

PROJECT TITLE: Reconstructing past temperatures from the terrestrial Southern Hemisphere over the last 20,000 years

DTP Research Theme(s): Living World, Changing Planet

Lead Institution: University of Bristol

Lead Supervisor: Dr B.D.A. Naafs, University of Bristol, School of Chemistry

Co-Supervisor: Dr A. Gallego-Sala, University of Exeter, School of Geography

Co-Supervisor: Dr S.J. Roberts, British Antarctic Survey, Palaeo Environments, Ice Sheets and Climate Change Team

Project Enquiries: david.naafs@bristol.ac.uk

Project keywords: Climate change, peat, organic geochemistry, paleoclimate, biomarker, Antarctic, terrestrial, temperature, deglaciation, Holocene, GDGT

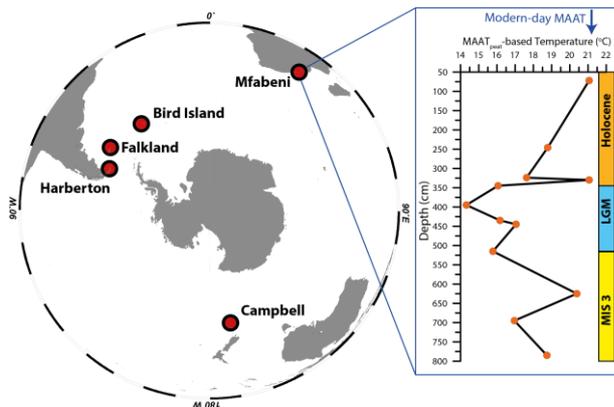


Image Caption: Location of peatlands that will be used in this study together with low-resolution pilot data from the Mfabeni peat, SA.

Image Caption: Peatland in the sub Antarctic, similar to those peatlands used in this project.

Project Background

By studying climate in the past, scientists can understand the natural processes and mechanisms that operate in Earth's system. This is needed to accurately predict human impact on future climate. Although the terrestrial realm (where we humans live) is a crucial part of Earth's system, key-dynamics such as past terrestrial temperatures are poorly constrained in some globally-important regions, such as the mid/high-latitude Southern Hemisphere. This project will address this major gap by quantifying terrestrial temperature around the Southern Ocean across a key-climate transition of Earth's past: the last deglaciation and Holocene (last 20,000 years)

You will use state-of-the-art biomarker methods developed by the supervising team to answer long-standing and exciting questions regarding how terrestrial temperatures varied in the past and identify the processes that drove these changes. Ultimately, the results from this research will allow for a better assessment of how the terrestrial realm may respond to future climate change.

Project Aims and Methods

The main research question you will address is: How did terrestrial temperatures in the environmentally sensitive mid/high-latitude Southern Hemisphere evolve during the deglaciation? For this purpose, you will apply biomarker proxies to continuous peat records from the mid/latitude Southern Hemisphere that reach into the deglaciation (Fig. 1 & 2). More specifically, you will learn how to use, and further develop the brGDGT-paleothermometer, for which peat-specific calibrations were recently developed by the project supervisor (Naafs et al., 2017). This proxy is based on more than 15 years of research that shows that the distribution of brGDGTs (membrane lipids produced by bacteria) depends on temperature. The biomarker records you will generate will be combined with other proxy evidence (e.g. pollen, stable isotopes, etc), generated by the research groups of the co-supervisors, to obtain a holistic understanding of terrestrial temperature change in the Southern Hemisphere during the last deglaciation.

There are many opportunities for you to develop specific aspects of the project based on your own interests and strength. This could include, for example, the possibility of fieldwork to the sub Antarctic region to sample new peatland environments, investigating seasonal and temperature driven changes in brGDGT distribution and abundance, and/or laboratory-based temperature incubation experiments. You will be based within the Organic Geochemistry Unit, University of Bristol, one of the oldest and most successful organic geochemistry groups in the world with decades of experience in paleoclimate research. In addition, you will benefit from existing collaborations between Bristol and Exeter and the British Antarctic Survey (BAS) to learn additional techniques/methods and develop a broad understanding of paleoclimate, the Antarctic, and peat research.

Candidate Requirements

The ideal candidate has a background in earth science, geography, and/or (geo)chemistry at MEdSci/MSc level, with a broad interest in paleoclimate research. We want to stress that (geo)chemistry experience is not obligatory.

Training

As part of this project you will be fully trained in: relevant organic geochemical techniques and concepts, Antarctic (paleo)climate, and peat research, and will learn to work with large datasets. There is the option to go on fieldwork to the sub Antarctic to retrieve new material, providing additional training in fieldwork, sampling, and develop key-leadership skills. In addition, you will receive a broad training on (academic) writing, project presentations, time management, and other transferable skills.

References / Background reading list

Naafs, B. D. A. *et al.* **Geochim. Cosmochim. Acta** 208, 285-301, (2017).

McGlone, M. S. *et al.* **Nat. Geosci.** 3, 622-626, (2010).

Zheng, Y. *et al.* **Geology** 45, 1031-1034, (2017).

Links:

School URL : <http://www.bristol.ac.uk/chemistry/courses/postgraduate/>

NERC GW4+ DTP Website: <http://nercgw4plus.ac.uk/>

Bristol NERC GW4+ DTP Prospectus:

<http://www.bristol.ac.uk/study/postgraduate/2019/doctoral/phd-great-western-four-dtp/>

Application deadline: 16:00 GMT, Monday 7 January 2019

How to apply to the University of Bristol:

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General Enquiries:

Bristol NERC GW4+ DTP Administrator

Email: bristol-nercgw4plusdtp-admin@bristol.ac.uk