Os-isotope constraints on the origin of Lena Trough peridotites, Arctic Ocean: Asthenospheric mantle or continental lithosphere?

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The Lena Trough is a highly oblique spreading center located at the smallest distance between North America and Eurasia in the Arctic basin. Effective half-spreading rates are very low, ~3.8 mm/yr, and the trough is almost completely amagmatic. Two hypotheses have been proposed to account for the nearly amagmatic nature of the Lena Trough. At slow spreading rates, conductive cooling may replenish oceanic lithosphere, producing a thick cap to the adiabatic melting column and lower melt production and extraction (c.f., [1]). Alternatively, Lena Trough peridotites could derive from continental lithospheric mantle that was unroofed during separation of North America and Eurasia, consistent with anomalous Na enrichments in clinopyroxenes from Lena Trough peridotites [2]. Similar enrichments are common in metasomatised continental lithosphere peridotites.

We have examined Os-isotope variations in Lena Trough peridotites to test these competing hypotheses. Abyssal peridotites, which derive from the convecting upper mantle, span a well-defined range in Os-isotopes, with $^{187}Os/^{188}Os$ values ranging from ~0.118 up to ~0.130 (Ave. = 0.1246). In contrast, continental peridotites that record ancient melt depletion extend to much less radiogenic Os-isotopes (< 0.120), reflecting long-term Re depletion. Os-isotopes in the Lena Trough peridotites are similar to abyssal peridotites, with $^{187}Os/^{188}Os$ ranging from ~0.120 to 0.126 (Ave.= 0.1252). Although the Lena Trough samples include highly refractory compositions with bulk Al_2O_3 < 1 wt.%, no evidence for ancient melt depletion is recorded in the Lena Trough peridotites. Thus, the Os-isotope data support interpretation of the Lena Trough as an ultra-slow oceanic spreading center, and not an ocean/continent transitional boundary. The melt depletion and metasomatic history of Lena Trough peridotites therefore provides new constraints on processes of melt generation and extraction at ultra-slow ridges.

[1] Montési & Behn (2007) *Geophys. Res. Lett.* **34**, L24307.
[2] Hellebrand & Snow (2003) *Earth Planet. Sci. Lett.* **216**, 283-299.

Bio-mediated and abiotic dolomite formation in saline lakes of the northern Great Plains of Canada

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Dolomite formation and dolomitization in the sedimentary realm are subjects of long-standing interest and study. Probably no other mineral or sedimentary rock has attracted as much speculation regarding its origin and genesis as dolomite. The northern Great Plains region of western Canada contains most of the reported occurrences of modern/Holocene non-detrital lacustrine dolomite in North America. Although the lacustrine systems of the NGP are generally regarded as being dominated by Na and SO_4 ions, dolomite is found in basins having a wide spectrum of geochemical characteristics, from highly productive hypersaline playas to hyposaline perennial basins. The dolomite is typically fine grained, poor to well ordered, and non-stoichiometric. Both Ca-rich and Mg-rich varieties occur. It is most often found as part of a complex mixture with other endogenic carbonates (e.g., aragonite, Mg-calcite, monohydrocalcite, hydromagesite) and detrital clays, however in some lakes $CaMg(CO_3)_2$ also occurs in discrete beds and laminae contained in sediments or in nearshore microbialites.

The origin of dolomite in Manito Lake is complex, with clear evidence of both biogenic (most likely the product of cyanobacteria processes as well as trapping and binding) and primary inorganic precipitation forming isopachous cements in consolidated siliciclastic shoreline sediments (Fig. 1).

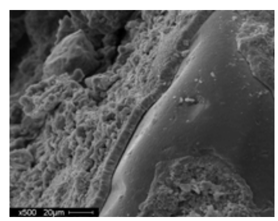

Figure 1: Dolomite cemented sand from Manito Lake.

In contrast, dolomite in Freefight, Waldsea, and Deadmoose lakes is most likely associated with sulfate reduction processes, whereas Manitoba and Chappice Lake dolomite is probably generated by mainly inorganic mechanisms. The composition and occurrence of the dolomite in these lacustrine basins provide important insight into the evolution of the lake waters and the paleoenvironmental implications of these changes.