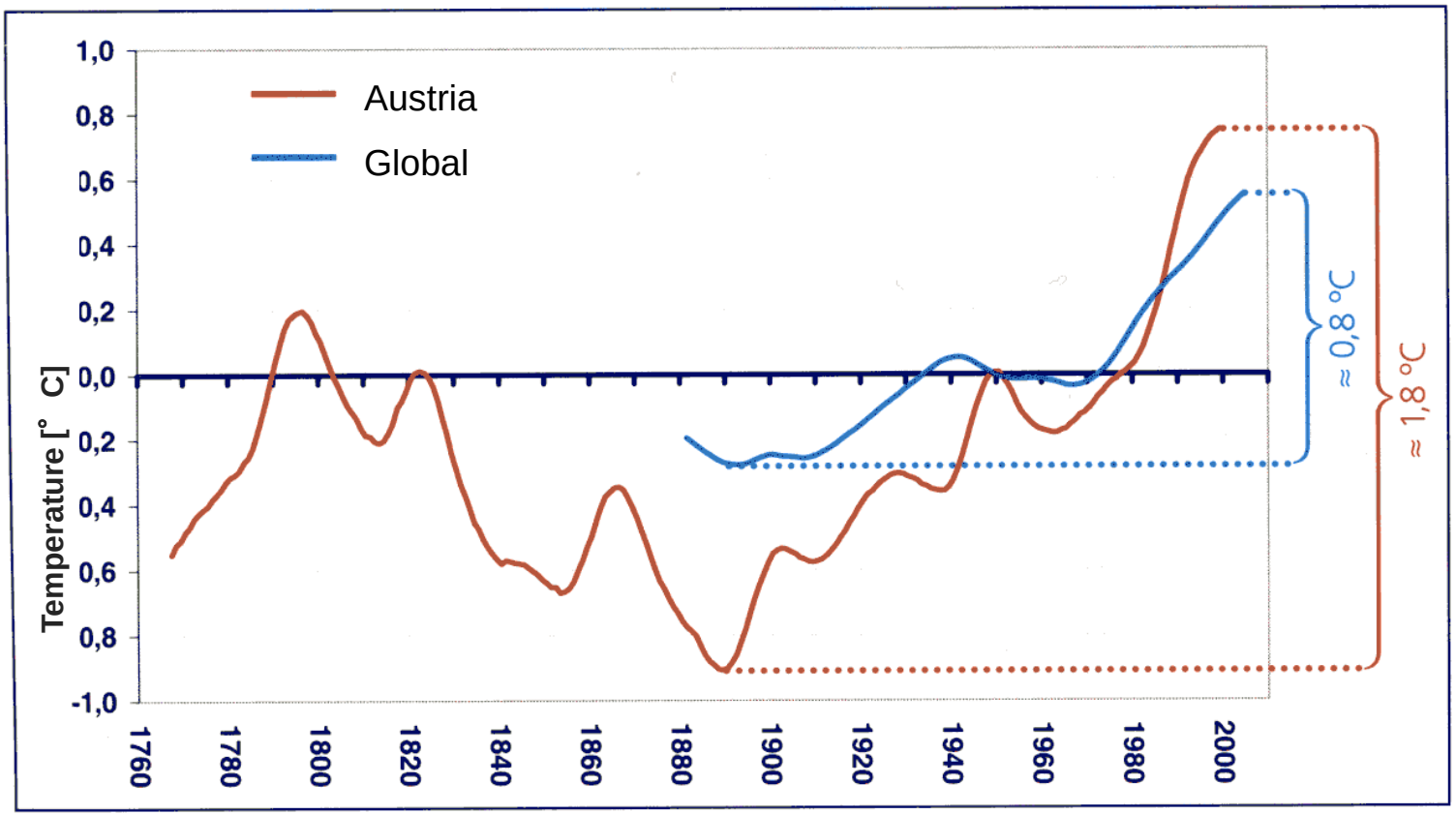
Soil microbial communities and their feedbacks to simulated climate change: comparisons among montane ecosystems

Ika Djukic[1], Franz Zehetner[1], Martin H. Gerzabek[1], Georg J. Lair [1,2], Verena Hell[3], Georg Niedrist[3], Ulrike Tappeiner[2,3], Michael Zimmermann [1,4] , Michael I. Bird[4]

