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Effect of aggregation, morphology and mixing state on optical properties of bare and internally mixed Black Carbon particles

Barbara Scarnato (1), Swarup China (2), and Claudio Mazzoleni (2)

(1) Naval Postgraduate School, Monterey, CA-93943, USA, (2) Michigan Technological University, Houghton, MI-49931, USA

Black carbon (BC) is a small, dark particle that warms Earth's climate.

BC is a distinct type of carbonaceous aerosol particle, product of combustion of fossil and biomass fuels. Upon emission into the atmosphere, BC internally mixes with other aerosol compounds. According to recent studies, internal mixing of BC with other aerosol materials in the atmosphere alters its aggregate shape, absorption of solar radiation, and radiative forcing. These mixing state effects are not yet fully understood.

Laboratory and field studies have identified a strong variability in the observed absorption efficiencies of internally mixed BC. Additionally, there is a discrepancy between modeled and measured values using traditional modeling approaches.

This talk will investigate the central role of parameterization of light interaction by BC particles in the assessment of its radiative forcing and present a sensitivity study of the effect of aggregation, morphology and mixing state on optical properties of bare and internally mixed BC with mineral dust, ammonium sulfate, sodium chloride and others.

Optical properties of the different mixtures, sampled both in field campaigns and laboratory environment, are computed using Discrete Dipole Approximation model in accordance with BC aggregation, morphology and mixing observed at microscopes. The results of this work are relevant for several applications in atmospheric science, including but not limited to radiative transfer calculations, regional and global climate modeling and, the interpretation of remote sensing measurements.