Airborne Dust, **"the good guy or the bad guy":** ***how much do we know?***

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ABSTRACT

All substances are poisons; there is none, which is not a poison.
The right dose differentiates a poison and a remedy.
– P. A. Paracelsus (1493-1541), one of the fathers of modern medicine

Processes in generating, transporting, and dissipating the airborne dust particles are global phenomena –African dust regularly reaching the Alps; Asian dust seasonally crossing the Pacific into North America, and ultimately the Atlantic into Europe. One of the vital biogeochemical roles dust storms play in Earth's ecosystem is routinely mobilizing mineral dust, as a source of iron, from deserts into oceans for fertilizing the growth of phytoplankton –the basis of the oceanic food chain. Similarly, these dust-laden airs also supply crucial nutrients for the soil of tropical rain forests, the so-called *womb of life* that hosts 50-90% of the species on Earth. With massive amounts of dust lifted from desert regions and injected into the atmosphere, however, these dust storms often affect daily activities in dramatic ways: pushing grit through windows and doors, forcing people to stay indoors, causing breathing problems, reducing visibility and delaying flights, and by and large creating chaos. Thus, both *increasing* and *decreasing* concentrations of doses result in harmful biological effects; so do the airborne dust particles to our *Living Earth.*

Since 1997 NASA has been successfully launching a series of satellites - the Earth Observing System - to intensively study, and gain a better understanding of, the Earth as an integrated system. Through participation in many satellite remote-sensing/retrieval and validation projects over the years, we have gradually developed and refined the SMART (Surface-sensing Measurements for Atmospheric Radiative Transfer) and COMMIT (Chemical, Optical & Microphysical Measurements of In-situ Troposphere) mobile observatories, a suite of surface remote sensing and in-situ instruments that proved to be vital in providing high temporal measurements, which complement the satellite observations. In this talk, we will present SMART-COMMIT which has played key roles, serving as network or supersite, in major international research projects such as the Joint Aerosol Monsoon Experiment (JAMEX), a core element of the Asian Monsoon Years (AMY, 2008-2012). SMART-COMMIT deployments during 2008 AMY/JAMEX were conducted in northwestern China to characterize the properties of dust-laden aerosols. In 2009, SMART-COMMIT also participated in the JAMEX/RAJO-MEGHA (Radiation, Aerosol Joint Observations-Monsoon Experiment in the Gangetic-Himalayan Area; Sanskrit for Dust-Cloud) to study the aerosol properties, solar absorption and the associated atmospheric warming, and the climatic impact of elevated aerosols during the pre-monsoon season in South Asia. To fully characterize the properties of airborne dust in the field is an important but challenging task. In this seminar, we will present our recent measurements and retrievals of airborne dust properties.