Goldschmidt 2022 Abstract
https://doi.org/10.46427/gold2022.11029

1D Simulation of mercury cycle in the Mediterranean Sea at the Dyfamed station with the NEMO/PISCES model

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The global ocean is under the influence of anthropogenic emissions and changing climate, both affecting the biogeochemical mercury cycle. Mercury is a global pollutant and a neurotoxin with a serious health risk for humans, mainly via the consumption of marine fish. Bacteria feeding on sinking marine organic matter in the mesopelagic zone are thought to produce the toxic methylmercury species (MMHg) that bioaccumulates along the marine trophic chain to harmful levels. Aside from atmospheric deposition, mercury is released into the oceans via rivers and coastal ground water fluxes,erosion and hydrothermal venting. In turn, oceans account for about half of total global emissions of mercury and anthropogenic Hg emissions have largely altered natural Hg levels. However, the direct links between anthropogenic Hg emissions and changing climate to marine fish Hg levels, and ultimately human exposure remain ill-understood.

In this context, there is a need of numerical models combining Hg biogeochemistry and transport, expected to improve our understanding of the Hg cycle and its impact on marine ecosystems and to provide reliable quantitative budgets of Hg in the ocean. In this context we have implemented the mercury cycle in the NEMO/PISCES Ocean Biogeochemical model. We have implemented 2 dissolved mercury species Hg0, HgII and the oxydo-reduction reactions that control their interaction, and pHg a particulate phase. We simulate the mercury cycle at the DYFAMED time-series station (43° 25'N, 7°52' E) in the western Mediterranean Sea, a low-nutrient low-chlorophyll region characterized by a long stratification period (May–November) and deep convection in winter (february) and the presence of a DCM (Deep Chlorophyll Maximum). We have investigated with a 1D vertical simulation how these dynamical and biogeochemical conditions affect the mercury cycle in this region.