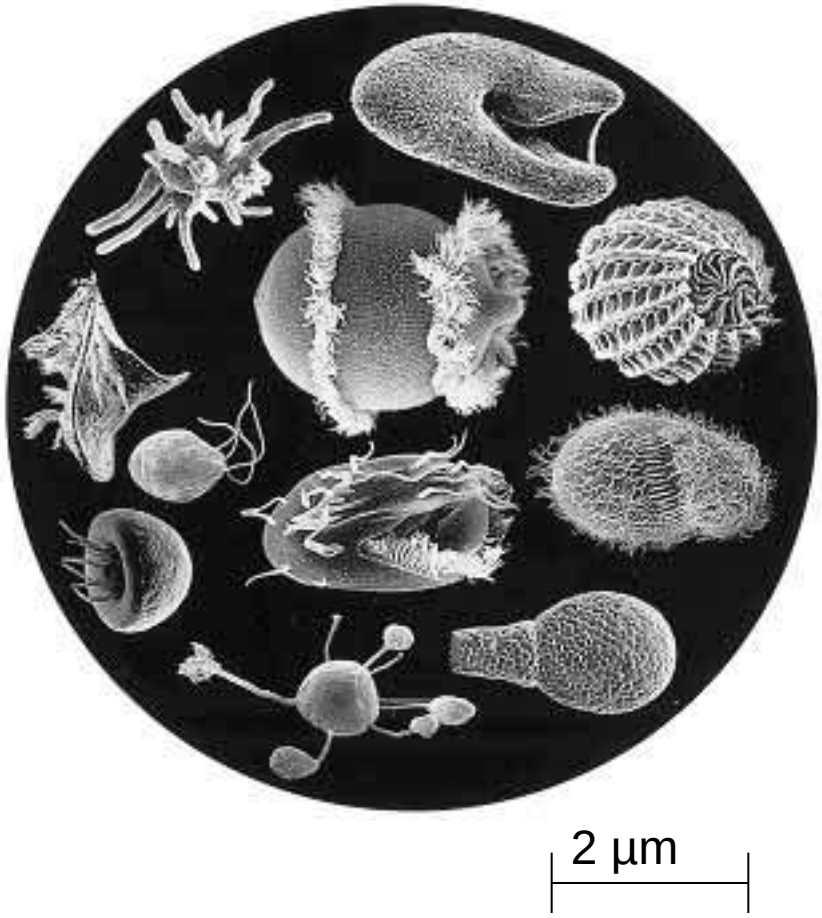
[1]Institute of Soil Research, University of Natural Resources and Life Sciences (BOKU), Vienna, Austria
[2]Institute of Ecology, University of Innsbruck, Austria
[3]European Academy of Bozen, Italy
[4]School of Earth and Environmental Sciences, James Cook University, Australia

