

Soil microbial communities are weakly linked to warming-induced vegetation changes



19th ITEX Meeting
25-27 April, 2019 Stirling, UK

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What about belowground communities if vegetation changes due to warming?

- Plant-microbe interactions
- Litter quality
- Organic matter decomposition
- Nutrient availability, soil carbon and nitrogen
- Increased soil temperature

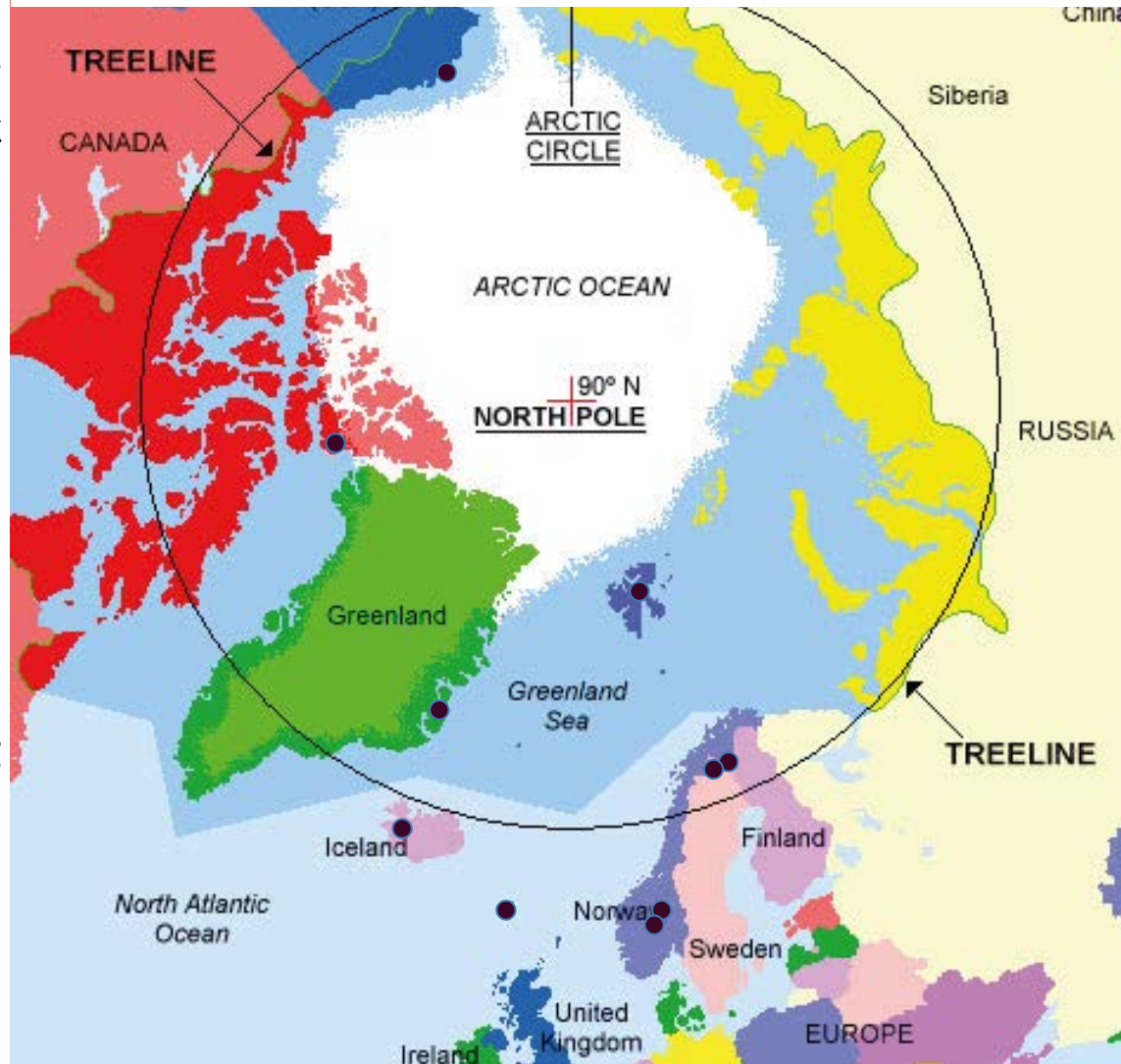


Hypotheses:

