

Compound-specific hydrogen isotopes of lipid biomarkers reveal paleoclimatic changes in Lake El'gygytyn, NE Russia

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Lake El'gygytyn is a 3.6 Ma old impact crater lake located in central Chukota, NE Russia 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 2003, comprise the last ~250 ka BP and thus probably represent the longest continuous terrestrial record of Arctic climate change. Analysis of the deuterium/hydrogen isotopic ratio of specific organic biomarkers allows reconstruction of the isotopic composition of past precipitation thereby providing a powerful tool for reconstructing past terrestrial Arctic climate changes. Preliminary δD measurements of terrestrial plant leaf waxes (C27 – C31 n-alkanes) from Lake El'gygytyn sediments show significant variation (~ 40 ‰) between glacial-interglacial intervals as well as variation on centennial timescales (~200 yr resolution). The most negative δD_{wax} values (~ -282‰) occur during the Last Glacial Maximum and increase to the most enriched values (~ -240‰) during the Early Holocene. These results suggest that variability in δD_{wax} primarily reflects large-scale processes associated with changes in global sea level and increased continentality as well as decreased temperatures during the Last Glacial Maximum. Additional δD measurements of short (aquatic) and long chain (terrestrial) fatty acids are underway and will allow more detailed assessment of paleohydrological changes on millennial timescales.