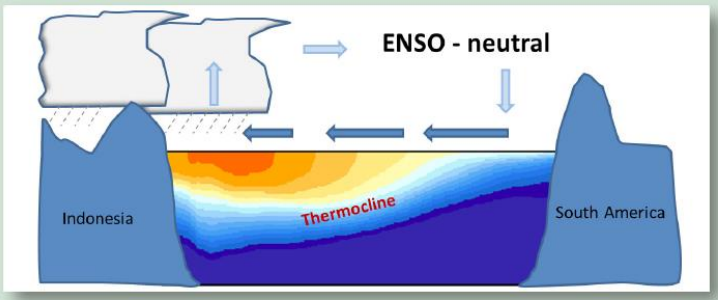
El Niño and its Impacts on Federated States of Micronesia – Pohnpei and Kosrae

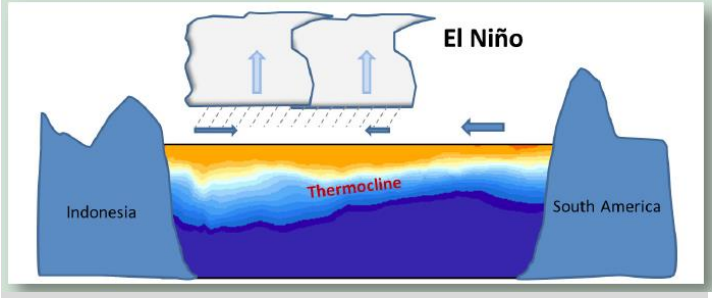
What is El Niño?

The El Niño – Southern Oscillation (ENSO) is a recurring climate pattern involving changes in the temperature of waters in the central and eastern tropical Pacific Ocean and the patterns of sea level pressure, lower- and upper-level winds, and tropical rainfall across the Pacific basin. On periods ranging from about two to seven years, the surface waters across a large swath of the tropical Pacific Ocean warm or cool by anywhere from 1°C to 3°C, compared to normal. This irregular oscillation between warm and cool patterns, referred to as the ENSO cycle, directly affects rainfall distribution in the tropics and can have a strong influence on weather across the Pacific basin. **El Niño** and **La Niña** are the extreme phases of the ENSO cycle; between these two phases is a third phase called **ENSO-neutral**.

ENSO-neutral: Under normal conditions strong trade winds blow from the east along the equator, pushing warm water into the western Pacific Ocean.



El Niño conditions occur when abnormally warm waters build in tropical region of the central and eastern Pacific Ocean and are usually associated with a weakening of the easterly trade winds, sometimes even reversing to westerlies. Consequently, tropical rains that usually fall over Indonesia move eastward; sea level decreases in the western Pacific; and the vertical, thermal structure of the ocean and coastal and upwelling currents are changed.



The ***Thermocline*** is a layer of water in which there is an abrupt change in temperature separating the warmer surface water from the colder deep water.

El Niño in FSM

Rainfall	**Less**
more at first, but then much less; longer and drier dry-season	↓
Trade Winds	**Less**
weaker, with occasional westerly winds	↓
Tropical Cyclones	**More**
increased risk, as more storms form closer to the islands	↑
Sea Level	**Less**
lower at first, then gradually recovering	↓
Ocean Conditions	**Less**
cooler at and below the surface	↓

See back page for more details

Every El Niño is a little bit different!

El Niño conditions can start to develop as early as May or June and typically reaches maximum strength during December; the conditions then subside towards normal conditions by June of the following year. However, the evolution and duration, strength and impacts of individual El Niño events can vary, in some cases greatly. This makes constant monitoring and awareness extremely important for decision makers across multiple sectors.

El Niño and Rainfall in Pohnpei and Kosrae

Rainfall during the El Niño year generally remains above normal through September in the eastern FSM. However, significant reductions in rainfall starts in November and peaks in February. Rainfall in eastern FSM can be as much as 60% below normal from January through April in the year after El Niño. The level of these dry conditions depends on the intensity of the El Niño event, with very strong El Niño events producing the driest conditions. Rainfall begins a return to normal by August of the year after El Niño for much of the two states.

