

Development of stable N isotope model for forest ecosystem

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Since the Industrial revolution, reactive nitrogen in the environment has increased due to the combustion of fossil fuels and increased use of chemically synthesized fertilizers, the amount of which has been doubled in the whole land before the industrial revolution. Excessive reactive nitrogen is a cause of various environmental problems such as generation of nitrous oxide which is a greenhouse gas, nitrate nitrogen contamination of groundwater, eutrophication of closed water area, and decline of biodiversity. Even in forest ecosystems, nitrogen saturation has been confirmed in many suburban areas, but it is still difficult to accurately measure the nitrogen balance in forest ecosystems. This is partly because it is difficult to quantify the denitrification in forest ecosystem. For this reason, we have also great uncertainties in the nitrogen cycle of the ecosystem (biogeochemical) models. However, the ratio of natural N isotopes is considered to reflect information on N loss rates (i.e., denitrification, leaching) in some extent. So, Houlton et al. (2015 in Nature Climate Change) proposed that implementing the ratio of natural N isotopes in ecosystem model and validate these values could improve their representation of N cycling.

In this study, to implement $\delta^{15}\text{N}$ calculation scheme to ecosystem model "VISIT", we measured the $\delta^{15}\text{N}$ of leaves, litter and soils, as a validation dataset, in five forest experimental sites across Japanese archipelago (Teshio Experimental Forest of Hokkaido University, Ryukyus, Fujiyoshida, Mt. Tsukuba, Tenryu Field of Shizuoka University, Yona Field of University of Ryukyus). First, to estimate soil $\delta^{15}\text{N}$ using VISIT, we implemented Houlton & Bai (2010 in Global Biogeochemical Cycle) scheme to VISIT model. However, the simulation results of soil $\delta^{15}\text{N}$ in VISIT showed smaller values, compared to observation in all site. We will report further progress in the representation $\delta^{15}\text{N}$ in the modified VISIT model.

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