Controls of soil carbon sequestration capacity by above- and belowground vegetation inputs

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Introduction

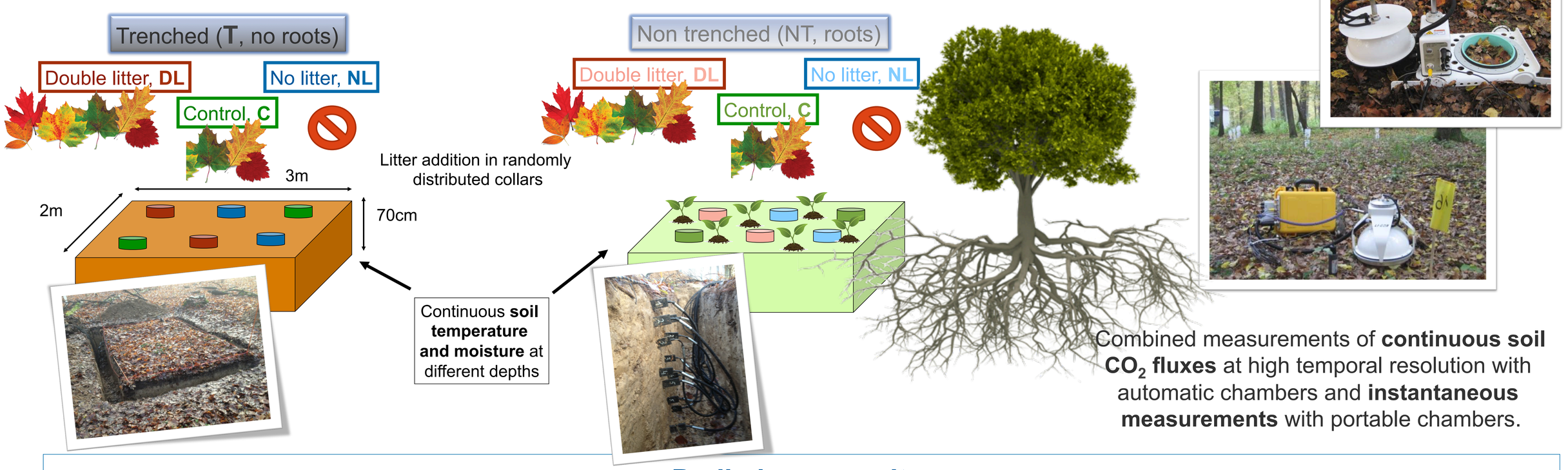
The stimulation of vegetation productivity can potentially compensate the increase on atmospheric CO_2 concentrations. However, changes on vegetation allocation patterns of would alter the amount of detritus inputs to the soil, which can lead to changes on microbial activity and soil biogeochemical processes. Here, we investigate how the alteration of above- and belowground vegetation inputs and their interaction affect to soil CO_2 emissions and soil C sequestration capacity.

Hypotheses

The extra supply of fresh organic matter from above- and belowground detritus inputs (i.e.: litter and root exudates) into the soil may activate the microbial mineralization of the stable fraction of soil organic matter (i.e.: priming effect).

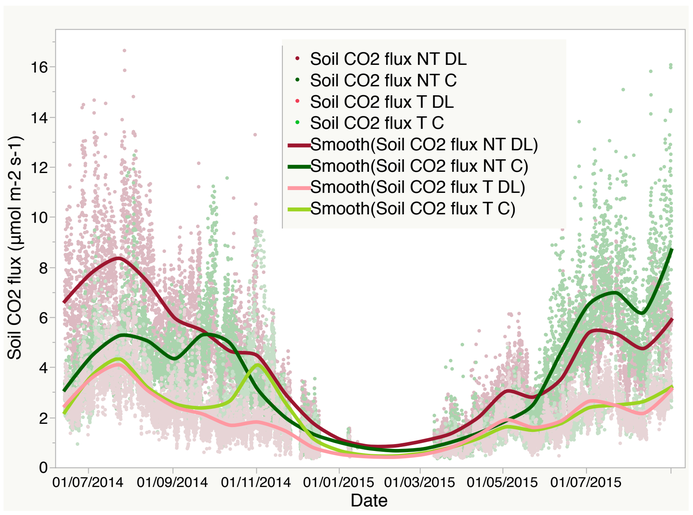
Experimental design:

Paired trenched (T, root exclusion) and non-trenched (NT, with roots) plots in a temperate deciduous forest.
Three levels of litter addition in each plot: Control, C; No litter, NL; and Double Litter, DL.

