



Climate and environmental history recorded in a ~240 ka permafrost profile in NE-Siberia

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High northern latitude regions play an important role for the global climate system, because (i) orbital changes in insolation and albedo feedbacks there are thought to be responsible for the succession of glacials and interglacials during the Quaternary (Milankovitch Theory), and (ii) arctic peatlands affect the carbon cycle by build-up of organic-rich permafrost soils ('yedoma') and emission of methane and carbon dioxide upon warming and mineralization, respectively. Here, we present new results from a ~240 ka permafrost profile in NE-Siberia, including lipid analyses (GDGTs) and compound-specific deuterium measurements on alkanes and fatty acids. The results (1) demonstrate the enormous potential of applying the above innovative analytical tools in loess/paleosol sequences for quantitative paleoclimate reconstruction, and (2) corroborate that large amounts of carbon were sequestered in yedoma during cold periods. Building also on our previous geochemical and palynological work, we can now draw a nearly continuous picture of the NE-Siberian climate and environmental history over the last two glacial cycles. Two findings are particularly interesting: Firstly, the Holocene is apparently a poor analogue for the conditions during the last interglacial (the Eemian), which was probably significantly warmer than today, and secondly, the last glacial (MIS 4-2) was not a good analogue for the penultimate glacial (MIS 6). The cold conditions during MIS 6 were not a limiting factor for tree growth. During the course of the last glacial a pronounced aridization trend was responsible for both the expansion of the dry 'mammoth steppe' and successively more restricted glacier extents in Siberia.