Japan Geoscience Union Meeting 2013
(May 19-24 2013 at Makuhari, Chiba, Japan)

ACC03-P09 会場:コンベンションホール 時間:5 月 22 日 18:15-19:30

Seasonal dynamics of nitrogen and source of nitrogen for larch in the taiga forest in north-eastern Siberia
Seasonal dynamics of nitrogen and source of nitrogen for larch in the taiga forest in north-eastern Siberia

Alexandra Popova[1], TOKUCHI, Naoko[2], Nobuhito Ohte[3], MAXIMOV, Trofim[4], Atsuko Sugimoto[5*]
Alexandra Popova[1], TOKUCHI, Naoko[2], Nobuhito Ohte[3], MAXIMOV, Trofim[4], Atsuko Sugimoto[5*]

[1]Faculty of Biology and Geography, North Eastern Federal University, [2]Field Science Education and Research Center, Kyoto University, [3]Graduate School of Agricultural and Life Sciences, The University of Tokyo, [4]Institute for Biological Problems of Cryolithozone, SB RAS, [5]Graduate School of Environmental Science, Hokkaido University
[1]Faculty of Biology and Geography, North Eastern Federal University, [2]Field Science Education and Research Center, Kyoto University, [3]Graduate School of Agricultural and Life Sciences, The University of Tokyo, [4]Institute for Biological Problems of Cryolithozone, SB RAS, [5]Graduate School of Environmental Science, Hokkaido University

Nitrogen (N) is known to be one of the major limiting factors for plant growth in the northern hemisphere. CO_2 assimilation is directly related to N contents in the plant leaf as it is the major component of photosynthetic system.

We conducted the study on N dynamics at Spasskaya Pad Experimental forest station located near Yakutsk city, Russia in 2009-2011 years. Amount of N input with atmospheric deposition occurred to be very low (about 48 mgN m^{-2} $year^{-1}$). It was found that in the beginning of the growing season the content of inorganic N in the soil pool was very few (about 1 to 2 gN m^{-2} was observed at depth 0 to 50 cm mineral layer of soil). From the mid-July (when soil temperatures at 20 cm depth reached about 300 degree days) intensive mineralization of N started. The largest content of inorganic N was observed in the end of August (about 14 gN m^{-2} at the same soil depth). And then, in the beginning of the next growing season, soil inorganic N pool was small again, which indicated large amount of microbial immobilization. Ammonium dominated soil inorganic N pool. Amount of water extractable N in the soil was much lower than KCl extractable, because ammonium was bound to clay particles in the soil.

Results of tracer $^{13}C^{15}N$-amino acid, ^{15}N-ammonium and ^{15}N-nitrate experiments showed that larch did not uptake organic N and inorganic N was the source of N for larch. Also in the beginning of growing season amino acid was not mineralized to inorganic N within two days but rather stayed in the soil or was immobilized by microbes.

Allocation of N uptaken from soil by larch varied during growing season. N that was uptaken in the beginning of growing season (June) was used for the growth of new organs: new shoots and needles; however, N that was uptaken in the middle of growing season (from the mid-July) was stored in the tree perennial parts (branches, trunk and short branches carrying buds) to be used in the beginning of the next growing season. Also, retranslocation of N prior to needle senescence was very high (60 to 70% of needle N content).

Needle N content was affected by environmental conditions (soil water and temperature) in the previous growing season. This can be explained by observed discrepancy between timing of N mineralization by soil microorganisms (in the late summer) and plant N demand (in the beginning of summer during larch needle and new shoot formation). Needle N content affected amount of litterfall also with one year delay. Therefore, there was a positive relationship between N availability and amount of CO_2 assimilated by larch trees in the area of study.

キーワード: boreal forest, taiga, nitrogen cycle, organic nitrogen uptake, soil nitrogen pool, nitrogen allocation
Keywords: boreal forest, taiga, nitrogen cycle, organic nitrogen uptake, soil nitrogen pool, nitrogen allocation