Ph.D. Defense Announcement
Jack Kodros
May 8, 2018 at 10:00am

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Ph.D. Defense

Tuesday, May 8, 2018
10:00am

Defense
ATS West Seminar Room (121 ATSW)

Post Defense Meeting
Riehl Conference Room (211 ACRC)

Committee:
Jeffrey Pierce (advisor)
A.R. Ravishankara
Sonia Kreidenweis
John Volckens (Mechanical Enigneering)

Climate and health impacts of particulate matter from residential combustion sources in developing countries

Globally, close to 2.8 billion people lack access to clean cooking technology, while 1.8 billion people lack access to electricity altogether. As a means to generate energy for residential tasks, it is common in many developing countries to rely on combustion of solid fuels (wood, dung, charcoal, trash, etc.). Solid fuel use (SFU) can emit substantial amounts of fine particulate matter ($PM_{2.5}$), often within or in close proximity to residences, creating concerns for human health and climate; however, large uncertainties exist in indoor and outdoor $PM_{2.5}$ concentrations and properties, limiting our ability to estimate these climate and health impacts. This work explores the uncertainty space in estimates of premature mortality attributed to exposure to $PM_{2.5}$ from residential SFU (e.g., cooking, heating, lighting) and makes the first estimates of health and radiative effects from combustion of domestic waste (i.e., trash burning). Next, we investigate key uncertain parameters (emission size distribution, black carbon mixing state, and size-resolved respiratory deposition) that drive uncertainties in health and radiative impacts from SFU, in order to improve model estimates of aerosol impacts from all sources.

Overall, we find that the aerosol radiative effects from SFU and trash combustion are largely uncertain and can range between positive and negative. Conversely, while there are still major uncertainties in global mortality estimates, the global health burden of this emission sector is substantial, providing a strong motivation for improvement in developing countries. The work presented here demonstrates that through combining observations and more physically complex models, we can constrain uncertainties in global models, thus improving our ability to predict future scenarios.