EGU22-12477, updated on 08 Aug 2022
https://doi.org/10.5194/egusphere-egu22-12477
EGU General Assembly 2022


# Assessing the spatial and temporal variability of MeHg biogeochemistry and bioaccumulation in the Mediterranean Sea with a coupled 3D model

**Ginevra Rosati**, Donata Canu, Paolo Lazzari, and Cosimo Solidoro
National Institute of Oceanography and Applied Geophysics - OGS, Trieste, Italy (grosati@inogs.it)

Previous research highlighted that Mediterranean tunas, as well as other edible fish species, are particularly enriched in mercury (Hg) due to a combination of physical, biogeochemical, and ecological factors that include a shallower occurrence of the MeHg concentrations maxima compared to the Ocean, likely resulting in higher phytoplankton exposure and bioaccumulation.
We developed a numerical model to simulate the fate of Hg species in the ocean, coupled with hydrodynamic transport and with the biogeochemical dynamics of nutrients, plankton, and detritus already implemented in the OGSTM-BFM model. The model is applied to a 3D domain of the Mediterranean Sea with a 1/16° horizontal resolution (~6 km) to investigate the spatial and temporal variability of MeHg distribution and bioaccumulation in the plankton food web.
The model reproduced strong zonal gradients of MeHg concentrations related to primary production in agreement with the observations. Model results also highlight the role of winter deep convection and summer water stratification in shaping the vertical distribution of MeHg. The modeled bioaccumulation dynamics in the plankton food web are characterized by high spatial and temporal variability driven by plankton phenology. Plankton MeHg enrichment relative to water concentrations, expressed as BAF (bioaccumulation factor) is maximum for the smallest phytoplankton group (picophytoplankton) and for the group representative of carnivorous mesozooplankton. The overall content of MeHg in plankton is highest in areas of the Mediterranean Sea where picophytoplankton is abundant and MeHg water concentrations are relatively high, such as the Tyrrhenian Sea and Southern Adriatic Sea. Biomagnification is maximum in areas of higher primary production where the trophic web includes more carnivorous zooplankton, such as the Alboran Sea and the Southern Western Mediterranean Sea.
The comparison among dynamics of different subbasins for the hindcast simulation suggests cascading effects of increasing water temperature through the decline of deep convection events in the Northern Western Mediterranean Sea that results in higher MeHg concentrations in the intermediate waters, and in turn in enhanced bioaccumulation. The model will be used to carry out long-term simulations under the climate change scenarios RCP4.5 and RCP8.5.