Processing of organic carbon and nitrogen within subtropical mudflat sediments under increased nutrient loading using dual isotope tracers (^{13}C and ^{15}N) and biomarkers

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Within bare intertidal sediments the relationship between benthic microalgae (BMA) and heterotrophic bacteria (HB) strongly governs the transfer, transformation, and fate of carbon (C) and nitrogen (N). High primary productivity by BMA results in organic matter with a high C/N ratio. In low nutrient settings, this leads to intense competition between BMA and HB for available nutrients and retention of both C and N within the sediment. This relationship may be altered, however, by increased inputs of anthropogenic nutrients to otherwise oligotrophic estuarine environments. We used an in situ pulse of rare stable isotopes (^{13}C and ^{15}N), combined with compound-specific isotope analysis of bacterial and algal biomarkers (amino acids and fatty acids), to investigate the effects of increased nutrient loading (N, P) on the fate and processing of C and N in intertidal sediments over 10 days. Nutrient amendments were established for individual core incubations in separate chambers as 2X, 5X and 10X assuming a 1X concentration of NH_4 at $6uML^{-1}$ and P at $5uML^{-1}$. We anticipate that increased availability of dissolved inorganic nitrogen will cause the decoupling of the relationship between BMA and HB, resulting in less tightly retained N within the sediments as substrates with higher C/N ratio are utilized less completely. Reduced utilization of organic matter is likely to increase migration of label both to the water column and throughout all sediment depths indicating a reduction in the potential for intertidal sands to process and retain organic matter.