Organic Matter Stoichiometry, Flux, and Oxygen Control Nitrogen Loss in the Ocean

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Abstract

Biologically available nitrogen limits photosynthesis in much of the world ocean. Organic matter (OM) stoichiometry had been thought to control the balance between the two major nitrogen removal pathways—denitrification and anammox—but the expected proportion of 30% anammox derived from mean oceanic OM is rarely observed in the environment. With incubations designed to directly test the effects of stoichiometry, however, we show that the ratio of anammox to denitrification depends on the stoichiometry of OM supply, as predicted. Furthermore, observed rates of nitrogen loss increase with the magnitude of OM supply. The variable ratios between denitrification and anammox previously observed in the ocean are thus attributable to localized variations in OM quality and quantity and do not necessitate a revision to the global nitrogen cycle.