Sokli: a hotspot for climate change research in the North Atlantic region

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Results from a decade of intensive studies at Sokli (NE Finland) have drastically changed classic ideas of glaciations, vegetation and climate in northern Europe during the Late Pleistocene. Sediments with age up to 130 kyr have been preserved in their original stratigraphic position in a deep hole formed in the strongly weathered rocks of the Sokli Carbonatite Massif. This unique preservation of Late Quaternary sediments stands in sharp contrast to earlier studies which were mostly based on the long-distance correlation of highly fragmented and poorly dated stratigraphic evidence. Furthermore, the unusual thickness of the warm stage deposits in the Sokli basin, and the fossil-richness of the sediments, allow for high-resolution, multi-proxy based paleoenvironmental reconstructions.

So far, sediments dated to MIS 5d-c (at ca. 110-90 kyr BP), early MIS 3 (around ca. 50 kyr BP), and the Holocene (last 11 kyr) have been studied in detail, while analyses are ongoing on thick MIS 5e (ca. 130-115 kyr BP) and MIS 5a (ca. 85-75 kyr BP) deposits in the Sokli basin. In collaboration with a group of international scientists, a multitude of proxies are analysed (geobiochemical data, pollen, macrofossils, chironomids, diatoms), detailed multi-proxy comparisons are made, and climate parameters are reconstructed quantitatively using both the transfer function approach and indicator plant species.

Our data from Sokli reveals a highly dynamic Fennoscandian Ice Sheet, with ice-free conditions and present-day summer temperatures at Sokli, during early MIS 3. These conditions contrast sharply with earlier reconstructions that assumed ice-cover over major part of Fennoscandia during this time period. Additionally, Sokli records strong continental climate conditions, instead of glaciation, for MIS 5d, and boreal interglacial conditions, instead of arctic conditions, for MIS 5c.