Diel patterns and deposition of atmospheric Hg species at nine inland and coastal sites

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To examine cycling and deposition of atmospheric mercury (Hg), we conducted several field studies across the central and eastern United States over the last 5 years. As part of this study, concentrations of atmospheric Hg species were measured at nine inland and coastal sites (36-364 days of data per site) including heavily industrialized inland areas (East St. Louis, IL and Milwaukee, WI), remote inland locations (Lostwood, ND; Devil's Lake, WI; and Big Meadows, VA), and coastal regions (Weeks Bay, AL; Cape Romain, SC; Woods Hole, MA; El Yunque, Puerto Rico).

Seasonal elemental Hg concentrations at these nine sites ranged from 1.27±0.31 to 2.94±1.57 ng m^{-3} and were greatest during the spring and winter and at sites near large local Hg sources. Seasonal reactive gaseous mercury (RGM) concentrations ranged from 1.5±1.6 to 63.2±528 pg m^{-3}; the season exhibiting the highest RGM differs among sites. The highest RGM concentrations concentrations (up to 38,300 pg m^{-3}) are associated with heavily industrialized sites (East St. Louis and Milwaukee) impacted by Hg sources such as coal-fired power plants, metal production facilities, and chlor alkali producers. Strong diel patterns with early afternoon maximum RGM concentrations were observed at the three coastal sites impacted by anthropogenic emission sources (Weeks Bay, AL; Cape Romain, SC; Woods Hole, MA) and are indicative of photochemical RGM production.

Total Hg deposition for the sites was determined by summing dry deposition (modeled) of reactive and particulate Hg with wet deposition (measured). Total annual Hg deposition ranged from 5.1 to 66 μg m^{-2}, with <35% being dry deposition at all sites except for East St. Louis (66%). Regional Hg emission and calculated deposition are weakly correlated. These findings suggest that further work is required to determine if there is a relationship between regional emission sources and Hg deposition.

Aerosol characteristics in rural and remote areas of south China

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Introduction

The Asian continent and China in particular is an important source region of aerosol particles, while the understanding regarding the aerosol chemical characteristics and sources is limited. Therefore, an intensive field campaign was conducted in south China to invesitgate the major chemical components of the ambient aerosol and to estimate source contributions, using molecular markers.

Experimental

Sampling was concducted at eight stations across south China, including urban, rural and remote sites, such as Hong Kong, Hainan Island and Tengchong. Aerosol samples were collected in two size ranges (PM2.5 and P10), using Mini-vol air samplers, with a typical sampling frequency of 24 hours.

Samples were analyzed for organic carbon (OC) and elemental carbon (EC), using a thermo-optical transmittance (TOT) protocol. Molecular tracers for biomas burning, fungi tracers and other polar organic species were measured by high-performance anion exchange chromatography (HPAEC).

Results

Various types of sources, including biomass burning and primary biogenic processes, influenced the aerosol composition in south China during the time frame of this study. The Pearl River Delta (PRD) region showed a particularly complex source signature, including local as well as long-range transport impact.

Biomass burning smoke had significant contributions to ambient aerosol at some of the sites, such as Tengchong, a remote site in the south-eastern part of the Tibetan Plateau, influenced by agricultural fires in south and south-east Asia.

Biogenic aerosol contributions were determined on the example of fungi tracers (i.e., arabitol and mannitol, with ambient concentrations of more than 100 ng m^{-3} each), showing important contributions of microbial activity, specifically at subtropical locations, such as Hainan Island.