

SEMINAR

Organic Aerosols in the Southeastern United States: Nitrate Radical Oxidation of Biogenic Volatile Organic Compounds

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Abstract:

Secondary organic aerosol (SOA) constitutes a substantial fraction of fine particulate matter and has important impacts on climate and human health. The extent to which human activities alter SOA formation from biogenic emissions in the atmosphere is largely undetermined. The interactions of biogenic VOCs with NO_3 radicals represent a direct way for positively linking anthropogenic and biogenic emissions. Here, we present direct observational evidence on the effects of anthropogenic NO_x on biogenic SOA formation based on comprehensive ambient measurements in the southeastern United States and coordinated laboratory chamber studies. Multiple high-time-resolution mass spectrometry organic aerosol measurements were obtained during different seasons at various locations, including urban and rural sites in the greater Atlanta area and Centreville in rural Alabama. Experiments on nitrate radical oxidation of monoterpenes were conducted in the Georgia Tech Environmental Chamber facility (GTEC) to investigate the formation and fates of SOA and organic nitrates under conditions relevant to the southeastern US. Anthropogenic NO_x is shown to enhance nighttime SOA formation via nitrate radical oxidation of monoterpenes, resulting in the ubiquitous presence of particulate organic nitrates in the southeastern US. Nighttime NO_3 chemistry can contribute up to 22-34% of total measured OA in the southeastern US. Updating current modeling frameworks with these observational constraints will lead to more accurate treatment of aerosol formation for regions with substantial anthropogenic-biogenic interactions and consequently improve air quality and climate simulations. Results from these studies also illustrate the substantial insights one can gain into aerosol chemistry and ambient aerosol source apportionment through coordinated fundamental laboratory studies and field studies; it is imperative not to view laboratory studies as isolated efforts, but instead to make them essential and integrated parts of future field campaigns.

Date: Wednesday, May 4, 2016
Time: 3:15 refreshments; 3:30 seminar
FL2-1022, Large Auditorium

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