Amino acid-specific C and N isotopes in sediments of the Gulf of Maine: Can we track nutrient-plankton dynamics during the late Holocene?

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Abstract

The Gulf of Maine is a semi-enclosed continental shelf basin in the northwest Atlantic Ocean. The region is located at the confluence of the northward-flowing Gulf Stream and the southward-flowing Labrador Current. Interannual variations in the strengths and positions of these current systems determines the relative proportion of subtropical versus subarctic water masses entering the Gulf, thereby influencing hydrography and nutrient distributions. The resulting bottom-up influences on biological productivity over interannual timescales remain poorly understood, particularly beyond the last few decades of observational evidence. With the goal of testing the paleoceanographic utility of novel isotope biogeochemical proxies, we analyzed sediment push cores collected from the central Gulf of Maine (Jordan Basin, 255 m water depth) and adjacent continental slope (Corsair Canyon, 745 m; Nygren-Kinlan Intercanyon area, 1018 m). Cores were micro-profiled for porewater oxygen concentrations upon collection, and subsequently analyzed for total and organic carbon, total nitrogen, amino acid abundances, and bulk and compound-specific $\delta^{13}C$ and $\delta^{15}N$. A suite of amino acid-specific $\delta^{13}C$ and $\delta^{15}N$ indices [1, 2] were used to investigate spatial and temporal (downcore) patterns in primary producer functional groupings, microbial resynthesis, trophic position, and nutrient sources. The ability of these proxies to reconstruct nutrient-productivity dynamics over late Holocene timescales will be discussed.

[1] McCarthy *et al.* (2007) *GCA* **71**, 4727-4744. [2] Larsen *et al.* (2015) *Biogeosciences* **12**, 4979-4992.