Recording high-resolution changes in temperature and hydrology from the Canadian Prairie

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Background: The interior of Canada is a drought-prone region that is reliant on grain and livestock production. The region is characterized by large changes in seasonal temperatures (~35.6C) and relatively low rainfall (36.4cm/yr). Little is known about the past temperatures in this region before the human instrumental measurements that go back about 100 years. However, extreme temperature and hydrologic variability historically have had large economic consequences for the region. For example, sustained droughts, such as the Dust Bowl Drought during the 1930s left crops destroyed and witnessed farming income losses >$300 million (USD). Similarly, large-scale flood events also cause damages, such as the flooding in 1955 that caused over $360 million (CAD) in damages. Contrary to the typical summer dry season that occurs annually here, the driest part of the Dust Bowl Drought (1936 AD) experienced one of the coldest years on record. The global climate mechanism for this and other major droughts (i.e., 1978 and 1996 AD) and floods are still not fully understood.

Aim: The aim of this project is use multiproxy biomarker evidence of past environmental changes over the last ~10,000 years to characterize known climatic events such as the 8.2 event, Holocene thermal optimum, the Medieval Warm Period (~900-1200 AD), the Little Ice Age (~1500-1800 AD), and the Dust Bowl Drought (1930's AD) to determine the links between these events and to global climate drivers.

Project Outline: Significantly, this project is funded by the European Research Council Starting grant 'ALKENoNE – Algal Lipids, the Key to Earth Now and aNcient Earth', so emphasis will be placed on developing high-resolution, quantitative temperature records from this region using alkenone paleothermometry. The PhD student will be supervised by Dr. Jaime L. Toney the leader of the Biomarkers for Environmental and Climate Science (BECS) research group at the University of Glasgow, which is a growing, international team of post-doctoral, PhD and Masters students working to develop exciting new records and create new knowledge around the mechanisms and links

between changing climate and associated environmental responses.

The PhD student on this project will assist in developing a novel lake biomarker as a temperature proxy derived from haptophyte algal biomarkers, namely alkenones. He/she will apply the proxy and other biomarker proxies to down core sediment records from this climatically sensitive region. The research team is currently investigating a number of biomarkers from a suite of 109 lakes across the Canadian prairie in Saskatchewan that spans a 5° latitudinal gradient and spring surface water temperature gradient of about 9°C.

Successful candidates will be expected to participate in rigorous fieldwork, spend a considerable amount of time in the laboratory, and be capable of coordinating collaborative links with projects partners, such as Professor Peter Leavitt (University of Regina), as well as with colleagues in Italy, Japan and the UK.

Qualifications: Holding a Masters degree or having evidence of taking a research project from start to completion, are not required, but will be among the selection criteria for this post. Other desired, but not required attributes for successful candidates include demonstrable: research experience, scientific writing experience, paleoclimate understanding, understanding of chemistry (particularly organic chemistry), time-series analysis, statistical analysis. Opportunities for training will be provided during the course of the PhD in the skills above, but also in relevant instrumentation and laboratory techniques, as well as, transferable skills, such as leadership, conference, networking, grant writing, and CV development skills.

Application procedure: Funding is available to cover tuition fees for one UK or EU applicant, as well as paying a stipend at the Research Council rate (£14,057 for Session 2015-2016). For entry in 2016 apply via the website of the College of Science and Engineering, and the deadline for applications for a College scholarship will be in late January 2016. Please contact the principal supervisor with any questions (Jaime.Toney@glasgow.ac.uk).

Note, that additional information on applying for a PhD in the School of Geographical and Earth Science and a list of projects can be found at the following link: http://www.gla.ac.uk/schools/ges/research/postgraduate/#/.