

The effect of particle density on the source, transport and distribution of sediment in coastal environments

MASTS Coastal Processes & Dynamics

Craig Smeaton

School of Geography and Sustainable Development, University of St-Andrews

Purpose of Grant

The MAST CPD grant was used to purchase the equipment required to determine if particle density (Cui et al., 2016) impacts the distribution of organic carbon in the coastal ocean and more specifically fjords which are known hotspots for carbon burial and storage (Smith et al., 2015, Smeaton et al., 2017). The funding allowed the purchase of heavy liquids (SPT: Sodium Polytungstate) and the materials to construct a vacuum filtration system.

Project

Samples were taken from three sea lochs (fjords) which differ in oceanographic conditions due to the difference in sill depth. These lochs were Sunart, Etive and Creran where existing samples from the loch head to the mouth were selected for analysis. The samples were filtered through SPT of different densities which separate the sediment into four groups (<1.6, 1.6–2.0, 2.0–2.5, and >2.5 g cm⁻³). Each of the density sub samples were analysed to determine the carbon and nitrogen content, the stable isotope value ($\delta^{13}\text{C}$ and $\delta^{15}\text{N}$) alongside the quality of the carbon (refractory vs labile). This work is still ongoing with the methods being applied to samples collected from 7 sea lochs during the summer of 2018. Once completed we expect this work to be published in a peer reviewed journal (**Target:** JGR: Biogeosciences).

Future work could involve exploring the age of each of the different density samples and potentially hydrodynamic modelling of the particles.

References

Cui, X., T. S. Bianchi, J. A. Hutchings, C. Savage, and J. H. Curtis, Partitioning of organic carbon among density fractions in surface sediments of Fiordland, New Zealand, *J. Geophys. Res. Biogeosci.*, 121, 1016–1031, 2016.

Smeaton, C., Austin, W. E. N., Davies, A. L., Baltzer, A., Howe, J. A., and Baxter, J. M.: Scotland's forgotten carbon: a national assessment of mid-latitude fjord sedimentary carbon stocks, *Biogeosciences*, 14, 5663-5674, <https://doi.org/10.5194/bg-14-5663-2017>, 2017

Smith, R. W., Bianchi, T. S., Allison, M., Savage, C., and Galy, V.: High rates of organic carbon burial in fjord sediments globally, *Nat. Geosci.*, 8, 450–453, <https://doi.org/10.1038/NGEO2421>, 2015.