Aerosol formation and growth in coal-fired power-plant plumes: Linking plume-scale processes to global aerosols and climate.

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DATE: Thursday, November 13, 2014
TIME: 3:30 P M
PLACE: C3024

Donuts and coffee will be available for consumption 10 minutes before the colloquium.

ABSTRACT: New-particle formation in the plumes of coal-fired power plants and other anthropogenic sulphur sources may be an important source of atmospheric particles. These particles are known to cause respiratory problems in humans, and may grow to sizes where they can alter the properties of clouds and affect climate. It has been unclear, however, how best to reproduce this new-particle formation in global- and regional-scale aerosol models with grid-box lengths that are 10s of kilometres and larger. These models have therefore made crude assumptions about the sub-grid physics that do not depend on the nature of the source or the ambient conditions, both of which affect the plume chemistry and physics in reality. The uncertainties in these assumptions have been shown to lead to large uncertainties in the effects of these particles on climate.

In order to better represent these processes, we have developed the Predicting Particles Produced in Power-Plant Plumes (P6) parameterization: a computationally-efficient, but physically-based, parameterization that predicts the characteristics of particles formed within sulphur-rich plumes based on variables commonly available in regional- and global-scale models. We implement this parameterization into a global chemical-transport model in order to evaluate the contribution of coal-fired power plants globally to particle number concentrations. We find that the sub-grid scale new-particle formation predicted by P6 is most sensitive to uncertainties in the pre-existing aerosol. For constant emissions, fewer new particles are formed in more polluted regions. This spatial heterogeneity in new-particle formation cannot be resolved by previous treatments of sub-grid sulphate but is captured by P6.

ALL ARE WELCOME!!!