Primary Aerosol Emissions and Radiative Effects

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Our main focus is the emission of black and organic carbon – components of combustion generated soot – that have health and climate implications. Several projects described below illustrate our interest and capabilities in measuring emission rates and radiative properties/effects of these carbonaceous aerosols and other pollutants.

Black Carbon Reduction of Snow Albedo

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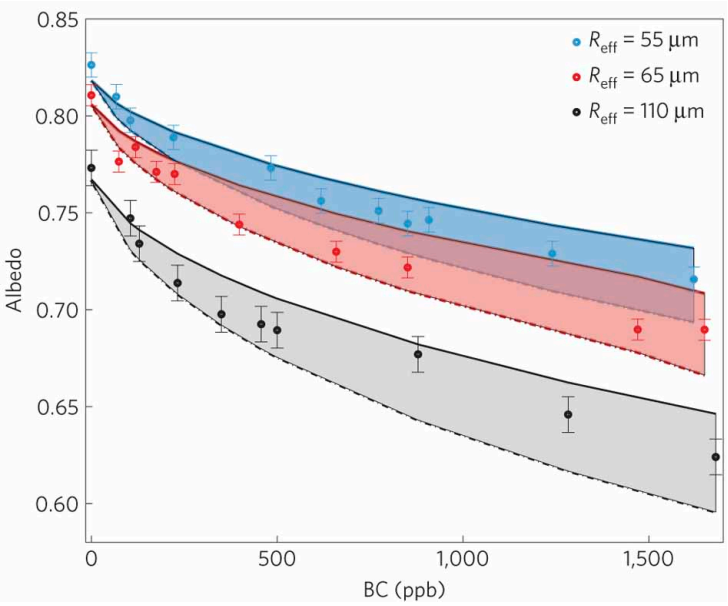
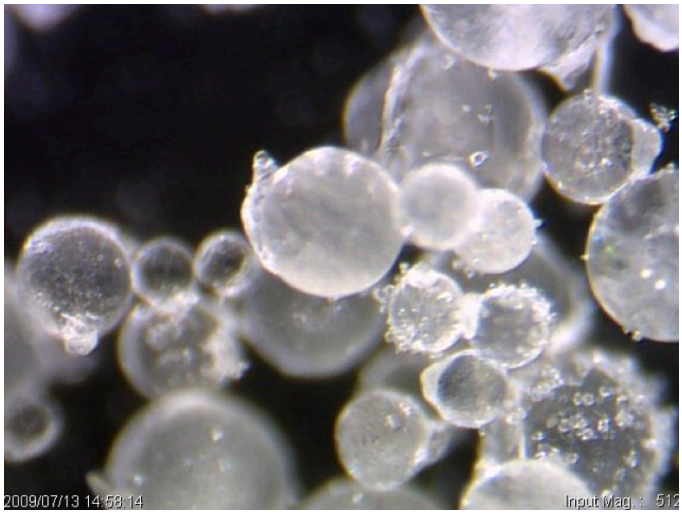
Climate models indicate that the reduction of surface albedo caused by black-carbon contamination of snow contributes to global warming and near-worldwide melting of ice. In a recent study, we generated and characterized pure and black-carbon-laden snow in the laboratory and verified that black-carbon contamination appreciably reduces snow albedo at levels that have been found in natural settings. Increasing the size of snow grains in our experiments decreased snow albedo and amplified the radiative perturbation of black carbon, which justifies the aging-related positive feedbacks that are included in climate models. Moreover, our data provide an extensive verification of the Snow, Ice and Aerosol Radiation model, which will be included in the next assessment of the Intergovernmental Panel on Climate Change.

Ref: http://www.nature.com/nclimate/journal/vaop/ncurrent/full/nclimate1433.html





Left Figure: Spectrally weighted snow albedo over the 300–2,500 nm solar spectrum: derived from our experiments (dots, ±1 standard deviation) and simulated using the Snow Ice and Aerosol Radiation model (shaded bands).

Right Figure: Laboratory snow grains at a magnification of 500x.