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Different responses of soil microbial communities to long-term experimental warming in northern Sweden

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	Heath	Mesic Meadow	Wet Meadow
Ground	Acid glacial moraine ridge	Calcareous bedrock	
Vegetation	Sparse; lichens and vascular plants (shrubs)	Continuous; mosses and vascular plants (shrubs, sedges)	
Moisture	Dry	Mesic	Mesic/Wet
Nitrogen and carbon content	Very low N content, high C/N	Medium N content, medium/low C/N	
pH	acidic	neutral	

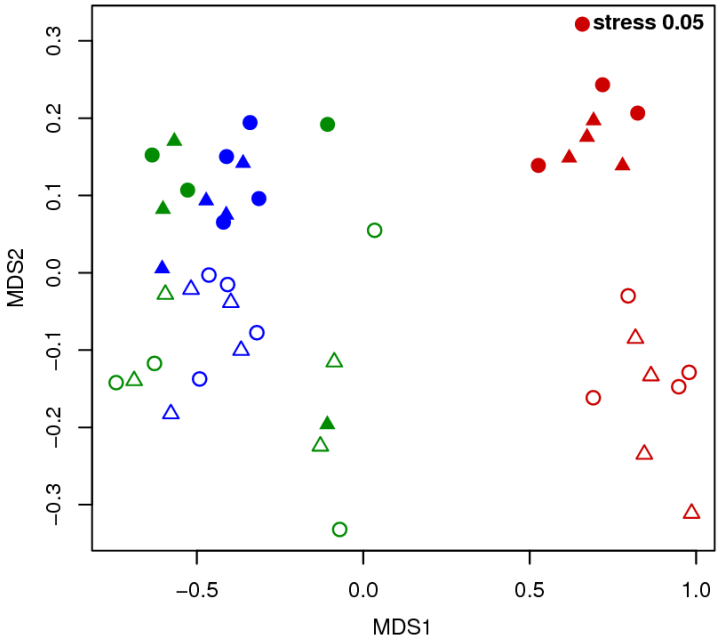
Latnjajaure Field Station

- Warming effect on the soil microbial community composition
  - HTS of bacteria (16S rRNA) and fungi (ITS)

- Warming effect on the microbial functions
  - Ecological guild assignment of fungal taxa
  - Predictive functional profiling of bacterial communities (PICRUST) from HTS data
  - Quantification of functional genes representing major inorganic nitrogen cycling pathways

Soil bacterial and fungal communities are strongly shaped by the habitat type and soil layer

