**Characterizing Aerosol Angular Scattering for Climate Studies**

A. McComiskey[1,2], J.A. Ogren[2], E. Andrews[1,2], M. Fiebig[1,2], A. Jefferson[2], and P.J. Sheridan[2]

[1]Cooperative Institute for Research in Environmental Sciences, University of Colorado, Boulder 80309; 303-497-6189, Fax: 303-497-5590, E-mail: Allison.Payton@noaa.gov
[2]NOAA Climate Monitoring and Diagnostics Laboratory, Boulder, CO 80305

The goal of aerosol research at CMDL is to obtain measurements of aerosol properties that enable evaluation of the anthropogenic climate forcing by aerosols. Aerosol radiative, chemical, and microphysical properties are measured in a variety of locations so that a wide range of aerosol types are included, allowing the radiative properties of the particles to be linked to chemical sources. Most of the observations are made at fixed ground stations that operate continuously on decadal time scales. These long-term observations are supplemented by year-long deployments of a movable aerosol sampling system, by routine vertical profiling from light aircraft, and by shorter term intensive field programs. Identical sampling protocols and instrumentation are used to ensure that results from the different locations can be compared quantitatively. Taken together, CMDL's worldwide observations of the radiative climate-forcing properties of aerosols form a unique data set needed to derive aerosol effects on climate.

Aerosol radiative forcing depends in part on the angular distribution of light scattered by the particles. Sunlight that is scattered back to space represents a loss of energy, while sunlight that is scattered towards the Earth's surface does not change the net energy budget. Radiative transfer calculations in climate models typically describe the angular distribution of scattered light by the asymmetry parameter, which is the intensity-weighted average cosine of the scattering angle. Light scattered directly back towards the source has an asymmetry parameter of -1, while light scattered directly away from the source has an asymmetry parameter close to +1. Methods for direct measurement of the aerosol asymmetry factor do not exist, so indirect methods must be used to derive asymmetry factor from other measurements. Figure 1 shows substantial spatial variability of these indirect determinations of aerosol asymmetry parameter, with typical values of 0.6-0.7.

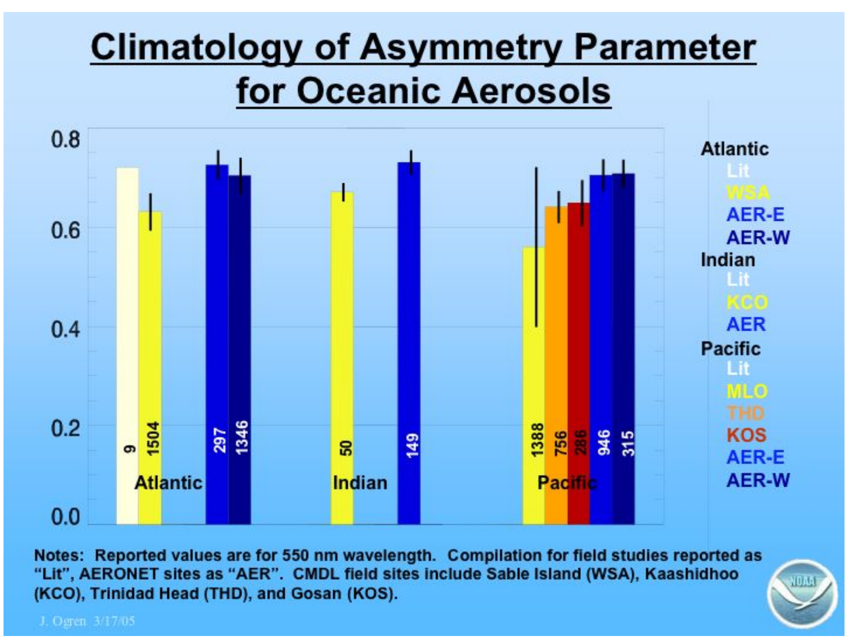


Figure 1. Compilation of aerosol asymmetry parameter based on a variety of aerosol measurements over the northern hemispheric oceans. The observed ±10% variability in asymmetry parameter causes a ±20% variability in the radiative forcing at the top of the atmosphere.