INVESTIGATING THE DROUGHT-PRONE BIOLOGICAL INTERPLAY OF SOIL MICROBIAL COMMUNITIES AND SCOTS PINE TREES

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Website of the project

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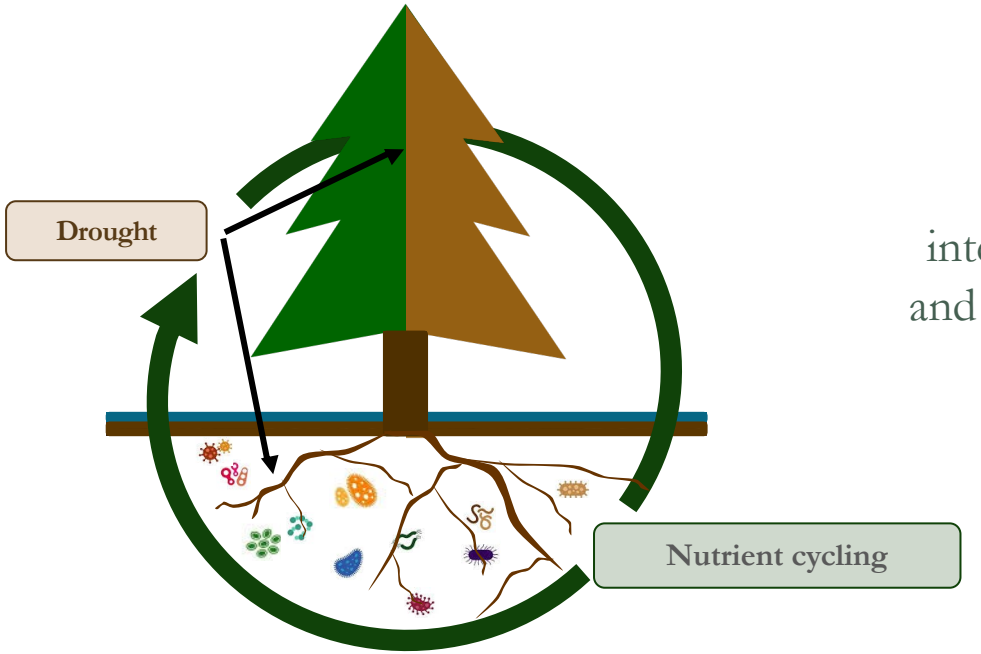
Background

Investigating the effects of drought on the biological interplay between Scots pine trees and soil microbial communities.

For Scots pine (*Pinus sylvestris* L.) high mortality rates have been observed in Switzerland[1]. This dieback appears to be primarily caused by effects of drought[1].



Drought induces a series of interconnected effects between trees and the associated soil microbiome[2].

→ **This could strongly alter carbon cycling in forests**

[1] Bigler, Bräker, Bugmann, Dobbertin, Rigling. Ecosystems. 2006;9(3):330–43.
[2] Classen AT, Sundqvist MK, Henning JA, Newman GS, Moore JAM, Cregger MA, et al. Ecosphere. 2015;6(8).

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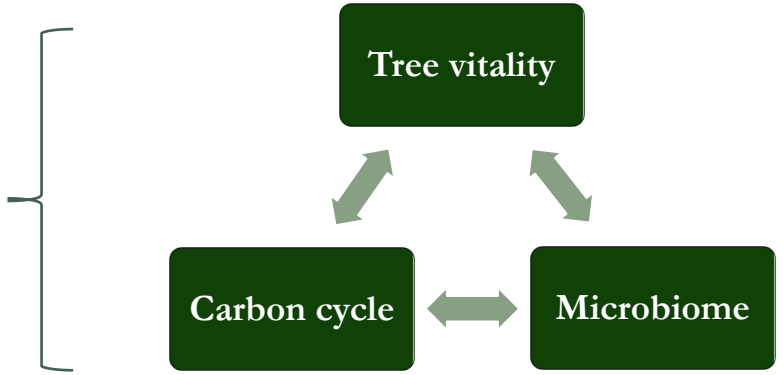
Objective

Visit vPICO **EGU21-1125**
by Emily F. Solly
in Session **SSS4.2**



Unravel shifts in microbial community composition and functional capacity under drought affecting carbon cycling and altering tree vitality contributing to tree mortality.

