Mercury isotopes fractionation in the Alaskan marine envIronment along an Arctic/subArctic transect

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Mercury is a globally distributed and highly toxic pollutant. Despite modest local sources of pollution, high latitude regions serve as a global sink for mercury that is transported atmospherically. Although mercury represents a proven health risk, its sources and much of its natural cycle, propagation and dynamics are not well known. Egg samples from two alcid seabird species (common and thick-billed murres) were collected at six colonies along the Alaskan Arctic/subArctic interface, from the North Pacific Ocean (Gulf of Alaska) to the Arctic Ocean (Chukchi Sea). Mercury (Hg) stable isotope ratios were determined in egg samples by cold vapor - MC-ICPMS, using NIST 997 Tl and NIST 3133 Hg as internal and external standards respectively. All samples were also analyzed for $\delta^{13}C$ and $\delta^{15}N$.

At each colony, $\delta^{202}Hg$ and $\Delta^{199}Hg$ (and $\Delta^{201}Hg$) anomalies in eggs correlated with egg Hg concentrations and with each other. Average $\Delta^{199}Hg$ anomalies also correlated negatively with increasing latitude with two distinct reservoirs in the North Pacific Ocean and in the Arctic Ocean respectively. $\Delta^{199}Hg/\Delta^{201}Hg$ ratios (averaging 1.19 at all sites) suggested the possible influence of methylmercury photoreduction [1] with the combined influence of the sea ice. The intracolony $\delta^{202}Hg$ vs. $v^{199}Hg$ trend systematically displayed a slope of 0.26, which in parallel with $\delta^{13}C$ and $\delta^{15}N$ fractionation patterns suggested that both biochemical reactions and foraging behaviors could contribute to Hg mass-dependent (MDF) and mass-independent fractionation (MIF) at the colony level. Statistical analysis clearly illustrated that regional food web structure assemblages and seabird foraging behaviors (estimated from $\delta^{15}N$) were responsible for Hg MDF variations between the Gulf of Alaska, the Bering Sea and the Chukchi Sea regions.

[1] Bergquist & Blum (2007) *Science* **318**, 417-420.

Ventilation of the Arctic Ocean since the Miocene: Osmium evidence

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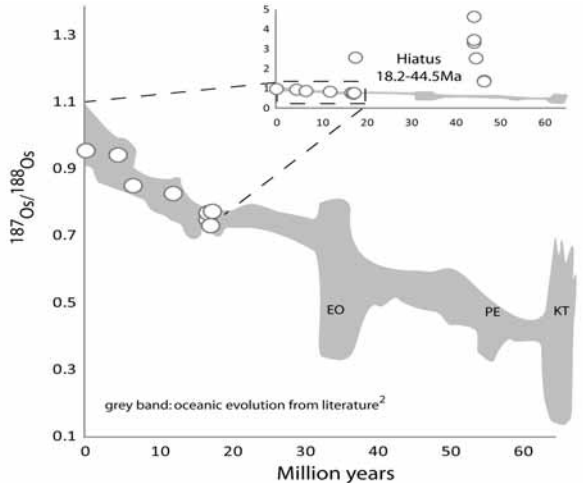
The Arctic Ocean has been a critical component of the Earth's climate system, especially since it has contributed to global thermohaline circulation. The sedimentary record that was retrieved from the Lomonosov Ridge during the Arctic Coring EXpedition (ACEX) in 2004 allowed to put time constraints on that specific moment[1].

Measurements of osmium isotopes in the Lomonosov cores revealed highly radiogenic compositions ($^{187}Os/^{188}Os$ = up to 4.6) and elevated concentrations (up to 1.3 ng/g) for both the Eocene and mid-Miocene epochs. These data coincides with the C_{org}-rich part of the core and are typical of radiogenic continental crust inputs during the 'lake stage' phase in the bassin. Since ~17.5 Ma, concentrations of Os decreased to values ranging 50-90 pg/g, whereas $^{187}Os/^{188}Os$ isotopic ratios follow closely those recorded in sediments from other oceans[2], rising from ~ 0.75 at early Miocene to about 1 for the late Pleistocene (fig. 1).

These preliminary data confirm the onset of a fair ventilation of the Arctic bassin since the early Miocene, as proposed by Jakobsson *et al.* (2006).



[1] Jakobsson *et al.* (2006) *Nature* **447**, 986-990. [2] Peucker-Ehrenbrink & Ravizza *Terra Nova* **12**, 205-219.