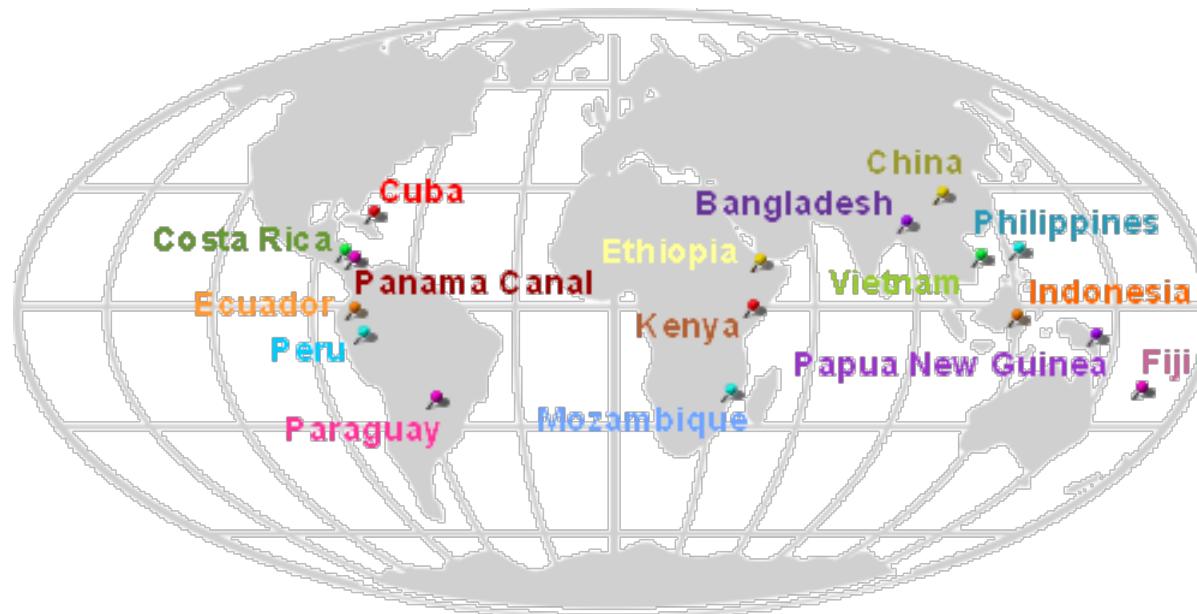


El Niño: Spawner of Hazards



Michael H. Glantz
Senior Scientist, NCAR

Paper prepared for Open Meeting of Global Environmental Change Research Community

