

SCIENCE NOW

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Winter 1998 — VOLUME 5, NO. 2

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Why Should We Care about El Niño?

If scientists are correct in their predictions, the world could be in for some wild weather in the coming months. The presence of a significant El Niño event for 1997-1998 is one of the biggest media stories of the year, and a focus of attention for thousands of researchers around the globe. Although extreme weather events like hurricanes, floods, and droughts occur every year, El Niño tends to cause more than the usual number. Communities that understand the effects of El Niño and plan accordingly can potentially save lives and protect their economies.

El Niño is the appearance of warm surface water in the central and eastern equatorial Pacific Ocean off the coast of Peru and Ecuador. The return of El Niño happens roughly every four to seven years, and each event tends to last between 12 and 18 months. However, there have been times when none has occurred during that period of time and other times when it has lasted for more than a few years, such as in the early 1990s.

Folklore suggests that the term "El Niño" (literally the Spanish term for "Christ Child" or "Baby Jesus") was used by Peruvian fishermen who noticed the annual appearance of warm water by December of each year, around Christmas time. In some years, the warm water did not disappear after a few months, but lingered for more than a year. This, too, was called El Niño. Now scientists broadly define El Niño as any sea surface warming in the eastern part of the equatorial Pacific.

In practical terms, the occurrence of El Niño means that many normally wet regions, such as Indonesia, become dry, while normally dry areas, such as the western coast of South America, become wet. Other changes take place; for example, the availability and abundance of fish populations in coastal areas shift. This leads to problems, reducing food production and fish landings and causing declines in fish meal production and exports in some locations while bringing unexpected increases or changes in others. (For

instance, tropical fish have been encountered as far north as Washington state this past year.) With declines in food production, some countries are forced to import food supplies to meet national needs, hurting their economies.

The 1982-83 El Niño event was like a wake-up call for scientists and the public. As the biggest El Niño in about 100 years, the extreme weather associated with it justified the funding of research to better understand the phenomenon. Early warnings and knowledge of past El Niño effects can help nations plan for potential problems. Knowing how to forecast torrential rains, devastating droughts, and shifting weather patterns benefits societies around the world.

Researchers at the University Corporation for Atmospheric Research study El Niño as a natural event, as well as how it affects communities and nations. Michael Glantz, a senior scientist for the Environmental and Societal Impacts Group, is particularly interested in how climate affects society and how society affects climate. El Niño has far-reaching consequences for the world's climate and weather. Glantz has spent years studying ways to help communities recognize the value of using information about El Niño, including forecasts.



Although extreme weather events like hurricanes, blizzards, floods, and droughts occur every year, El Niño tends to cause more than the usual number. Unlocking the mystery of forecasting El Niño could lessen the effects of natural hazards such as floods and droughts. An economy that might otherwise be devastated may be able to avoid catastrophe with enough advance warning.

What El Niño Does

Before scientists started to pay attention to El Niño, one sign to local people that El Niño was in progress was the appearance of hundreds of thousands of dead birds along the Peruvian shore. When an El Niño is coming, warm water covers over the cold water that normally comes up to the surface; fish rely on the nutrient-rich cold water for food. When the fish migrate because their food source is gone, the birds do not eat, so they grow weak and fall into the sea.

Later, after Peru developed a fishing industry, interest in El Niño centered around the fact that it was blamed for the collapse of Peru's fishing industry in the early 1970s. It was after the major El Niño of 1982-83, however, that interest in El Niño's impact on weather around the world developed. It was the largest El Niño event in 100 years and was so big that its impacts around the globe were easy for everyone to see: droughts throughout much of Africa, Australia, Central America, the Soviet Union, Southern Africa, and northeast Brazil; flooding in Kenya; and cyclones in the Pacific. The impacts were so devastating and widespread that popular magazines ran stories on the phenomenon.

In contrast, El Niño does bring its share of benefits. There are fewer Atlantic hurricanes during El Niños and some ecosystems thrive with the occasional shift in climate. One example is in Ecuador. During an El Niño the wild shrimp off the coast of Ecuador do very well and reproduce in great numbers. This sudden increase in shrimp brings in millions of dollars to Ecuador's developing economy.

An El Niño can be big or small, depending on several factors: how warm the ocean's surface waters get, how large an area of the equatorial Pacific warms up and how much damage it causes around the globe. Researchers are currently trying to identify El Niño's impacts on North America. Research indicates that during an El Niño, winter in the Pacific Northwest is more likely to be warm and dry, winter in the Northeast U.S. mild and wet, and winter in the southeastern U.S. wet and cool. However, its impacts on the Rocky Mountain West and California remain unclear. This is partly because major El Niños can have different impacts than minor ones; for example, stronger El Niños appear more likely than weaker ones to cause heavy rains in southern California.

El Niño's worldwide impacts are referred to as teleconnections, or the connections between the warming of sea surface waters in the Pacific and weather around the globe (from the Greek prefix tele, meaning "at a distance"). Its impacts are strongest from Latin America across the Pacific and Indian Oceans, to the African continent. It also affects weather patterns outside the tropics. Some of the links may be based on what scientists observe and verify. Others are based on statistical relationships suggesting that when an El Niño occurs, there is a good chance that a drought in Mozambique, for example, might also occur. Still others are based on "wishful thinking," or the belief that links may exist and remain reliable over time, despite the lack of obvious connections. To some degree then, teleconnections can be used cautiously for economic development and disaster preparedness planning.

