SOUTH PACIFIC

SEA LEVEL AND CLIMATE MONITORING PROJECT

# EL NIÑO AND LA NINA
# IMPORTANT OCEAN PHENOMENA

A Project supported by the Australian Government

## WHAT IS EL NIÑO?

The term El Niño (Spanish for "the Christ Child") was originally used by fishermen along the coasts of Ecuador and Peru to refer to a warm ocean current that typically appeared around Christmas time and lasted for several months. Every few years the water was especially warm and interrupted fishing for longer than usual. These days, the term "El Niño" is used for these exceptionally strong warm intervals.

Over the past two decades scientists have discovered that a whole array of climate fluctuations, from drought in Indonesia to weakened tradewinds across the Pacific, are associated with the warm currents off South America. One such fluctuation is the so-called "Southern Oscillation". This is the see-saw pattern of reversing surface air pressure between the eastern and western tropical Pacific; when the surface pressure is high in the eastern tropical Pacific it is low in the western tropical Pacific, and vice-versa. Because the ocean warming and pressure reversals are, for the most part, simultaneous, scientists call this phenomenon the El Niño/Southern Oscillation or ENSO for short.

ENSO is an example of the combined effect of the ocean and the atmosphere to determine climate variability. It is a disruption of the ocean-atmosphere system in the tropical Pacific having important consequences for weather around the globe. This condition results in redistribution of rains, with flooding in some places and droughts in others.

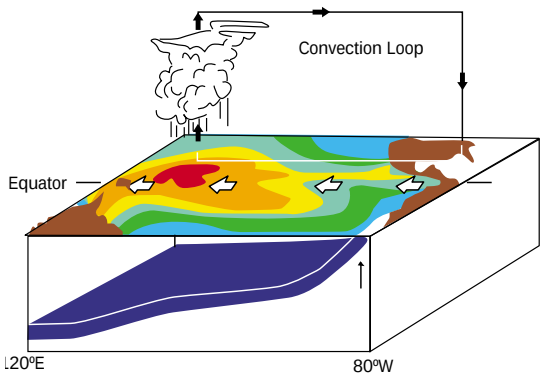
## A TYPICAL EL NIÑO

Scientists do not completely understand how or why El Niños form and unfortunately, not all El Niños are the same as the atmosphere does not always react the same to the changes in the surface temperature of the ocean. An El Niño may last for six months or two years, disappearing as mysteriously as it arrived.

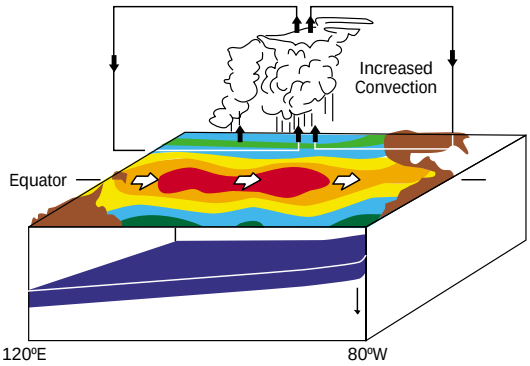
The beginnings of an El Niño can usually be traced back to a weakening of the easterly (east to west) winds (the tradewinds) in the equatorial Pacific Ocean. West of the dateline, the prevailing winds may shift to westerly. This typically occurs around mid-year.

Within a few weeks of the weakening or reversal of the tradewinds, the ocean begins to react. Sea level at Christmas Island (Kiritimati) in the

**Normal Conditions**




**El Niño Conditions**



mid-Pacific rises by six or eight centimetres. A month or two later the sea level increase has spread eastward to the coast of South America, by which point it may be as much as 20 or 30 centimetres. As sea level rises in the eastern Pacific, it falls in the west, exposing and damaging the upper layers of the fragile coral reefs surrounding many islands. The fall in sea level may extend southwards away from the equator to include Tuvalu, Fiji, and beyond.

Rainfall is closely connected to the temperature of the sea surface. Areas of ocean with warmer water usually receive higher rainfall. When the warm equatorial water flows to the east, wide areas of the western tropical Pacific experience drought, while heavy rainfall and flooding often occur from the central Pacific to the west coast of the Americas.