6-8 October 2001



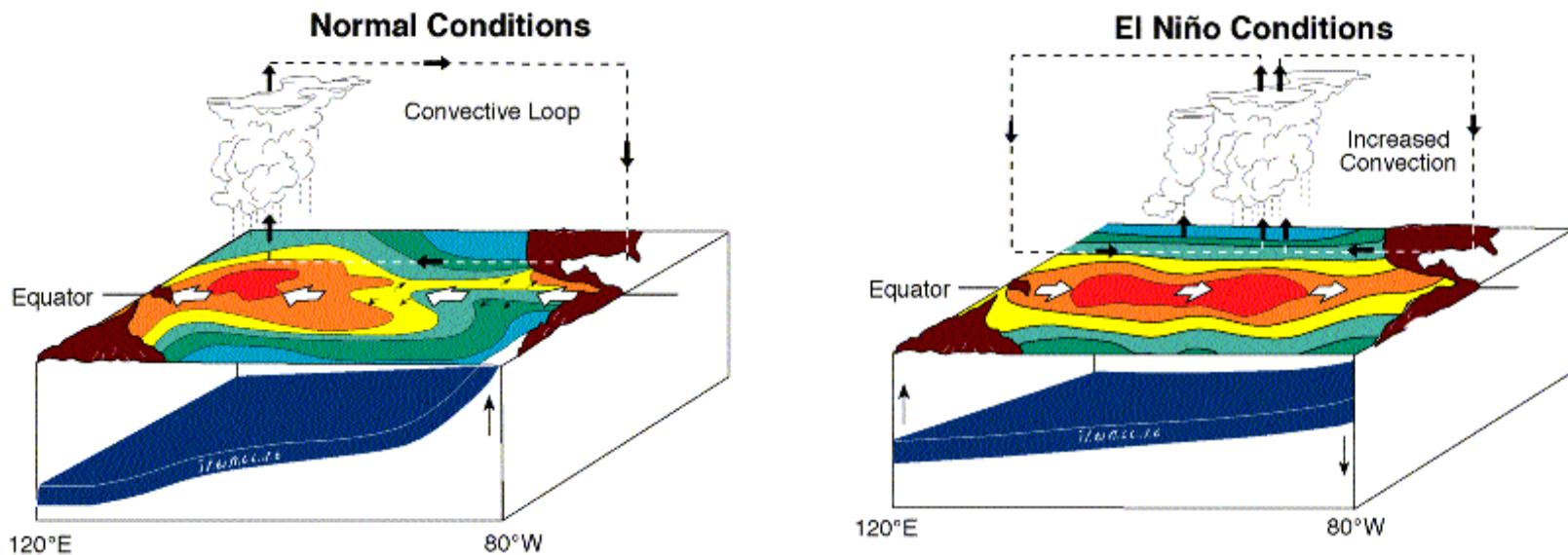
El Niño: What it is

- ◆ The term “El Niño” encompasses both a localized coastal ocean warming off Peru and Ecuador and the broader basin-wide event across the equatorial Pacific Ocean.
- ◆ When an El Niño occurs (every 3 to 7 years, on average), the sea surface temperatures (SSTs) in the western Pacific will drop by a couple of degrees and in the east by 2-3°C. In 1997-98, during the El Niño of the Century, the SSTs increased by 5-6°C.
- ◆ They typically last 12 to 18 months, passing through an onset, growth, mature, and decay phase.

El Niño: How it develops

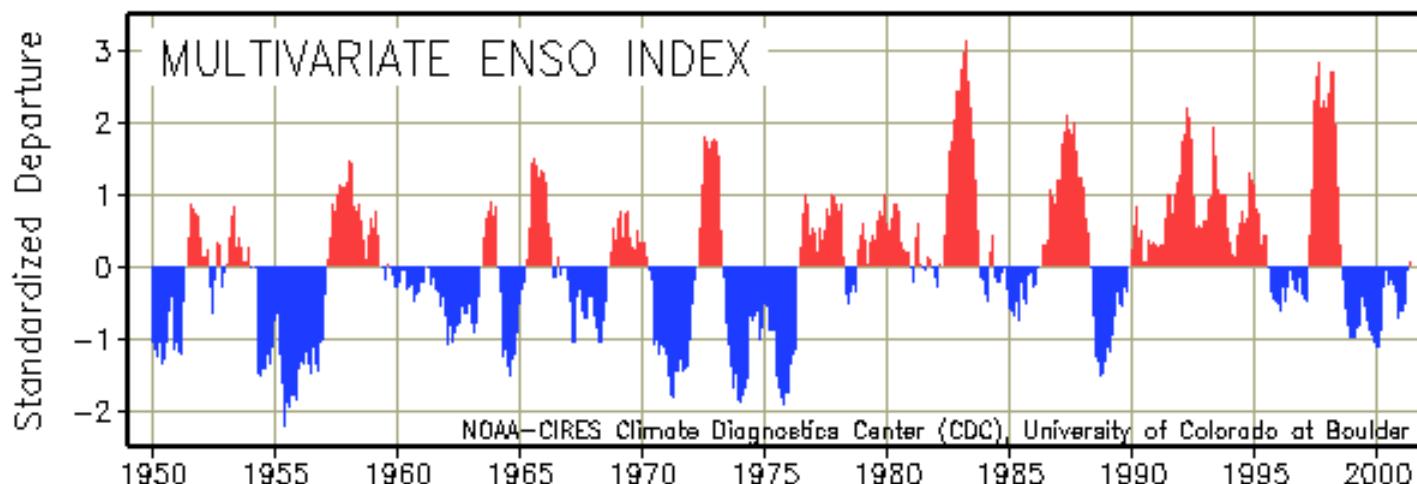
- ◆ Normally, the westward-flowing winds push surface water toward the western part of the Pacific Basin. The sea level there is 60 cm or so higher than in the eastern part of the basin.
- ◆ Deep cold water then wells up to the surface to replace the displaced water in a process called “coastal upwelling.”
- ◆ Every so often the westward winds weaken or reverse and the warm water that piled up in the west “sloshes” back toward the east.
- ◆ The convective (rain-producing) atmospheric processes tend to follow the warm surface water as it moves from west to east.
- ◆ Biologically productive coastal upwelling processes are reduced in the central and eastern equatorial Pacific, affecting fisheries.