Climate change in Alpine ecosystems



Source: Kromp-Kolb, 2005

Soil microorgansisms

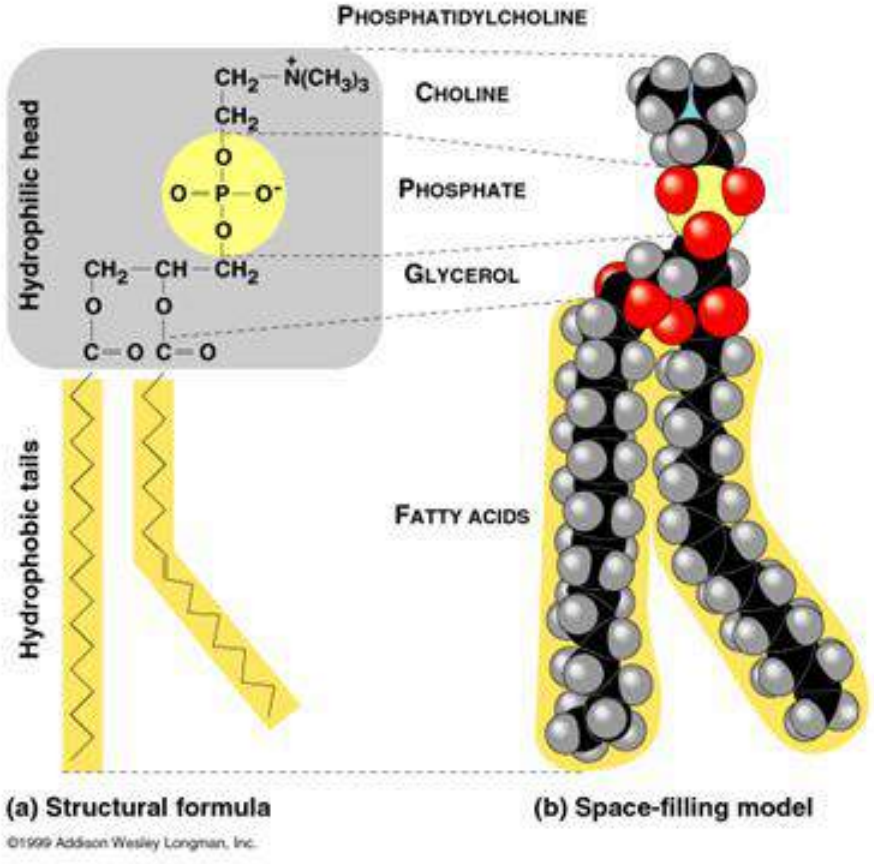


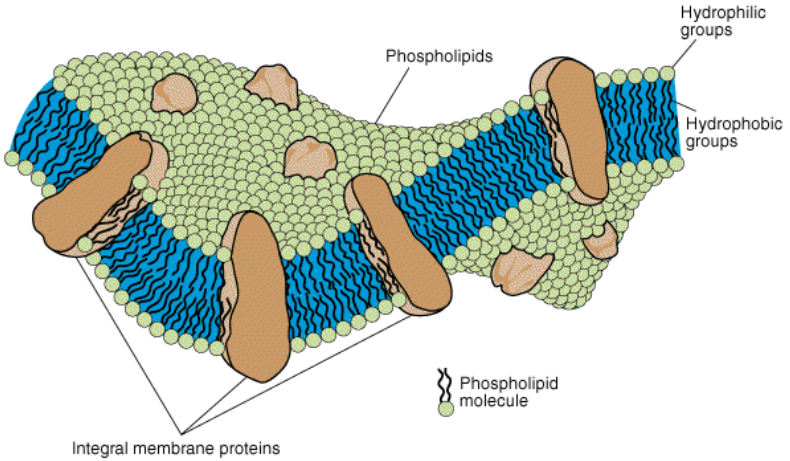
Aims

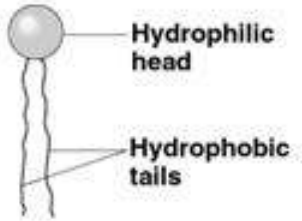
Short-term effects of changing climatic conditions on soil microbial community composition

- To quantify changes in the microbial structure in three different montane ecosystems
- To attribute observed changes to the controlling parameters
- To draw conclusions on impacts of climate warming on microorganisms in contrasting environment

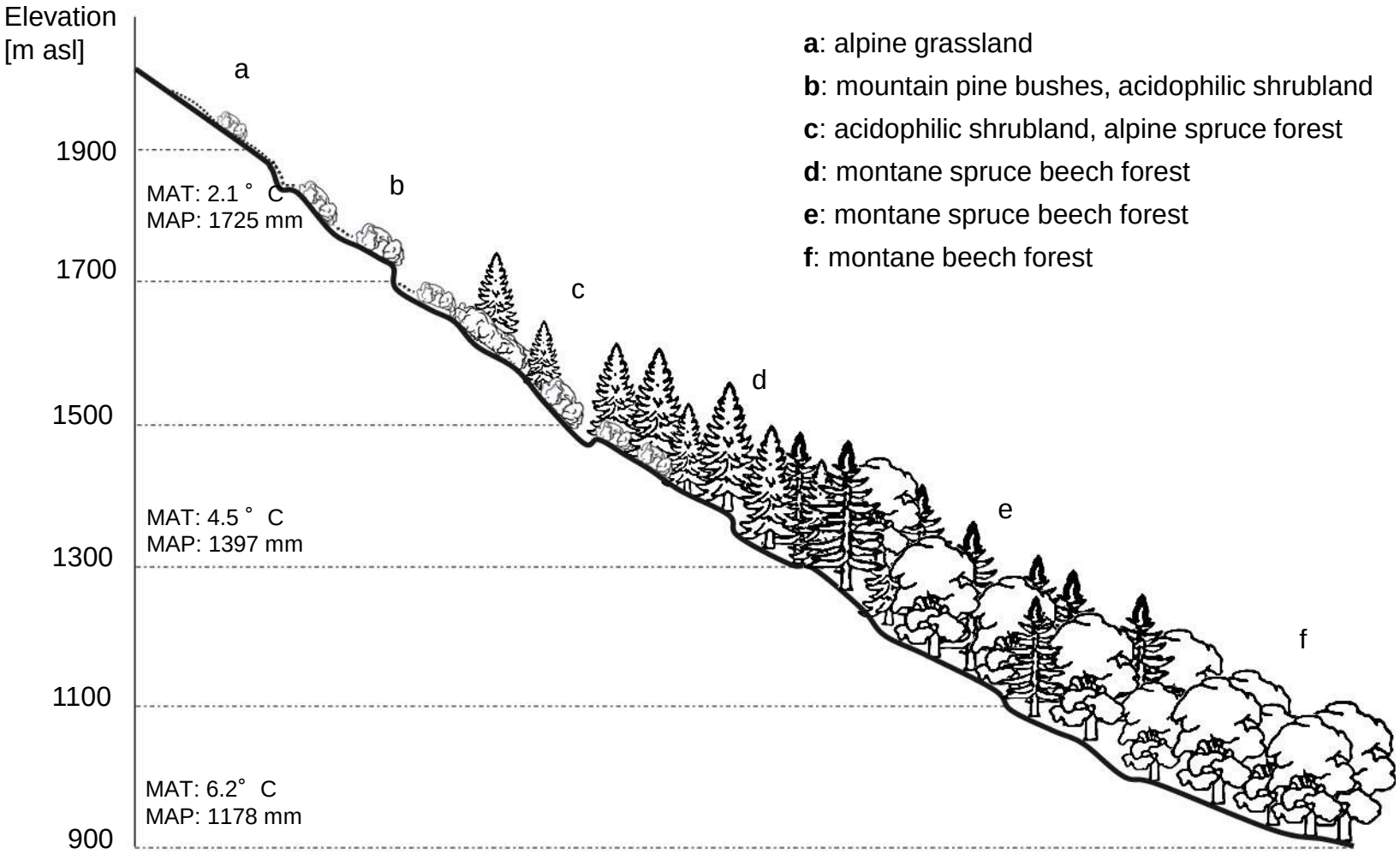
Phospholipid Fatty Acids (PLFAs)



