ONE Planet
Doctoral Training Partnership

Natural Environment Research Council

Project title: Role of turbidity currents in organic carbon transport to deep sea

Ref: OP2458

Keywords: organic carbon, turbidity currents, deep-sea, sedimentation

One Planet Research Theme:
Climate & Climate Change ☐ | Earth System Processes ☒ | Anthropocene ☐ | Environmental Informatics ☐

Lead Supervisor:
Dr. Sanem Acikalin, Newcastle University

Key Research Gaps and Questions:
- How much organic carbon is transported to deep sea and buried there?
- Does biofilm (EPS) form a significant part of the total organic carbon?
- Are turbidty currents key for nutrient and organic carbon transport to deep sea?

Project Description: Powerful seabed sediment flows called turbidity currents form the largest sediment accumulations, deepest canyons and longest channels on Earth. These flows transfer vast amounts of detrital sediment and organic carbon to deep sea. Burial of organic carbon (OC) in marine sediment is important as it forms the second-largest sink of atmospheric CO_2, and thus contributes to long-term regulation of climate. The type and the amount of OC varies and controlled by the frequency of submarine flows and the availability of different OC sources.

This project aims to understand *OC transport pathways* to deep-sea. *The study focuses on quantifying the various types of OC and their distribution in submarine canyons (Bute Inlet, Canada and Congo Submarine Canyon).* Alongside the other OC sources, we will particularly be focusing on a cohesive substance formed by microorganisms, called extracellular polymeric substance (EPS). Previous studies shows that EPS can makes up the 40% of total organic carbon transported to the deep sea (1). EPS is adhesive and hence facilitates clay flocculation, formation of clay-coated sand grains and binding of organic matter and nutrients to sediment (1,2).

The project will initially utilise sample sets collected on NERC funded Congo and Bute Inlet, cruises. More data collection and joining research cruises might be possible. Various sedimentological and biological analytical techniques (EPS quantification, grain size analysis, core logging, clay mineral identification, biomarker analysis) as well as statistics and quantitative modelling will be used during the data interpretation.
The candidate will join the wider UK and international researcher community of the submarine sediment transport. This will provide opportunity to develop excellent communication and team player skills. Academic and analytical skills will involve understanding of carbon cycle, sediment transport processes and climate modelling as well as organic geochemistry, core logging, and clay mineralogy.

Ref: (1) Craig, M., et al., 2020, Geology, 48, 1, p. 72-76; (2) Duteil, T., et al., 2020, Geology, 48, 10, pp. 1012-1017; (3) Baudin, F., et al., 2017, Deep-Sea Research Part II: Topical Studies in Oceanography, 142, pp. 75-9

Prerequisites: MSc degree in: Earth Sciences; Geology; Marine Sciences; Physical Geography or similar relevant subject. For more information, please contact Dr. Sanem Acikalin (sanem.acikalin@ncl.ac.uk).

Newcastle University

Northumbria University NEWCASTLE