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## Overview of challenges using speciated Hg measurements to support model evaluation and development

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A review is provided on the state of modeling reactive mercury (RM) species, coherent patterns that have emerged in model-observation comparisons and specific model applications that will benefit from reliable RM measurements. Observations play a crucial role in modeling. We gain confidence in the utility of models through rigorous, systematic, and frequent evaluation against observations, and model-observation mismatches spur scientific progress and model development. Over the last decade there has been a proliferation of sophisticated mercury models (GRAHM, GEOS-Chem, ECHMERIT, GLEMOS, CMAQ-Hg, CAM-Chem, and WorM3), which have been largely evaluated against only gaseous elemental mercury (Hg(0)) surface measurements and wet deposition. Surface measurements of gaseous oxidized mercury (GOM) and particulate-bound mercury (PBM) have become more numerous in recent years, but have been incorporated into relatively few modeling studies. Using RM to evaluate model performance and support model development remains a challenge in light of analytical artifacts. The most consistent model-observation discrepancy to emerge is a large (up to 10-fold) model overestimate of GOM and PBM. The bias is larger than the analytical underestimate of GOM alone and mounting evidences suggests a need to revisit the speciation in anthropogenic emission inventories. Although Hg(0) and wet deposition are the most robust measurements currently available to models, the information embedded in these measurements is still intrinsically limited. Improved GOM and PBM observations, both through development of new analytical techniques and correction factors for existing measurements, will directly benefit modeling applications such as: assessing different oxidation and reduction mechanisms; characterizing the spatial and temporal behavior of mercury in the free troposphere and upper troposphere/lower stratosphere; gas-particle partitioning; source-receptor analysis; inverse methods for source attribution; and quantifying total (wet + dry) deposition to ecosystems, which is a crucial step in the pathway to mercury exposure.

### Biography

Helen M Amos received her BS from University of Washington in Atmospheric Sciences and is currently a doctoral candidate in the Earth & Planetary Science Department at Harvard University. Her research is focused on anthropogenic perturbations to the global biogeochemical cycling of mercury.

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