El Niño and Tropical Cyclones

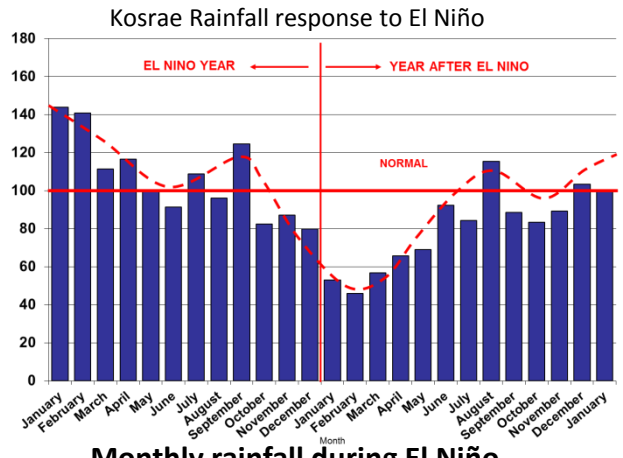
El Niño tends to shift the development of tropical cyclones (TC) eastward toward the Dateline. This makes for increased risk of TC activity in eastern FSM from March-July and October-December of El Niño years. Eastern FSM is also a common "birthplace" for TCs to form during El Niño years.

El Niño and Sea Level

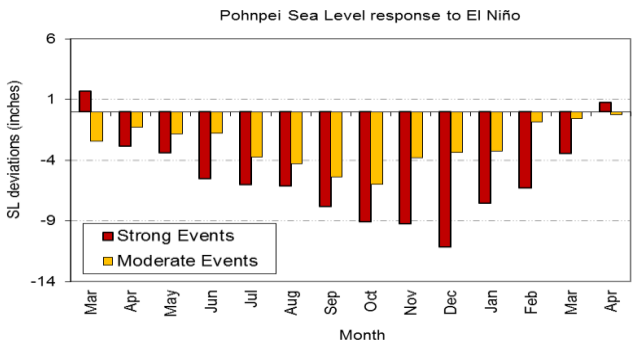
During strong El Niño events, falls in sea level can be seen in Pohnpei as early as February of the El Niño year and returning to normal as late as June of the year following El Niño. For moderate events, sea level usually starts falling during April or May and remains below normal until March or April of the following year.

El Niño and Ocean Conditions

During El Niño, ocean waters tend to warm substantially in the central and eastern Pacific at both the surface and subsurface. In FSM however, cooler than normal ocean waters are commonly observed during strong El Niño's, reducing tuna catch as the fish are displaced eastward.



Monthly rainfall during El Niño.



Monthly sea level variations during El Niño.

What does El Niño mean to you?

- **If you are a water manager**, expect adverse impacts on water availability, including increased demand on groundwater resources as catchments and surface water sources become stagnant or dry up due to less rain.
- **If you are a disaster manager**, prepare for prolonged drought and potential damage to infrastructure due to late-season tropical cyclones.
- **If you are involved in public health,** prepare for reduced freshwater quality and quantity, and reduced quality and quantity of local food supplies, and potential increase in mosquito-borne diseases.
- **If you are a coastal and ocean resource manager**, expect an increased risk of coral bleaching and potential changes in tuna catch as tuna habitat migrates away from its regular location.
- **If you are involved in agriculture**, expect adverse impacts on crop production and grass fires due to drought, and that these affects might linger as a result of seawater inundation of cropland.
- **If you are involved with the recreation and tourism,** drought and ecosystem impacts may negatively affect recreation and tourism. Waterfalls may be reduced to a trickle.

For Additional Information go to

- Weather Station Office (WSO) Pohnpei or Kosrae: http://www.prh.noaa.gov/pohnpei/ http://www.prh.noaa.gov/kosrae/
- Pacific ENSO Applications Climate (PEAC) Center: http://weather.gov/peac/
- NOAA Climate Prediction Center (CPC) :http://www.cpc.ncep.noaa.gov/
- NOAA National Centers for Environmental Information (NCEI)

Also, Contact the Pacific Region Climate Officer,
Pacific ENSO Applications Climate Center, peac@noaa.gov