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**El Niño and the Southern Oscillation: Multiscale Variability and Global and Regional Impacts, edited by H.F. Diaz & V. Markgraf**

Louis A. Scuderi

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nineteen nineties gridlock in the federal courts. This result is surely not a "Goal For the Next Century" that anyone should encourage.

JON A. SOUDER

PhD, University of California, Berkeley

Co-author, with Sally K. Fairfax, of

*State Trust Lands: History, Management, and Sustainable Use*

**EL NIÑO AND THE SOUTHERN OSCILLATION:  
MULTISCALE VARIABILITY AND GLOBAL AND REGIONAL  
IMPACTS**

EDITED BY H.F. DIAZ & V. MARKGRAF

Cambridge: Cambridge University Press, 2000

Pp. 496 + xv, \$90.00

Over the past two decades the term El Niño has become part of the vernacular of both scientists and planners who have worked to understand the processes that control climatic variability and the regional and global impacts of these climatic events. *El Niño and the Southern Oscillation: Multiscale Variability and Global and Regional Impacts*, while written for a scientifically based audience, will be of great importance to readers in a wide range of disciplines. This book ties together nicely the current scientific understanding of El Niño/Southern Oscillation (ENSO) climatic variability and the planning and decision making that takes place because of this global phenomenon.

ENSO is part of the natural climate system of the Earth and represents a large-scale interaction between the tropical Pacific/Indian Ocean and the atmosphere. While its strongest impacts are experienced over the Indo-Pacific sector of Earth, linked meteorological changes (teleconnections) related to alterations in atmospheric circulation patterns result in the effects of El Niño being felt over most of the remainder of the planet. Since the timing of individual El Niño events is aperiodic, normally ranging from two to seven years between events, a complete evaluation of El Niño timing and behavior is critical to understanding and planning for the meteorological and climatic change associated with these events. As well, this knowledge can be used to assess the impacts of El Niño (warm tropical) and the associated antiphase La Niña (cool tropical) extremes on regions and ecosystems far from the core ENSO event in the Indo-Pacific sector.

This volume, the collected work of over thirty-five leading experts in their respective fields, represents the current state of knowledge

regarding El Niño dynamics. It is well written and edited and includes superb graphics and tables. This volume considerably expands and updates Diaz and Markgraf's earlier work, *El Niño: Historical and Paleoclimatic Aspects of the Southern Oscillation* (1992, Cambridge University Press), and provides the reader with significantly enhanced discussions of the history of El Niño over the past 500 years, possible causality mechanisms for ENSO variability, and specific regional impact analysis of ENSO teleconnections. The material in *El Niño and the Southern Oscillation* is written in a form easily accessible for both scientists and decision makers.

The volume is divided into two major sections. The first, "Global and Regional Characteristics and Impacts of ENSO Variability," deals with the effect of ENSO variability and global teleconnections between regions. This includes a well-written chapter on the history of El Niño/La Niña over the past 150 years. This period of well-documented meteorological records and first-hand accounts of El Niño is important because it provides researchers with high quality information about the near-global climatic impacts associated with El Niño. This provides a base from which scientists can analyze variations in El Niño over time. Separate chapters in the first section specifically focus on El Niño related climatic relationships between different regions and changes in tropical cyclones and disease patterns that occur in response to the varying climate input signals from El Niño and La Niña.

Of great importance to planners is the chapter dealing with assessments of streamflow variability associated with ENSO events. The authors document streamflow responses to ENSO in many areas and show that two important modes of streamflow are present in the Western Hemisphere. This result has important implications for water supply and for water managers in semi-arid areas that experience drought conditions on a regular basis. A similar co-authored chapter deals with climatic factors associated with the incidence of diverse vector-borne diseases (VBDs). The authors show how interannual climatic variability associated with ENSO events is directly linked, via changes in air temperature and precipitation, to outbreaks of malaria and dengue fever. These statistical correlations and modeling results can be used to develop health-related early warning systems for climate conditions conducive to outbreaks and could be used to facilitate public health interventions to control the extent of these and other vector-borne diseases.

The second section, "Long-Term Changes in ENSO: Historical, Paleoclimatic, and Theoretical Aspects," deals with the scientific aspects of El Niño variability. The section opens with a chapter that analyzes evidence of El Niño from four and one-half centuries of historical documents from western South America, one of the areas that experiences significant ENSO variability and impacts. This record is the major reference for proxy calibrations of ENSO during historical and pre-instrumental periods. This

historical material then forms the basis for further analysis in three subsequent chapters. In these chapters, tree-ring records and tropical ice-core data are used to reconstruct El Niño/La Niña variability further back in time. This knowledge is critical in determining the timing of El Niño events in the past and in analyzing their variability over time.

The final three chapters deal with evidence for decadal and longer scale variability in ENSO and link these lines of evidence to a theoretical framework of climate change. Particular attention is given to modeling studies using general Circulation Models (GCMs) and how well these models explain ENSO behavior. Possible future changes in the long-term variability of ENSO due to anthropogenic climate forcing is also addressed in depth. A final chapter by the editors synthesizes the current state of ENSO research, summarizes what is known about ENSO over time, and raises some interesting questions concerning the functioning of El Niño in the possible CO<sub>2</sub> enhanced warmer world of the near future.

*El Niño and the Southern Oscillation: Multiscale Variability and Global and Regional Impacts* will be of great importance to scientists in a wide range of earth science disciplines including climatology, meteorology, oceanography, hydrology, and ecology. Researchers, planners, and decision makers in medicine, public health, and emergency planning will find this volume useful in determining their responses to El Niño induced environmental change. Overall the volume is a valuable reference resource on past ENSO history, dynamics, and consequences and should be a part of any science or environmental planning/management library.

LOUIS A. SCUDERI  
Department of Earth and Planetary Sciences  
University of New Mexico  
Albuquerque, New Mexico 87131