- 1) Directional changes in vegetation due to warming consistently affect belowground microbial community composition (bacteria, fungi)
- 2) An increase in shrubs will result in a more closed nitrogen cycle as a consequence of increased ecto and/or ericoid mycorrhizal fungal associations

ITEX sites (13 sites, 19 exp):

Barrow
Atqasuk



Alexandra Fjord

Zackenbergl

Audkuluheidi
Sornfelli

Endalen
Adventdalen

Latnjajaure
Paddus

Kilpisjärvi

Dovre
Finse

Soil cores and vegetation data from ITEX network:



Litter layer

- Sequenced bacterial 16S rRNA
- Sequenced fungal ITS

Organic layer

- Soil properties
- Sequenced bacterial 16S rRNA
- Sequenced fungal ITS
- Quantification of genes in inorganic N cycling

Mineral layer

- Only Latnjajaure

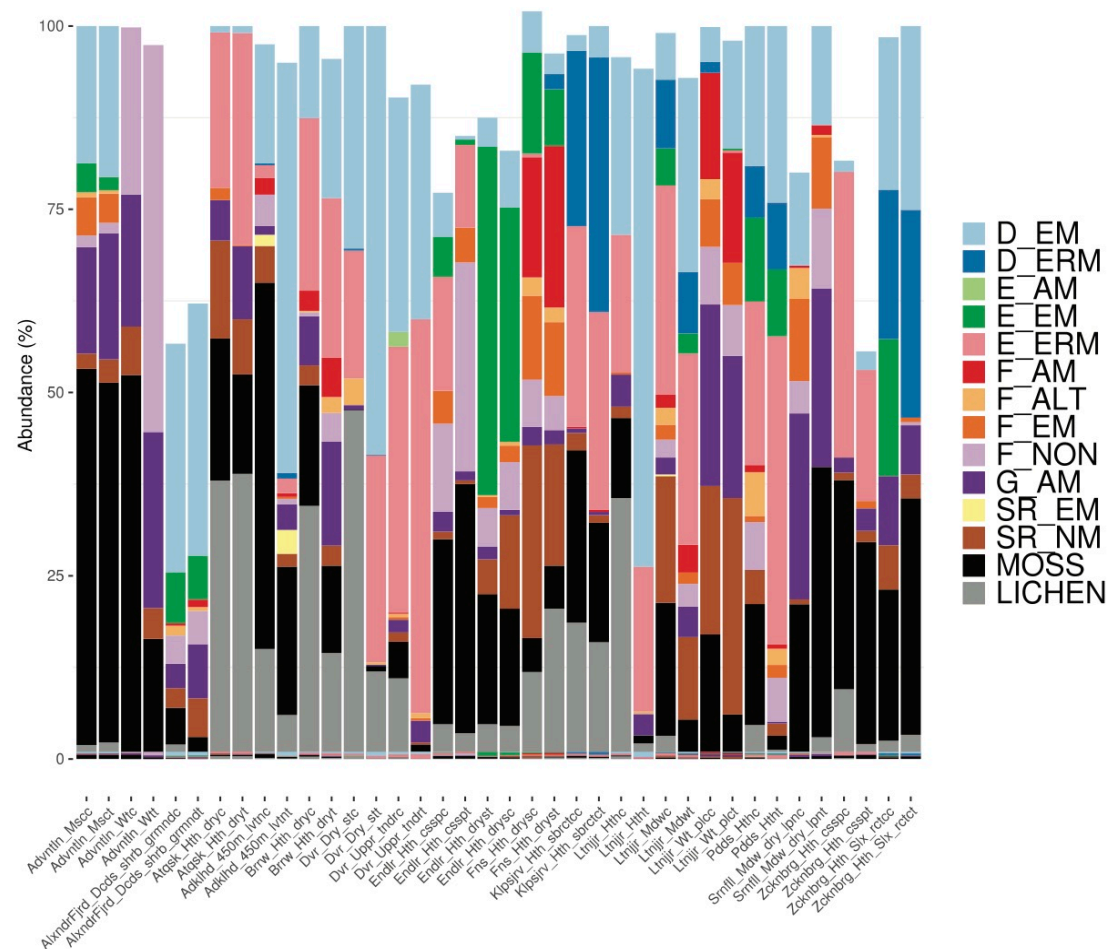
Vegetation analysis based on functional groups

