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Unique $\Delta^{17}O\text{-}NO_3^-$ in Arctic Ocean Atmosphere: Influence of Sea Ice–Derived enhancement of OH and HO_X

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Oxygen isotope anomaly of nitrate ($\Delta^{17}O\text{-}NO_3^-$) contributes to understanding the atmospheric nitrogen chemistry in the polar oceans. Here, $\Delta^{17}O\text{-}NO_3^-$ of the aerosol samples was analyzed based on a cruise from Shanghai, China, to the Arctic Ocean to explore the nitrate formation mechanisms. $\Delta^{17}O\text{-}NO_3^-$ decreased with the increase of latitude, especially when after entering the Arctic Circle. $\Delta^{17}O\text{-}NO_3^-$ (e.g., 11.50~21.23‰) was extremely low while crossing the sea ice-covered Arctic Ocean. This is most likely influenced by the combined enhancement of hydroxyl (OH) and peroxy (HO_2+RO_2) radicals derived by the sea ice under the permanent sunlight period. In addition, the obvious increase in the $\Delta^{17}O\text{-}NO_3^-$ of return trip with shortened daytime indicated the advantage of the night pathways (NO_3 related) with the higher $\Delta^{17}O$ endmembers. The mutation of $\Delta^{17}O\text{-}NO_3^-$ can reflect the change of NOx conversion pathways to nitrate, and it can be more sensitive to the change of radical chemistry related to atmospheric oxidation.