



Variations in the osmium isotopes record during the Azolla phase (IODP Expedition 302)

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We report on a reconstruction of the seawater $^{187}\text{Os}/^{188}\text{Os}$ ratios in organic-rich and anoxic sediments of the Lomonosov Ridge (IODP Expedition 302) from the Azolla event (49.3-48.1Ma) [1] and compare it with a newly reconstructed $^{187}\text{Os}/^{188}\text{Os}$ record from an open ocean site (ODP Site 1263). The Azolla phase is a stratigraphic marker in the Arctic and surroundings seas and indicates strong salinity-stratification and limited exchange with the open ocean. If we assume that the Os isotopic composition of the Arctic Ocean is homogeneous and represents a mixture of unradiogenic dissolved Os from hydrothermal and extraterrestrial ($^{187}\text{Os}/^{188}\text{Os} \sim 0.13$) and radiogenic from continental sources ($^{187}\text{Os}/^{188}\text{Os} \sim 1.4$), the Re-Os isotope system can be used as a proxy to estimate the ventilation of the Arctic Ocean. We have measured Os and Re using both bulk fusion-leachates and Carius Tubes digestion methods to calculate the initial $^{187}\text{Os}/^{188}\text{Os}$ and compare methods. Significant authigenic enrichment of Re-Os suggests that these organic-rich sediments have the potential to record the Os isotopic composition of the Middle Eocene Arctic Sea. Measured $^{187}\text{Os}/^{188}\text{Os}$ ratios range from 1.2 to 1.6. This is indicative of significant in-situ decay of ^{187}Re to ^{187}Os . During the Azolla time interval where multiple analyses yield initial $^{187}\text{Os}/^{188}\text{Os}$ close to 0.8, with two post-Azolla samples yielding values as high as 1.2. These ratios are significantly larger than contemporaneous values of seawater $^{187}\text{Os}/^{188}\text{Os}$ ratios measured in Site 1263 (0.45-0.5). Thus we interpret these data as supportive of a highly restricted Arctic Ocean at this time.

[1] Brinkhuis, H., et al. (2006), *Nature*, 441, 606– 609. [2] Stein, R., B. et al., (2006), *Geophys. Res. Lett.*, 33, L18606, doi:10.1029/2006GL026776.[3] Backman, J., et al., (2008), *Paleoceanography*, 23, PA1S03, doi:10.1029/2007PA001476.