Geophysical Research Abstracts
Vol. 15, EGU2013-4039, 2013
EGU General Assembly 2013

Benthic biological C processing patterns in two Scottish estuaries and the significance of bacterial C uptake in sandy sediments

Clare Woulds (1), Greg Cowie (2), Ursula Witte (3), and Jack Middelburg (4)

(1) University of Leeds, School of Geography, Leeds, United Kingdom (c.woulds@leeds.ac.uk, +44 (0)113 343 3308), (2) University of Edinburgh, School of GeoSciences, Edinburgh, United Kingdom, (3) University of Aberdeen, Oceanlab, Aberdeen, United Kingdom, (4) Utrecht University, Department of Earth Sciences, Utrecht, The Netherlands

The supply of detrital organic matter to marine sediments is important for the nutrition of benthic ecosystems, while its remineralisation and burial supplies nutrients to the water column, and is a significant C sequestration process. Biological processes regulate sedimentary organic matter cycling, however the dominant processes vary between sites, and our knowledge of the factors driving that variation is still limited.

Isotope tracing experiments have shown that the pattern and rate of biological processing of organic carbon (C) in marine sediments allows sites to be categorised based on the relative importance of different processes and C pools. Thus, total community respiration is often the dominant process, but its dominance is maximal in deep ocean sediments. In shallower settings, with greater organic matter availability, faunal uptake of organic C becomes more significant, and, where there is particularly high faunal biomass, can become dominant.

New isotope tracing experiments have been conducted which compare biological C processing patterns in two contrasting Scottish estuaries. These are Loch Etive, where muddy, comparatively organic C rich sediments become hypoxic within millimetres of the sediment-water interface; and the Ythan estuary, where organic C poor, sandy sediments are kept oxygenated by porewater advection. Taken together with other experiments from the literature, the results now suggest that estuarine and shelf sandy sediments constitute a distinct category of biological C processing, in which bacterial C uptake plays a particularly significant role.