

Nitrogen dynamics and stable isotope signature of Arctic tundra ecosystem

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Nitrogen cycling in terrestrial ecosystems can be characterized by rapid turnover of nitrogen, thus, it is not easy to comprehend in-situ nitrogen dynamics in terrestrial ecosystems. In confrontation with this difficulty for nitrogen dynamics study, ^{15}N -tracer technique is a promising tool to trace productions and consumptions of nitrogen compounds quantitatively. However, terrestrial ecosystems is frequently limited by nitrogen supply, thus an addition of nitrogen as ^{15}N into the system will inevitably affect status of nitrogen dynamics.

Natural abundance of ^{15}N ($\delta^{15}\text{N}$) is also considered to be a promising tool because $\delta^{15}\text{N}$ of a certain nitrogen compound can provide useful information on processes which a certain compound has been undergone (production, consumption and movement). Thus, $\delta^{15}\text{N}$ can be used as a conservative tracer compared with ^{15}N -tracer, which is basically appropriate to use for the in-situ nitrogen dynamics study that requires technique with less disturbance of the system. Despite of this usefulness, and recent methodological developments which make the measurement of $\delta^{15}\text{N}$ much easier, it is sometimes still difficult to interpret soil and plant $\delta^{15}\text{N}$ data because of complex dynamics of several types of nitrogen compounds in soil-plant systems.

Here I present preliminary results from Arctic tundra ecosystem where plant production is strongly nitrogen-limited. I report $\delta^{15}\text{N}$ values of soil nitrogen including ammonium and some sort of dissolved organic nitrogen, and combined with the results from simple simulation model for nitrogen cycle in tundra ecosystems capable of $\delta^{15}\text{N}$ calculations, I discuss expected processes that can lead tundra ecosystems to ^{15}N -depleted ones compared with other terrestrial ecosystems, especially processes of nitrogen loss responsible for strong nitrogen-limited situation of tundra ecosystems.