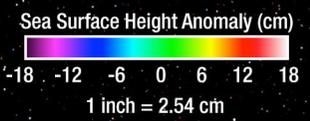
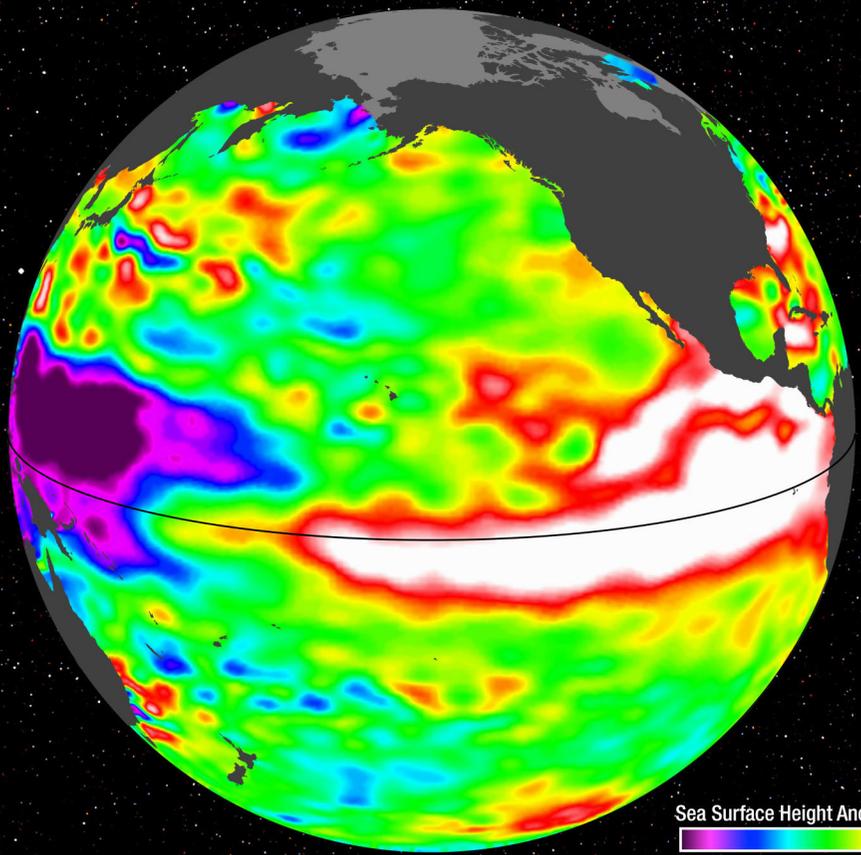


El Niño and La Niña

El Niño
December 27, 2015

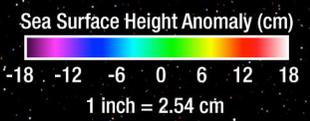
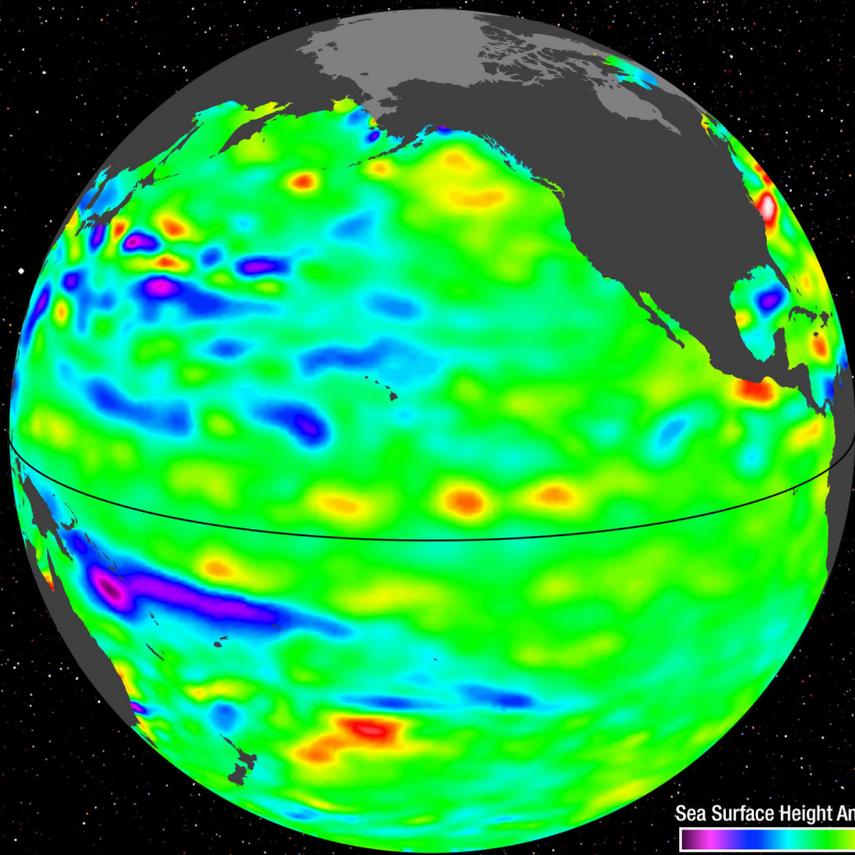
National Aeronautics and
Space Administration



