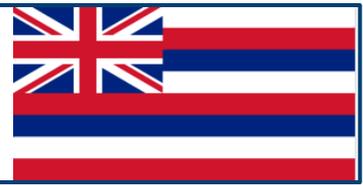




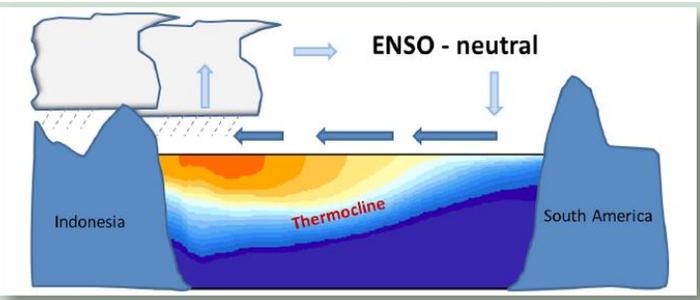
# El Niño and its Impacts on The Hawaiian Islands



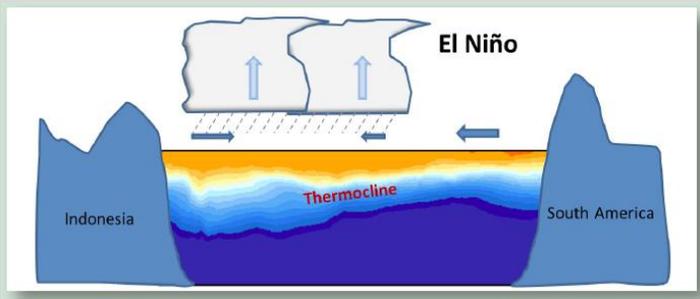
## What is El Niño?

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 Hawai'i

|  |             |
|--|-------------|
| <b>Rainfall</b>  | <b>Less</b> |
| more at first, but then rapidly becoming less; dry wet-season              | ↓           |
| <b>Trade Winds</b>   | <b>Less</b> |
| weaker, with occasional westerly winds                                     | ↓           |
| <b>Tropical Cyclones</b>   | <b>More</b> |
| increased risk, as more storms form closer to and move towards the islands | ↑           |
| <b>Sea Level</b>   | <b>More</b> |
| near to slightly above normal; high run-up from distant swells             | ↑           |
| <b>Ocean Conditions</b>  | <b>More</b> |
| much warmer 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 Hawai'i

Rainfall during the developing El Niño starts out much wetter than normal, especially from August through October. By November, a rapid decline in rainfall begins, sinking to well below average by February of the following year. The level of these dry conditions depends on the intensity of the El Niño event, though widespread dryness across the Hawai'iian Islands is typical. Rainfall returns to normal by July of the year following an El Niño event.

## El Niño and Tropical Cyclones in Hawai'i

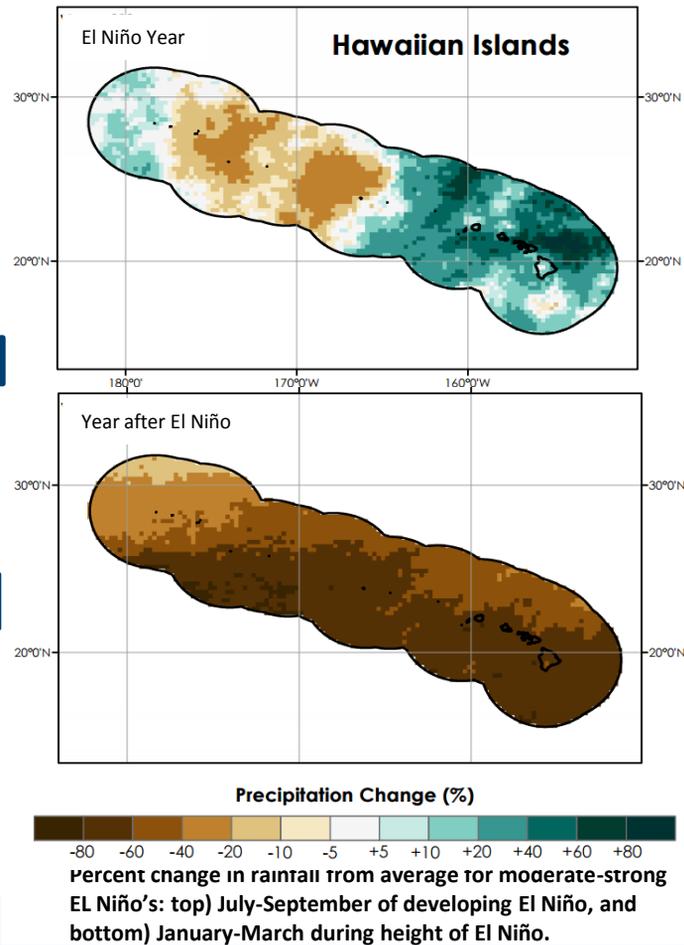
El Niño tends to increase the number of tropical cyclones (TC) in the eastern and central North Pacific regions. This makes for increased risk of TC activity in Hawaii during the TC season of El Niño years.

## El Niño and Sea Level in Hawai'i

In Hawai'i, sea levels are near to slightly above normal during strong El Niño years. Exceptionally large swells associated with winter storms tracking north of Hawaii are common.

## El Niño and Ocean Conditions in Hawai'i

During El Niño, ocean waters tend to warm substantially in the central and eastern Pacific at both the surface and subsurface. In Hawai'i, warmer than normal ocean waters are commonly observed during strong El Niño's, increasing fish populations and coral bleaching events.



## What does El Niño mean to you?

- **If you are a water manager**, expect minor impacts on surface water availability and increased demand on groundwater resources as rainfall is reduced during the normal wet season (Nov-Apr).
- **If you are a disaster manager**, prepare for an increased likelihood of damage to infrastructure due to tropical cyclones and flooding and erosion associated with high waves.
- **If you are involved in public health**, prepare for increased incidences of water borne disease and other ailments typically associated with natural disasters.
- **If you are a coastal and ocean resource manager**, expect a substantial increase in risk of coral bleaching and potential increases in tuna catch as tuna habitat migrates toward Hawai'i from its regular location.
- **If you are involved in agriculture**, expect impacts on crop production and reduced cattle feed with an increased chance of wildfires, especially from January-March as a result of anticipated dry conditions.
- **If you are involved with the recreation and tourism**, minor impacts are expected to coastal resources from damages to beaches and coral reefs.

## For Additional Information go to

- **Weather Forecast Office (WFO) Honolulu:** <http://www.prh.noaa.gov/hnl/>
- 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](mailto:peac@noaa.gov)