1. Growth form

- Deciduous (D) shrubs
- Evergreen (E) shrubs
- Forbs (F)
- Grasses (G)
- Sedges/Rushes (SR)
- Lichens and Mosses

2. Mycorrhizal association

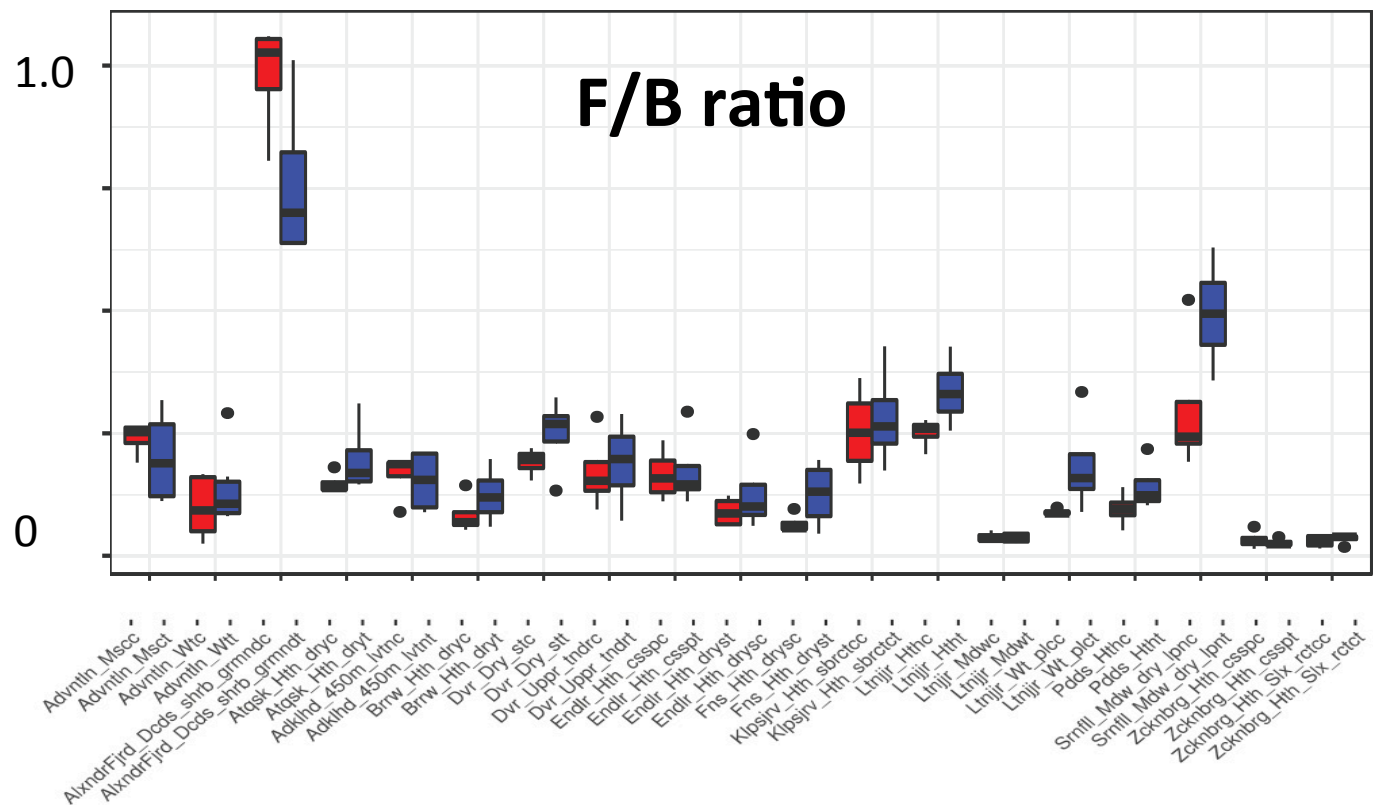
- ecto- (EM)
- ericoid- (ERM)
- arbuscular mycorrhiza (AM)
- alternative associations (ALT)
- non-mycorrhiza (NM)



