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Recent brownification of South Swedish lake waters – an effect of climate change or land use?

Petra Bragée1, Florence Mazier1, Peter Rosén2, Anna Broström1, Wilhelm Granéli3 and Dan Hammarlund1

A. Introduction
Dissolved organic carbon (DOC) content, especially terrestrial humic matter (DHM), and water colour of many lakes and streams have increased substantially during the last decades (Evans et al. 2004, Roulet and Moore 2006). Brownification not only reduces the quality of these waters as drinking water supplies and for recreational purposes, but lake biodiversity is also expected to be affected. The aim of this project is to evaluate the potential underlying causes of the recent brownification of South Swedish lakes. A multiproxy approach is applied (fig. 3.) for reconstruct on of the biogeochemical and biological changes within selected lakes, and the vegetation/land use changes within their catchments for the past c. 1000 years. Here we present the study area, main methods, preliminary results and links to Fredh et al. project.

B. Study sites

C. Methods
TOC concentration
Past changes in lake-water total organic carbon (TOC) concentration are based on near-infrared spectroscopy (NIRS) of the lake sediments. Recent studies have shown that NIRS of lake sediments exhibit good correlations with TOC concentrations of lake-water (Rosén 2005). The method utilizes the fact that the organic fraction of lake sediments has a distinctive NIR signal that can be summarized using multivariate statistical tools. New models for South Swedish lakes with TOC content variations up to 30 mg/l are in progress.

Chronology
Accurate chronologies will be based on radiocarbon dating. Core correlation is based on highly resolved proxy data.

Catchment vegetation
A novel modelling approach, the Landscape Reconstruction Algorithm (LRA), will be used to quantify catchment-scale vegetation changes based on pollen data. Past land cover in terms of absolute areas of different landscape units (forest, open land, pastures, cultivated areas, etc.) will be estimated (see also poster by Daniel Fredh et al.).

D. Preliminary results

Figure 4. Radiocarbon dates, NIRS inferred lake-water TOC concentration, magnetic susceptibility and preliminary pollen data from Lake Åboda plotted against depth below the water surface.

E. Next steps
• Establish an accurate chronology.
• Apply the same approach and methods for the sediment sequence from Lake Lindhultsgölen.
• Quantitative vegetation reconstructions using the LRA modelling.
• Sample the lakes with a freezecorer to enable continuous and more highly resolved subsampling.
• The flagellate Gonyostomum semen (fig. 5.) is an invasive algae which is favoured by increased lake water DHM content (Cronberg et al 1988). If its resting cysts can be found in the lake sediments, information about its occurrence and its connection to different changes in the lake, TOC concentration for example, might be evaluated.

References