Soil bacterial community composition



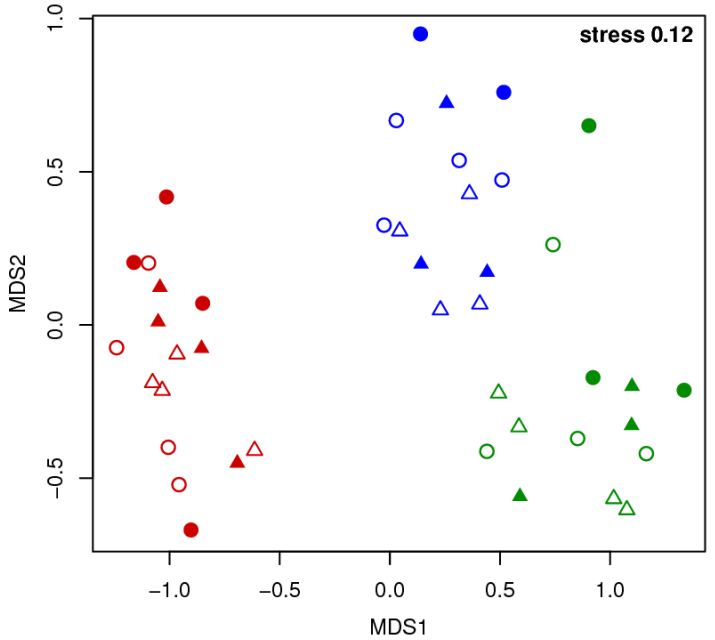
Habitat type***, soil layer*

Heath
Mesic meadow
Wet meadow

Mineral
Organic

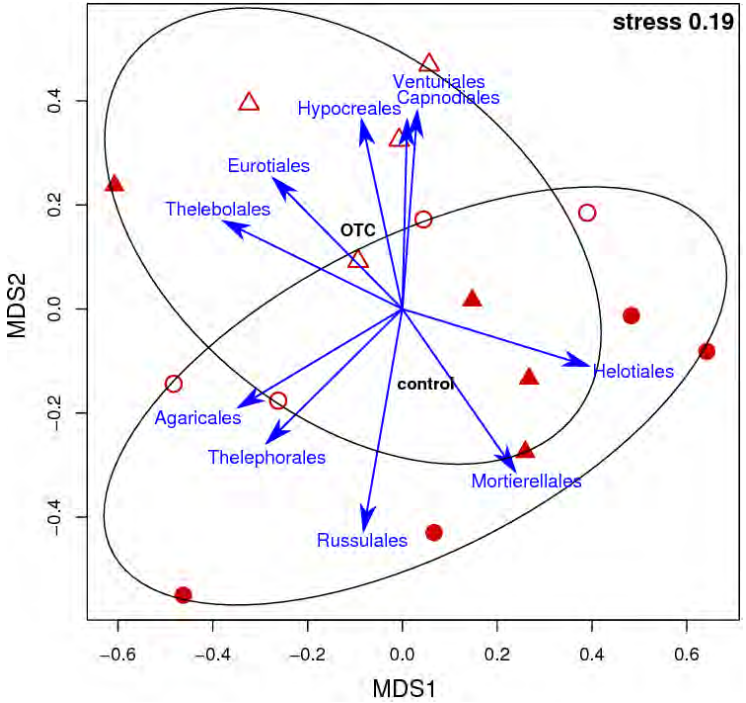
Control
OTC

Soil fungal community composition



Habitat type***

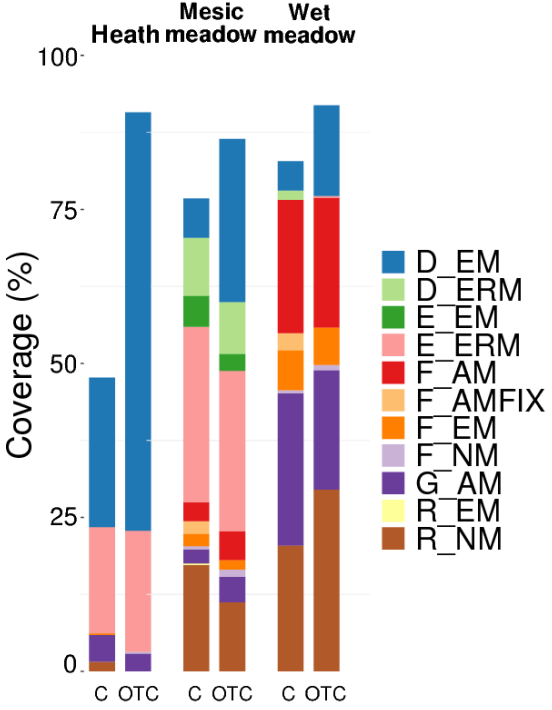
Fungal community composition changed in the heath



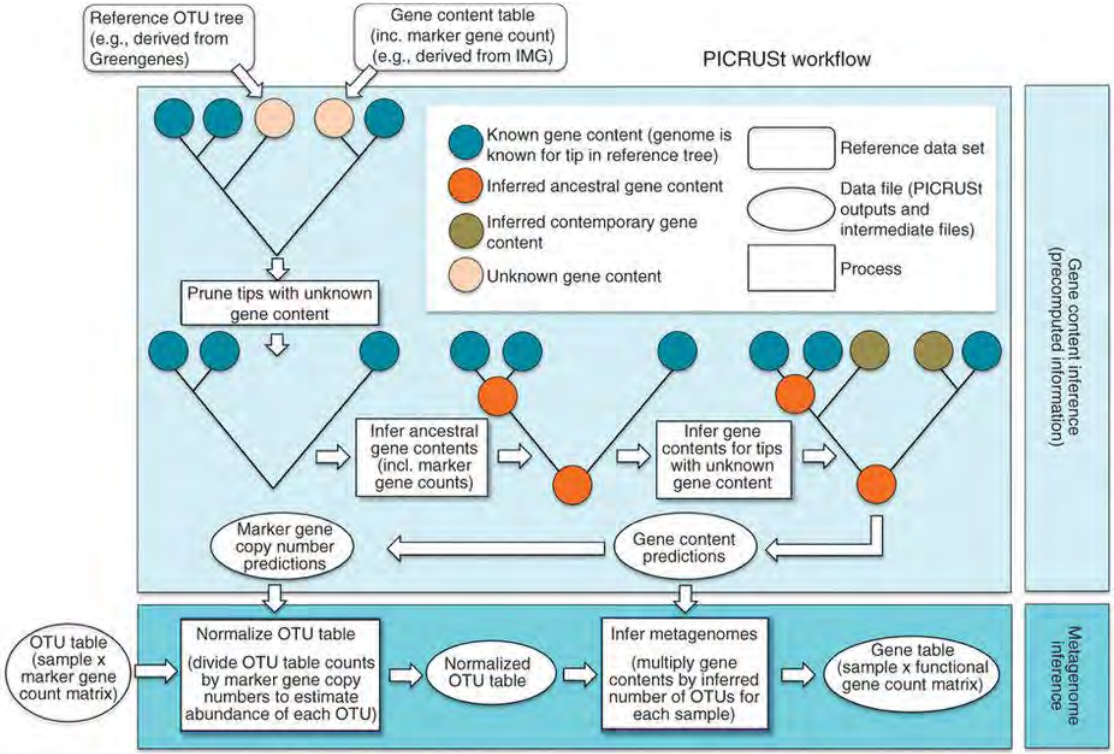
Mineral
Organic

Control
OTC

Cover of deciduous shrubs associated with ectomycorrhizal fungi increased in the heath and mesic meadow



PICRUST (**P**hylogenetic **I**nvestigation of **C**ommunities by **R**econstruction of **U**nobserved **ST**ates)



Langille et al., 2013,
Nature Biotechnology 31.

