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Towards a better understanding of mercury (Hg) dynamics in the marine environment

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Mercury (Hg) is a highly toxic pollutant of global relevance, whereby monomethyl mercury (MMHg) is of special concern for human health due to its neurotoxicity and biomagnification in aquatic food webs. Although Hg in oceans has been studied for decades, large knowledge gaps remain concerning Hg transformations and fluxes. The GMOS-Train network has been created to investigate Hg transformations and the biogeochemical Hg cycle. Combining aquatic biogeochemistry, ecology and analytical chemistry we aim to provide the basis for improved multimedia modelling. Moreover, we strive to provide scientific results for policymaking, thereby contributing to the assessment of the implementation of the Minamata Convention.

Herein, we present one work package of GMOS-Train which is fully dedicated to investigating marine Hg dynamics in coastal and open ocean marine environments. On a global basis, the ocean functions as a large Hg reservoir and as a temporary sink to anthropogenic Hg emissions. For the population, consumption of seafood is the main exposure pathway of Hg [1]. Advances in clean sampling protocols and analytical methods enabled the observation of Hg species distribution in the Arctic, Atlantic Pacific and Southern Ocean [2]. Due to the absence of traceable and validated methodologies for the determination of low concentrations of different mercury species in the marine environment, metrological comparability of the measurement results still needs to be demonstrated, which is also one of the objectives of GMOS-Train. Further, the program aims to investigate Hg and MMHg (bio)-transformations, and bioaccumulation in lower food webs in marine environments, sorption and uptake rates by key marine particles and the role of natural organic matter (NOM) in Hg reactivity.

We will present general approaches and experimental set-ups, used to achieve the stated goals such as (i) enriched stable isotope techniques, (ii) differences in analytical approaches for Hg speciation at ultra-trace level (Hg(II), Hg(0), MMHg, DMHg),(iii) application of stable isotope ratios, and (iv) results of the first inter-comparison and training event.

[1] Outridge et al. (2018), *ES&T.* ***52***, 11466-11477.
[2] Bowman et al. (2020), *Sci. Total Environ.* ***710***, 136166.