Succession of microbes associated with below and above ground plant parts in a glacier fore field

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Research area



 Central Eastern Alps, Hohe Tauern National Park Stubachtal, Salzburg

• Altitude: 2068m - 2150m a.s.l

- Glacial loss: 1.7 km since 1850
- 135 Plots ~ one plot per 1.25 years of succession
- 5 Plots hosting climax communities

Data generation





Time







Microbes Microbes from from leaves (NGS) soil (NGS) Insect Plant phenotyping traps

Data analysis & Hypotheses

Objectives

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- Glacier forefields provide an excellent opportunity to study several decades of microbial succession over the distance of only a few hundred meters. Colonizable substrate age is well documented (time since deglaciation) and can be correlated to the diversity of microorganisms.
 - We will combine fieldwork and laboratory



experiments to gain novel insights into the interdependencies of microorganisms with other taxonomic groups, such as plants and arthropods.

These findings will be essential for future conservation and restoration efforts of natural and anthropogenic altered ecosystems.

Methods

- Vegetation survey
- Arthropod sampling with Pitfall traps and Berlese funnels
- Sequencing: NGS for microbiome, Sanger to identify cultivar strains

16S rRNA for Bacteria





- Taxonomic, functional and phylogenetic a- and βdiversity
- Novel statistical tools exploiting the properties of *n*-dimensional hypervolumes
- Asymmetric dependence measures to detect direct relationships between organisms

Data validation

- Hypotheses on ecological relationships derived from field-data will be tested under controlled laboratory conditions
- Selected plant species will be grown in

ITS for Fungi



- Detection of ecologically important inter-specific relationships with new statistical methods
- Microcosm experiments under controlled conditions to confirm hypotheses postulated from field data



Microcosm

sterile containers.

- Plants will be innoculated with defined bacterial or fungal strains
- Allows to test for direct- and indirect effects of microorganisms on plants and animals





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