Climatology of Aerosol Radiative Properties in the Free Troposphere

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High-altitude mountaintop observatories provide the opportunity to study aerosol properties in the free troposphere without the added expense and difficulty of making airborne measurements. Here we present statistics of means, variability, and trends of aerosol radiative properties, including light scattering, light absorption, light extinction, single scattering albedo, Ångström exponent, hemispheric backscatter fraction and radiative forcing efficiency, from various high altitude measurements. These climatologies utilize data from ten mountaintop observatories in the 20-50ºN latitude band: Mauna Loa, USA; Lulin Mountain, Taiwan; Pyramid, Nepal; Izaña, Spain; Mount Waliguan, China; Beo Moussala, Bulgaria; Mount Bachelor, USA; Monte Cimone, Italy; Jungfraujoch, Switzerland; Whistler Mountain, Canada. Results are also included from two multi-year, *in-situ* aerosol vertical profiling programs: Southern Great Plains, USA and Bondville, USA. Figure 1 shows the monthly climatology of free troposphere aerosol scattering at Mauna Loa Observatory, and demonstrates the well-documented effect of long range transport from Asia in the springtime months. By taking this data set as a whole and developing a self-consistent climatology, the combined observatory measurements of free tropospheric aerosol radiative properties have the potential to contribute to aerosol-climate research in a way that far exceeds the contribution from individual observatories. For example, this type of analysis may help constrain chemical transport models and validate satellite measurements.

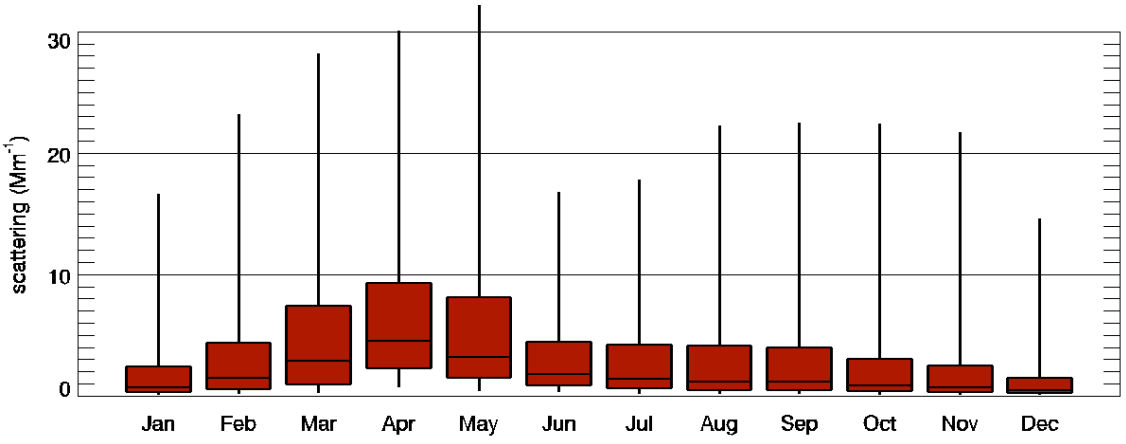

Figure 1. Monthly climatology of aerosol scattering at Mauna Loa (1974-2009), USA.