Recent progress on mercury deposition studies

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Mercury (Hg) dry deposition at multiple locations in eastern and central North America were estimated using AMNeT data. The estimated Hg dry deposition agrees well with limited surrogate-surface dry deposition measurements of gaseous oxidized Hg (GOM) and particulate-bound Hg (PBM) and also agrees well with litterfall Hg measurements conducted at multiple locations in this region. Results suggest that gaseous elemental Hg (GEM) contributes much more than GOM+PBM to the total dry deposition at the majority of the sites; the only exception is at locations close to significant point sources where GEM and GOM+PBM contribute equally to the total dry deposition. The relative magnitude of the speciated dry deposition and their good comparisons with litterfall deposition suggest that mercury in litterfall originates primarily from GEM. Total dry deposition of mercury is equal to, if not more important than, wet deposition of mercury on a regional scale in eastern North America.

Daily samples of bulk PBM dry deposition and size-fractionated (18, 10, 2.5 and 1.0 μm) PBM concentration were collected at three sites in central Taiwan. On annual average, $PM_{1.0}$ contributed more than 50% to the bulk concentration at the traffic and the industrial sites and contributed 25% at the wetland site, $PM_{1.0\text{-}2.5}$ contributed 25% to 50%, and coarse fraction ($PM_{2.5\text{-}18}$) contributed 7% to 25%. Samples with very high bulk concentrations had large fine fractions. Coarse PBM was estimated to contribute 50-85% of the total PBM dry deposition. Daily dry deposition velocities ranged from 0.01 to 7.7 cm s^{-1} with annual averages of 0.29-0.60 cm s^{-1}. These values can be reasonably reproduced using a size-resolved model and measured size fractions.

The Maximum Likelihood Estimation method was used to establish a statistical relationship between wet deposition amounts measured in MDN and atmospheric concentrations measured in AMNeT. Three super stations were selected to establish the regression model which was further validated using datasets from the other seven monitoring stations in eastern USA. The model is capable of partitioning atmospheric GOM and PBM using wet deposition measurements and thus increasing the spatial coverage of GOM and PBM by taking advantage of the more extensive spatial coverage of the wet deposition network.

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