El Niño and La Niña

Neutral January 15, 2014

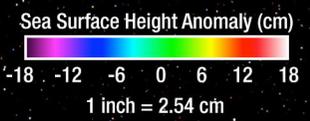
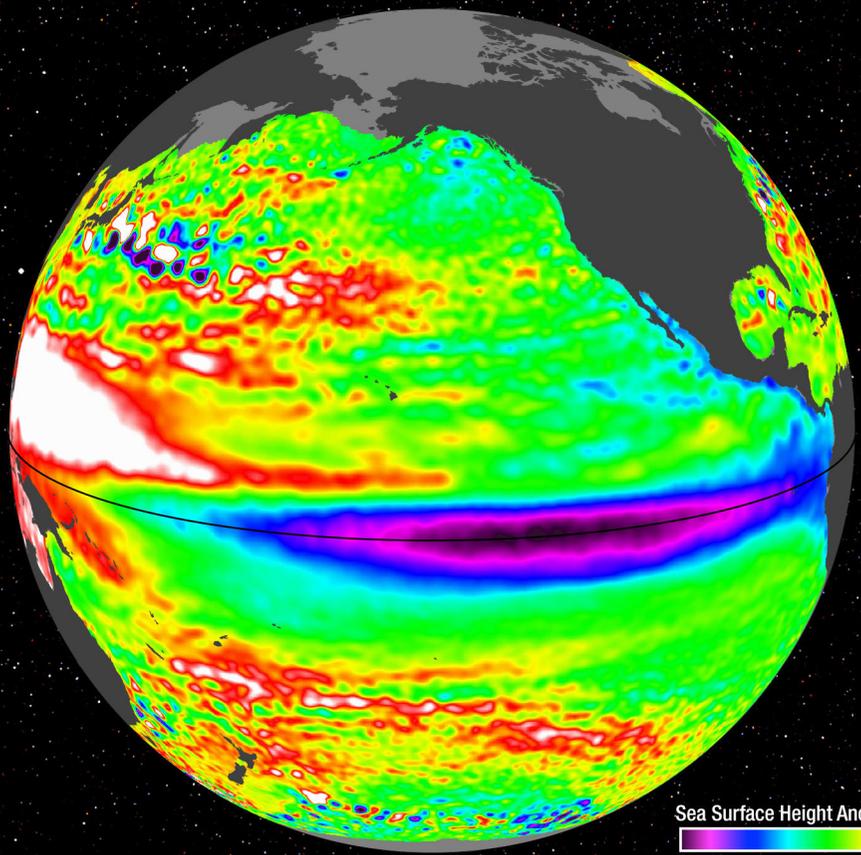
National Aeronautics and
Space Administration



