INTRODUCTION

During most of 1997 and into 1998, a strong El Niño event occurred which was in many ways similar to earlier such phenomena, especially the last strong El Niño, of 1983. The El Niño/Southern Oscillation (ENSO) is a large-scale phenomenon in the ocean-atmosphere system, centered in the tropical Pacific, but with influences in areas well beyond. During ENSO, the normal tropical atmospheric and oceanic states are disturbed. Each El Niño event includes increases of sea surface temperature (SST) along the Pacific west coast of South America and further into the eastern tropical Pacific. This oceanic warming is part of one phase of the so-called Southern Oscillation, a shifting of atmospheric mass across the breadth of the Pacific Ocean. In the El Niño phase, the oscillation typically produces anomalously high pressures over the West Pacific-Australian-Indonesian region and low pressures further to the east, over the central Pacific. Modification of zonal winds during an El Niño episode are observed over much of the Pacific. Low latitude easterly winds tend to collapse and the middle latitude westerlies usually increase. In this way influence of ENSO phenomena on atmospheric processes goes beyond the tropics to connect to middle latitude regions.

The changes in wind patterns and redistribution of masses in the atmosphere and ocean are accompanied by noted variations in Earth rotation, due to changes of angular momentum and its exchanges between the solid Earth and its fluid envelope. Typically, positive anomalies of length-of-day (LOD) and noticeable disturbances of polar motion occur during ENSO events. Following an El Niño event, often the negative phase of the ENSO cycle occurs, now known as a La Niña, with the opposite response in LOD as in the El Niño case.

The strong El Niño of 1997/98 was the first to occur during the era in which Earth rotation parameters are determined by high accuracy space geodetic techniques, reaching tenths of a millisecond of arc on the Earth surface. Additionally, the TOPEX/Poseidon's precise altimetric measurements of sea level variations were available during that time as well. At the same time, series of Atmospheric Angular Momentum, from atmospheric operational analyses and reanalyses, as well as Ocean Angular Momentum from ocean models have been available. Thus, comprehensive studies of the most recent El Niño, including its influence on Earth rotation parameters, namely length of day and polar motion, have become possible in the present era.

Noting in September 1997 that we were in the midst of a strong El Niño, we issued a call from the IERS to study the present El Niño event's impact on Earth orientation parameters in Gazette #21 (attached), and we followed this call by the organization at the American Geophysical Union (AGU) '98 Spring Meeting, held in Boston May 26-29, 1998, of the special Geodesy Session, "Impact of El Niño on other Low-Frequency Signals on Earth Rotation and Global Earth System Parameters" (D. Salstein and B. Kolaczek, conveners; program session attached).

This volume consists of papers dealing with this subject, many of which were presented at the AGU meeting. Some of the themes that are represented in this collection include

- strong impact of El Niño on LOD variations;
- new facts dealing with El Niño impact on polar motion, and
- importance of altimetry measurements in studies of El Niño;
- similarities and differences of El Niño phenomena in 1983/1984 and 1997/1998;
- characterization of the statistical nature of El Niño.