

The Calbuco Chronicle: Volcanic Aerosols in the Post-Pinatubo Stratosphere

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The brightness of the moon during a total lunar eclipse depends on, among other things, the presence of volcanic aerosols in the stratosphere. Following the eruptions of Agung, Chichón, and Pinatubo in 1963, 1982, and 1991, the effect was striking, and allowed accurate determination of globally averaged aerosol optical depths (AOD) from each volcano. The most recent lunar eclipse, on 28 September 2015, was seen by many observers to be about 33 percent dimmer than predicted (for an aerosol-free stratosphere). While initially this slight dimming was thought to be within the range of observational error, sightings of "volcanic twilights" around the time of the eclipse suggested that the dimming was volcanic in origin.

The source of the aerosols was traced to the eruption of Calbuco in Chile 5 months earlier. The global AOD derived from the eclipse observations, 0.010, is close to the value by Steve Albers (NOAA) derived from twilight observations.

The detection of Calbuco in the eclipse record suggests that other events with small AOD in the 0.010 range could be found (keeping in mind the likely uncertainties could be half this value). Six such events are tentatively identified in the post-Pinatubo era. It should be noted that because of the timing of lunar eclipses - with occasional gaps of two years - other similar AOD events may have "slipped through the cracks" and were not detected.

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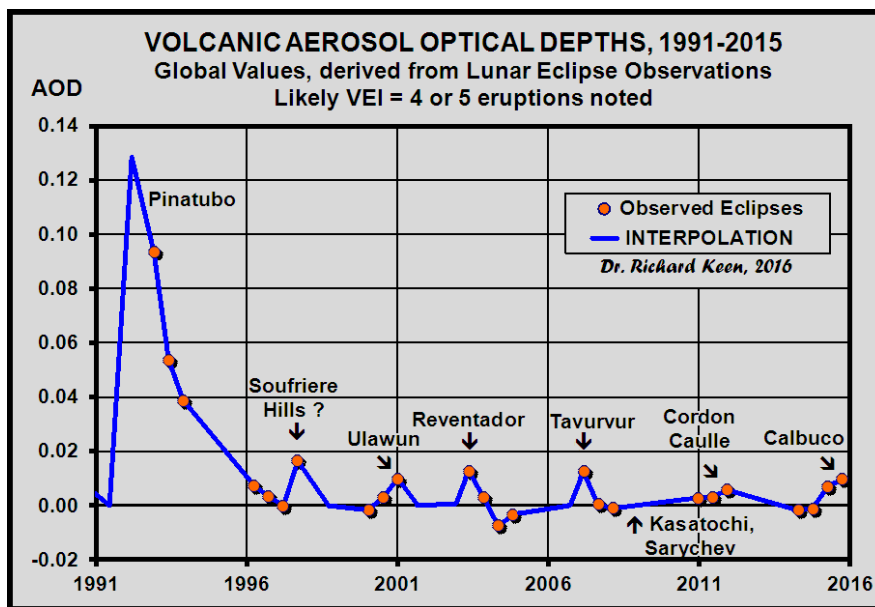


Figure 1. 1991-2015 Volcanic Aerosol Optical Depths.