Toward a More Accurate Estimate of Global Stratospheric Aerosol Surface Area Density. Is It Important?

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Stratospheric aerosol, controlled primarily by the transport of tropospheric sulfur bearing molecules into the stratosphere, play important roles in the chemical and radiational balance of the atmosphere. While these aerosol are important radiationally only following major volcanic eruptions, chemically they play an important role in controlling NOx, ClOx, and HOx abundances, and thus O_3, during periods of both volcanic activity and long volcanic quiescence, such as now. Our current climatology of stratospheric aerosol is based primarily on the SAGE (1979-1982) and SAGE II (1985-2005) satellite records. In addition to these long-term global measurements there are several long-term lidar records (São José dos Campos, Brazil; Mauna Loa, Hawaii; Hampton, Virginia; and Garmisch-Partenkirchen, Germany), and *in situ* size distribution measurements from a number of sites, but primarily from Laramie, Wyoming.

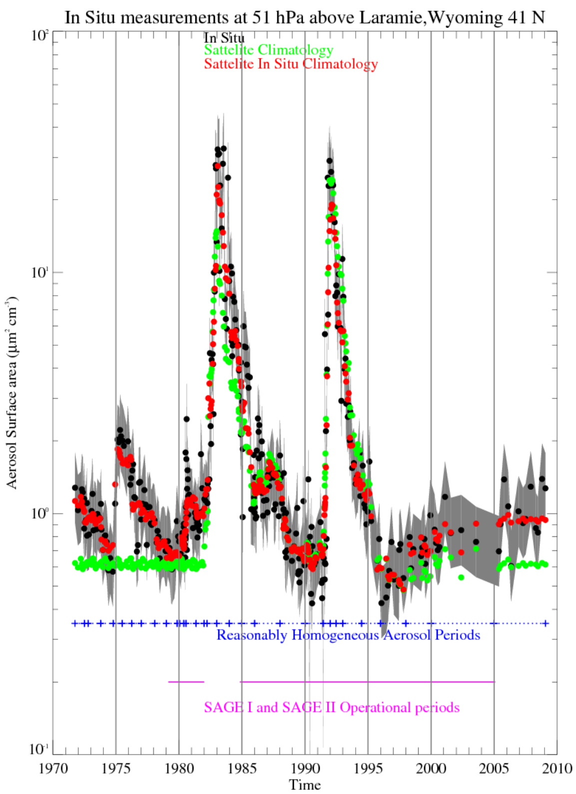

Figure 1. Stratospheric aerosol surface area densities from *in situ* measurements above Laramie, from the current surface area density climatology based on SAGE measurements (green), and from the SAGE climatology modified by comparison with the *in situ* measurements. The SAGE and SAGE II operational periods are shown as well as the time periods used to subdivide the record (in blue).

The *in situ* and SAGE II records of aerosol surface area density (SAD) compare favorably during periods of moderate to high aerosol loading, but diverge during periods of stratospheric background, *in situ* (SAD) ~ 2 * SAGE (SAD). In addition the *in situ* record precedes and antecedes the SAGE record. The present SAD climatology in use in the modeling community is based on the SAGE records with simple extrapolations applied prior to 1979 and post 2005. The *in situ* record extends from 1971 to 2009. Here the *in situ* record is compared to the SAD climatology above Laramie to form a temporally dependent "corrected" SAD profile. This correction, adjusted to account for transport differences between the northern and southern hemisphere (primarily important for Fuego in 1974), is then applied to produce a "corrected" global SAD climatology from 1971-2009. The corrections become important for the extrapolated periods and the periods of volcanic quiescence in the present climatology. Experimental runs of the community atmosphere model, with the chemical package, using the standard and corrected SAD climatology are in progress. The impact of the corrected SAD climatology on modeled stratospheric ozone over the past 38 years will be compared to model predictions using the standard climatology. During this time chlorine has ranged from pre ozone-hole levels to its recent stratospheric maximum. Results from this comparison will be shown along with the basis for the corrected climatology.