

# EL NIÑO SOUTHERN OSCILLATION: EXPLANATION

El Niño is an **oscillation** (repetitive variation) of the ocean-atmosphere system in the tropical Pacific. El Niño has important consequences for weather around the globe. El Niño means “Little Baby Jesus” as it is a phenomenon that shows up around Christmas time.

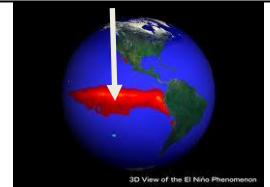
One consequence of El Niño is increased rainfall across the southern parts of the US and in Peru, which has caused destructive flooding. In the West Pacific, they are more subject to droughts, which may cause devastating brush fires in Australia. Observations of conditions in the tropical Pacific are considered essential for the prediction of short-term (a few months to 1 year) climate variations. To provide necessary data, NOAA (National Oceanic and Atmospheric Agency) operates a network of buoys which measure temperature, currents, and winds near the equator. These buoys transmit data daily which are available to researchers and forecasters around the world in real time.



In normal, non-El Niño conditions, the trade winds blow towards the west across the tropical Pacific. These winds pile up warm surface water in the west Pacific, so that the sea surface is about 1/2 meter higher in Indonesia than in Ecuador. The sea surface temperature is about 8 degrees C higher in the west. Cool temperatures exist off of South America due to an upwelling of cold water from deeper levels. This cold water is nutrient-rich, supporting high levels of primary productivity, diverse marine ecosystems, and major fisheries. Rainfall is found in rising air over the warmest water, and the east Pacific is relatively dry.

Warm Water Along Equator

During El Niño, the trade winds relax in the central and western Pacific. This causes warm water to accumulate (build up) along the Equator. Upwelling of cold water stops and thus, the water becomes nutrient poor. If there are no nutrients, primary productivity in the ocean stops. This adversely affects the trophic levels of the food chain, including commercial fisheries in this region. Rainfall follows the warm water eastward, with associated flooding in North and South America. Also, there is drought in Indonesia and Australia. El Niño occurs every 3-8 years.



In the Pacific, La Niña is characterized by unusually cold ocean temperatures in the eastern equatorial Pacific, compared to El Niño, which is characterized by unusually warm ocean temperatures in the same area. The La Niña condition often follows the El Niño, especially when the latter is strong. This occurs because eventually the trade winds will pick back up and the warm water that moves out will be replaced with really cold water from the poles.

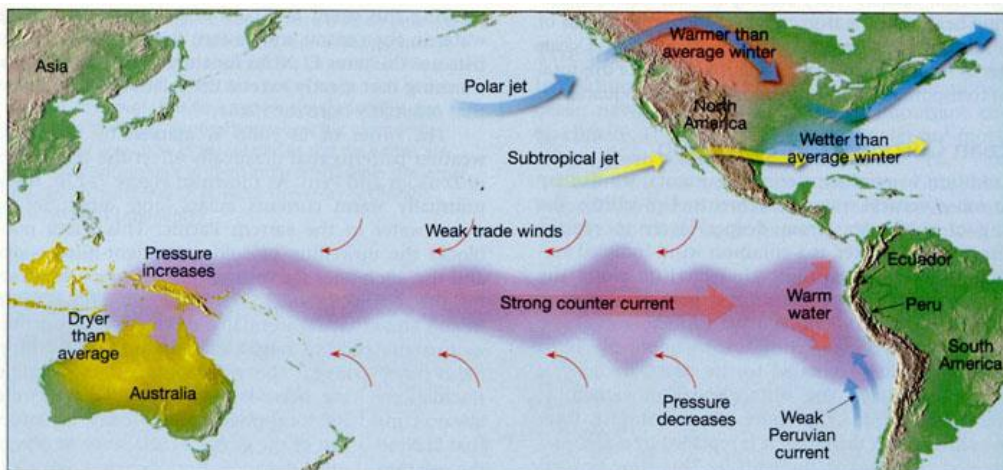


Fig.14 Upon the advent of an ENSO event, the pressure over the eastern and western Pacific flip-flops. This causes the trade winds to diminish, leading to an eastward movement of warm water along the equator. As a result, the surface waters of the central and eastern Pacific warm, with far-reaching consequences to weather patterns.

**Directions:** Grab a red and a blue colored pencil. In the globes below, color the temperatures of the Pacific Ocean in normal conditions and in El Niño conditions. Include arrows to show the direction of the water movement.

**Normal, Non ENSO Conditions**

**ENSO Conditions**



**Directions:** When El Niño occurs, it has many global impacts around the world. In the table below, list as many effects that occur because of El Niño. Then, discuss how this effect impacts the environment, humans, or our economy.

El Niño Southern Oscillation Effects	Environment/Human/Econ. Impacts
1)	
2)	
3)	
4)	
5)	
6)	

**Analysis:** Please answer the questions below using **complete sentences**.

1) How are we impacted here in Southern California by El Niño?

2) How are El Niño and La Niña different (besides the obvious boy/girl name)?

3) How would you make sure that people are informed and ready for an El Niño event? Explain your steps.