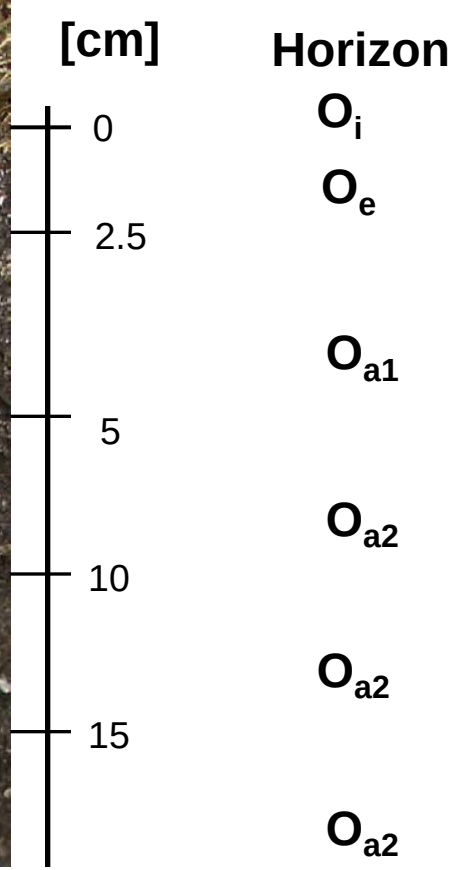




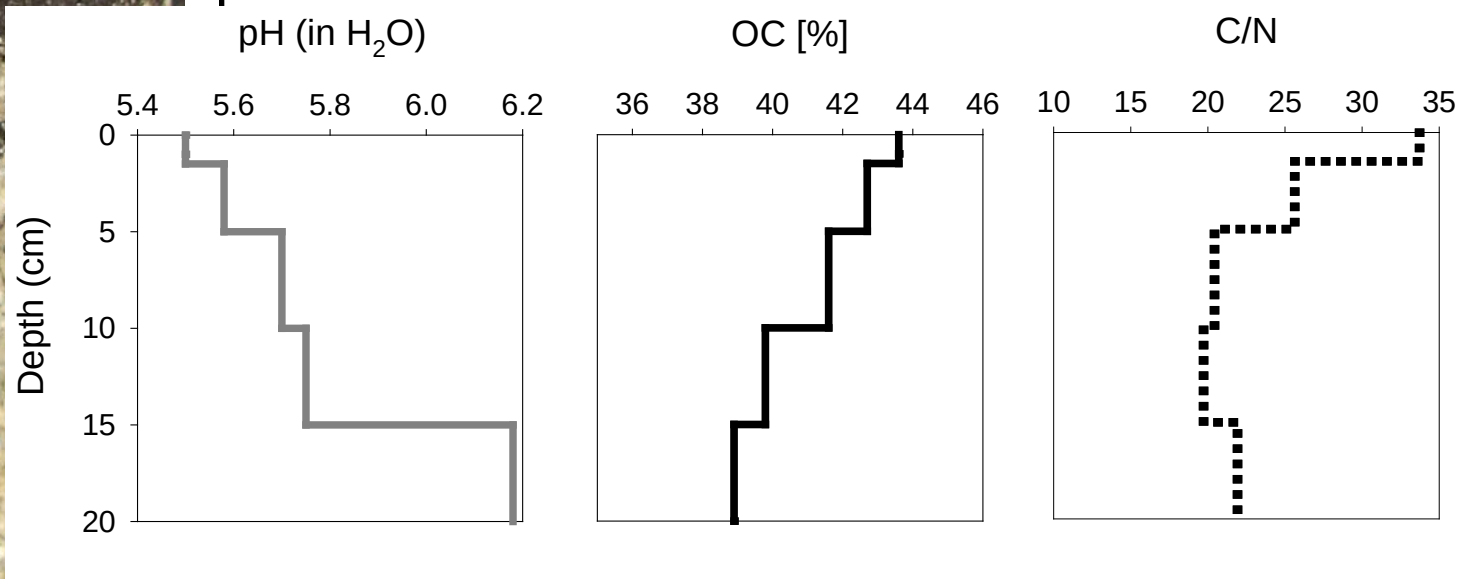
Climosequence



a: alpine grassland
b: mountain pine bushes, acidophilic shrubland
c: acidophilic shrubland, alpine spruce forest
d: montane spruce beech forest
e: montane spruce beech forest
f: montane beech forest



Leptic Histosols (Rendzina)



