Advances in Sustained Aerosol Optical Depth Measurements

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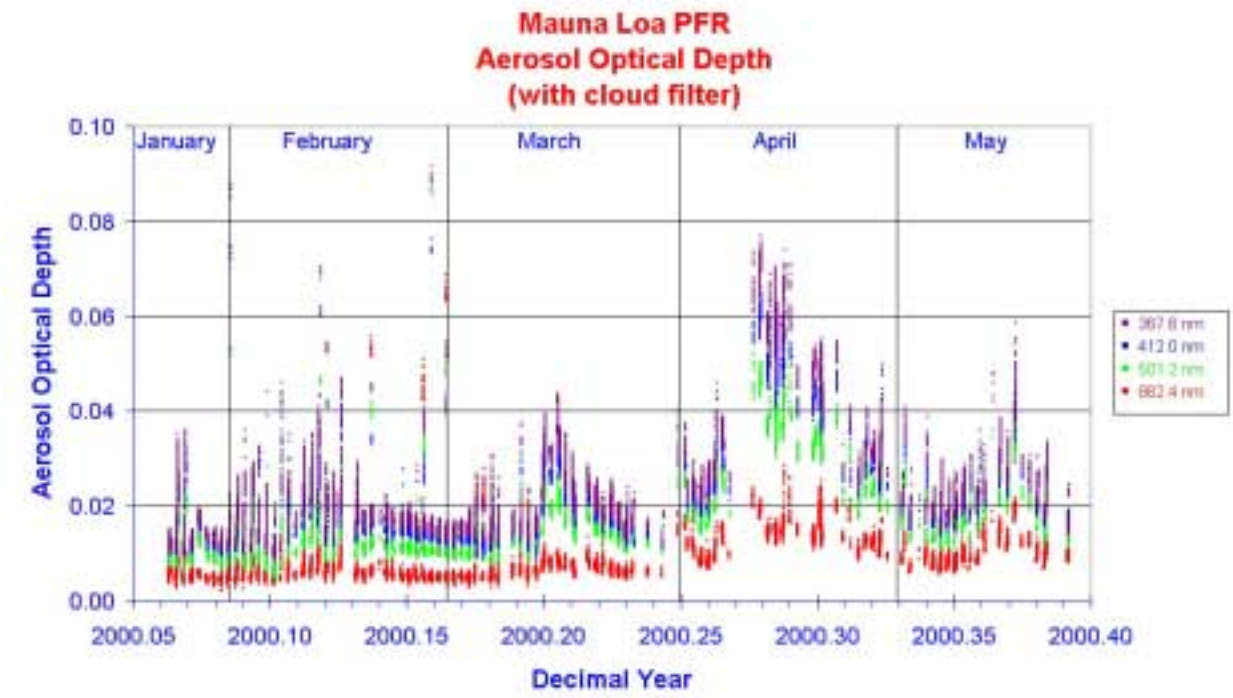
Aerosol optical depth (AOD) is an important indicator of the radiative effects in the total column atmospheric aerosol loading in clear skies. Measured spectrally, the optical depths are also an indication of the size distribution of the aerosols from which additional optical properties of the aerosol can be estimated. Although not as useful as in situ or vertically resolved aerosol measurements for some applications, the relative ease of automated observations on a sustained time frame makes the information from optical-depth measurements a useful quantity for many research applications, particularly for research into the temporally varying impact of atmospheric aerosols on the Earth's surface energy budget on several time scales. In order to make useful comparisons between observed and expected (modeled) surface solar radiation, a detailed knowledge of spectral aerosol-optical depth is essential. Other applications include constraining the total aerosol mass loading of the atmosphere over a site, providing an indicator of air quality, evaluating the extent of source strengths, and transport efficiencies. CMDL has been developing its aerosol optical-depth measurement program from sporadic sampling with handheld to continuously automated instrumentation and analysis. Requirements for this mode of operation involve automated methods for cloud interference identification and ongoing calibration checks and adjustments as well as routine final data processing, evaluation, and summary. The CMDL Solar and Thermal Atmospheric Radiation (STAR) Group has been using a variety of different radiometers and analysis methods in a quest for the most desirable sustained observational capability and methodology. Results and examples from this effort will be presented.



A time series of spectral aerosol optical depth from the new precision-filter radiometer (PFR) for the late winter and spring of 2000 at Mauna Loa showing the effect of the enhanced spring time aerosol transported there from Asia.