Microbial composition & functioning

Activity	Basal Respiration	**Abundance**	qPCR of taxonomic markers (16S, 18S)
Biomass	CFE → C_{mic}, N_{mic}, $\delta^{13}C$ enrichment	**Diversity**	Metabarcoding
Structure	Extractable PLFAs → $\delta^{13}C$ enrichment	**Function**	Metagenomics

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Experimental Set-up

18 Scots pine- soil mesocosms

Origin of trees & soil: Pfyn forest, CH

Controlled seasonal temperatures

1st year

3 drought treatments

2nd year

+ 4 °C in growing season

→ drought + heat stress

Control
field capacity

Dry
40 % reduction

Drought
75 % reduction

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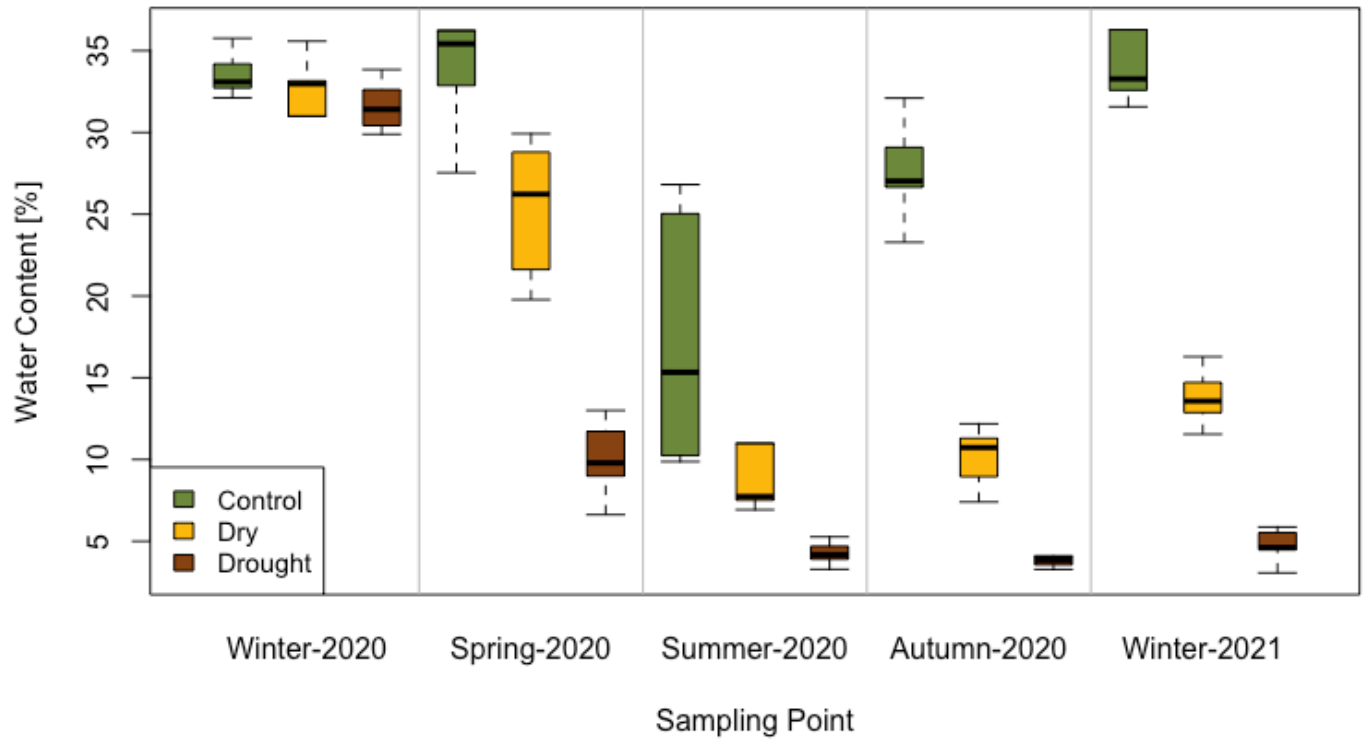
One year of experimental drought



