Late Pleistocene and Early Holocene variability in organic matter sources in Lake El'gygytgyn, NE Siberia

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Lake El'gygytgyn is a 3.6 Ma old impact crater lake located in central Chukota, NE Siberia and has now become the major focus of multi-disciplinary drilling program to study the climate history of the Arctic. Sediment cores recovered as pilot work from the central part of the lake in 1998 and 2003, comprise the last ~250 ka BP and thus probably represent the longest continuous terrestrial record of Arctic climate change. The results of this research will contribute to protocols for multinational teams of scientists to investigate more than 400 m of sediment expected to record climate change over the past 3.6 Ma.

Organic biomarkers representing four lipid classes (saturated hydrocarbons, ketones, alcohols and sterols, and free fatty acids) were isolated from selected depths in the core. Depths represent extreme environmental conditions (e.g. Early Holocene warmth and cold and dry conditions of the Last Glacial Maximum, LGM) determined from previous bulk sedimentary and inorganic geochemistry (Melles *et al*., 2007; Minyuk *et al*., 2007). The suite of *n*-alkanes recovered reflect a combination of autochthonous production and terrestrial plant input. Indices such as OEP and TAR consistently point to enhanced delivery of terrestrial OM during warm, wet conditions. In contrast, cold phases show diminished terrestrial input compared to aquatic production, likely controlled by perennial ice cover and water column stratification. Additionally, a suite of complex branched alkanes are observed within the LGM samples, yet their identification and source remain to be determined. A wide suite of sterols were also identified including cholesterol, cholestanol, stigmasterol and sigmasterol, consistent with Hanisch *et al*., 2004. Differences are observed between the LGM and interglacial intervals among low molecular weight alcohols, such as n-alcohols, and higher molecular weight sterols and other cyclic and acyclic isoprenoids. These preliminary results suggest complex interactions between OM sources and productivity, seasonal ice cover and regional climate.

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Subduction erosion of lower continental crust: A mechanism to produce chemical mantle heterogeneities

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Sr-Nd-Pb-Hf-Os isotope and trace elements data suggest that the lower continental crust (LCC) may be part of the so-called enriched mantle (EM) sources (Kamenetsky 2001; Escrig, 2004; Hanan , 2004; Lustrino, 2005; Willbold, 2006). The mechanism(s) that transport LCC material into the mantle, however, remain enigmatic. Delamination and foundering of LCC during continental break-up are the mechanisms suggested most often, but may only lead to shallow-level contamination of upper mantle sources (Escrig., 2004; Hanan, 2004). Moreover, isotopic and trace element constraints on EM–type ocean island basalts require upper and lower crustal material to be mixed with ancient subduction-modified oceanic lithosphere previous to incorporation of the recycled material in OIB sources (Willbold, 2006). Subcontinental lithosphere is chemically buoyant and lower crustal signatures are generally not accompanied by the characteristic Hf and Os signatures expected for the subcontinental lithosphere. These observations provide a major obstacle for delamination processes. Erosion and subsequent subduction of overlying lower arc-crust at erosive plate margins (Clift, 2004; von Huene, 2004), on the other hand, is a suitable and straight-forward physical mechanism for creating blends of the lower and upper continental crust (i.e., as sediments) and for recycling them, together with the subducted oceanic lithosphere, into the deeper mantle. Subduction erosion may thus be one of the principal mechanisms involved in generating EM sources and may also have important implications for the compositional evolution of the Earth's mantle-crust system in general.

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