European forest soil microorganisms in the face of drought: the influence of tree species diversity

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1 Introduction

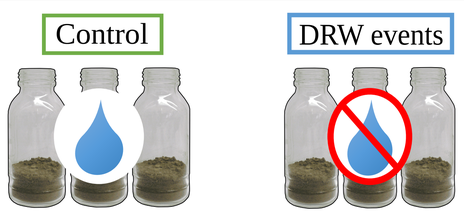
Climate change models predict increased drought frequency and severity for a significant part of Europe, which may affect the activity of the forest soil microbial communities who control much of the carbon and nutrient cycling[1,2]. This may alter biogeochemical cycles with potential feedbacks on forest productivity[2]. The resistance and resilience of forest soil microorganisms to drought will depend upon several abiotic and biotic factors, among which tree community diversity and composition may be particularly important[3]. Knowledge of the influence of the tree community on microbial resistance and recovery can help direct forestry management for future climate changes.

We investigated:

(1) the effects of drying-rewetting (DRW) cycles on European forest soil functioning along a latitudinal gradient

(2) the influence of tree species diversity on soil microbial resistance and resilience during these events.

2 Materials and Methodes



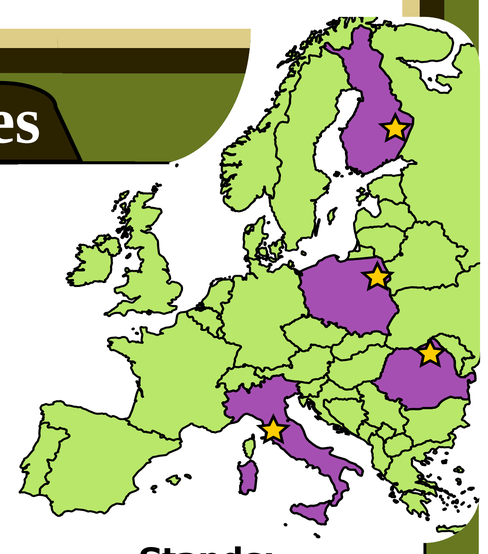
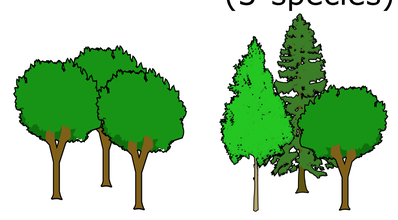
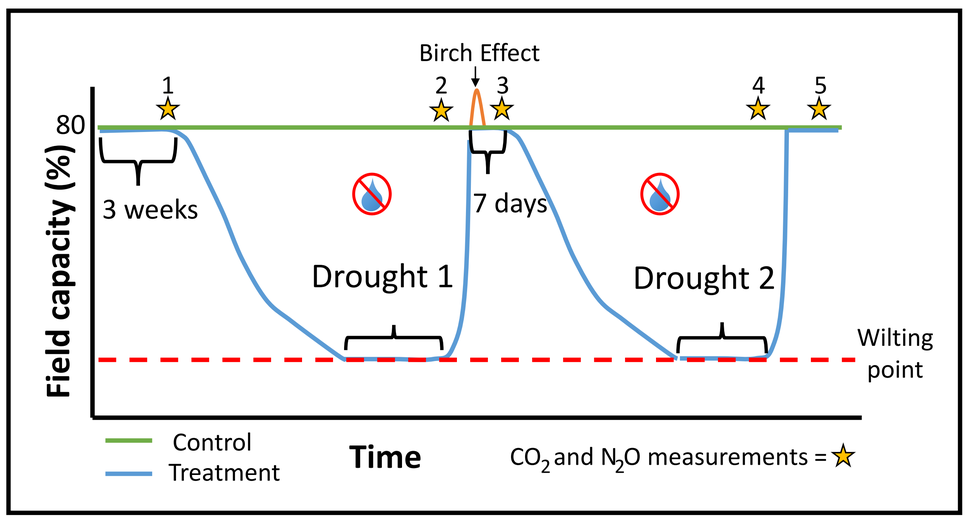


Figure 1. Experiment with two drying and rewetting events (DRW). Soil microbial activity (CO_2 and N_2O production) was measured (represented by a star): before the disturbance (1), end of the drought (2, 4), and after the rewetting period (3, 5). The control group (green line) was kept at 80% of the field capacity and the treatment group (blue line) was dried to the wilting point during each drought (drought duration and wilting point varied by country determined by the number of water stress days per year, i.e. number of days the relative extractable water was <0.2, and by the wilting point average respectively.).

