Past constraints on the Arctic Ocean fixed nitrogen cycle from foraminifera-bound N isotopes

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Sedimentary denitrification on the Arctic shelves is a significant contributor to global ocean bioavailable (fixed) nitrogen loss. A better understanding of how climate and Arctic boundary conditions impact this shelf denitrification—and the Arctic Ocean fixed N cycle more broadly—is critical for projecting future productivity within the changing Arctic Ocean. Recently, measurements of nitrogen isotopes within the organic matrix of planktic foraminifera shells (FB-δ^{15}N) have been developed to investigate past changes in upper ocean N cycling. Here we present FB-δ^{15}N measurements from a sediment record on the Mendeleev Ridge (AOS94-B8, 78.1°N, 176.7°W) to reconstruct changes in the Arctic Ocean N cycle over the last 14,000 years. Results show a dramatic FB-δ^{15}N increase between 12 and 10 ka, synchronous with postglacial opening of the Bering Strait. We interpret this FB-δ^{15}N increase to reflect the rapid resumption of Pacific water nitrate inflow, with corresponding resumption of denitrification on the Arctic shelves and halocline strengthening leading to more complete surface nitrate consumption, following Bering Strait opening. These results suggest that shelf denitrification and surface ocean N consumption in the western Arctic is tightly linked to Pacific water inflow. We will discuss opportunitites to extend the application of FB-δ^{15}N in Arctic sediments to past warm climates as potential constraints for the future Arctic Ocean N cycle.