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A review of nitrogen isotopic alteration in marine sediments

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Nitrogen isotopes are an important tool for evaluating past biogeochemical cycling from the paleoceanographic record. However, bulk sedimentary nitrogen isotope ratios, which can be determined routinely and at minimal cost, may be altered during burial and early sedimentary diagenesis, particularly outside of continental margin settings. The causes and detailed mechanisms of isotopic alteration are still under investigation. Case studies of the Mediterranean and South China Seas underscore the complexities of investigating isotopic alteration. In an effort to evaluate the evidence for alteration of the sedimentary N isotopic signal and try to quantify the net effect, we have compiled and compared data demonstrating alteration from the published literature. A >100 point comparison of sediment trap and surface sedimentary nitrogen isotope values demonstrates that, at sites located off of the continental margins, an increase in sediment N-15/N-14 occurs during early burial, likely at the seafloor. The extent of isotopic alteration appears to be a function of water depth. Depth-related differences in oxygen exposure time at the seafloor are likely the dominant control on the extent of N isotopic alteration. Moreover, the compiled data suggest that the degree of alteration is likely to be uniform through time at most sites so that bulk sedimentary isotope records likely provide a good means for evaluating relative changes in the global N cycle.
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