Geophysical Research Abstracts
Vol. 21, EGU2019-16317, 2019
EGU General Assembly 2019

Root traits along environmental gradients: from EcM-fungus-specific morphometry to functional relationships within root-rhizobiome and biomass allocation patterns.

Ivika Ostonen (1), Marika Truu (1), Kaarin Parts (1), Jussi Heinonsalo (2), and Jaak Truu (1)

(1) University of Tartu, Institute of Ecology and Earth Sciences, Vanemuise 46, Tartu, Estonia (ivika.ostonen@ut.ee), (2) University of Helsinki, Department of Forest Sciences

Root studies are increasingly prominent and increasing amount of root trait data improve our understanding of ecosystem functioning and retention in the context of rapid global changes.
We aimed 1) to analyze ectomycorrhizal (EcM) fungus specific morphology of absorptive roots in lab experiments in comparison to same fungus colonized root traits in field study sites along latitudinal gradient in European boreal forests 2) to compare the response of fine roots in manipulative studies and along climate gradient to describe the universal trends in root traits and to raise hypotheses about general mechanisms in fine root system adaptation of forest trees in global change. Root traits from climate manipulation experiments, manipulated by CO_2 concentration, relative air humidity and soil warming in forest ecosystems and the data for different tree species along natural gradient encompassing different climate and forest zones in Northern Europe were analyzed. The fungal colonization was the main driver of absorptive root tip morphology in lab as well as in manipulation and gradient studies, while fungus-specific effect on root morphology along environmental gradients varied significantly. We envisage a role of trilateral relation between the morphological traits of absorptive fine roots, exploration types of colonising EcM fungi and rhizosphere and bulk soil bacterial community structure. A significant change in absorptive fine root biomass in all experiments and for all studied tree species coincided with changes in absorptive root morphology, being longer and thinner root tips with higher root tissue density in poor/treated sites. These changes were associated with significant shifts in community structure of dominating EcM fungi as well as soil and rhizosphere bacterial communities. We suggest a multidimensional concept of absorptive fine root foraging and adaptation strategies involving both qualitative and quantitative changes in root-mycorhizosphere along environmental gradients and in climate experiments.