Air Mercury Speciation Accuracy and Calibration

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Development and use of methods to measure atmospheric mercury speciation date back to the early 1980s. A major advancement occurred in the late 1990s when an automated, continuous system to measure gaseous oxidized mercury (GOM), particulate-bound mercury (PBM) and gaseous elemental mercury (GEM) was made available to researchers. The air mercury speciation system (Tekran Models 2537, 1130, 1135) was initially challenged by the USEPA and over the years by many research groups in field and lab studies, both with good results. The application of the air mercury speciation system resulted in observations that continued to build assurance that the mercury speciation system was generating high quality results. Examples of these will be presented, such as observation of high GOM values in point-source emission plumes, higher PBM during winter months, increased GOM during polar GEM depletion events and highly elevated GOM concentrations in stable free tropospheric air. The air mercury speciation system detector (Tekran 2537) is routinely calibrated with a traceable GEM source to establish accuracy. Although there have been hundreds of high quality publications of atmospheric mercury speciation, one critical limitation has been the lack of traceable GOM and PBM standards at the picogram/m^3 (pg/m^3) level. Recent studies have once again highlighted the need for field-deployable atmospheric mercury speciation standards to further improve estimates of accuracy. A brief review of attempts to develop standard GOM sources for air mercury speciation systems will be presented with an emphasis on the challenges of transport, stability and traceability. Lastly, a conceptual proposal for an automated GOM source for routine standard additions at the pg/m^3 level will be shown.