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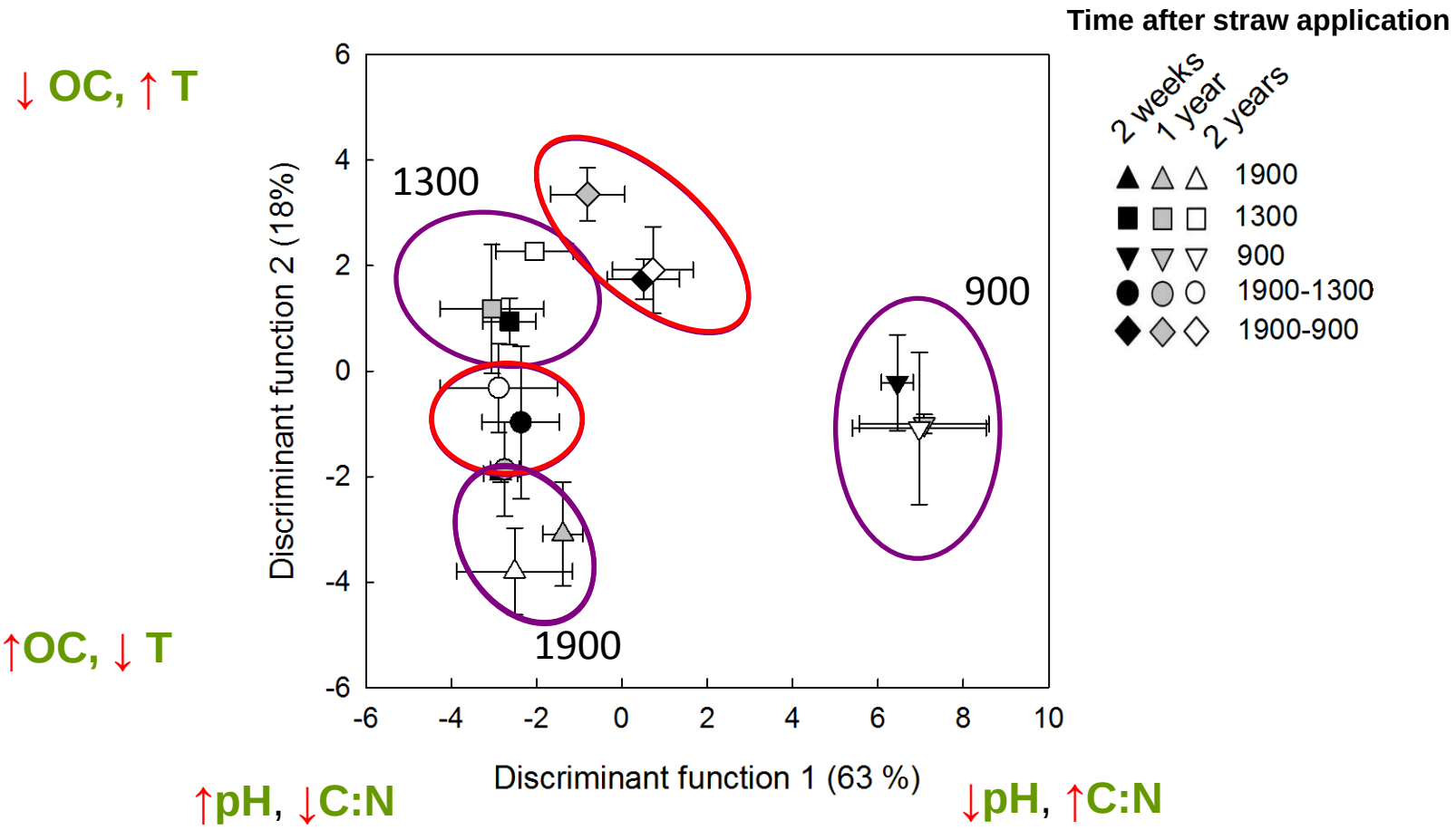
Microbial community composition



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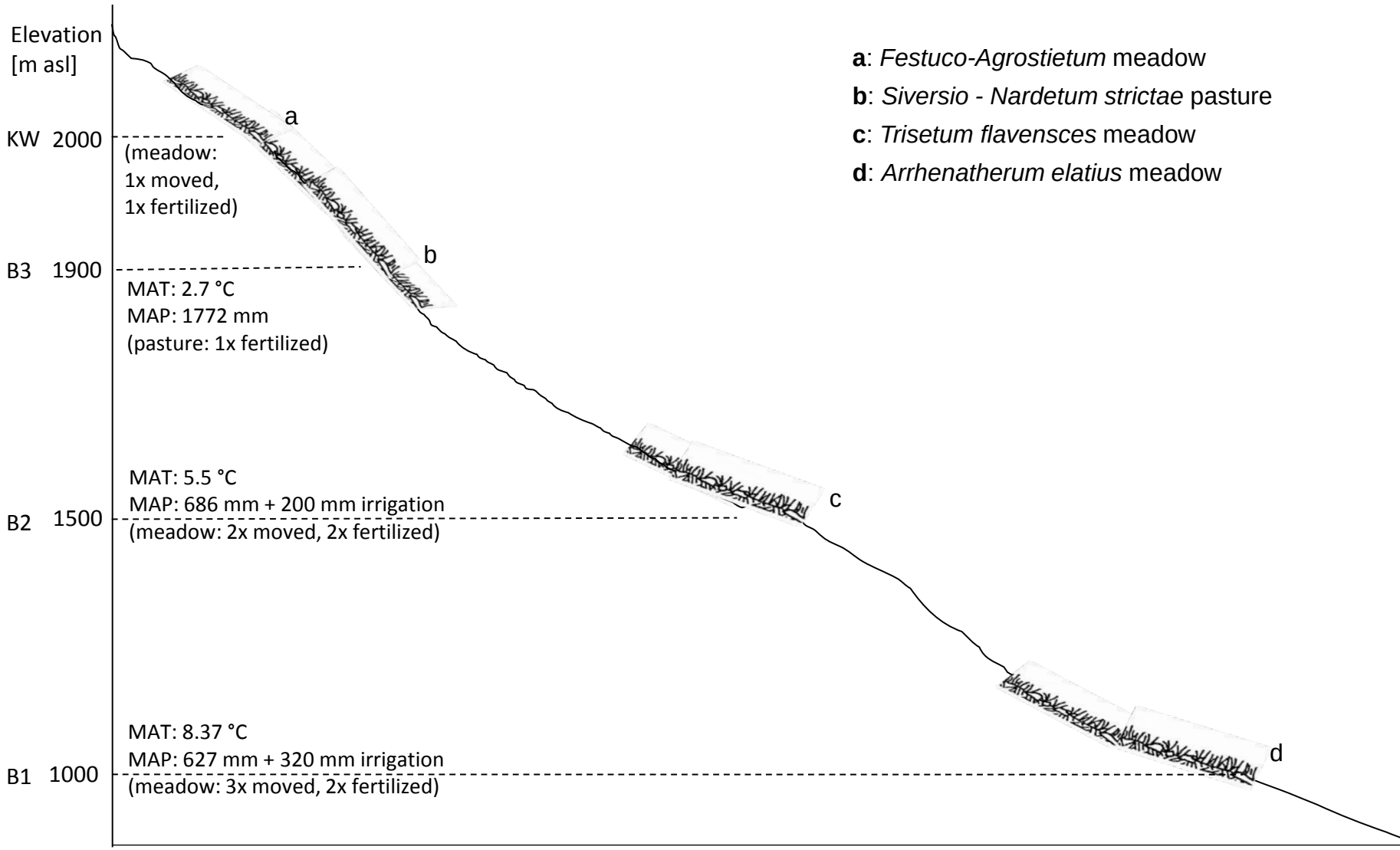