Graphic Representation of Sea Surface Temperature Changes in the Tropical Pacific



NOAA/PMEL/TAO

Time Series for El Niño (red) and La Niña (blue)



El Niño: What it does

- ◆ It brings devastatingly heavy rains to Peru's normally arid coastal areas and droughts to Bolivia and southern Peru.
- ◆ It has been associated with severe drought in the Brazilian Nordeste and floods in southern Brazil.
- ◆ It is usually but not always associated with droughts in Australia, Indonesia, Philippines, Papua New Guinea, Southern and Eastern Africa and the Horn of Africa. Floods occur in Argentina, Paraguay, Uruguay.
- ◆ The 1997-98 event was linked to major forest fires and haze in South East Asia.
- ◆ The range of costs attributed to the climate and weather anomalies alleged to have been spawned by (or teleconnected to) El Niño was estimated between US\$32 and \$96 billion.

The United Nations Foundation support for an El Niño project

- ◆ UNEP and NCAR proposed a 19-month-long, 10-country study of El Niño's impacts and response strategies in Pacific Rim countries to the UN Foundation.
- ◆ We expanded participation to include the UNU, the WMO and the ISDR. NCAR added 6 countries using additional support, with China and Bangladesh providing their own resources.
- ◆ The UNU, with NCAR, has taken the lead to publish and disseminate the study's results.
- ◆ The executive summary is online at the following website:
<http://www.esig.ucar.edu/un/>

El Niño: Spawner of Hazards

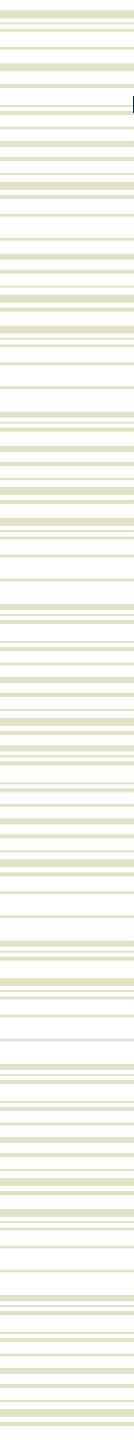
Highlights of the UNEP/NCAR/UNU/WMO/ISDR
16-country study on

**“Reducing the impacts of environmental
emergencies through early warning and
preparedness: The Case of the 1997-98 El Niño”**

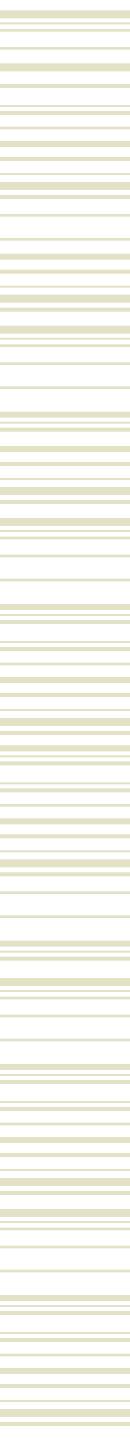


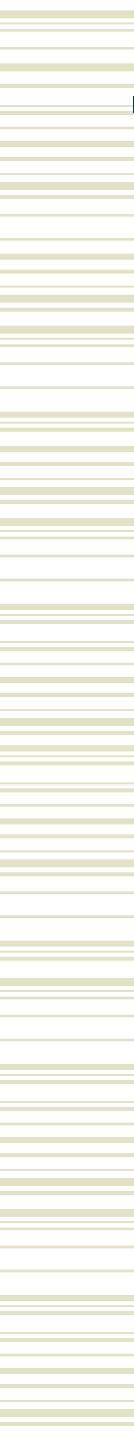
Lessons learned

1. Many governments already know about the problems sparked by the impacts of climate anomalies but, for a variety of reasons, have not taken the steps necessary to cope effectively with those often-devastating effects.
2. For some countries the association of climate-related anomalies with El Niño events is very strong and is, therefore, reliable enough for use in decision making.
3. Forecasts about the potential societal impacts of El Niño are needed as urgently, if not more urgently, than forecasts of El Niño's onset.

- 
- 4.** El Niño-related forecasts should be of interest to *ALL* government ministries and not just those that are primarily concerned with various aspects of disaster.
 - 5.** The public, policy makers and educators need to know more about the various ways that climate forecasts can be used in the sustainable development of society and economy.
 - 6.** It is important for government agencies to identify the positive aspects of El Niño and not only focus on the negatives.

- 
- 7.** Transparency between governments and donors is necessary, so that the needs and expectations of both about disaster assistance are well understand.
 - 8.** It is important, if not imperative, for each country and the sub-regions within it to develop the expertise needed to assess the El Niño forecasts which usually come from outside the country.
 - 9.** Although there remains considerable uncertainty with El Niño forecasts, people must be educated about the El Niño phenomenon and how best to cope with it.

