MERCURY AND ITS SPECIES IN THE ADRIATIC SEA

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Abstract
Mercury and its speciation were studied in surface and deep water of the Adriatic Sea during two oceanographic cruises onboard the research vessel Urania. Several mercury species together with some other water parameters were measured in coastal and open sea deep water profiles. Spatial and seasonal variations of measured Hg species concentrations in different identified water masses were observed. THg concentrations in the water column, as well as in sediments and pore waters, were the highest in the northern, most polluted part of the Adriatic Sea as the consequence of Hg mining in Idrija and the heavy industry of northern Italy. Furthermore, a Hg mass balance for the Adriatic Sea was calculated based on these measurements and literature data.

Keywords: Mercury, Central Adriatic Sea

The Adriatic Sea receives the inflow of heavily polluted rivers and other direct or indirect natural or anthropogenic Hg loads, especially in its northern and central parts. Elevated Hg levels were found on both the western and eastern coast of the N Adriatic. Water concentrations are reflected in THg concentrations in the sediments and pore waters of the area. It is evident that Hg enrichment in coastal N Adriatic waters and sediments is limited to the near shore zone and continental shelf. The spatial distribution of THg in water and sediment strongly depends on the water circulation of the sea, but there are several biological and/or geological factors affecting its speciation. N Adriatic water columns exhibit strong temperature and salinity stratification. The vertical distribution of Hg species reflects well mixed water with low deviations from the average for each location. Some correlations between maximum DGM and RHg peaks and the low oxygen zone were observed, which was not the case at the most polluted locations of the Gulf of Trieste and near Venice. Such an association is more evident in locations in the Central and Southern Adriatic where DGM at the surface is relatively low, reflecting the importance of evasion and photochemical oxidation due to the strong UV radiation and the presence of chlorine and bromine [1] and hydroxyl radicals [2, 3] at the surface. In deeper water layers the DGM distribution shows correlation with the oxygen concentration and indicates the importance of redox processes due to microorganism activity, and another, usually sharp increase towards the bottom. This indicates microorganism production and diffusion from sediment and/or tectonic activity, especially at locations in the S Adriatic Pit, which is tectonically very active. RHg vertical profiles are mostly opposite to those of DGM as Hg(II) is a substrate for DGM production. MeHg profiles are mostly related to Chl-a and oxygen concentrations. This underlines the role of planktonic production and regeneration in the methylation/demethylation processes. The low MeHg concentrations found in shelf edge or coastal sediments and water over the sediment indicate that coastal or shelf sediments are not a significant MeHg source for adjacent open sea waters. At some exceptional deep sea locations the increase of MeHg over the bottom suggest some bottom source (i.e. resuspension or diffusion from sediment), further supported by the estimated diffusive fluxes from sediments ranging from 0.150 to 16.6 pmol m^{-2} day^{-1}. Mass balance calculations showed that deposition and inflow from the Strait of Otranto are the most important sources of Hg, while evaporation and outflow to the Mediterranean are the most important sinks.

References

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