Markus Petters, NC State

Talk: Do biomass burning particles nucleate ice?

Statement: My research focuses, in part, on the physicochemical properties of biomass burning aerosol. In particular, my aim is to relate the chemical composition of the emitted particles to their water uptake properties. In 2006 and 2007, I participated in series of experiments hosted at the Fire Science Laboratory in Missoula, MT, where we studied chemical, optical, and water uptake properties of freshly emitted particles from burning a variety of fuels. Results from these experiments are now available in the peer reviewed literature, including the relationship between composition and hygroscopic growth (Carrico et al., 2010), the parameterization of, and the relationship between hygroscopic growth and cloud condensation nucleation activity (Petters et al., 2009a), the efficiency with which these particles can serve as ice nuclei in cold convective clouds (Petters et al., 2009b), and the relationship between hygroscopic growth and the homogeneous freezing ability of haze in the cirrus cloud regime (DeMott et al., 2009). Follow up studies by Tony Prenni et al., undertaken at Colorado State University have used these data to explain the freezing properties of aerosol in ambient plumes emanating from controlled burns and wild fires.

Combined, these experiments have highlighted some additional research needs, but also helped us to develop a set of parameterizations that may advance the modeling of emissions and evolution of aerosol emissions from fires, stratified by fuel type and combustion conditions. Our studies therefore tie in directly to the topics discussed at the forum: 1) observations of biomass burning processes and models of direct burning emissions, and 2) atmospheric modeling of biomass burning emissions at “weather” scales.

I recently started a new position as Assistant Professor at North Carolina State University, where I am beginning to pursue similar research objectives. I have two proposals, currently under review at NSF, where I propose to examine the relationship between aerosols and precipitation, and the relationship between semi-volatile organic compounds and cloud formation. Both projects were in part inspired by, and are directly related to the problem of biomass burning emissions. For example, some components of smokes are semi-volatile, and my proposal will directly address this aspect of the emissions. Further, I maintain a direct interest in working with the modeling community to produce optimally aggregated properties to the biomass burning process over a range of scales. For this reason, I am highly interested to exchange ideas with other researchers on this topic and would enjoy participating in the forum.

References