Mercury stable isotopic variations in Arctic Ocean pelagic sediment

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Mercury isotopic compositions were measured in 14 samples of Arctic Ocean pelagic sediment from three sites: Lomonosov Ridge, Yermak Plateau and Mendeleev Ridge. Holocene-age sediment from 4 piston cores shows highly negative and variable mass dependent isotopic fractionation (δ^{202}Hg = -1.06 to -2.98; +/-0.15‰). Surface sediment at two localities (Lomonosov Ridge and Yermak Plateau) shows small deviations from mass dependence recorded as Δ^{201}Hg = -0.11 to -0.14 (+/-0.10‰). In piston core 96/12-1pc (Lomonosov Ridge; 1003 m water depth; 87°05.9'N; 144°46.4'E), δ^{202}Hg appears to decrease with depth in the core from surface (δ^{202}Hg = -2.22) down to MIS 5.3 (~100 ka; 2 meters depth; δ^{202}Hg = -2.98). Mercury concentrations (~3 ppb to 114 ppb) are not well correlated with Hg isotopic composition, and neither of these parameters appears to be correlated with the Mn-rich/Mn-poor cyclic banding in core 96/12-1pc, which is thought to record variations in Quaternary ventilation and/or ice conditions of the Arctic Ocean. Overall, the sediment Hg isotopic compositions likely reflect a variable provenance signal of mixed terrestrial and atmospheric Hg reservoirs supplying the Arctic Ocean. The enhanced negative Δ^{201}Hg signature in the modern Arctic sediments could be due to the influence of anthropogenic Hg from coal combustion, or from enhanced photochemical reduction and loss of Hg from modern Arctic surface waters due to reduced sea-ice cover.

Sulfate reduction and microbial abundance in saline, alkaline Lake Van (Turkey)

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Lake Van is the fourth lagest terminal lake in the world. It is located on the Eastern Anatolia High Plateau (Turkey) and surrounded by two semi-active vulcanos (Nemruth Dagi and Syphan Dagi). Evaporation processes, chemical weathering of vulcanic rocks and hydrothermal activity have created an environment of extreme alkalinity (155 m eql^{-1}, pH 9.81) and salinity (21.4 ‰) [1]. Kempe and Degens [2] proposed an ancient Ocean with high alkalinity, a high pH and low Ca and Mg concentrations, analogous to modern soda lakes like Lake Van. This theory was and still is discussed controversly, e.g. Hardie [3] suggested that the post-Hadean ocean was never a soda ocean but instead a neutral-halide ocean. Recently, Shibuya *et al*. reportet evidence for high alkaline fluids in an Archean subseafloor hydrothermal system resultling in reactive mixing zones between alkaline fluids and neutral seawater [4]. A detailed study of the currently ongoing microbial processes in Lake Van may provide the information necessary to interpret the signals from fossil ecosystems. Independent from the different opinions about early Ocean chemistry, this study explores an ecosystem that deviates considerably from typical freshwater or marine systems with regard to porewater chemistry and biogeochemical processes.

We here report the first results from microbiological investigations (porewater chemistry, cell abundance and sulfate reduction rates) in samples from two sites (Northern Basin and Ahlat Ridge) at Lake Van, retrieved during the ICDP drilling campaing in summer 2010. Although located in relatively close proximity (7 km) sulfate reduction rates reveal unexpected differences between the two sites, indicating a high sensitivity of microbial activity to changes in hydrological conditions and organic matter input. Overall cell abundances deviate considerably from what is commonly observed in marine sediments.

[1] Kempe *et al*. (1991), *Nature* **349**, 605-608. [2] Kempe and Degens (1985), *Chem. Geol*. **53**, 95-108. [3] Hardie (2003), *Geology* **31**, 785-788. [4] Shibuya *et al*. (2010) *Precambrian Res*. **182**, 230-238.