An Analysis of Co-located Atmospheric Mercury Speciation Data from AMNet

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Atmospheric mercury speciation measurements are being made and reported on-line as part of the new Atmospheric Mercury Network (AMNet). It is easy to overlook that mercury is the only atmospheric constituent routinely and continuously measured at the part per quadrillion level (ppqv, mixing ratio). Typical values range from a few hundred ppqv for gaseous elemental mercury (GEM) to 0.5 to 10 ppqv for gaseous oxidized mercury (GOM) and particulate-bound mercury (PBM). For contrast, background ozone concentrations are roughly 30 million times higher than average GOM concentrations. Because of the exceedingly low atmospheric mercury species concentrations, it is technically very difficult to generate and deliver stable and traceable standards to the inlet of automated measurement systems for quality assurance and calibration purposes. Thus, quality assurance has normally consisted of 1) routine automated internal calibration of the detector with a traceable elemental mercury permeation source, 2) manual injections of elemental mercury at locations upstream of the detector and 3) direct intercomparisons of measurements with two or more instruments over a short time period. Both manual injections and direct intercomparisons are done infrequently and few are reported in the literature. Fortunately, within AMNet, there have been 3 sites where two instruments have been co-located for an extended period of time. From this data we have learned that: 1) harmonized methods and one operator produce the highest quality results, 2) inlet height differences may lead to significant GOM differences and 3) the automated data reduction program must be supplemented by well documented field observer forms. A statistical analysis of co-located, synchronous atmospheric mercury speciation data will be presented. Additionally, a summary of historical atmospheric mercury speciation quality assurance data will be shown.

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