ATS/CIRA Colloquium

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Atmospheric Mercury from the Boundary Layer to the Free Troposphere: Airborne Observations of Emissions, Transport, and Chemistry

Hosted by Emily Fischer

Friday, December 11, 2015

ATS room 101; Discussion will begin at 11:15am
Refreshments will be served at 10:45am in the weather lab

Mercury (Hg) is a bioaccumulative neurotoxin that is emitted to the atmosphere from both natural and anthropogenic sources. Once in the atmosphere, chemistry and transport are fundamental in determining the introduction of Hg to terrestrial and aquatic ecosystems. While gaseous elemental mercury (Hg(0)) may remain in the atmosphere for months, chemical conversion to the more soluble oxidized form (Hg(II)) facilitates atmospheric deposition. Characterizing the relative atmospheric emissions from major sources and deciphering the mechanism for atmospheric Hg(0) oxidation are therefore paramount to understanding the global Hg cycle. During the 2013 Nitrogen, Oxidants, Mercury and Aerosol Distributions, Sources and Sinks (NOMADSS) campaign, airborne Hg measurements were collected in the eastern U.S. to (1) constrain Hg emissions from major source regions, and (2) identify the mechanism for enhanced Hg(II) in the free troposphere. Two case studies are presented addressing these objectives. First, measurements of total atmospheric Hg, carbon monoxide (CO), nitrogen oxides (NOx), and sulfur dioxide (SO2) are used to characterize emissions from the Chicago/Gary urban/industrial area with respect to the U.S. EPA National Emissions Inventory (NEI). FLEXPART model analyses suggest that there are many small emission sources that are not fully accounted for within the inventory, and/or that the re-emission of legacy Hg is a significant source of THg to the atmosphere in this region. Second, measurements in a free tropospheric air mass over Texas are used to investigate the mechanism for atmospheric Hg oxidation, which is purportedly induced by bromine radicals but direct observational evidence for this process has been unavailable. Results of a chemical box model for the sampled air mass support the role of bromine as the dominant oxidant of Hg in the upper troposphere. These and other NOMADSS results collectively provide important new insight into the atmospheric emissions, transport, and chemistry that influence global Hg cycling.

Link to colloquium videos and announcement page: http://www.atmos.colostate.edu/dept/colloquia.php