Title: Development of lacustrine biomarkers to reconstruct Late Holocene temperature change in the Saskatchewan Great Plains.

Authors: Bianca Cavazzin[1], Mike Zwick[1], Heather Haig[2], Peter Leavitt[2], Stephen Juggins[3], Emma Pearson[3], Stefan Schouten, Jaime Toney[1]

1. Geographical and Earth Sciences, University of Glasgow, UK
2. Institute of Environmental Change and Society, University of Regina, Canada
3. Geography, Politics, and Sociology, Newcastle University, UK
4. Marine Microbiology and Biogeochemistry, NIOZ, Netherlands

Abstract:

Extreme hydrological events such as prolonged droughts and seasonal floods are among Canada's costliest natural calamities resulting in disastrous impacts on agriculture, forestry, industry, and ecosystems. Investigations into climate variations prior to significant anthropogenic modification are essential to build effective projection models and adaptation strategies needed to reduce economic, social and environmental vulnerability within the prairies eco-region.

In this study, we use organic geochemical analysis of lipids produced by bacteria, archaea, and algae in a suite of 105 lakes in Saskatchewan. In particular, we focus on Glycerol Dialkyl Glycerol Tetraethers (GDGT) and long-chain diol biomarkers. GDGTs are ubiquitous in soils and lacustrine environments and have been shown to provide a quantitative temperature proxy in many regions. By contrast, our analyses of the relationships among individual GDGTs with temperature, pH, conductivity, water depth and other environmental variables show that in the Canadian prairies these are better suited as a proxy for salinity. Six of the 31 GDGT isomers that we identified show a strong correlation to salinity and are used to create a preliminary calibration.

We also report our initial findings of the distribution of algal-derived, long-chain diols and provide insights into their presence and absence, as well as their correlation with our training set that includes data from core-top sediments from 105 lakes across spanning a 5° latitudinal gradient and a spring surface water temperature gradient of about 9°C.