Modelling the optical properties of Black carbon mixed with dust and other components with observational constraints

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Black carbon (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 compounds. Internal mixing of BC with other material alters its aggregate shape, absorption and scattering of solar radiation, and radiative forcing. These mixing state effects are not yet fully understood and characterized.

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 simplified 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 aggregate morphology and mixing state on optical properties of bare and internally mixed BC with mineral dust, ammonium sulfate and sodium chloride.

Optical properties are computed using a Discrete Dipole Approximation model in accordance with the BC morphology and mixing characteristics presented in the literature and from field campaigns and laboratory studies. 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.