# Volcanic Eruption, El Chichón

Alan Robock

Volume 1, **The Earth system: physical and chemical dimensions of global environmental change**, pp 736–736

Edited by

**Dr Michael C MacCracken and Dr John S Perry**

in

**Encyclopedia of Global Environmental Change**
(ISBN 0-471-97796-9)

Editor-in-Chief

**Ted Munn**

# Volcanic Eruption, El Chichón

On March 29th, April 3rd and April 4th, 1982, the El Chichón volcano in Southern Mexico erupted, injecting about 7 million metric tonnes of sulfur dioxide ($SO_2$) and 20 million metric tonnes total of particulate material into the stratosphere. The cloud of volcanic gases and particles traveled westward, circling the Earth in three weeks. The April 4th eruption was the largest of the three, and its cloud went right over Hawaii a couple days after the eruption, allowing detailed observations from instruments at the Mauna Loa Observatory. The cloud quickly developed into a band extending from the Equator to 30 °N for more than six months, and then gradually spread even more widely. This was one of the largest volcanic eruptions of the 20th century, only exceeded in stratospheric input by the 1991 Mt. Pinatubo eruption. The eruption took place without warning, and killed many people in towns near the volcano. El Chichón had never erupted before in historic times.

The eruption took place just as the largest El Niño of the century so far was beginning. (In fact the volcanic cloud in the stratosphere fooled the satellite sensors which monitor ocean temperatures into thinking ocean temperatures were normal, whereas they had warmed substantially. Thus, scientists were not aware of the El Niño until months after it had started (*see* **El Niño**, Volume 1). A dense network of buoys in the tropical Pacific now prevents that from happening.) Because of the simultaneous eruption and appearance of warm ocean temperatures, several scientists suggested that the El Chichón eruption caused the El Niño. But climate model simulations and detailed studies of past eruptions and El Niños have shown that there is no plausible mechanism connecting these two events, and in fact their timing was a coincidence.

Because of the simultaneous eruption and El Niño, the climatic system felt the impacts of both, and it was difficult to separate their effects on temperature. Normally a large eruption like this would cool the global climate, especially in the summer, but during the first year after the El Chichón eruption, no large cooling was observed, as the El Niño produced large compensating warming. Studies of these effects using climate models have improved understanding of the climate system and increased confidence in projections of global warming from anthropogenic greenhouse gases, which are made with the same models.

The climatic effects also included winter warming of Northern Hemisphere continents in 1982–1983, with the temperature over North America, Europe, and Siberia much higher than normal. During the same winter, it was colder than normal over Alaska, Greenland, the Middle East, and China. The volcanic aerosols in the stratosphere produced heating, which changed the atmospheric wind patterns, to one we now call the positive phase of the Arctic Oscillation (*see* **Arctic Oscillation**, Volume 1).

*See also*: **Volcanic Eruptions**, Volume 1.

ALAN ROBOCK *USA*