

Microbial and metazoan metabolisms leave distinct isotopic traces during degradation of marine particles

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The intensity of heterotrophy at the ocean's surface and the vertical distribution of heterotrophy beneath the surface modulate the distribution of organic carbon in marine water columns, but the relative importance of microbes and metazoans in this process is difficult to constrain. Recently we have distinguished the effects of microbial and metazoan heterotrophy on small and large particles that contribute to vertical flux and deep-sea food resources using relative differences in the $\delta^{15}\text{N}$ values of individual amino acids. From these patterns, we have developed a multivariate classification of the trophic history of detrital organic matter. We find differing contributions of unaltered phytodetritus, zooplankton-influenced material, and microbially-altered detritus between particle size classes and across depths spanning from the surface to upper bathypelagic depths in contrasting ocean locations. We suggest that some observed variations across water columns may result from upper ocean ecosystem structure and/or the transport of material by vertical migrators. I will additionally discuss how different microbial metabolisms and mechanisms of degradation may shape our interpretation of the sedimentary stable isotope record.