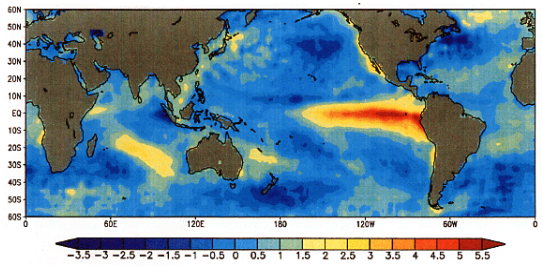
EL NIÑO

El Niño: *An extensive ocean warming that begins along the coast of Peru and Ecuador in South America.*

Along the west coast of South America, where the cool Peru Current sweeps northward, southerly winds promote up-welling of cold, nutrient-rich water that gives rise to large fish populations.

Near the end of the calendar year, a warm current of nutrient-poor tropical water often moves southward, replacing the cold, nutrient-rich surface water. Because this condition frequently occurs around Christmas, local residents call it El Niño, Spanish for boy child, referring to the Christ Child.

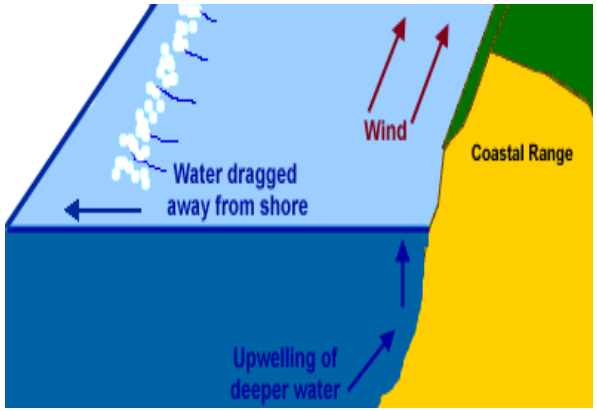
The warming lasts for only a few weeks to a month or more, after which weather patterns usually return to normal. This extremely warm episode, which occurs at irregular intervals of 2 to 7 years and covers a large area of the Tropical Pacific Ocean, is now referred to as a Major El Niño Event or simply El Niño.



WHY DOES THE OCEAN BECOME SO WARM OVER THE EASTERN TROPICAL PACIFIC?

Normally in the Tropical Pacific Ocean, the trade winds blow westward from a region of higher pressure over the Eastern Pacific toward a region of low pressure centered near Indonesia.

The trades create upwelling that brings cold water to the surface. As the water moves westward, it is heated by the sun and the atmosphere. Consequently in the Pacific Ocean, surface water along the equator usually is cool in the east and warm in the west. In addition, the dragging of surface water by the trades raises sea level in the Western Pacific and lowers it in the east, which produces a thick layer of warm water over the Tropical Western Pacific Ocean and a weak ocean current (called the counter current) that flows slowly eastward toward South America.



Caption: The effect of the trades on the Pacific Ocean

Every few years, the surface atmospheric pressure patterns break down, as air pressure rises over the region of the Western Pacific and falls over the Eastern Pacific. This change in pressure weakens the trades, and during strong pressure reversals, east winds are replaced by west winds that strengthen the counter-current. Surface water warms over a broad area of the Tropical Pacific and head eastward towards South America in a surge know as the Kelvin Wave, which is an enormous wave perhaps 15cm high but extending for hundreds of kilometers north and south of the Equator.

Toward the end of the warming period, which may last between 1 and 2 years, atmospheric pressure over the Eastern Pacific reversed and begins to rise, whereas over the Western Pacific it falls. This see-saw pattern of reversing air pressure at opposite ends of the Pacific Ocean is called the Southern Oscillation.

Because the pressure reversals and ocean warming are more or less simultaneous, scientists call this phenomenon the El Niño/ Southern Oscillation or ENSO.

Following an ENSO event the trade winds usually return to normal. However, if the trades are exceptionally strong, unusually cold surface water moves over the central and eastern Pacific and the warm water and rainy weather is confined mainly to the western Tropical Pacific.

This cold-water episode, which is the opposite of El Niño conditions, has been termed La Niña (the girl child).

EL NIÑO AND HURRICANES

The warm ocean waters play a significant role in many meteorological phenomenon. They provide the thermal energy that steers evaporation and hence cloud formation and storms. The extra heat within the water acts like wood tossed on a fire, creating more and bigger, storms.

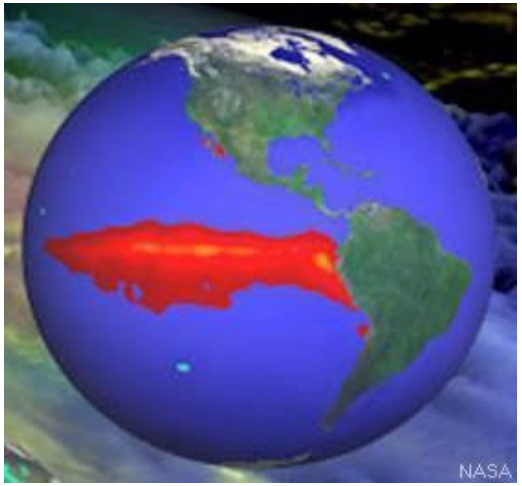
Strong winds aloft typically occur over the Atlantic during a major El Niño event. Consequently there are fewer Atlantic hurricanes than normal. Strong winds tend to disrupt the organized pattern of convection and disperse the heat, which is necessary for the growth of storms.

However the warmer water of El Niño in the northern Tropical Pacific favors the development of hurricanes in that region.

During the cold water episode in the Tropical Pacific (La Niña) winds aloft over the tropical Atlantic usually weaken and become easterly – a condition that favors hurricane development.

Unfortunately not all El Niño's are the same, nor does the atmosphere always react in the same way from one El Niño to another.

This is why NASA's Earth scientists continue to take part in international efforts to understand El Nino events. Hopefully one day scientists will be able to provide sufficient warning so that we can be better prepared to deal with the damages and changes that El Niño causes in the weather.



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El Niño

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Protecting lives and property against natural hazards