El Niño and La Niña

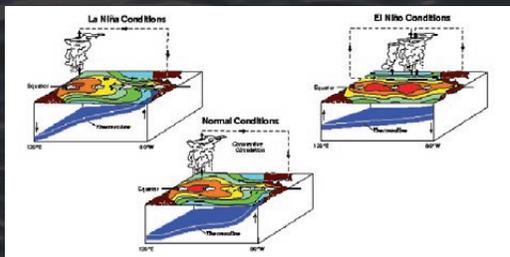
La Niña November 15, 1999

National Aeronautics and
Space Administration



About the Images

The images show El Niño, neutral, and La Niña sea surface heights (SSHs) relative to a reference state established in 1992. In the equatorial region of the Pacific Ocean, the SSH during El Niño was higher by more than 18 cm over a large longitudinal region. The warmer water associated with El Niño displaces colder water in the upper layer of the ocean causing an increase in SSH because of thermal expansion. During La Niña the temperature of the upper ocean is lower than normal, causing SSH to decrease because of thermal contraction. The neutral condition occurs when the upper-ocean temperature is “normal.” Red and white shades indicate high SSHs relative to the reference state, while blue and purple shades indicate SSHs lower than the reference state. Neutral conditions appear green. The El Niño and neutral images are derived using data acquired by the Ocean Surface Topography Mission (OSTM)/Jason-2 satellite. The La Niña image is derived using data acquired by the Topography Experiment (TOPEX)/Poseidon mission, other satellites, and tide gauges.



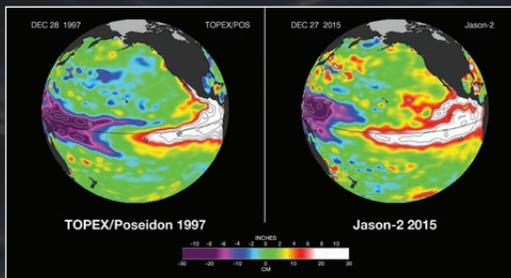
During neutral, or “normal,” conditions in the eastern tropical Pacific, prevailing easterly winds, called *trade winds*, drive warm surface water westward, away from South America. This causes cold, nutrient-rich water to well up to the surface, called *upwelling*. El Niño and La Niña represent departures from the long-term average, or neutral, conditions. Specifically, La Niña is characterized by strong trade winds, which causes upwelling to intensify in the eastern tropical Pacific. With the onset of El Niño, a drop in air pressure over this region causes the trade winds to weaken and sometimes even reverse, driving warm water eastward, towards the coast. Both events occur approximately every two to seven years and tend to peak in December. Image credit: www.pmel.noaa.gov/tao/proj_over_diagrams

What are El Niño and La Niña?

The naturally occurring El Niño and La Niña phenomenon represents a “dance” between the atmosphere and ocean in the equatorial Pacific Ocean. Sometimes the atmosphere leads the ocean and causes ocean conditions, and sometimes the ocean leads the atmosphere and produces atmospheric motions that—when strong enough—influence global atmospheric circulation. Sea surface temperature (SST) is the critical variable connecting the atmosphere and ocean. Since SSH measurements yield critical information about the depth of the subsurface temperatures, e.g., the thermocline, they provide key information on the onset, maintenance, and dissipation of El Niño and La Niña events.

The 2015 El Niño Event

After five consecutive months with SSTs 0.5 °C above the long-term mean, the National Oceanic and Atmospheric Administration (NOAA) issued an El Niño Advisory in July 2015 to declare the arrival of the phenomenon. A strong El Niño (sea surface temperatures more than 2 °C above normal) continued to develop through Northern Hemisphere fall months, rivaling the 1997–98 event.



These images provide a side-by-side comparison of Pacific Ocean SSHs in 2015 [right] with SSHs during the 1997–98 El Niño [left], from Jason-2 and TOPEX/Poseidon, respectively. While SSH was more intense in December 1997, the area of high sea levels was considerably broader in December 2015. Image credit: sealevel.jpl.nasa.gov/elniño2015/index.html

