

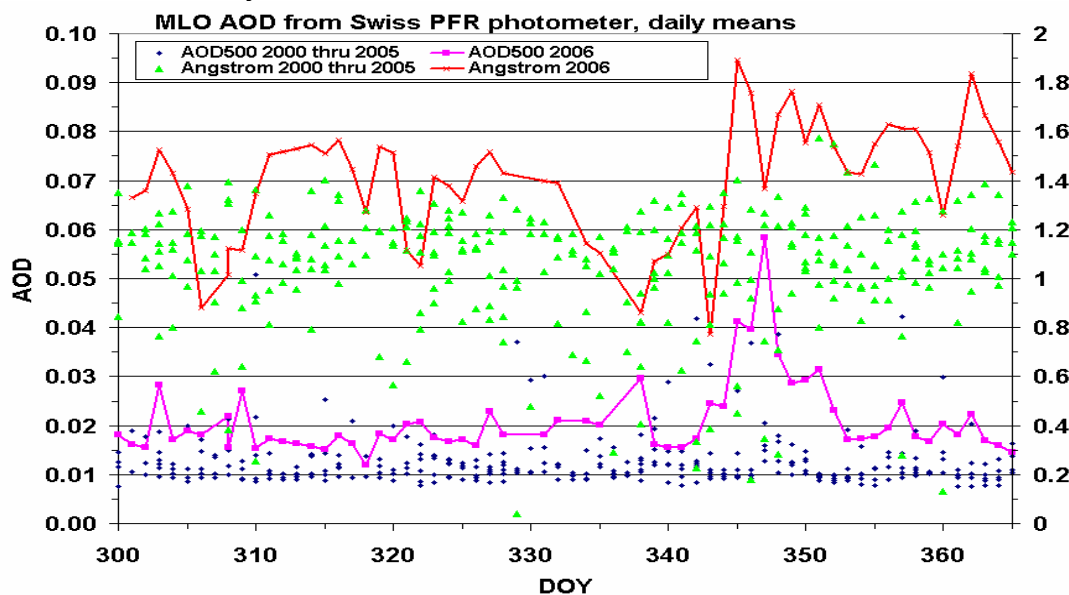
## Mauna Loa Mystery Cloud–II (2006) and a Comparison of the ESRL Historical and Current Atmospheric Transmission and Aerosol Optical Depth Measurements

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In December 2006, an unusual enhancement of aerosols above Mauna Loa was detected at 17 km in the Mauna Loa lidar data and a maximum increase in 500nm aerosol optical depth 0.06 was recorded, roughly 4 times background for that time of year. The duration of the event was about 10 days, peaking on the 5<sup>th</sup> day. Two subsequent but lesser events were noted peaking at ten day intervals after the initial peak but it is not clear if they were related to the first. The origin of this event is unknown and has not been otherwise reported. Efforts are underway to attempt to identify its source. Three months before the April 1982 explosive eruption of the Mexican volcano El Chichón, another stratospheric cloud of unknown origin was detected by some of the same ground-based radiation sensors and lidar at Mauna Loa. That cloud was coined “The Mystery Cloud” in the popular scientific literature and was later determined to be from the Nyamuragira volcano in Africa. The 2006 anomaly is a shorter duration event but has been better quantified in our newer spectral optical depth records. A comparison is made between the two mystery events as well as between our atmospheric transmission and aerosol optical depth measurement capabilities then and now. The clear-sky solar transmission methodology that has provided a 50-year record at MLO has remained essentially unchanged while reliable spectral optical depth observations were non-existent at the time of the first event. Spectral optical depths derived from sunphotometer measurements are now highly refined and provide that most temporally complete record of this 2006 event. As a result of recent reorganization, ESRL GMD’s overall aerosol optical depth measurement capability has recently increased substantially.



**Figure 1.** The appearance of a 2006 anomaly of unknown origin is noted above in the optical depth (500nm) and Angstrom exponent, around day of year (DOY) 347 over Mauna Loa. The lines are for the 2006 data and the points are for the previous 6 years. Right-hand axis is for the Angstrom exponent, left is for aerosol optical depth.