



Project acronym: PhenoLink

Project title: Above- and Belowground Phenology Linkage to Carbon Exchange in Spring with Varying Snow Cover and Reindeer Grazing

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Discipline: Earth Sciences & Environment: Global change & Climate observation

Station(s): Oulanka Research Station (Finland)

Snow cover and herbivore grazing shape boreal ecosystem functioning, specifically by changing the interplay between the soil and the atmosphere. The interaction appears particularly important in periods where the coupling between the two changes i.e., the snowmelt period. So far, both influences have never been considered together with this temporal perspective in mind while taking above and belowground processes into account. While aboveground growth and carbon uptake appears intuitively linked to snow cover extent, root activity is much more elusive. Yet, selective feeding, trampling, removal of protective lichen cover, and nutrient redistribution might influence species assembly and soil functioning and thus, grazing can exert noticeable influence belowground. Hence, pairing the two factors is vital for our understanding of northern ecosystems.

Above- and belowground phenology often does not follow the same seasonal progression. Yet, both are important for carbon uptake and emission potential. Previously, high sampling frequency root assessments were unfeasible. In this project, we want to take advantage of new AI tools to identify root growth in multi-factor experiments and at a high temporal resolution. With that, we want to investigate whether synchronicity affects carbon gas exchange and to what extent snow cover changes and grazing have influence on the compartmental linkage. We follow the above- and belowground phenology in a northern boreal forest and fen during the highly dynamic snowmelt and spring and alongside, we track CO₂ gas exchange.