



Washington University in St. Louis

Energy, Environmental & Chemical Engineering

Friday, February 26, 2010

11:00am

Lopata Hall, 101

“Unraveling Aerosol-Cloud-Climate Interactions”

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Anthropogenic atmospheric aerosols (suspended particulate matter) can modify the radiative balance (and climate) of the Earth by altering the properties and global distribution of clouds. Current climate models however cannot adequately account for many important aspects of these aerosol-cloud interactions, ultimately leading to a large uncertainty in the estimation of the magnitude of the effect of aerosols on climate.

The seminar will focus on methods to develop and implement explicit, physically-based descriptions of aerosol-cloud processes in climate models. Particularly I will show new developments on: (1) the representation of ice cloud formation in atmospheric models and (2) the inclusion of the effects of mixing and kinetic limitations in existing liquid cloud parameterizations. The parameterizations are analytical solutions to the

cloud ice and water particle nucleation problem, developed within a framework that considers the mass and energy balances associated with the freezing / droplet activation of aerosol particles. The new frameworks explicitly account for the impact of cloud formation dynamics, the aerosol size and composition, and the dominant freezing mechanism (homogeneous vs. heterogeneous) on the ice/droplet concentration and size distribution.