Geophysical Research Abstracts
Vol. 16, EGU2014-10543, 2014
EGU General Assembly 2014

Russian Arctic climate change in the Late Holocene – spatial and seasonal aspects from studying North Siberian glacier and ground ice

Thomas Opel (1), Hanno Meyer (1), Diedrich Fritzsche (1), Thomas Laepple (1), and Alexander Dereviagin (2)

(1) Alfred Wegener Institute Helmholtz Centre for Polar and Marine Research, Department of Periglacial Research, Potsdam, Germany (thomas.opel@awi.de), (2) Moscow State University, Faculty of Geology, Moscow, Russia

The Arctic currently experiences a pronounced warming. This highly dynamic response on changes in climate forcing and corresponding feedbacks and the global impact of the Arctic water, carbon and energy balance make the Arctic a key region to study past and future climate changes. Recent proxy-based Arctic-wide temperature reconstructions for the past two millennia show a long-term cooling trend that has been reversed by the ongoing Arctic warming. However, most records are based on proxies that record summer information and the reconstructions are, thus, assumed to be seasonally biased. Moreover, there exist only a few records from the Russian Arctic. Consequently, this region is significantly underrepresented in Arctic-wide reconstructions and a comprehensive picture of Arctic climate variability is challenging.

Here we present glacier and ground ice records from the Russian Arctic that are related to the research project "Eurasian Arctic Ice 4k" funded by the German Research Foundation. They add valuable information for a better spatial and seasonal understanding of Holocene climate variability in the Arctic.

The high-resolution Akademii Nauk δ18O ice core record (Severnaya Zemlya) proves the Late Holocene cooling trend and the unprecedented warming after 1800. It shows neither a pronounced Medieval Climate Anomaly nor a Little Ice Age but gives evidence of several abrupt warming and cooling events in the last centuries. These are probably related to the internal variability of the Arctic climate system, i.e. atmosphere-sea ice feedbacks in the Barents and Kara seas region.

Ice wedges were studied at several study sites in the Lena River Delta and the coastal permafrost lowlands of the Laptev Sea region. They are formed by the repeated filling of wintertime thermal contraction cracks by snow melt water in spring. Radiocarbon dating of organic matter enables the generation of centennial scale δ18O records that are indicative of climate conditions in the cold period of the year.

Our single-ice wedge and stacked records show general increasing trends over the Mid and Late Holocene and an unprecedented warming in recent times. Both may be related to the increases in solar insolation during the cold season as well as in greenhouse gas concentrations over the last millennia. However, this pattern is in contradiction to most other Arctic temperature records that, in turn, are likely summer-biased. Our ice-wedge records add therefore unique and substantial climate information for understanding the seasonal patterns of Holocene climate in the Arctic.