Contrasting Hg isotope ratios from the Kermadec and Mariana trenches

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Previous studies have explored mercury isotope variation in fish from the North Pacific Gyre (NPG) down to ~1050 m. This study reports Hg isotope analyses of fish and amphipods from the Kermadec and Mariana trenches at depths of 7 and 10 km. The magnitude of odd-mass independent fractionation (odd-MIF) in biota is believed to be a measure of the extent of photo-degradation of methyl-Hg (MeHg) before it enters the foodweb; it is highest in surface-dwelling organisms and decreases with depth. In the Kermadec and Mariana trenches odd-MIF is similar between each trench, regardless of depth, and is equal to values from the NPG at about 400 m. This suggests that trenches receive MeHg from the upper mesopelagic zone that is transferred to extreme depths by sinking particles and/or carcasses. Even-MIF is observed in Hg deposited from the atmosphere in precipitation (Δ^{200}Hg ≈0.15‰) and is believed to be produced by photochemical oxidation of Hg in the atmosphere. Even-MIF in the NPG is found in fish at a value of Δ^{200}Hg ≈0.10 ‰ from the surface down to 1050 m. Samples from the Mariana trench display Δ^{200}Hg in biota averaging 0.08‰, but biota samples from the Kermadec display an average value of only 0.03‰. The difference in Δ^{200}Hg between the two trenches indicates a greater precipitation-derived Hg component in the Mariana compared to the Kermadec. Finally, the mass dependent fractionation (MDF) signature for the Kermadec biota is higher (δ^{202}Hg≈1.0) than that of the Mariana (δ^{202}Hg≈0.25). MDF in the trench biota suggests that MeHg in the Kermadec trench underwent a greater extent of biotic demethylation compared to the Mariana trench.

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