Nitrogen isoscape of the coasts in South Korea, revealed by CSIA of amino acid

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Isoscape of nitrogen stable isotope value ($\delta^{15}N$) provides informations relate to the source of inorganic nitrogen and N cycle processes in the ocean. Previous stuudies have been used $\delta^{15}N$ value of dissolved inorganic nitrogen (DIN), particulate organic matter (POM) or bulk tissue of primary consumers to demonstrate nitrogen isoscape. However, $\delta^{15}N$ DIN and POM can be rapidly changed in various environmets. Moreover, $\delta^{15}N$ of primary consumer provides indirect information due to the trophic enrichment of nitrogen isotope.

Recently, compound specific isotope anlaysis of amino acid (CSIA of AAs) used to identify the trophic postion of various ecosystem. In addition, $\delta^{15}N$ of individual amino acid also can be used as proxy for source of nitrogen because it includes both trophic and nitrogen source information in a single organism.

In this study, $\delta^{15}N$ of individual amino acid of bivalves (oyster and mussel) were determined to draw the nitrogen isoscape for west and south coasts in Korea, including 5 estuaries. Among the individual amino acids, $\delta^{15}N$ value of phenyilalanine ($\delta^{15}N_{phe}$) was used for isoscape due to the least changes between diet and bivalve. We also analysed the bulk $\delta^{15}N$ values of POM ($\delta^{15}N_{POM}$) and bivalves ($\delta^{15}N_{bulk}$) to compare the $\delta^{15}N$ values of the amino acid between dry and rainy season.

Temporal variation of the $\delta^{15}N_{POM}$ indicates rapid reflection of nitrogen stable isotope of DIN in coastal envirnments. On the other hand, $\delta^{15}N_{bulk}$ showed smaller temporal variation than $\delta^{15}N_{POM}$, indicating $\delta^{15}N_{bulk}$ of bivalves provides time integrated information of nitrogen source. However, much enriched in the ^{15}N were found in all bivalves due to trohic enrichment. In case of $\delta^{15}N_{phe}$, both strong correlation with $\delta^{15}N_{bulk}$ and larger range among the sites were found, resulting in useful for nitrogen isoscape. In addition, base on the trophic position by CSIA of amino acid and $\delta^{15}N_{bulk}$, we calculate the $\delta^{15}N$ of diet source for bivalve ($\delta^{15}N_{diet}$), which represent phytoplankton. This $\delta^{15}N_{diet}$ found very strong correlation with $\delta^{15}N_{phe}$ and as a result, $\delta^{15}N_{diet}$ can be used to describe the nitrogen isoscape.Consequantly, we confirm the CSIA of amino acid can be useful tool for nitrogen isoscape. This approch will support to understand to identify nitrogen source and nitrogen cylce, and also helpful for basic ecological food web study.