

An insight into the area characteristic of seasonal change in nitrogen isotope ratio based on a marine nitrogen isotope model

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The condition of nitrogenous nutrient in the surface water is an important factor that determines the primary production and the carbon cycle in the ocean. Nitrogen isotope ratios ($\delta^{15}\text{N}$) of nitrate, sinking particles, sediments have been widely used as a proxy for the condition of nitrogenous nutrient in the surface water. However, the interpretation of $\delta^{15}\text{N}$ values are not simple. The $\delta^{15}\text{N}$ value of surface primary producer records $\delta^{15}\text{N}$ value of nitrate supplied to the euphotic layer, nitrate utilization efficiency and rate of N_2 fixation. As there are multiple possibilities for the interpretation, $\delta^{15}\text{N}$ values should be interpreted with ample consideration of the characteristics of surface nitrogen cycle by region. In this study we show the area characteristic of seasonal change in $\delta^{15}\text{N}$ by using a global ocean nitrogen isotope model in order to improve the interpretation of observed $\delta^{15}\text{N}$ values. We installed a marine nitrogen isotope model (Yoshikawa et al., 2005) with denitrification (Shigemitsu et al., 2016) and N_2 fixation (Coles et al., 2007) schemes into an off-line biogeochemical model that is driven by climatological monthly mean physical fields obtained from the outputs of a preindustrial control simulation performed with MIROC 3.2 (K-1 Model Developers, 2004). The simulated $\delta^{15}\text{N}$ of sinking particles had a global distribution similar to the observed $\delta^{15}\text{N}$ of surface sediments (Tesdal et al., 2013). The simulated sinking particles were enriched in ^{15}N in the eastern and western tropical North Pacific and the Indian Ocean where water column denitrification occurs and were depleted in ^{15}N in the Sargasso Sea, the Kuroshio extension region, and the Indian Ocean where N_2 fixation occurs. The seasonal variations in $\delta^{15}\text{N}$ of sinking particles vary considerably from one region to another. In this talk, we will report the seasonal $\delta^{15}\text{N}$ patterns categorized by region and the factors in the determination of those seasonal patterns.

Keywords: Marine nitrogen cycle, Nitrogen isotope ratio, Marine ecosystem model