- 
- 10.** Countries most vulnerable to El Niño's impacts are especially in need of financial assistance to carry out programs to cope with El Niño's occurrence.
 - 11.** National scientific establishments need the support of their governments, as well as the international donor agencies, to undertake studies on regional and local problems related to El Niño.
 - 12.** Institutions must review their operations during the 1997-98 El Niño event and identify strengths, weaknesses and jurisdictional constraints, and conflicts in institutional responses to the forecasts and impacts of El Niño.

- 
- 13.** Governments in a given region should consider setting up a regional mechanism focused on El Niño.
 - 14.** Many adjustments are likely to be required in the ways that societies operate to make El Niño earliest warnings more effective.
 - 15.** “Looking back to look ahead” can provide disaster and other agencies with an opportunity to review how well their contingency plans worked in 1997-98 and, if necessary, make adjustments.
 - 16.** Educators at all levels in a country’s educational and training system should encourage their students to study the interactions between climate, society and environment.

Categories of Findings

- ◆ **Teleconnections drive severity of impacts**
1997-98 El Niño of the Century need for attribution and understanding teleconnections
- ◆ **Forecasting El Niño and its impacts**
Importance of forecasts at subnational level
Forecasts and the public
Forecasting positive impacts
Forecast surprises
- ◆ **Information – who knows what and when**
Transparency of information to stakeholders
Raising public's awareness about El Niño
Use of new technologies for information gathering and dissemination
- ◆ **A look at societal aspects of El Niño**
Usefulness of forecasts to societies
Public education about El Niño to improve societal response
Role of media in how society responds
- ◆ **Understanding scientific issues underlying El Niño**
Importance of focused and localized scientific research
Communication amongst the scientific community
- ◆ **Role of national institutions in responding to El Niño**
Importance of interagency cooperation
Conflicting interests
Integrated response a must
Economic development and impact studies
Defining a management paradigm to cope with El Niño
- ◆ **Understanding the social, economic, and political setting**
Reassessing the status quo
Inter- and intra-national “brain drain”
Political change and challenges
- ◆ **Use of forecasting by analogy as a predictive tool**
- ◆ **The need for capacity building**

Successes of UNFIP Study

- ◆ Findings for disaster management
- ◆ Proposal for capacity building on climate issues
- ◆ UN agencies energized on ENSO affairs
- ◆ UNU now involved in El Niño issues
- ◆ High visibility findings
- ◆ NCAR prominent in UN documents related to El Niño
- ◆ Added 6 countries to original UNFIP 10 studies by securing outside funding from different sources
- ◆ Fostering El Niño forecasts as providing the earliest warning of potential climate-related problems
- ◆ Links to emergency responses to sustainable development needs
- ◆ Got UN agencies that usually do not work together to do so
- ◆ Identified the different (often harsh) circumstances under which developing-country scientists must do their research

Problems with UNFIP Activity

- ◆ Editing from different languages
- ◆ NCAR overhead issues
- ◆ Timely responses from UNEP (funding agency) on urgent issues
- ◆ Uneven report quality from study teams
- ◆ Translation issues
- ◆ Budget issues
 - Little flexibility in dealing with the contingency issues
 - Different rules on expenditures for “social” activities (i.e., working dinner)
 - UNEP/NCAR differences in budgeting approach
- ◆ Getting teams to follow consistent Forecasting-by-Analogy approach
- ◆ Viruses in electronic file transfer
- ◆ Receipt of reports from teams in timely manner
- ◆ Need for PI to edit all 16 reports several times
- ◆ Political and economic problems encountered by team leaders

Nine Lessons from the Study

1. El Niño of the Century in 1997-98 highlighted need to understand El Niño’s connections to local climate
2. Use historical information: in other words, “look back plan ahead”
3. Make El Niño forecasts user-friendly *and* “usable”
4. Enhance in-country forecasting skill to reduce climate surprise
5. Improve public awareness through information dissemination (don’t just rely on the media)
6. Integrating inter-agency responses to El Niño’s impacts is a “must do”
7. Protect El Niño research from challenges of politics
8. El Niño-related capacity building is a “must”
9. Maintain in-country El Niño expertise

UNU/NCAR proposal: Climate Affairs Capacity Building

The objective of “Climate Affairs” is to:

- (a) Advise educators in developing countries about the importance of understanding how climate and society interact.
- (b) To encourage them to include climate-related information in their educational and training activities.
- (c) Educators can then inform today's policy makers and can educate future generations of society's decision makers.