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Patterns of microbial nitrogen incorporation and retention in oxygen minimum zone sediments: An in situ 13C:15N labelling approach.

William Ross Hunter (1), Bart Veuger (2), and Ursula Witte (1)

(1) University of Aberdeen, Oceanlab, Ellon, United Kingdom (r01wh8@abdn.ac.uk), (2) Netherlands Institute of Ecology (NIOO-KNAW), Yerseke, the Netherlands (B.Veuger@nioo.knaw.nl)

At present, approximately 6 % of the continental margins (1.5 million km^2 of seafloor) experience permanent dysoxic conditions within oxygen minimum zones (OMZs). These areas are predicted to grow as a consequence of climate changes with major implications for both localized ecosystem function and global biogeochemical cycles. The Arabian Sea OMZ impinges upon the western Indian continental margin at bathyal depths (150 - 1500m) producing a strong depth dependent oxygen gradient at the sea floor. Between October and November 2008, a multi-national expedition led by Prof Hiroshi Kitazato (JAMSTEC) studied the role of benthic ecosystem zonation, oxygen availability and organic matter (OM) availability and characteristics upon carbon and nitrogen cycling. Within this research program, microbial processing of OM was investigated by *in situ* stable isotope pulse chase experiments. Semi-enclosed experimental meso-cosms (Spreaders) were used to deploy doses of ^{13}C:^{15}N labeled *Thalassiosira weissflogii*, equivalent to 650 mg C. m^{-2}, onto the sediment surface at four stations from the OMZ core across its lower boundary (water depth 540 – 1100 m; [O_2] = 0.35 - 15 μM). ^{13}C and ^{15}N labels were traced into sediment, bacteria, meio- and macrofauna and in the case of ^{13}C into porewater DIC and DOC.

Here we present the results of incorporation and retention of ^{13}C and ^{15}N labels into the hydrolysable amino acids (HAAs) and the bacterial biomarker D-alanine (D-ala), in the upper 0-1 and 1-2 cm sediment layers. In addition, the ^{13}C label was traced into the bacterial phospholipid fatty acids (PLFAs). Results showed clear differences in phytodetrital N incorporation between the lower boundary versus the core of the OMZ. At the lower boundary stations (800m and 1100m) relatively little of the phytodetrital N label was recovered from the sediment, with the HAAs recovered derived primarily from unaltered phytodetritus. In contrast, high concentrations of the labelled N were recovered from sediment in the core of the OMZ (540m). Biomarker data (D-Ala & PLFA) revealed substantial bacterial incorporation of both phytodetrital-C and –N, at 540m, with a strong preference for N. These results indicate that the microbial pathways for carbon and nitrogen cycling vary across an OMZ impacted continental margin, with demand for nitrogen driving microbial uptake of both carbon and nitrogen from an organic matter source.