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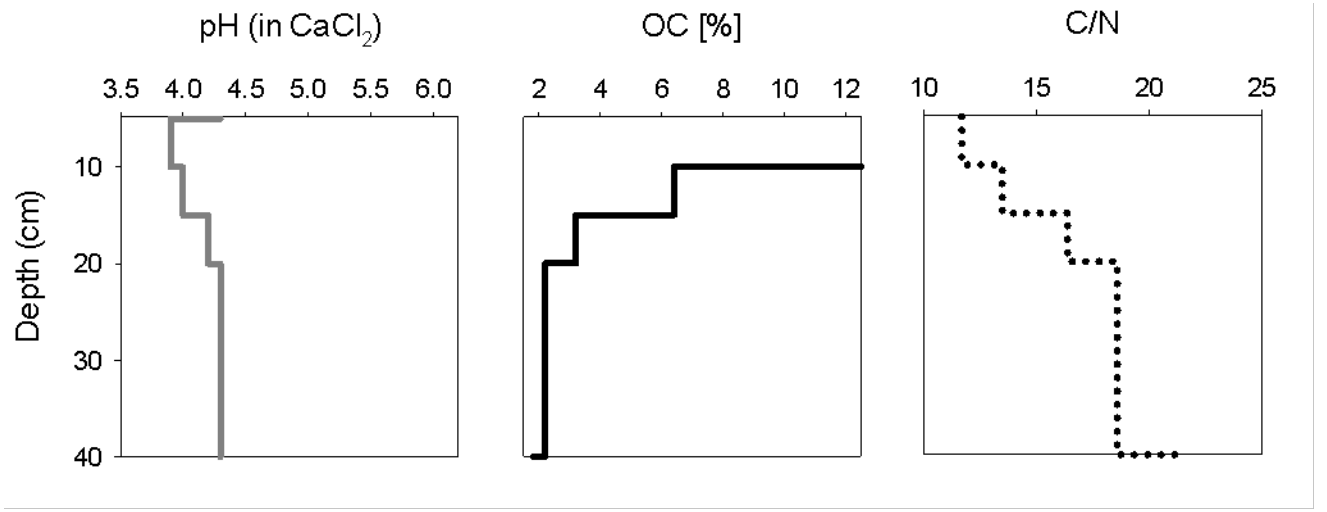
Leptic Cambisol