Control	Ø 29.6 % ± 8.38
Dry	Ø 18.8 % ± 9.89
Drought	Ø 10.9 % ± 10.9

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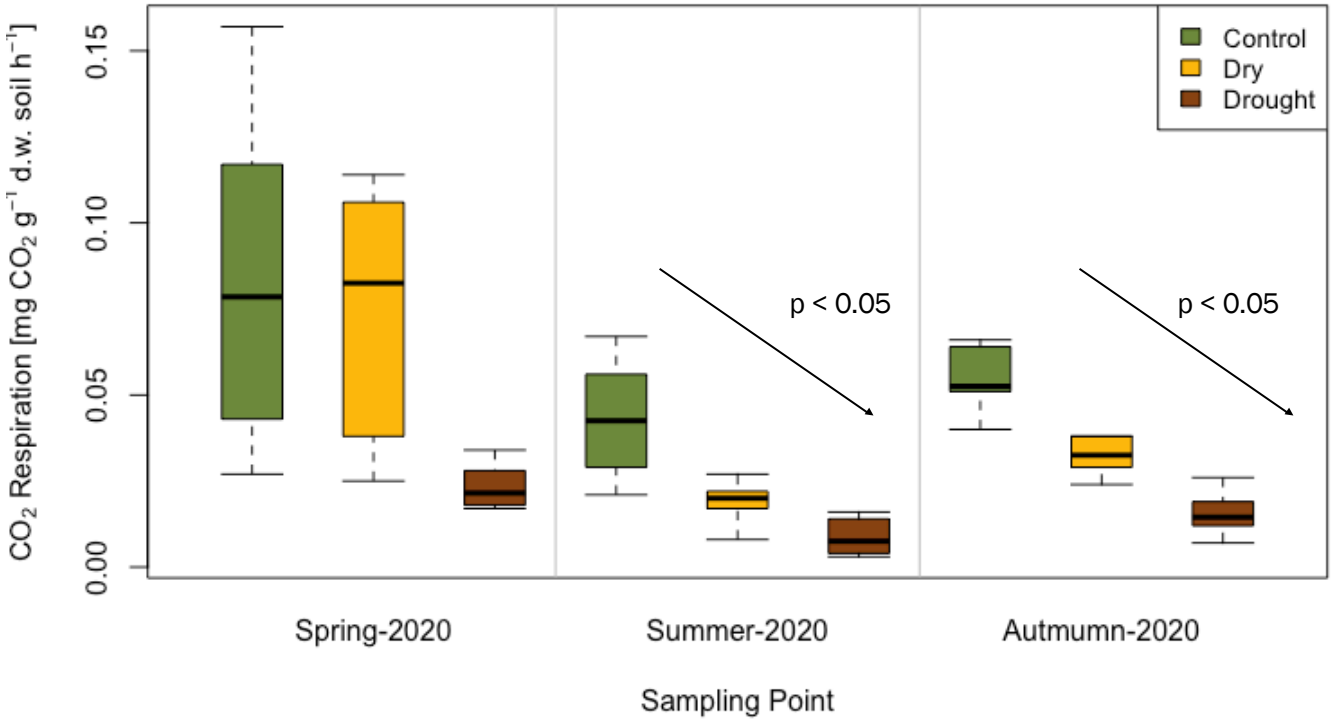
Basal Respiration during growing season



→ Basal respiration used as indicator for microbial activity

→ Experimental drought influenced basal respiration in soils

→ **Drought** condition showed **significantly lower basal respiration** during growing season

