

## **The Impacts of Nitrogen Availability and Seasonal Dynamics on Plant-Microbial Interactions Affecting C and N Cycling in Coniferous Forest Soils**

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**Abstract:** Coniferous forests are widely distributed in temperate and boreal biomes and the fact that they efficiently store large stocks of carbon makes them globally important. Decomposer and mycorrhizal fungi are key players in the carbon and nitrogen cycles in this environment. Despite the recognition of potential effects of N availability on C cycle-related processes, detailed information is not available. Mycorrhizal fungi, associated with tree roots, mediate the link between the living plants and nutrients as well as between the C and N cycles. They are obviously dependent on the activity of their host which dramatically cycles annually between high photosynthetic activity in summer and inactivity in winter. This project aims to follow the activity of soil and litter microbes with a focus on the tree root-associated ones, across seasons in temperate mountainous forests with high N availability and in boreal forests with low N content. The concerted analysis of metatranscriptomes of roots, rhizosphere soil, bulk soil and litter together with the analysis of metabolomes and metaproteomes proposed here is likely to uncover the plant effect on the functioning of fungal and bacterial communities as affected by the C and N exchange between plants and microbes. The metabolome analysis should indicate the drivers of seasonal changes in microbial function -- both inside and outside the tree root -- as well as the interplay between the tree and their symbiont fungi. The functional aspect is to be revealed by metatranscriptome and metaproteome analyses of the corresponding microbial communities and the host tree. The project will also focus on the autecology of important bacterial and fungal taxa inhabiting the studied ecosystems whose genomes are either available or to be obtained soon in the frames of the JGI 1000 Fungal Genomes project.