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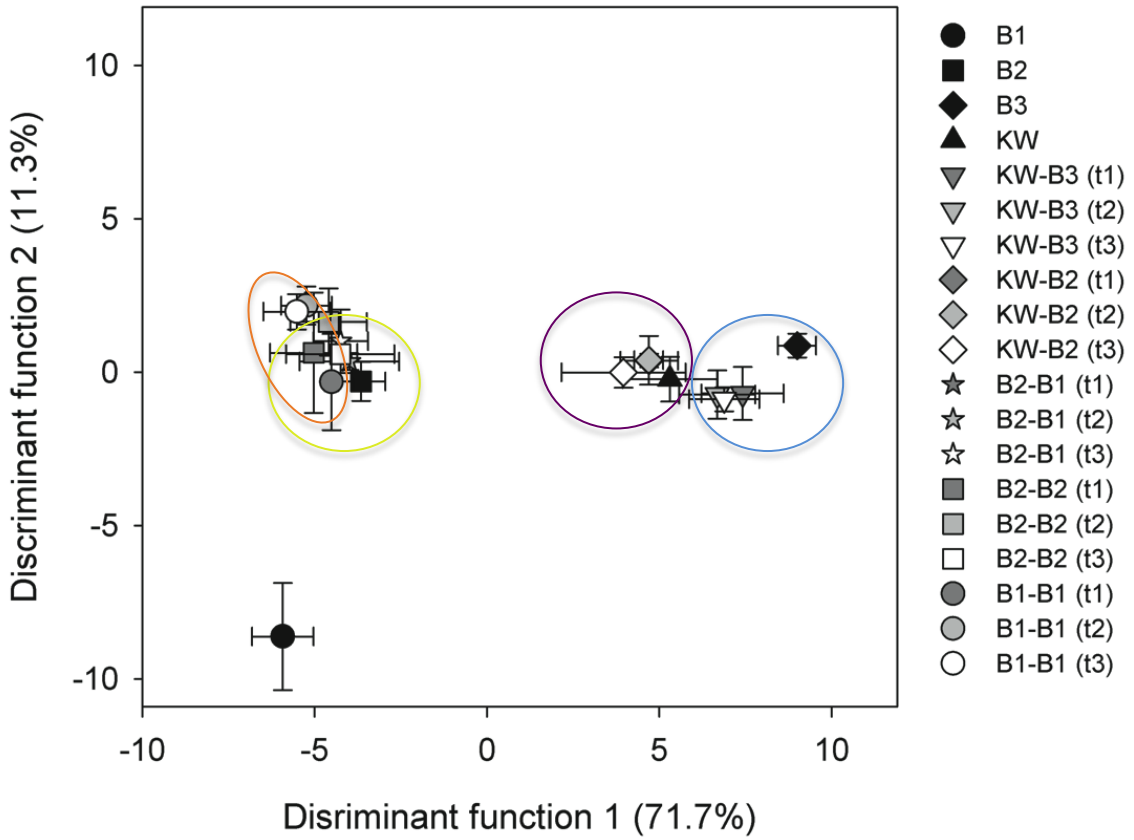
Microbial community composition



↑pH, ↑NO_3^-

↓pH, ↓NO_3^-

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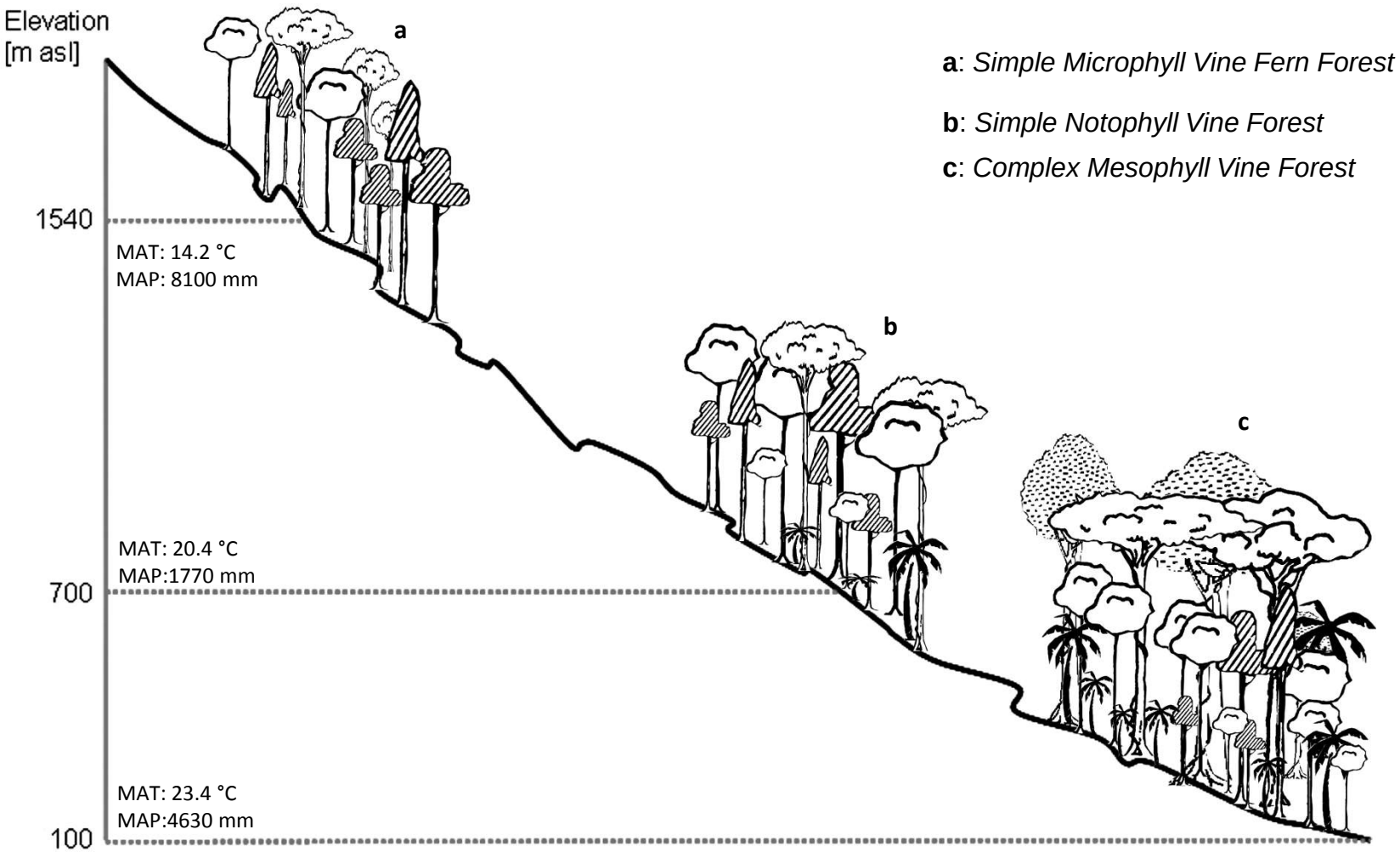
Climosequence

