Session: B6 Oral presentation

Trends and annual cycles in the background stratospheric aerosol layer

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The quiescent volcanic period of the last ten years has provided a unique opportunity to observe the background state of stratospheric aerosols. Here observations of aerosol backscatter from Rayleigh/Mie lidars located in Lauder, New Zealand, Mauna Loa, Hawaii and Boulder, Colorado during this period are explored with an emphasis on analyzing the seasonal cycles and decadal trends in the stratospheric aerosol layer. The results from this analysis show an increasing trend in the backscatter cross-section over the last decade at all three sites that is modulated by a strong seasonal cycle with a winter maximum. To further understand the differing roles of transport, chemical and microphysical processes of the aerosol layer, the results of the lidar data analysis are compared to output from a base run of the Whole Atmosphere Community Climate Model coupled to the Community Aerosol and Radiation Model for Atmospheres that has been structured to include sulfate aerosols and meteoritic dust. This comparison shows overall agreement within the standard deviation of the annual mean aerosol profile at all three lidar locations. However, work needs to be done to understand discrepancies in the amplitude of the model's seasonal cycle. Correlation of the modeled aerosols and modeled nitrous oxide, lead to the conclusion that the observed seasonal cycle of stratospheric aerosols is controlled by the seasonally varying quasi-isentropic eddy transport associated with planetary wave breaking in the extra-tropical stratosphere. We will discuss how changes in these transport mechanisms and pollution located near the Asian monsoon may be causing the observed decadal trends in the sulfate aerosol layer.