

Sources of dissolved organic nitrogen in the ocean indicated by nitrogen isotopic analysis of amino acids

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Estimating sources of marine dissolved organic matter (DOM) is one of crucial steps for mechanistic understanding of marine biogeochemical cycles. Bacteria have been suggested as important sources of marine DOM, but nature of the source Bacteria (e.g., heterotrophic v.s. autotrophic) currently remains uncertain. While compound-specific isotope analysis of amino acids (CSI-AA) can be a powerful tool for elucidation of the source of marine DOM, it has been difficult due to the large analytical errors of CSI-AA associated with the complexity of marine DOM. Here we developed a new method for precise d15N-AA analysis of marine DOM by coupling HPLC purification and GC-IRMS, and then applied the method to high-molecular-weight (HMW) DOM samples collected at the Gulf of Mexico and the North Pacific Subtropical Gyre. d15N-AA values and patterns of the HMW-DOMs were significantly different between the surface and the mesopelagic depths, indicating that their sources are different. Especially, the d15N-AA signatures of the mesopelagic HMW-DOMs suggest that they are product of resynthesis by heterotrophic Bacteria, rather than remnant of DOM produced by autotrophic Bacteria.

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