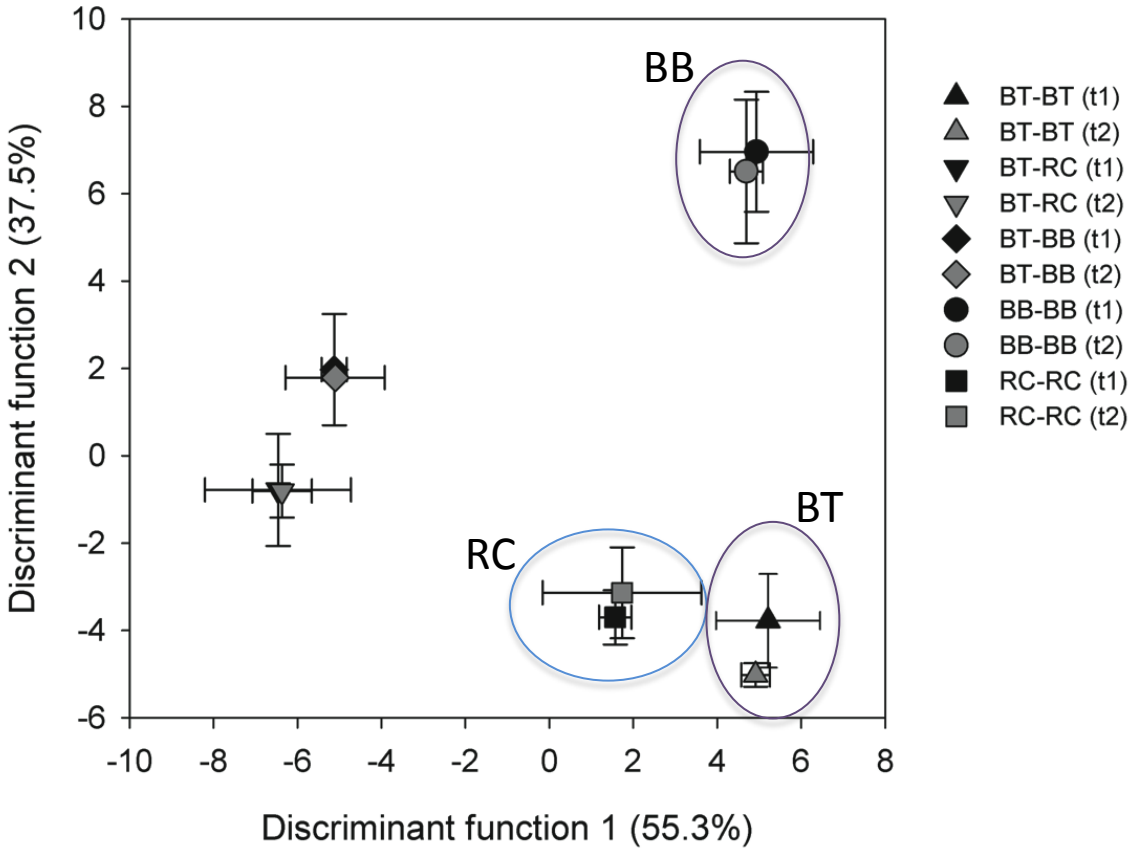


a: *Simple Microphyll Vine Fern Forest*

b: *Simple Notophyll Vine Forest*

c: *Complex Mesophyll Vine Forest*

Microbial community composition



Ika Djukic, May 2014

Simulated soil warming by high-to-low elevation soil translocation

Temperate Forests & Grasslands	Temperate Grasslands	Tropical Forests
– Significant changes in microbial composition occurred rapidly after the soil translocation	– Microbial community remained mostly unchanged over time	– Microbial structure moved away from the origin site but did not become similar to the community at the host site within 2 years
– Microbial structure was more strongly influenced by environmental/site condition than by changes in litter quality	– Microbial community composition was largely driven by soil pH and nutrient content	

- Overall, climate shifts caused a strong alteration in microbial community composition if accompanied with changes in vegetation under semi-natural conditions, while under intensive managed conditions the change in microbial structure were hardly present.

- Both climatic parameters and substrate availability likely influenced observed changes in microbial communities at the studied sites.

Outcomes

- Soil translocation is a feasible (and low cost) approach for assessing the effects of climate change on the soil ecosystem
- Microbial parameters are very sensitive to environmental changes and can be used as valuable indicators of change
- Need for long-term study


Thank you for listening!