

Research Experience Placement (REP) Scheme Project

Project Supervisors:

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Host Organization and Department (if applicable):

Durham University, Department of Geography

Project Title:

Exploring the seasonality of carbon of global scale carbon mobilisation and deposition by wind from different source regions

Project Description:

An often overlooked component of the carbon cycle is redistribution of carbon by wind. Climate change and land degradation will likely alter the spatial distribution and magnitude of wind erosion (dust emissions), leading to changes in the distribution and amount of wind-driven mobilisation of carbon in dust. The extent and consequences of this disruption to the terrestrial carbon stock is largely unknown, yet may have important implications for climate change. Preliminary estimates indicate that wind can mobilise around 82 Tg of organic carbon and 29 Tg of inorganic carbon (Turnbull and Wainwright, 2021).

The aim of this project is to undertake detailed analyses to explore the seasonality of carbon of global scale carbon mobilisation and deposition by wind from different source regions, and the redistribution of carbon associated with different sediment size fractions. This work will involve a variety of research approaches including a meta-analysis of carbon mobilisation by wind and geospatial data analysis in R.

The findings from this project will help to constrain the role of wind-driven carbon redistribution in the carbon budgets of source and sink regions and should help to greatly improve our understanding of the importance of this process in different systems. This project will benefit from a student who is interested in potentially pursuing further research in this area, and who already has some experience of using R.

Skills and Career-Development Opportunities:

Through this project, the student will learn about the importance of wind-driven carbon mobilisation and deposition on carbon budgets, learn to undertake a meta-analysis of wind-driven carbon transport, and will become confident in geospatial data analysis in R.

Training will be delivered by the supervisors on geospatial data analysis in R as required, to ensure that the student can successfully undertake this project. We will encourage and support the student to write up this work in an academic publication and to present it at a conference, and will provide an opportunity for the student to apply for a PhD position through IAPETUS to develop this work further.

The student will have weekly meetings with the supervisory team to establish progress and planned work. The lead supervisor will be available for day-to-day supervision as required.

Wider context of research:

In addition to the student undertaking this research project, there will be opportunity for the student to be more widely involved in other research-related activities (e.g. seminars, reading groups and informal activities with academic staff and postgraduate students) through the Hazards and Surface Change research cluster within the Department of Geography and within the research groups of Turnbull-Lloyd and Wainwright.

Project Timeframe:

The duration of the project is 8 weeks. Proposed dates are 21st June – 8th August, but these dates can be modified to suit the availability of the student.

Week 1: Learning about factors that affect wind erosion, how global aerosol models deal with dust emissions and deposition, current understanding of carbon transport in dust and recent work by the supervisors on wind-driven carbon redistribution.

Week 2: Training in geospatial data analysis in R. Starting to explore the dust data that will underpin the research.

Weeks 3 – 6 Meta-analysis of carbon transport in dust (exploring enrichment of carbon in different particle-size fractions) and developing and running scripts in R for data analysis to explore carbon redistribution by wind on a seasonal basis and particle-size controls.

Weeks 7 – 8: Results interpretation, presentation to the research group and preparation of manuscript.