

Microbial membrane fossils as tracers of methane oxidation in peats

Project reference IAP/I3/52. Please quote this reference when applying.

University of Glasgow, Geographical & Earth Sciences

In partnership with: Newcastle University, Civil Engineering & Geosciences

Supervisory Team

- **Dr. Jaime L. Toney, University of Glasgow**
<http://www.gla.ac.uk/schools/ges/staff/jaimetoney/>
- **Prof. David Graham, Newcastle University**
<http://www.ncl.ac.uk/ceg/staff/profile/david.graham/>
- **Prof. Susan Waldron, University of Glasgow**
<http://www.gla.ac.uk/schools/ges/staff/susanwaldron/>

Key Words

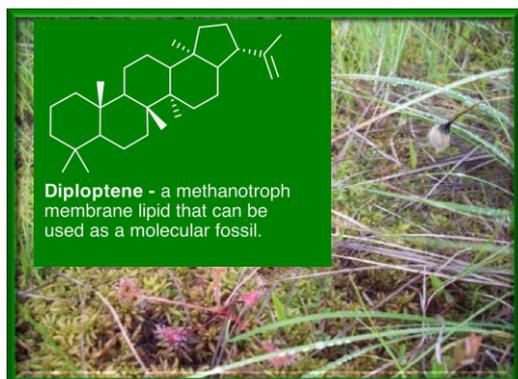
Methane, Palaeoclimate, Carbon Stable Isotopes, Peatlands, Organic Geochemistry

Overview

Methane (CH₄) is a greenhouse gas that is 25-times more potent than CO₂ at trapping heat at the Earth's surface. The largest natural source of CH₄ to the atmosphere is peatlands. Under projected climate change scenarios, peats are expected to increase their contribution to atmospheric CH₄. New work is urgently needed to understand processes that abate CH₄ emissions from peats. This project will focus on characterising, quantifying, and modelling the effect of CH₄ dynamics in peats on microbial biomarkers, communities and resident methanotrophic bacteria. This project aims to develop an applicable biomarker for aerobic methane oxidation in peat environments using study sites in Scotland, U.K. and samples from Svalbard, Norway.

Methodology

The PhD candidate will conduct field analyses in peatlands in Scotland to assess the effects of environmental variables and CH₄ efflux on biomarker structure, concentration, and carbon stable isotopic signatures, as well as, how microbial communities respond to the changing environment. The PhD candidate will measure *in situ* field parameters, employ cutting-edge biomarker techniques, and use environmental genomic analysis to understand the role of methanotrophs in abatement of CH₄ emissions in peatlands.





biogeochemistry, biomarker, and genomic techniques. Furthermore, the University of Glasgow provides a supportive environment with access to numerous career development opportunities, including: weekly workshops and seminars that provide training in oral presentations, manuscript writing and review, grant writing and more. Upon completion the candidate will be marketable for a wide range of job opportunities ranging from palaeoclimate research to engineering microbiology.

References & Further Reading

Textbook & Peer-reviewed Literature:

Echoes of Life – What fossil molecules reveal about Earth history. Gaines, Eglinton, and Rullkötter, 2009. Oxford Press. pp. 355

Kip et al. (2010) *Nature Geoscience*, doi:10.1038/ngeo939

Links:

Carbon Landscapes

<http://www.carbonlandscapes.co.uk>

Global Carbon Project

<http://www.globalcarbonproject.org/methanebudget/>

Timeline

First 18 months:

Field-intensive monitoring of *in situ* environmental parameters in Scottish peatlands and sample collection for subsequent laboratory analysis. Training in latest techniques in biomarker analysis in the [BECS](#) (Biomarkers for Environmental and Climate Science) research group.

Second 18 months:

Training and laboratory work be based partially at Newcastle University aimed at characterising methanotroph and methanogen abundances and diversity in Scottish peatland samples, and work-up of previously collected samples from Svalbard permafrost soils/peats. The PhD student will contrast field geochemical and biomarker data, and then assess the potential metagenomic assessment of selected sites. Work may extend to metagenomic sequencing techniques and functional gene analysis, depending on earlier results.

Final 6 months:

Analysis of data and compilation among various project parts. Write-up of papers and thesis.

Training & Skills

This project provides an excellent opportunity for interdisciplinary training of a PhD student in the latest

Further Information

Dr. Jaime L. Toney

School of Geographical and Earth Sciences

University of Glasgow

Email: Jaime.Toney@glasgow.ac.uk

Phone: +44 (0)141 330 6864