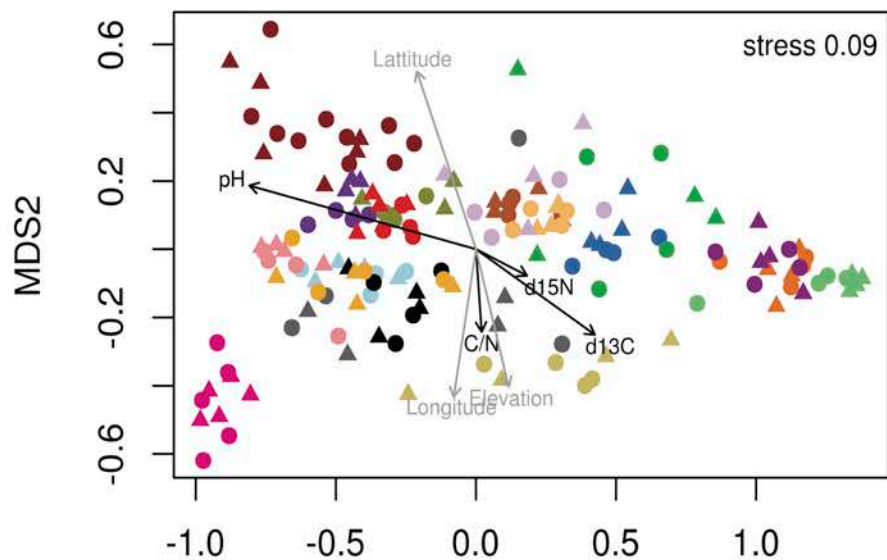
Permanova: Site (R^2 0.54) Duration (R^2 0.04) Warming (R^2 0.015)

Bacterial communities: 11 500 OTUs

Fungal communities: 5 000 OTUs

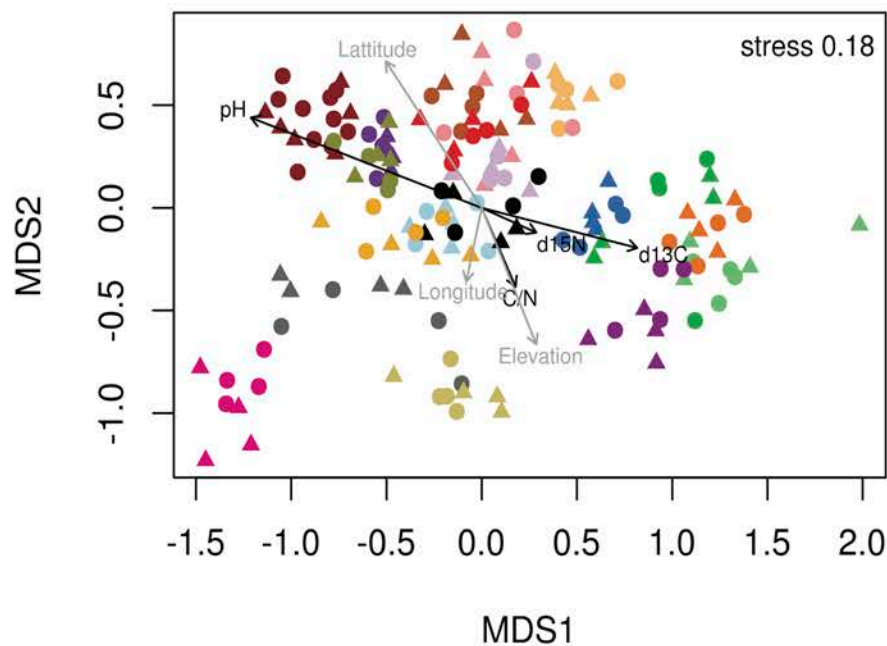


Bacteria:



