# Soil respiration after rain exclusion in stands of Douglas fir, European beech and their mixtures on contrasting soil types

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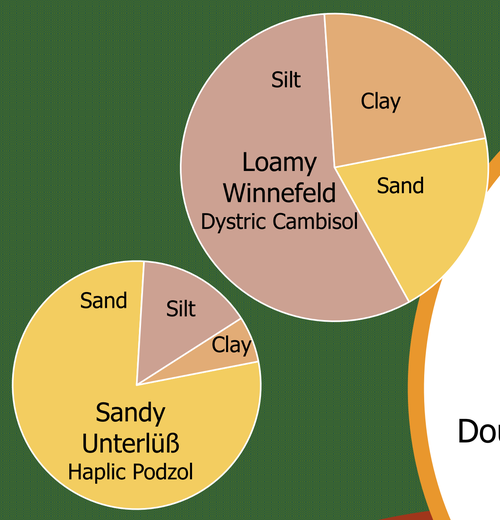
## Background

Planting Douglas fir (DF) is a viable climate-change adaptation strategy, particularly in mixture with beech[1]

Species identity and site drive C stock and stability; Identity effects are more pronounced on sandy/poorer sites; Mixtures enhance SOC storage[2]

Rainfall reduction affects SOC stock[4]

Distance to tree stem is expected to decrease $CO_2$ efflux (root respiration)




## Methods

$CO_2$ efflux measurements with a mobile IRGA sensor

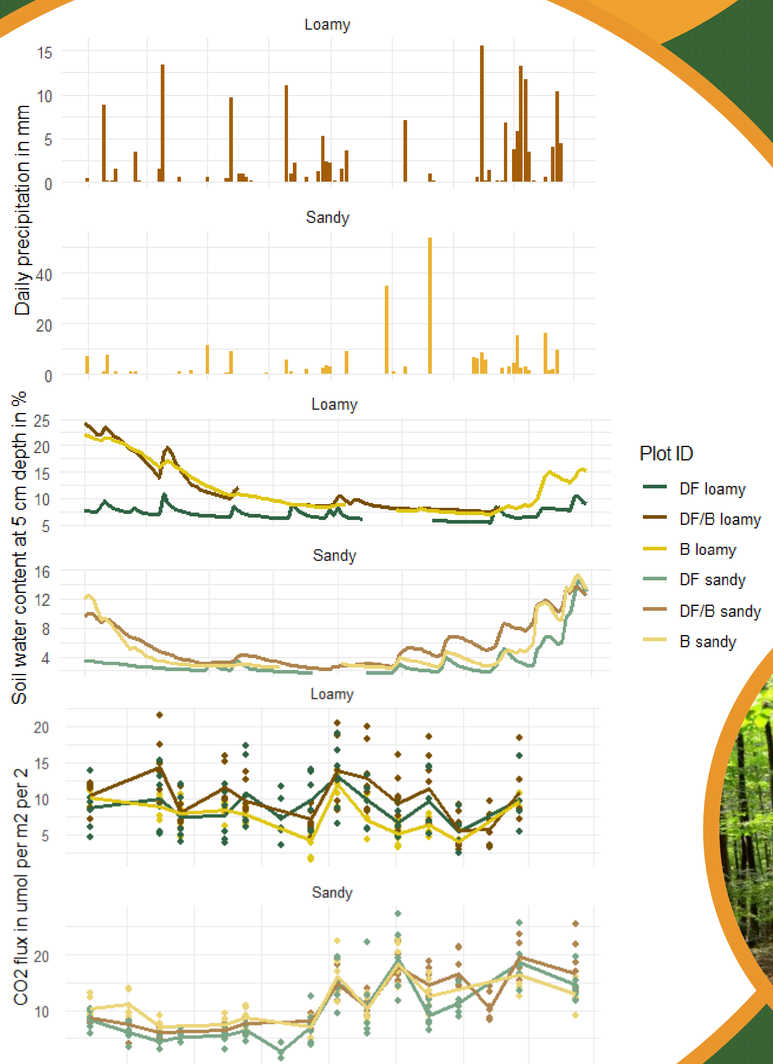
6 - 8 closed chambers per plot

Sandy and loamy site

Douglas fir (DF), European beech (B) and mixture (DF/B)

