Physics Colloquium

Michigan Technological University
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4:00 pm
Room 139 Fisher Hall

Aerosols and Climate Change: Beyond the Whitehouse Effect

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Abstract: Climate change research initially focused on the greenhouse effect, that is warming due to the absorption of thermal infrared radiation by anthropogenically emitted gases such as carbon dioxide. Inclusion of aerosol effects into radiative transfer calculations started with the cooling effect of non-absorbing sulfate aerosols that were thought to dominate the anthropogenic aerosol forcing. With a good sense of humor, this effect was named the "Whitehouse Effect". More recently, it has become clear that light absorption by carbonaceous and mineral dust aerosols in the atmosphere is more dominant and widespread than previously thought. The inclusion of these aerosols into the radiative transfer component of climate models presents several challenges: 1) aerosol light absorption adds a heating term to the cooling term of non-absorbing aerosols; 2) these aerosols can be non-spherical and inhomogeneous with soot aerosols often emitted as fractal-like chain aggregates, making calculation of their optical properties difficult; 3) aerosol light absorption generally has a complex wavelength dependence; 4) atmospheric aerosol lifetimes and deposition modes are influenced by hydrophobic/hydrophilic properties; 5) light-absorbing aerosols can continue to contribute to climate change after deposition on snow surfaces; and 6) light-absorbing aerosols are emitted from both natural and anthropogenic sources.

Biography: Dr. Moosmüller's interests include experimental and theoretical research in optical spectroscopy and its applications to atmospheric, aerosol, and climate physics. His research focuses on development and application of real time, in situ measurement methods for aerosol light absorption, scattering, extinction, and asymmetry parameter, and new optical remote sensing techniques. These measurement methods are being used for ambient air monitoring and vehicle, fugitive dust, and biomass burning emission studies. His latest interests are fast, ultra-sensitive measurements of elementary mercury concentrations and fluxes and aerosol morphology and its influence on aerosol optical properties with a focus on fractal-like chain aggregates found in combustion particles.