Geophysical Research Abstracts
Vol. 12, EGU2010-827, 2010
EGU General Assembly 2010

Holocene palaeoclimate and deglaciation of Sermilik Fjord, southeast Greenland

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The palaeoglaciology of the southeast sector of the Greenland Ice Sheet (GrIS) has received relatively little attention, and thus the ice margin history is poorly constrained in this climatically sensitive sector. As such, the extent of the GrIS throughout the Holocene is currently not fully understood, which is problematic for setting the dramatic changes of the last decade in a long-term context. Furthermore, the lack of knowledge of fjord-ice dynamics is one of the major sources of ice sheet-model uncertainty.

Sermilik Fjord, at ∼80 km long, is the largest in the southeast region of Greenland, and was the route of a major outlet glacier of the GrIS at the Last Glacial Maximum. Terrestrial Cosmogenic Nuclide (TCN) dating carried out on samples from a tributary valley off the main fjord implies that the mouth of the fjord was deglaciated by ∼11 ka BP (Roberts et al. 2008) but the timing of retreat throughout the Holocene is unknown. To fully understand the GrIS dynamics, it is necessary to link retreat patterns with palaeoclimatic data. Although ice-core data provides a comprehensive record of central Greenland temperature, the SE region has seen very little research using palaeoclimatic proxies at the coastal margins.

We report preliminary results and activities of our July 2009 field season to Sermilik Fjord. Following successful pollen reconstructions further north on the east coast of Greenland (Wagner & Melles, 2002), exploratory sediment cores were taken from isolation basins flanking Sermilik Fjord; preliminary results of climate-proxy micro-fossils are presented, suggesting scope for further study and palaeoclimatic reconstruction of the region. To improve the glacial chronology six sites were sampled for absolute TCN dating, using a mixture of point sampling and vertical transects in order to constrain the 3D retreat of ice. Sites were chosen to enable full coverage of the fjord, and with consideration of possible standstills and pinning points of the former glacier. Using paired bedrock-erratic 10Be analysis and additional 26Al analysis of selected samples, we will investigate possible multi-event ice histories of the fjord.