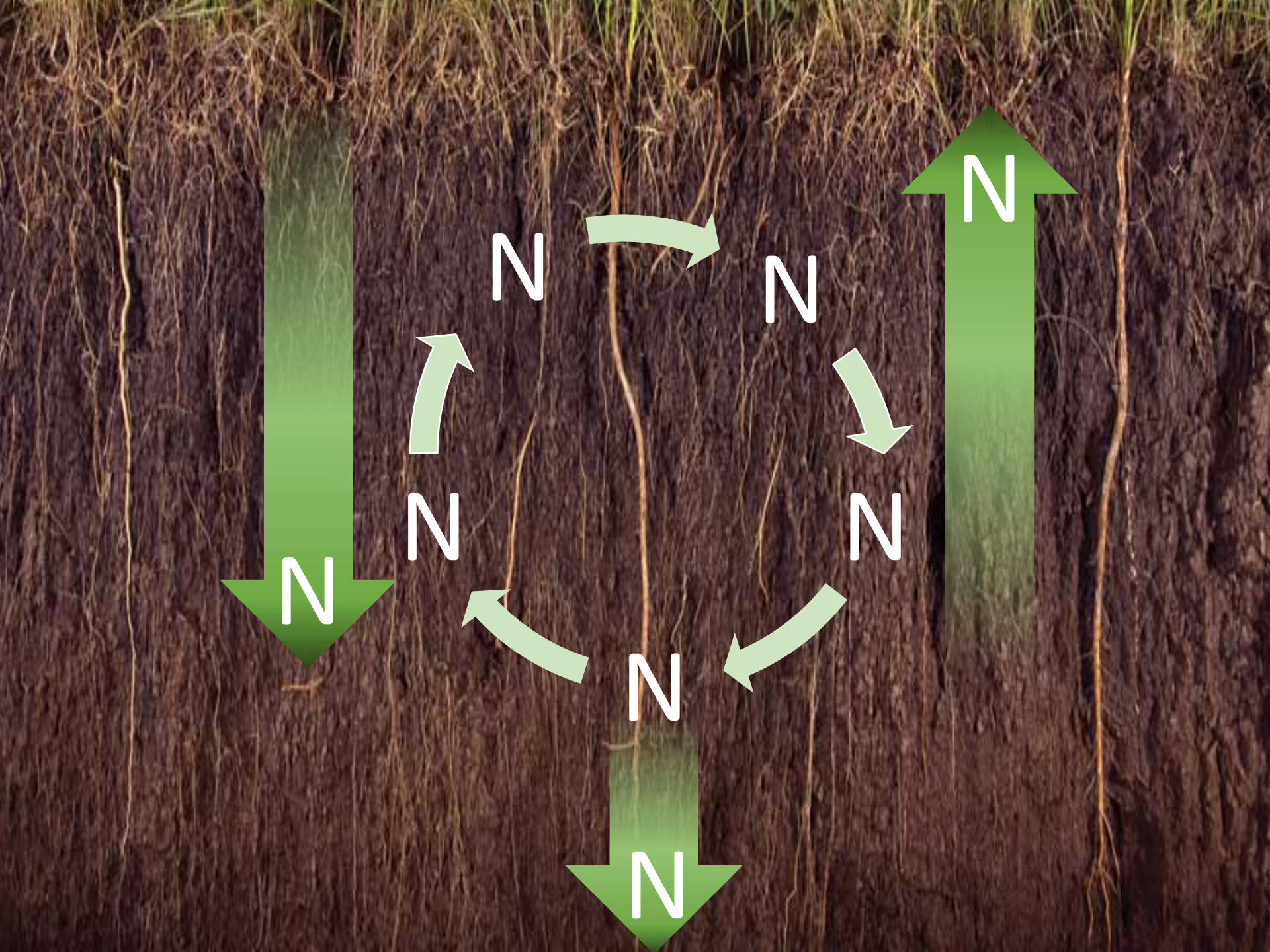
- Audkuloheidi_450m_elevation
- AlexandraFjord_Deciduous_shrub_graminoid
- Dovre_Dry_site
- Latnjajaure_Heath
- Paddus_Heath
- Endaler_Heath_cassiope
- Zackenberg_Heath_cassiope
- Atqasuk_Heath_dry
- Barrow_Heath_dry
- Endaler_Heath_dryas
- Finse_Heath_dryas
- Zackenberg_Heath_Salix_arctic
- Kilpisjarvi_Heath_subarctic
- Latnjajaure_Meadow
- Sornfelli_Meadow_dry_alpine
- Adventalen_Mesic
- Dovre_Upper_tundra
- Adventalen_Wet
- Latnjajaure_Wet_place