While there are several regions where El Niño teleconnections appear to be consistent and reliable, there are many parts of the globe where connections to El Niño are not clear. In other locations, regional climate variations associated with El Niño are known, but they appear to cause few problems. And even in some countries where El Niño creates major problems, local areas in that country may be untouched. So why should people in unaffected areas care about El Niño? The answer lies in the fact that people live in a global community. What hurts one economy may help another, and a climate disaster in a region which supplies food or other commodities to the world can then spread well beyond its initial impact area.

Consider Kenya, for example. The actual links of Kenya's climate variations to El Niño are not very clear. Therefore, Kenyan policy makers may not care much about the warming of sea surface temperatures halfway around the globe. Kenya, however, grows and exports coffee. Many international competitors of Kenyan coffee growers such as those in Brazil, Ethiopia, or Indonesia are more clearly affected by El Niños that can reduce their production of coffee in the international marketplace. Kenya's economy could reap the profits lost by the other nations.

Another example involves palm oil. Palm oil production in the Philippines declines during an El Niño, which tends to spawn droughts in the region. Commodity brokers (people who buy and sell raw goods for international trade) trying to purchase palm oil at low prices must find other sources of palm oil in, for example, West or Central Africa. The reduced supplies from the Philippines could lead to increased prices for the oil from those other regions. Even the hint of an El Niño could be valuable to decision makers in these places. Many journalists now recognize the importance of teleconnections; what happens in one region can have global consequences, particularly if the event impacts the international marketplace.



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Forecast Value

Today, El Niño has become a household word in many parts of the globe. Articles on it and its impacts have appeared in such mass-media publications as *Reader's Digest*, *National Geographic*, *Time*, *Newsweek*, *U.S. News and World Report*, and *Business Week*. El Niño provides the media with a scientific mystery that the researchers are trying to solve.

If El Niños can be forecast some months in advance, societies could prepare to prevent or lessen their impacts (at least in theory). In practice, of course, societies (i.e., governments, corporations, and individuals) respond in different ways to the threat of impending natural hazards. Some societies don't like risk and tend to prepare early; others are risk-takers and may not take preventive measures at all. Community responses depend on many factors, including the credibility of the forecasters, the government's ability to prepare for disaster, and the government's ability to communicate to its citizens the risks involved with a potentially disastrous event like El Niño.

In the future, El Niño events could be forecast from four to twelve months in advance. Certainly the current El Niño of 1997 - 1998 is an example of early warning. In countries such as India and Ethiopia, which have drought management systems in place, that advance warning of the onset and ending of a drought period can lead to greatly reduced loss of life, human suffering, and economic losses. Forecasting the beginning, duration, and end of El Niños is no easy scientific task. However, breakthroughs are expected and likely. This optimism is not based on wishful thinking, but on the day-to-day basic and applied research activities of hundreds of scientists in many countries, including the United States, Australia, Peru, Chile, Canada, China, Brazil, Japan, and South Africa. In the United States, some government computer models predicted the onset of the 1997-1998 El Niño several months in advance; however, at least one model failed to predict it at all. Obviously there is still work to be done to improve El Niño forecasts.

Unlocking the mystery of forecasting El Niño could improve planning at the national level of many productive but fragile fisheries; improve agricultural production efforts; minimize potential health consequences; make better trade deals, especially for commodities; and lessen the effects of natural hazards such as brush and forest fires, floods, and droughts. An economy that might otherwise be devastated may be able to avoid catastrophe with enough advance warning. The potential uses of El Niño forecasts and the information they contain are almost limitless, and if the forecasts ultimately save lives, they are priceless.

RESOURCES

Currents of Change (Cambridge University Press, 1996), a book by social scientist Michael Glantz of the

National Center for Atmospheric Research, explains in clear terms what El Niño is, its impacts on society, and how those impacts might be forecast.

Fragilecologies www.sni.net/mglantz/index.html is a web site written by Michael Glantz which features columns on a variety of environmental issues, including El Niño. This site also links back to the Environmental and Societal Impacts Group at NCAR.

Environmental News Network www.enn.com/specialreports/elnino/index.html provides current media information about El Niño.

The El Niño Theme Page <http://www.pmel.noaa.gov/toga-tao/el-nino/nino-home.html> provides background information and current research; it also includes links to other sites.

FEMA. El Niño Loss Reduction www.fema.gov/nwz97/elnino.htm provides information on flood insurance, cutting losses, news releases, and includes links to other sites.

Online Forum www.pbs.org/newshour/forum/october97/el_nino_10-3.html features a question and answer session about El Niño with Bob Livezey of the National Weather Service Climate Prediction Center.

Science Now is jointly published by the **Walter Orr Roberts Institute at the University Corporation for Atmospheric Research** and **SIRS Publishing, Inc.** (Social Issues Resources Series.) Science Now is published three times during the school year and is distributed to SIRS subscribers. Comments and questions should be directed to Joyce Gellhorn via Internet at jgellhorn@sprynet.com. You can also contact your SIRS representative or write to:

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