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Mass independent mercury isotope fractionation in tropical, and Arctic food webs.

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Recently, mass independent mercury isotope fractionation (MIF) was observed in natural fish tissues from temperate climate zones [1]. The same study showed experimental net photoreduction of Hg species by fulvic acids under quasi-environmental conditions to be a plausible mechanism for inducing MIF. Here we investigate biological tissues, including bird eggs, fish and human hair from tropical and Arctic environments. Mercury (Hg) stable isotope ratios were determined by cold vapor - MC-ICPMS, using NIST 997 Tl and NIST 3133 Hg as internal and external standards respectively.

Bird eggs from common and thick-billed murre species were collected in the Gulf of Alaska, Bering Sea and Chuckchi Sea, under the Sea Tissue Archival and Monitoring Project (STAMP). Both the δ^{202}Hg and Δ^{201}Hg (and Δ^{199}Hg) anomalies in eggs correlate with egg Hg concentrations and with each other. Average Δ^{201}Hg and Δ^{199}Hg anomalies also correlate positively with latitude and Δ^{199}Hg/Δ^{201}Hg ratios average 1.19 at all sites. This suggests that MIF partly originates in methylmercury dominated photoreduction taking place in the waters surrounding the bird colonies. All colonies define δ^{202}Hg vs. Δ^{201}Hg trends with the same slope of 0.26, suggesting that species-specific biochemical reactions also contribute to MIF.

Piranha and Pellona fish species, as well as human hair from indigenous, fish-eating,

communities were collected in the Andean piedmont of Bolivia. Whereas average δ^{202}Hg increases from -0.55‰ in fish to to +1.16‰ in human hair, Δ^{199}Hg anomalies are similar at +0.18‰ and +0.17‰ suggesting that MDF accompanies bioaccumulation. Both case studies will be compared and used to illustrate that the ensemble of mercury MDF and MIF may serve as proxies for photic zone photochemistry, and bioaccumulation processes.

.[1] B.A. Bergquist, J.D. Blum, Science 318(2007) 417-420.