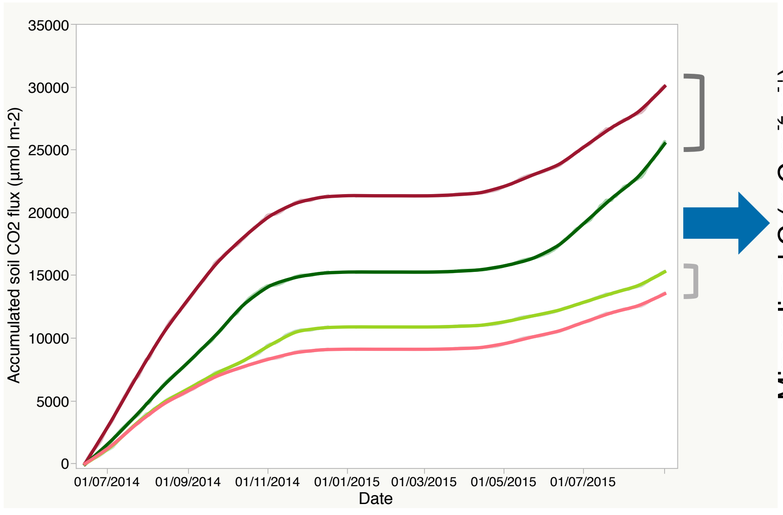


Preliminary results:

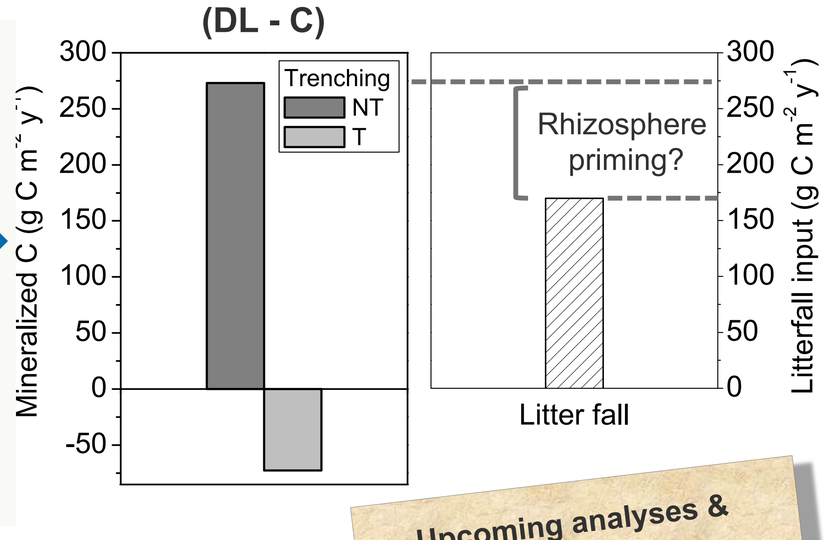
Continuous CO_2 flux measurements



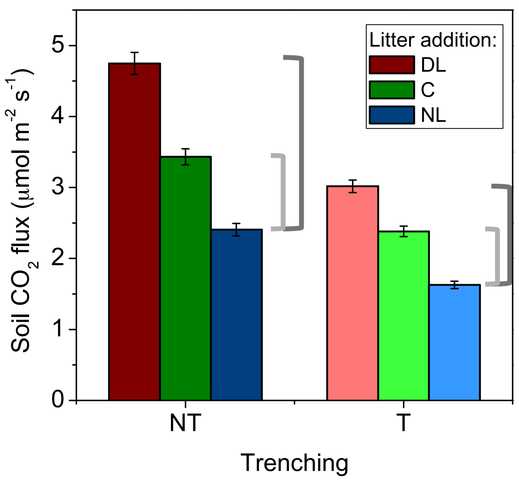
Cumulative soil CO_2 fluxes



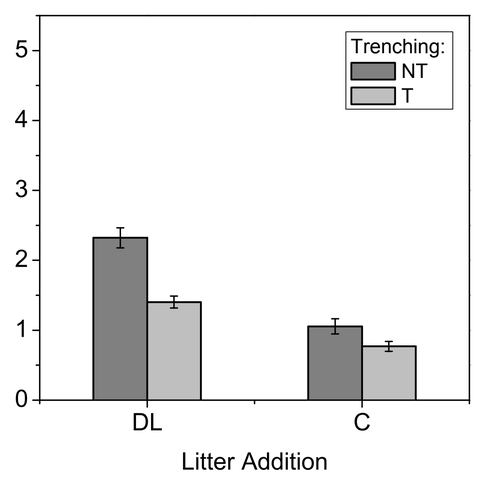
Increase of mineralization in response to litter addition (DL - C)



Instantaneous CO_2 flux measurements



Increase of mineralization in response to litter addition (DL - NL & C - NL)



Upcoming analyses & Results

Annual soil carbon and nitrogen stocks will inform on the long-term changes in soil carbon sequestration in response altered above- and belowground inputs.

- ✓ Rhizosphere inputs activate microbial mineralization of a more stable organic matter fraction (i.e.: litter)
- ✓ Increases on atmospheric CO_2 concentrations may affect soil C sequestration capacity through the alteration of C allocation patterns of vegetation and the quality and quantity of detritus inputs to the soil.

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