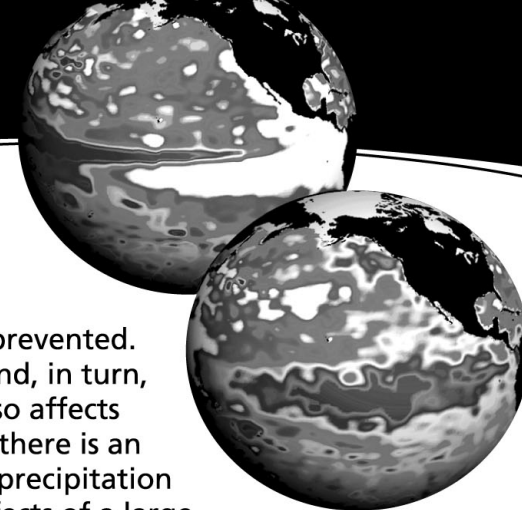


El Niño and La Niña Forecasting



One of the most important uses of Topex/Poseidon data has been monitoring changes in the ocean surface that could be indicators of abnormal changes in the weather.

An El Niño is a disruption in the normal Pacific Ocean circulation pattern that affects the weather worldwide. Relatively small changes in ocean temperature over large areas can mean very big changes in weather patterns. An El Niño is a natural event that occurs every 5–10 years. The term “El Niño” was first used by those who fish the waters off the coasts of Ecuador and Peru to refer to the warm current that appears around Christmas, causing a decline in the fish population.

During La Niña, the opposite changes occur and colder water reaches across a large area of the equatorial Pacific, causing colder, dryer weather along the Pacific Coasts of North and South America.

How does it work?

In a normal year, the easterly (westward-blowing) trade winds push warm surface water against the western boundary of the Pacific Ocean near Australia and Indonesia, while nutrient-rich cold water upwells along the west coast of South America, helping fish thrive.

An El Niño occurs when the trade winds over the equator weaken and even reverse direction; that is, they blow from west to east. This allows the warm “pile” of water normally held against the western shore of the Pacific to move eastward along the equator.

When this bulge of warm water reaches South America, it can move north and south along the coast for hundreds of miles.

When the warm water bulge is against the shore of South America, the normal upwelling of cool nutrient-rich water is prevented. As a result, there is little for fish to eat and, in turn, few fish for people to eat. The ocean also affects the atmosphere. With the warm ocean, there is an increase in evaporation and subsequent precipitation over the mountains in that area. The effects of a large El Niño reach considerably further than the area surrounding the tropical Pacific; jet streams are altered all over the world, and many places have weather that is very different from normal.

The change in the trade winds that leads to El Niño has yet to be fully understood. The trade winds are controlled by the interaction between the atmosphere and the ocean, with sea-surface temperature an especially important factor.

Topex/Poseidon and Jason-1 can measure the buildup of warm water in the western Pacific Ocean, which in a large El Niño can be as much as 1 meter higher than that in the eastern Pacific. By tracking this buildup early, scientists can get an advance notice of a coming El Niño and can estimate its severity. This information, when provided to government agencies and the general public, can help lessen the damages to life and property caused by these events.

