Nitrogen cycle in aquatic ecosystems using stable isotope methodes

Akiko Makabe[1]

[1] Environmental Sci and Tech, Tokyo Institute of Tech

Anthropogenic sources now dominate the supply of fixed nitrogen to many aquatic ecosystems. Because nitrogen can limit primary production in both freshwater and marine systems, nitrogen loads by human activities cause blooms of particular phytoplankton and increase nitrate concentration that pose health risks to human if it is high in drinking water. Therefore it has become important to understand the biogeochemical processes that comprise the nitrogen cycle.

The processes of denitrification is of particular interest because it leads to the loss of fixed nitrogen from aquatic ecosystems through the reduction of nitrate to inert gaseous forms (primarily nitrogenous gas, but also nitrous oxides). Because nitrous oxides is one of greenhouse gases, quantification of denitrification is important.

However, rates of denitrifications have been difficult to estimate for entire ecosystems because denitrification occurs only under specific biogeochemical conditions that are difficult to sample or replicate in a laboratory. There are two common ways of estimating denitrification in aquatic ecosystems. One involves laboratory incubation of sediment cores and the other involves mass-balance estimates based on transport and transformation rates. We present in situ nitrogen isotope methods to understand nitrogen cycle in aquatic ecosystems. Isotope ratios have the information for processes and when compounds were produced.

We investigated three whole rivers that run out to Lake Biwa and have differ populations, and one whole river that go through the city of Mongolia. We also investigated downstream of dams. We analyzed nitrogen and oxygen isotope ratios of ammonium, nitrate and nitrous oxides, then explore relationships among them.

Dissolved nitrous oxides are supersaturated in most sampling sites and the amount and stable isotope ratios of oversaturated nitrous oxides show activities of both nitrification and denitrification. In Mongol river, we acquired the proof of nitrification and denitrification at downstream of the city area that septic waste run out to the river.