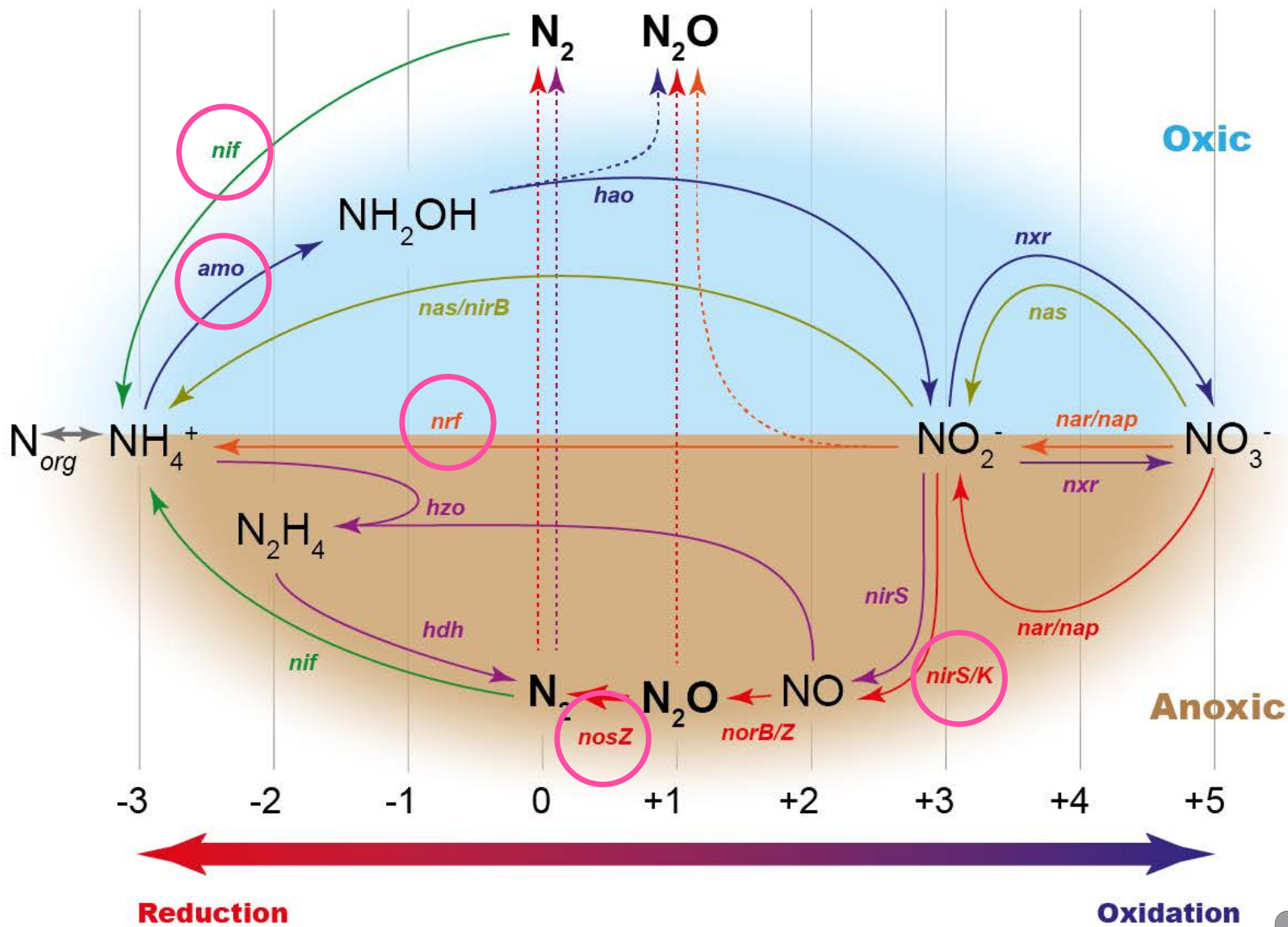
Fungi:



