea surface temperatures at Pohnpei tend to be warmest in August to November reaching, on average, a maximum of 30 °C (86.0 °F) and coolest in February reaching, on average, a minimum of 29 °C (84.2 °F). Hourly temperatures can be up to 1.5 °C (2.7 °F) higher or lower than these monthly averages at Pohnpei and may differ at other locations in FSM.

Sea level has increased

A combination of sea level rise and land subsidence has increased relative sea level by 4.9 mm (0.19 in) per year at Pohnpei since 2002 (Figure 4). Peak sea levels typically occur in both May/June as well as December/January, with most instances of peak sea levels occurring in November.

Figure 5:

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



The long-term trend in sea level across FSM's EEZ is 3–4.5 mm (0.12–0.18 in) per year since 1993. For some regions (Figure 5), this trend is higher than the global average trend (3.1 ± 0.4 mm per year, or 0.12 ± 0.02 in).

The rise in global 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).

© Luigi Guarino: Pohnpei

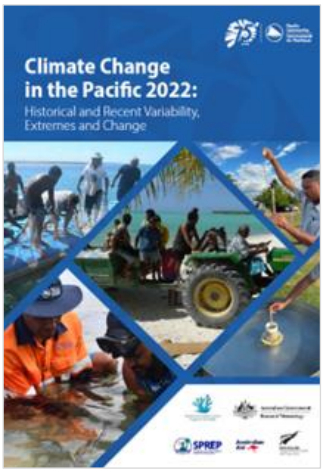
Waves

Waves at Pohnpei come from the northeast. On average, Pohnpei experiences 3.9 extreme wave events - defined as reaching or exceeding wave height of 2.45 m (8.04 ft) - 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 and longest wave periods usually occur between November to March.

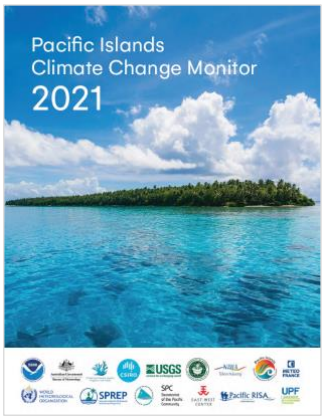
Further reading

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

© U.S. Coast Guard photo by Chief Warrant Officer Sara Muir: UNESCO World Heritage site of Nan Modal in Pohnpei, Federated States of Micronesia

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For more detailed information on the climate of the Federated States of Micronesia 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.*

For more information

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