Stands:

Monospecific | Polyspecific (3-species)





3 Results and Discussion

Boxplot avec les fluxes cumulatifs x Pays +Traitments ?

Tableau des R^2 et p-values (si je peux en faire ?

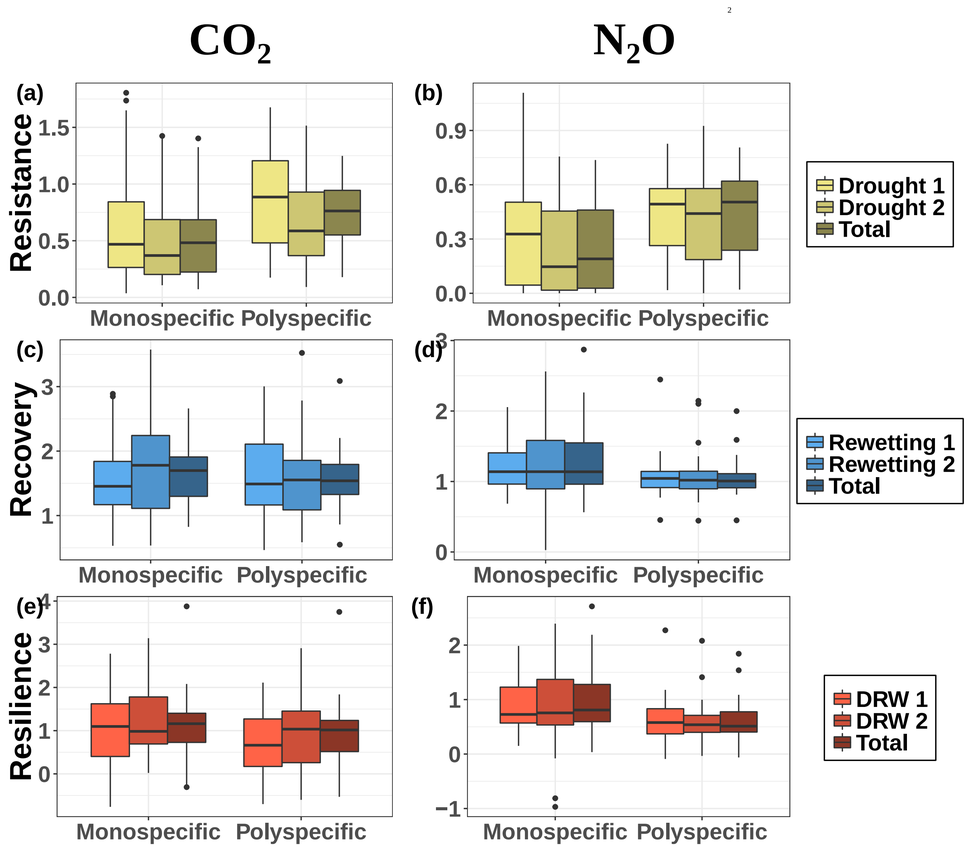
Formulas[4]:

$$\text{Resistance} = \frac{\text{Drought}_{\text{Treatment}}}{\text{Drought}_{\text{Control}}}$$

$$\text{Recovery} = \frac{\text{Rewetting}_{\text{Treatment}}}{\text{Rewetting}_{\text{Control}}}$$

$$\text{Resilience (estimation)} = \text{Recovery} - \text{Resistance}$$

We calculated the resistance, recovery, and resilience



4 Conclusion

These results could help predict changes in forest microbial functioning under climate change based on tree community composition and possibly predict changes in forest productivity. However, a better understanding of how microbial community composition changes during DRW events is still required.

References

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