Control_vs_OTC

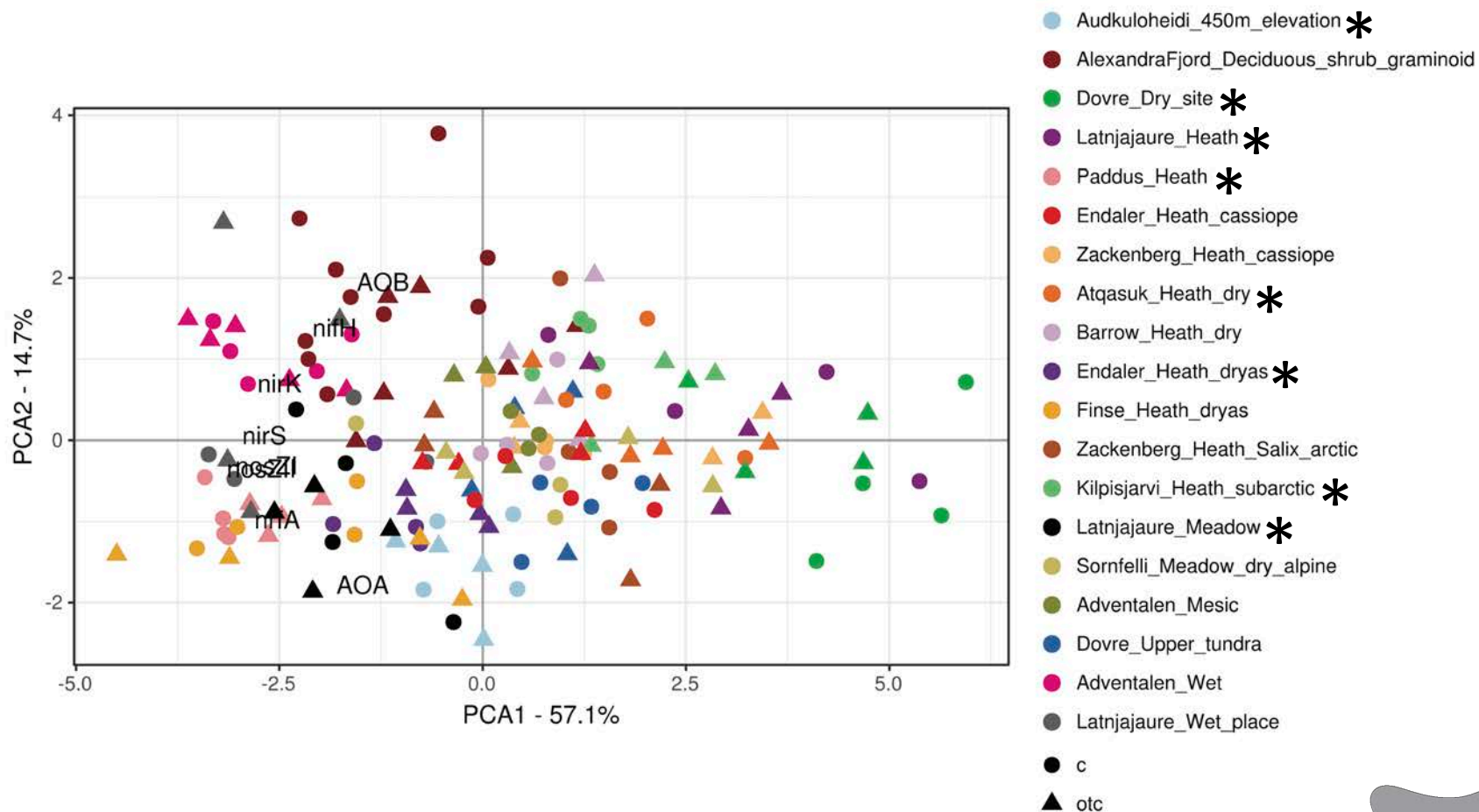
- c
- ▲ otc





(Hallin et al. 2018 *Trends Microbiol.*)

Concatenated matrix of all N cycling gene abundances



*Shrub increase: detailed study on these sites

Conclusions

- Strong site effect on vegetation and microbial community composition
- Warming effect on some plant groups, but not at all sites
- Warming-induced changes in vegetation not reflected in microbial community composition
- Genetic potential for N cycling not affected by warming



But....

- Warming affected fungal communities at Latnjajaura (talk by Jaanis Juhanson)
- Warming affects on bacterial and fungal networks (talk by Mathilde Jeanbille)

Acknowledgements

Awesome team

Jaanis Juhanson
Mathilde Jeanbille
Karina Clemmensen
Sara Hallin

Collaborators

ITEX network
Juha Alatalo
Anders Michelsen
Björn Lindahl

Funding

The Swedish Research
Council Formas



The Swedish University of
Agricultural Sciences



Bacterial diversity:

