Spatial variations in larch and soil nitrogen isotope ratio along forest-grassland gradient in northern Mongolia

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The underlying processes that affect the Nitrogen isotope ratio of plant and soil, which is known as a good indicator of N dynamics and shows dependency on climate, is not yet clearly understood.

In this study, we compare the nitrogen isotope ratio of single plant species (Larix sibirica Ledeb.) and soils along the forest-grassland gradient of a forest-steppe ecotone in Mongolia. Larch needles and soils were sampled during the growing season (May- August) from 2004-2012 at several sites in seven study areas.

The results showed the clear spatial pattern in needle, soil nitrogen isotope ratios, and its difference ($\Delta\delta^{15}\text{N}$) along forest-grassland gradient and the pattern corresponded to humus type (mor/mull). $\Delta\delta^{15}\text{N}$ also had significant correlations with needle $\delta^{13}\text{C}$ and C/N ratio of bulk soil, suggesting the $\Delta\delta^{15}\text{N}$ change relates to water, light conditions and soil N availability. Isotope mass-balance model was applied to investigate the processes affecting the spatial pattern of $\Delta\delta^{15}\text{N}$.

Keywords: ecotone, Mongolia, nitrogen isotope ratio, plant and soil