Geophysical Research Abstracts
Vol. 17, EGU2015-10486, 2015
EGU General Assembly 2015

Reconstructing Climate Change Since The Late Glacial At Amsterdamøya, NW Svalbard (80°N), Based On Lake Sediments From Lake Hakluytvatnet

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Records of past climatic changes are sparse and poorly resolved in the Arctic due to obvious reasons such as lack of dateable organic material and logistical challenges. Here, we present a new time series from the island of Amsterdamøya, NW Svalbard (80°N), based on lake sediments from Lake Hakluytvatnet. Located at the northernmost branch of the North Atlantic Current, this high-Arctic site is ideally placed to infer changes in past atmospheric and oceanic circulation patterns recorded as changes in precipitation and temperature.

Our novel data set provides a climatic reconstruction based on multi-proxy analyses on lake sediments from a non-glacial lake. We have combined one long piston core with a shorter gravity core to capture the entire sediment infill from the bottom of the basin to the most recently accumulated sediments on top. A robust chronology has been established for the cores through 28 AMS radiocarbon (14C) ages in combination with one lead (210Pb) profile of the most recent sediments, and this gives an unprecedented age control for a lake at this latitude as well as a precise sediment accumulation rate.

The Hakluytvatnet cores are analysed for physical sediment properties as well as newer scanning instruments (e.g. XRF scanning, Scanning Electron Microscope, SEM, analyses) in order to produce a high-resolution reconstruction of the climate development for the study site. A separate alkenone study will produce a high-resolution temperature curve for the area. Soil samples from the surrounding catchment have also been subject to geochemical analyses in order to distinguish between the relative influences of different sediment sources on sediment accumulation in the lake. Geomorphological mapping has been carried out to combine interpretation of the catchment development with the lake sediment record interpretation. Numerical analyses (e.g. Principal Component Analysis, PCA) are applied on the results from the lake sediment and catchment samples in order to constrain the different sediment contributions to the lake infill at different times throughout the Late Glacial and the Holocene.

The investigated sedimentary archive has recorded the last $\sim$ 13,000 years of climate change, and is the first terrestrial record going back to the Late Glacial at this site. According to older studies, the island of Amsterdamøya remained ice-free during the LGM. Our novel findings show that a glacier was present at the study site during the OD/YD. Our work also contributes with new data on the sea-level history for NW Svalbard based on geochemical indices from the lake sediments, results from the geomorphic mapping as well as from d13C results. Furthermore, the robust age chronology is of importance for high-Arctic studies as it can be used as basis for subsequent chronological work at NW Svalbard.