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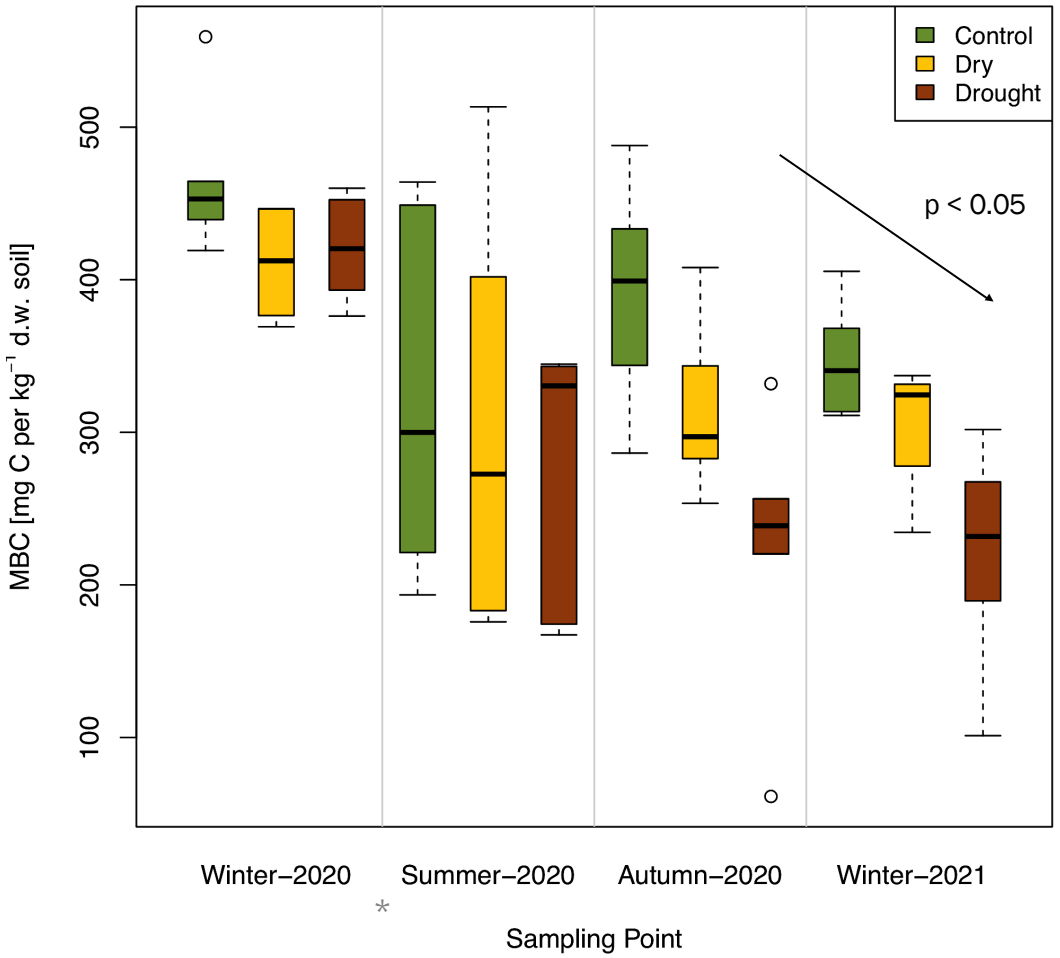
Microbial Biomass Carbon (MBC)



→ One year of experimental drought altered microbial biomass carbon (MBC) in soils

→ MBC is **decreased** under **dry** and **drought** conditions

**data for Spring-2020 missing due to COVID-19*

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Outlook

Tracing the natural pathway of photosynthetic CO_2 assimilates into microbial groups under drought

^{13}C-CO_2 pulse-labelling of
9 mesocosms

1000 ppm of 99.9 % ^{13}C-CO_2

45 min per Tree

Sampling:
0h, 24h, 48h, 72h, 7d

Structure	Extractable PLFAs → $\delta^{13}C$ enrichment
Biomass	CFE → C_{mic}, N_{mic}, $\delta^{13}C$ enrichment

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