ID: W1987585697

TITLE: Nutrient regime shift in the western North Atlantic indicated by compound-specific ? ¹⁵ N of deep-sea gorgonian corals

AUTHOR: ['Owen A. Sherwood', 'Moritz F. Lehmann', 'Carsten J. Schubert', 'David B. Scott', 'Matthew D. McCarthy']

ABSTRACT:

Despite the importance of the nitrogen (N) cycle on marine productivity, little is known about variability in N sources and cycling in the ocean in relation to natural and anthropogenic climate change. Beyond the last few decades of scientific observation, knowledge depends largely on proxy records derived from nitrogen stable isotopes (?(15)N) preserved in sediments and other bioarchives. Traditional bulk ?(15)N measurements, however, represent the combined influence of N source and subsequent trophic transfers, often confounding environmental interpretation. Recently, compound-specific analysis of individual amino acids (?(15)N-AA) has been shown as a means to deconvolve trophic level versus N source effects on the ?(15)N variability of bulk organic matter. Here, we demonstrate the first use of ?(15)N-AA in a paleoceanographic study, through analysis of annually secreted growth rings preserved in the organic endoskeletons of deep-sea gorgonian corals. In the Northwest Atlantic off Nova Scotia, coral ?(15)N is correlated with increasing presence of subtropical versus subpolar slope waters over the twentieth century. By using the new ?(15)N-AA approach to control for variable trophic processing, we are able to interpret coral bulk ?(15)N values as a proxy for nitrate source and, hence, slope water source partitioning. We conclude that the persistence of the warm, nutrient-rich regime since the early 1970s is largely unique in the context of the last approximately 1,800 yr. This evidence suggests that nutrient variability in this region is coordinated with recent changes in global climate and underscores the broad potential of ?(15)N-AA for paleoceanographic studies of the marine N cycle.

SOURCE: Proceedings of the National Academy of Sciences of the United States of America

PDF URL: https://www.pnas.org/content/pnas/108/3/1011.full.pdf

CITED BY COUNT: 148

PUBLICATION YEAR: 2011

TYPE: article

CONCEPTS: ['Coral', 'Trophic level', 'Oceanography', 'Nutrient', 'Gorgonian', 'Context (archaeology)', 'Isotopes of nitrogen', 'Organic matter', 'Chemical oceanography', 'Environmental science', 'Ecology', 'Isotope analysis', 'Climate change', 'Chemistry', 'Geology', 'Biology', 'Nitrogen', 'Paleontology', 'Microorganism', 'Organic chemistry', 'Microbial biodegradation', 'Bacteria']