Session: B9 Oral presentation

Radiative forcing from aerosols: A bold new field experiment to test global model predictions

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Aerosol-radiative interactions have emerged as a major factor in understanding twentieth century climate change. It has long been known that aerosols have a major influence in global mean climate change. The global cooling by volcanic aerosols and the global scale dimming by anthropogenic aerosols are two well known examples that have experimental basis. New science, since the last decade, has taken the aerosol-radiative forcing science in a new direction. The focus now is on regional forcing and regional climate changes such as the Sahelian drought, the weakening of the monsoonal circulation over Asia, the melting of the Himalayan glaciers and the retreat of Arctic sea ice. These impacts arise largely from the so-called direct effects of absorbing aerosols on atmospheric heating and surface dimming. Another equally important effect of aerosol is to alter the cloud-radiative forcing by nucleating more cloud drops, the so-called aerosol indirect effect. While there are hundreds of model studies showing the large cooling due to this indirect effect, observational support is lacking. Remarkably, the planetary cloud fraction as well as cloud optical properties in the relatively pristine southern hemisphere are similar to those in the polluted northern hemisphere. Clearly we need a new experiment to test our ideas on aerosol-radiative forcing. I will describe such a field experiment, which is akin to a soft-geo engineering experiment, in which we replace traditional mud-stove cooking with biomass fuels (which contributes to about 60% of the aerosol forcing over S. Asia) with improved cook stoves (smoke free) on a hundred sq km scale with a population of 50000 in rural N. India. Comprehensive high spatial resolution measurements will be undertaken to measure the response of the aerosol physical and chemical state and the radiative forcing to the intervention.