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Diatom-ooze – A Large Neglected Global Marine Mercury Sink

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Current models of the global mercury (Hg) cycle suggest minor importance of Hg sequestration in marine pelagic sediments. We investigated Hg accumulation in biogenic siliceous sediments (diatom-ooze) based on high resolution (10-20 years) cores taken at three sediment basins around Antarctica: Adélie Basin (AB) (IODP318-U1357), Prydz Bay (PrB) (ODP119-740) and Palmer Basin (PB) (ODP178-1098). Based on our sediment data, mean global diatom-ooze sedimentation rates and on the sequestration of biogenic silica in the oceans we estimated global Hg accumulation in diatom-ooze. Diatom-ooze sediments exhibit the highest Hg accumulation rates (up to 1800 μg m-^{2} yr-1) ever reported for the marine environment and provide a large Hg sink (17-1309 Mg yr-1), potentially surpassing model estimates (190 Mg yr-1) for ocean Hg sequestration up to a factor of 6.8.
Anthropogenic pollution of the Antarctic oceans starts $\sim$ 150 years ago and our estimates suggest that 0.3 to 20 % of the Hg emitted to the atmosphere during this period could have been stored in diatom-ooze alone. Indications of a global influence of Hg emissions from gold and silver mining in the Americas before 1850 and during 1850 and 1910 as estimated in recent models were not found in our cores questioning the influence of Hg emissions from colonial gold and silver mining and the so called legacy Hg in the Southern Hemisphere.
Our data indicates that previous studies have potentially underestimate net Hg sequestration in the ocean by neglecting the role of Hg sedimentation through large algae blooms which likely reduce Hg re-evasion. Our studies highlight the importance of Hg scavenging by microalgae as a fast and important vector for Hg sequestration in the oceans.