1 season; biweekly measurements

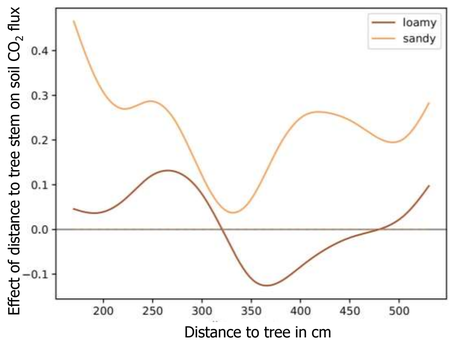
Rain and rain shelters



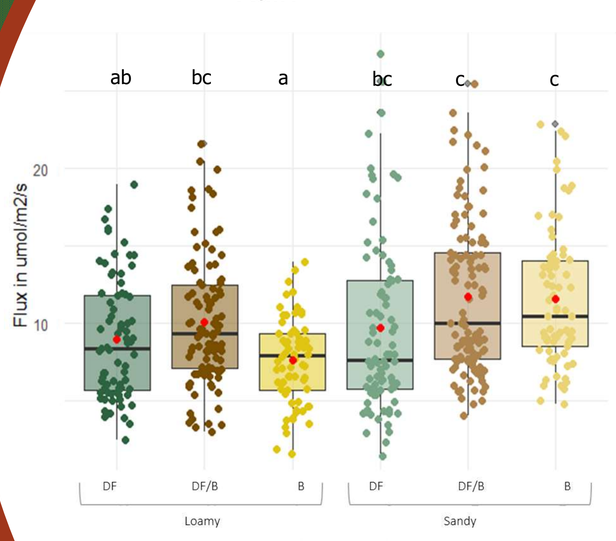
## Tree species
## Site texture
## Rain exclusion

## Distance from stem

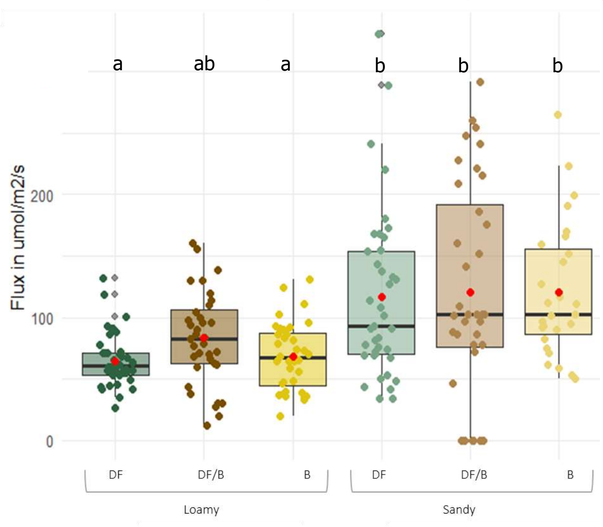



Mean of the nonlinear effect of distance to tree on $CO_2$ flux for each site. Log $CO_2$ flux model with mixture and shelter as linear effects, chamber as random effect, and week and distance to tree as nonlinear effects.

## Rain




## Shelter (rain exclusion)




Soil $CO_2$ efflux per plot under normal precipitation and rain exclusion. Colored dots are observations (weekly measurements on one chamber). Means are shown with red dots; if two or more means share a letter above the boxplot, they are not different (alpa=0.05) according to a Tukey post hoc test on two linear mixed effects models with fixed effect plot, random effect week.
DF=Douglas fir, DF/B= Douglas fir/European beech, B= European beech.

## Key messages

Highest $CO_2$ efflux on mixed plots (reflecting higher SOC stocks[2])

Sandy sites higher $CO_2$ efflux than loamy sites (more SOC stock in the organic layer[2])

Rain exclusion reduced soil respiration

Relationship between distance to tree stem and $CO_2$ efflux is strong up to distance ~3.8 m

Proximity to tree stem increases $CO_2$ efflux more on sandy site (reflecting more extensive vertical distribution of fine roots[3])

## References

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4 Meier I, Leuschner C (2010): Variation of soil and biomass carbon pools in beech forests across a precipitation gradient. Global Change Biology, Volume 16, Issue 3.


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