Pathways for simple carbon compounds degradation are more abundant in the heath

Carbohydrate metabolism

Amino sugar and nucleotide sugar metabolism
Starch and sucrose metabolism
Galactose metabolism
Fructose and mannose metabolism
Pentose and glucuronate interconversions
Pentose phosphate pathway
Citrate cycle

Glycan biosynthesis and metabolism

Glycosaminoglycan degradation
Other glycan degradation
Glycosphingolipid biosynthesis

Pathways for recalcitrant carbon compounds degradation are more abundant in two meadows

Xenobiotics biodegradation and metabolism

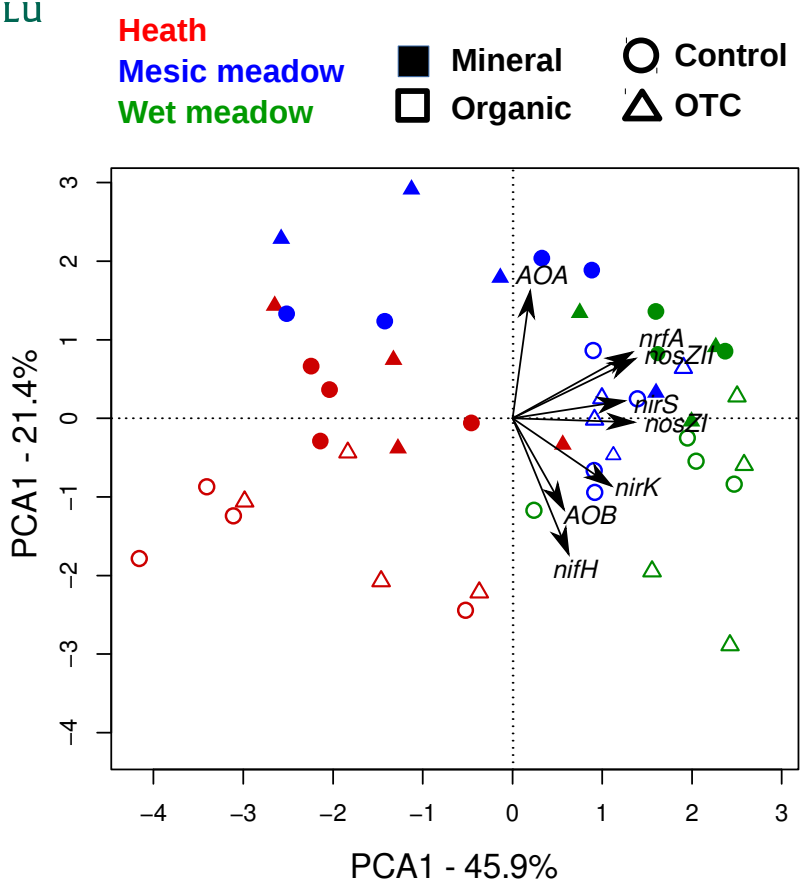
Atrazine degradation
Benzoate degradation
Caprolactam degradation
Polycyclic aromatic hydrocarbon degradation

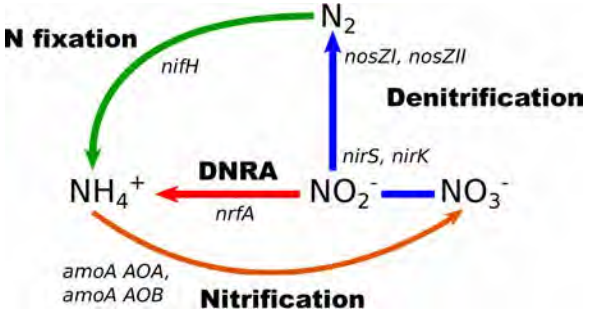
Energy metabolism

Carbon fixation pathways in prokaryotes
Sulfur metabolism
Methane metabolism
Nitrogen metabolism

Metabolism of terpenoids and polyketides

Geraniol degradation
Limonene and pinene degradation
Terpenoid backbone biosynthesis
Biosynthesis of type II polyketide backbone





Potential for denitrification and respiratory ammonification is higher in two meadows

Archaeal and bacterial ammonia oxidation separated between mineral and organic soil layer

Conclusions:

- Warming impact only on the fungal community composition in the heath – are belowground microbial communities largely resistant to long-term warming in tundra soil?
- Global warming likely has site specific impact on soil C and N balance depending on the local genetic potential and soil conditions.

Acknowledgements

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Thank you for your attention!