

An Examination of the Role of Particles in Oceanic Mercury Cycling

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Recent models of global mercury (Hg) biogeochemistry have identified the downward flux of sinking particles in the ocean as a key process in the cycling of this toxic metal. These models estimated the amount of anthropogenic Hg in the ocean to be about 400 Mmoles, with sinking fluxes representing an important vector by which this pollution Hg was able to penetrate the ocean interior. Using data from recent cruises to the Atlantic (GEOTRACES, CoFeMUG) and the Pacific (GEOTRACES, Metzyme) Oceans, we have examined the dissolved and particulate partitioning of mercury (Hg) in the oceanic water column as a cross-check on the hypothesis that sinking fluxes are important. Interestingly, these new data suggest particle-dissolved partitioning (K_d) that is approximately 20x greater than estimates used in some of these models and which thereby challenges certain assumptions regarding the scavenging and active partitioning of Hg in the ocean. Combined with two campaigns in which the vertical flux of Hg was measured directly, the new particle data suggest that weak, “regenerative” scavenging (as opposed to “equilibrium” or reversible scavenging) is the most likely mechanism by which the association of Hg and particles occurs. Finally, we examined the implications of incorporating this mechanism into global models.