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Mercury species sorption and partition kinetics from a model marine phytoplankton

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The uptake of dissolved methylmercury (MeHg) by phytoplankton presents the largest bioaccumulation step along aquatic food chains. Nonetheless, there is a knowledge gap in our understanding of biologically mediated processes within the Hg biogeochemical cycle, the role of plankton in Hg methylation, as well as, the role of particles in Hg bioavailability in different marine ecosystems. Information on Hg levels in organisms at the base of food web, as well as their controlling factors, are important for our ability to predict concentrations in the upper trophic levels. However, within the marine Hg cycle models Hg partitioning and speciation between dissolved and particulate phases and the rate at which they occur, are one of the major uncertainties in ocean Hg bioaccumulation models and play a major role for a better understanding of the fate of Hg currently in the ocean.

Consequently, in order to document and quantify interactions between different species of dissolved Hg and phytoplankton, this research is focused on studying inorganic Hg and MeHg species sorption and partition kinetics by *Tisochrysis lutea* (T-iso). Hg sorption experiments were performed by exposing T-iso cultured in axenic seawater to environmental relevant concentrations of iHg and MeHg, followed by separation of the dissolved and particulate phases by centrifugation and subsequent filtration. Dissolved and adsorbed (cysteine rinse) THg and MeHg was analyzed by cold-vapor Atomic Fluorescence Spectrometry (CVAFS) and hydride generation-CVAFS respectively. While absorbed (freeze-dried cysteine rinsed particles) THg was analyzed by Atomic Absorption Spectrometry AAS and absorbed MeHg was analyzed by liquid-liquid extraction followed by AAS.

The results present information on the distribution of Hg within the different studied phases over time, along with Hg partition coefficients per suspended particulate matter, particulate organic carbon, as well as, the uptake rates of Hg species per cell per exposure to Hg. The study will provide insights on the role of living particles in Hg dynamics in the marine environment through future work on the parameterization of a physical/ecological coupled 1D Hg bioaccumulation model.