Aerosol Optical Properties Focus Group

Aerosol optical properties such as scattering and absorption of radiation and the dependences of these properties on wavelength and relative humidity are intrinsic to aerosol radiative forcing of climate and also to many techniques used to extract ancillary aerosol properties such as number concentration, size distribution, and composition that play a role in nearly every aspect of aerosol lifecycle and are necessary to understanding of the effects of aerosols and aerosol processes on clouds. The importance of aerosol optical properties to many aspects of ASR science, and the large interest in these properties by many ASR investigators suggests that formation of a Focus Group on Aerosol Optical Properties would serve several useful purposes.

Firstly, formation of such a focus group is a means of identifying a reservoir of expertise and knowledge that can provide avenues of fruitful collaboration on relevant issues such as optical techniques. These collaborations can further common aims and development of interest to the larger community.

A second purpose would be the identification of overarching scientific gaps in aerosol optical properties and related issues on which collaboration and concerted effort could be successfully applied to reduce uncertainty in understanding key processes and properties in a several-year time frame. Key examples of scientific gaps are the contribution of absorption of black carbon to atmospheric heating rates, the contribution of near-UV absorption of secondary organic aerosol coatings on aerosol particles to aerosol direct effects on climate, and accurate parameterization of the relative humidity dependence of aerosol scattering and absorption for use in models. Potential focus group topics are listed below.

Finally, formation of an Aerosol Optical Properties Focus Group would provide a framework for coordination of ASR scientific efforts in topics relevant to optics and aerosol optical properties, and would facilitate communication between investigators in the measurement and modeling communities.

Interested parties are invited to join this focus group and are encouraged to provide their thoughts on this subject.

- Examination of atmospheric heating rates and related affects due to absorbing aerosols in the atmosphere. The absorbing aerosols of interest this group will include BC, BrC, and dust. At shorter wavelengths (<400 nm) this list could be expanded to include SOA (see below). The focus on this subtopic would be to develop the required emissions, optical properties and vertical profile data that could be used to estimate contributions from absorbing aerosols to atmospheric heating rates.
- Comparison of climate model output with field measurements, where size-dependent composition measurements are used as model inputs. This subtopic would provide a vehicle for critical examination of how well models can reproduce the observed optical properties (including RH dependence) and CCN properties (number vs supersaturation). Deliverable: new parameterizations or ‘tested’ parameterizations

- Examination of the current state of f(RH) parameterizations (both scattering and absorption humidification factors) against field measurements.
- Quantification of the contribution by semi-transparent coatings on BC and SOA in the in the shortwave (near-UV) to the direct effect. Work from recent campaigns suggest that below RGB wavelengths typically used to study aerosol absorption, pronounced light absorption is present. For example, while the mass absorption cross-sections for SOA in the near UV spectral will likely be smaller than BC, the larger number density of these aerosols and their respective Ångstrom exponents can potential result in absorption coefficients (Mm^{-1}) that exceed BC at these shorter wavelengths.