## LA NINA

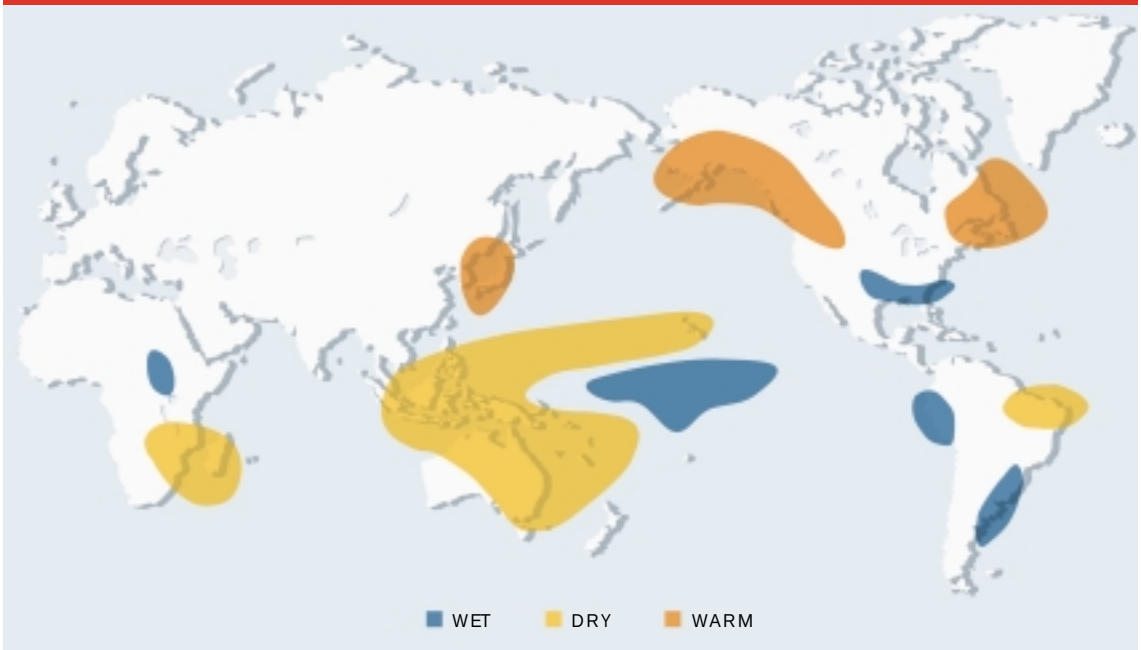
In Spanish, La Nina means Little Girl. This is El Niño's 'sister', an event with opposite effects to El Niño. During La Nina the water temperatures in the tropical eastern Pacific fall below average. In a short space of time places that previously suffered droughts receive unusually high precipitation and resulting floods. Eastern and northern Australia and Indonesia experience increased rainfall. Drought conditions replace storms in the Americas. The severe floods that hit Fiji in the Western Division at the start of 2000 are an example of La Nina's impact.

## IMPACTS ON THE PACIFIC

El Niño and La Nina impact the Pacific region significantly, although their influence is felt as far away as Africa, Canada, USA, as well as Indian Ocean and Asian countries. A significant El Niño event took place in 1982/1983 and it has been estimated that the global impact of this resulted in damage, lost crops and reduced fish catches totalled US$13 billion. In 1998 El Niño managed to push the monsoon belt higher than normal, reducing rainfall around the South East Asian region. Indonesia and Malaysia suffered severe droughts and the annual slash and burn farming fires in Indonesia went out of control, as the usual rains did not come to halt them. This produced a haze problem across Indonesia, Malaysia and Singapore which lasted several months. Australia suffered severe droughts particularly in the eastern states and farming communities suffered substantial losses of livestock and crops with consequent financial hardship.

El Niño also provides favourable weather conditions for cyclones. Cyclone Oscar, the most damaging cyclone to hit Fiji, occurred in 1983 as a result of El Niño. Then in 1987 Fiji was hit by three cyclones in the space of a few months. In 1997 Tuvalu suffered three damaging cyclones, while Tonga was hit hard by two El Niño induced cyclones, severely damaging its squash industry, already reeling from drought. In December 2001 a damaging cyclone also hit Tonga.

## AREAS MOST AFFECTED BY EL NIÑO



The El Niño of 1997/98 saw drought wipe out two thirds of Fiji's new sugar cane plantings. Tonga's squash exports were reduced to more than half. Papua New Guinea required emergency food aid for those in isolated highlands and low lying islands. More than 30 Federated States of Micronesia atolls ran out of drinking water, while Marshall Islands needed assistance for desalination plants to supply the population with fresh water as wells had run very low. Large areas of Samoan natural forests were destroyed by fire sparked by extremely dry conditions. The El Niño also significantly altered seasonal tuna catches for many Pacific Islands, including Samoa and Tonga.

La Nina also has its consequences. After the 1997 El Niño, grossly distorted rainfall patterns brought flash floods to Fiji, while Kiribati, Nauru and Tahiti which had previously enjoyed high rainfalls of El Niño suffered droughts. Kiribati needed desalination plants to supply the population with drinking water.

Seaframe Station at Betio, Kiribati.

## MONITORING EL NIÑO

In recent years, as the El Niño and La Nina phenomena are becoming better understood, scientists from around the world have reached the stage where they can make rough predictions of their likely occurrence. This is achieved through a comprehensive ocean and atmospheric monitoring program. Sea level measurements are obtained from tide gauges and satellites. Moored instruments and satellites measure currents and sea temperatures, while winds are monitored by surface measurements and from satellites. The information is used to develop numerical models that describe the ocean-atmosphere dynamics. These models are run on supercomputers and can be used to predict future events. The continued monitoring of a wide range of ocean parameters is essential to improve the accuracy of these models and to support their operation.

The South Pacific Sea Level and Climate Monitoring Project, funded by the Australian Government, has established a network of high resolution monitoring stations collecting sea level and atmospheric data from 14 member countries in the South Pacific. These data are an essential contribution to improving the understanding of El Niño and La Nina and their prediction.

While nothing can be done to stop El Niño or La Nina, it is possible to reduce the impact of their damaging forces. For example, if farmers are informed of the likely occurrence of an El Niño induced drought in the coming year, they can plant more drought resistant crops rather than traditional crops that may suffer severely in drought conditions. If fishermen are warned of an El Niño event, they can target other species of fish less dependant upon constant water temperatures or look to other methods of generating revenue. And Governments can better plan for disasters such as flooding and fires to reduce their impact and therefore reduce their cost of potential damage.

Information from the South Pacific Sea Level and Climate Monitoring Project can contribute to this planning process.

## FURTHER INFORMATION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