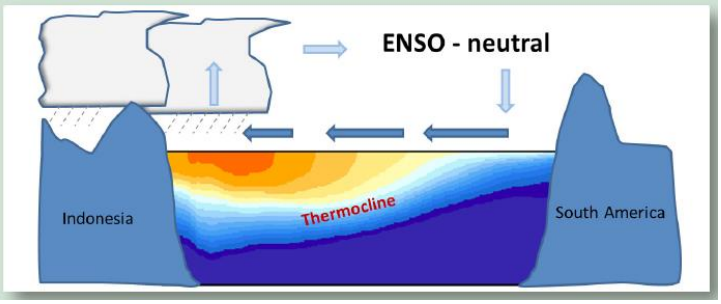
El Niño and its Impacts on Guam and the Commonwealth of the Northern Mariana Islands

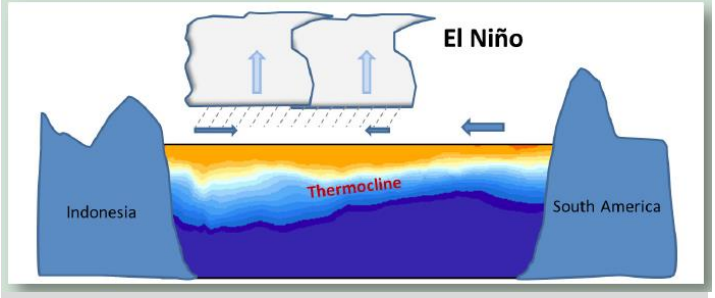
What is El Niño?

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 Guam and CNMI

Rainfall	**Less**
more at first, but then much less; prolonged dry season	↓
Trade Winds	**Less**
weaker, with occasional westerly winds	↓
Tropical Cyclones	**More**
increased risk, as more storms form closer to and move towards the islands	↑
Sea Level	**Less**
very low 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 Guam/CNMI

El Niño poses the threat of major drought for Guam and the Commonwealth of the Northern Mariana Islands. Through December of the El Niño year, rainfall averages near to slightly above normal before beginning a rapid decline, sinking to well below average by February of 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. Dry conditions usually peak around April of the year following El Niño and rains usually begin to return by July in the year after El Niño.

El Niño and Tropical Cyclones

El Niño tends to shift the development of tropical cyclones (TC) eastward away from the Philippines and western Micronesia towards the Dateline. This makes for an increased risk of TC activity from March-July of the El Niño year, as well as an increased risk from October-December during the El Niño year.

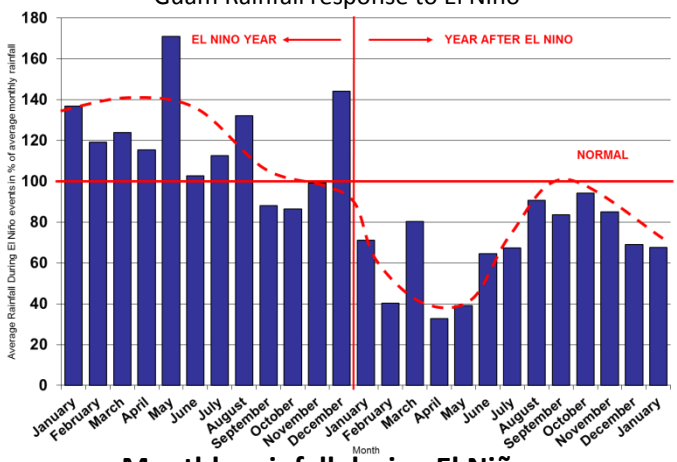
El Niño and Sea Level

In Guam and CNMI, sea levels are much lower than normal during strong El Niño years — the amount commensurate with the strength of the El Niño . The falls begin in the summer of the El Niño year and peak in the winter. Sea level rises begin in the summer of the year following El Niño.

El Niño and Ocean Conditions

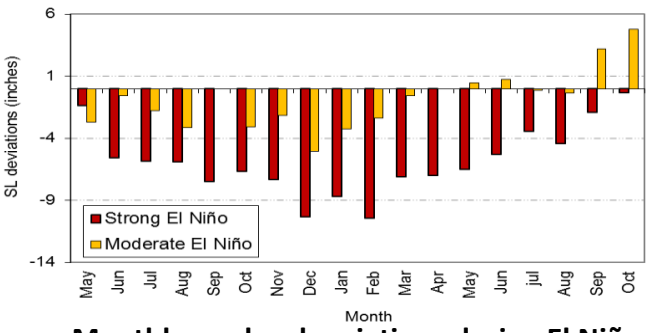
During El Niño, ocean waters tend to warm in the central and eastern Pacific at both the surface and subsurface. In Guam and CNMI, cooler than normal ocean waters are commonly observed during strong El Niño's, reducing fish populations as they migrate east with the warmer water.

Guam Rainfall response to El Niño



Monthly rainfall during El Niño.

Guam Sea Level response to El Niño



Monthly sea level variations during El Niño.

What does El Niño mean to you?

- **If you are a water manager**, expect minor impacts on the availability of surface water and increased demand on groundwater resources as rainfall is reduced.
- **If you are a disaster manager**, prepare for prolonged drought, the elevated risk of tropical cyclones and potential damage to infrastructure due to coastal flooding and storm surge.
- **If you are involved in public health,** prepare for increased incidences of water borne and other ailments typically associated with natural disasters.
- **If you are a coastal and ocean resource manager**, expect an increased risk of coral bleaching and other ecosystem impacts associated with low sea-level stands.
- **If you are involved in agriculture**, expect impacts on crop production and livestock health in CNMI, but good crop yields on Guam where irrigation is possible. Expect increased grass fires during the dry months.
- **If you are involved with the recreation and tourism,** minor impacts are expected in association with coastal ecosystem damages.

For Additional Information go to

- Weather Forecast Office (WFO) Guam: http://www.prh.noaa.gov/guam/
- 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