

アラスカ内陸部の活動層厚の異なるクロトウヒ林における細根現存量

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Fine root biomass in two black spruce stands with different active layer depths in interior Alaska

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Fine roots (roots < 2 mm in diameter) are a key component of carbon dynamics in forest ecosystems. To understand effects of different permafrost conditions on fine roots, we examined fine root biomass in two black spruce (*Picea mariana*) stands with different soil active layer depths (thawing mineral soil depth during growing season), which are located on a same north-facing slope in interior Alaska (Figure 1). Fine root biomass of black spruce trees in the plot with shallower active layer (ca. 70 cm; S plot) were smaller than in the plot with deeper active layer (ca. 110 cm; D plot) significantly (711 ± 68 vs. 1097 ± 91 g m⁻²). In contrast, fine-root/aboveground biomass ratio was greater in the S plot than in the D plot. On the other hand, fine root biomass of understory shrubs were significantly greater in the S plot than in the D plot (311 ± 24 vs. 164 ± 23 g m⁻²), whereas their aboveground biomass was similar in both the plot (122 vs. 113 g m⁻²). These results suggested that black spruce trees and understory shrubs could increase biomass allocation to fine roots in sites with shallower active layer to acquire limited below-ground resources from colder environment (Noguchi et al. 2016).

樹木の細根（直径 2 mm 以下の根）は、森林生態系の炭素動態の重要な要素の一つである。本研究では、異なる永久凍土条件が細根に及ぼす影響について理解するために、活動層厚（鉍質土壌の融解深）の異なるクロトウヒ（*Picea mariana*）林 2 林分を調査地として、細根現存量について調査した。その結果、活動層厚の大きい林分（D 区）におけるクロトウヒの細根現存量は、活動層厚の小さい林分（S 区）と比較して有意に小さかった。一方、林床の灌木類については、地上部現存量が S 区と D 区で同様であったのに対し、S 区の細根現存量は D 区よりも有意に大きかった。これらの結果は、クロトウヒと林床の灌木類が、活動層厚の小さい林分では限られた地下部の水分・養分を効率よく獲得するために、細根へのバイオマス分配を増加させていることを示唆している。



Figure 1. Photographs of the study plots and fine roots of black spruce. Left, D plot; Center, S plot; Right, Fine roots of black spruce.

References

Noguchi K, Matsuura Y, Sparrow SD and Hinzman LD (2016) Fine root biomass in two black spruce stands in interior Alaska: effects of different permafrost conditions. Trees (in press)