Seasonal nitrogen baseline ($\delta^{15}N$) variation of sinking particles in the Western Arctic revealed by compound-specific isotope analysis of amino acids

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The Western Arctic have strong seasonality based on growth and decay of sea ice. These sea ice and seasonal irradiation tightly control the Arctic primary production and even organic matter export to the deep ocean. In this circumstance, nitrogen is mostly connected to this organic matter formation which has strong seasonality. However, understanding the seasonal variation of nitrogen dynamics in the Arctic Ocean is usually challenging because of difficulty in nitrogen 'source' determination in a mixed organic nitrogen pool. Compound-specific isotope analysis of amino acids (CSIA-AAs) can be used to determine nitrogen baseline ($\delta^{15}N$) in marine biogeochemistry, by separating amino acid containing $\delta^{15}N$ baseline information from samples. In this study, we determined the nitrogen baseline from sinking particles collected from Aug 2017 to Aug 2018 in the Western Arctic Ocean. Molar abundance and the $\delta^{15}N$ values of amino acids were analyzed in sinking particles collected at 100m water depth.

A large decrease of salinity (around 31 psu) was observed at the water depth of the collected sinking particles after summer bloom. In sinking particles, AAs flux has a similar trend with total organic carbon (TOC) and total mass flux (TMF), and was the highest in summer when high primary production is observed after melting sea ice. In amino acid $\delta^{15}N$ analysis, the representative source amino acid, phenylalanine $\delta^{15}N$ values showed a significant isotopic enrichment from September to February. Probably, these results might be related by a deficiency of dissolved inorganic nitrogen (DIN). Thus, the $\delta^{15}N$ enrichment of the phenylalanine from winter to spring may be caused by microbial DIN utilization, which is supported by the increase in the proportion of non-proteinous amino acids in the total AAs pool during that period.