



# 130 years of afforestation does not result in changes in soil organic carbon stocks in the Swiss Alps

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## Swiss alpine forests in a race against time

- Strong warming in the Swiss Alps (MAT + 2.5 C since 1980)<sup>1</sup>
- Losses of soil organic matter (SOM)<sup>2</sup>

### Afforestation of former pastures

- Promising for SOM sequestration
- Slightly **higher soil organic carbon stock** after **120 years** of spruce afforestation but a **strong alteration** of the **soil organic matter (SOM) composition**<sup>3</sup>



Tatjana Speckert, 2020

<sup>1</sup>Gehrig-Fasel et al., (2007), *Journal of Vegetation Science*

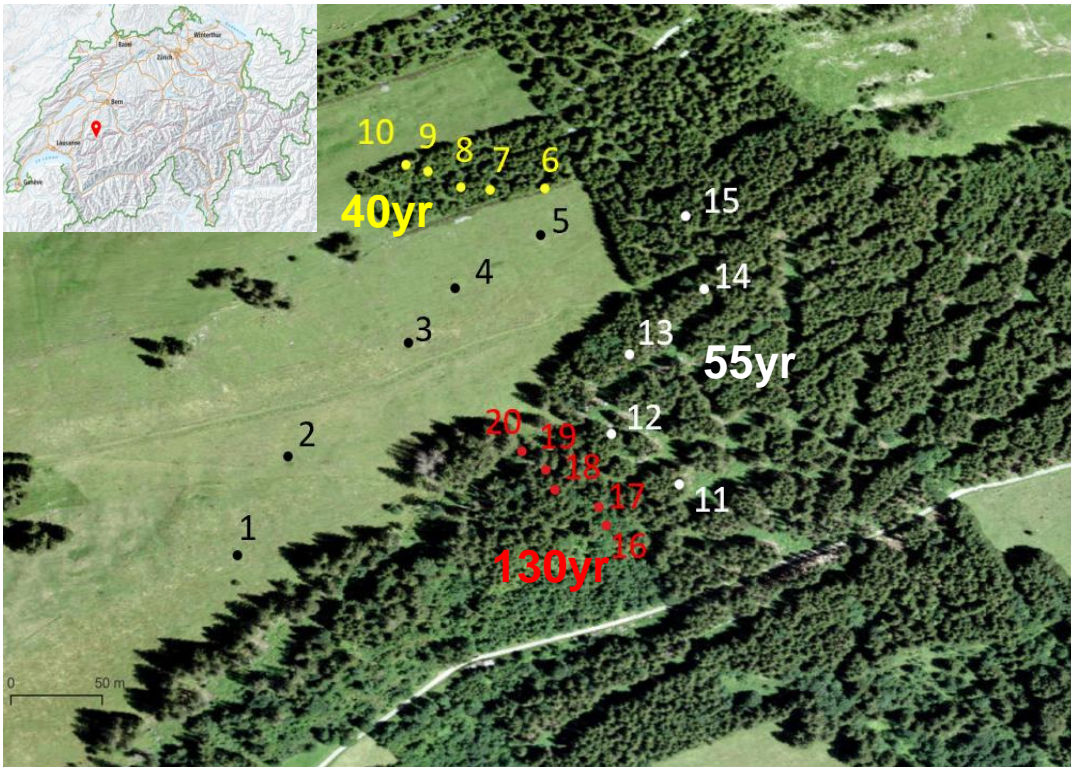
<sup>2</sup>Thuille, A., and Schulze, E. D. (2006). *Global Change Biology*

<sup>3</sup>Hiltbrunner et al., (2013), *Biogeochemistry*





## Afforestation sequence (40 – 130 years) in Jaun, Fribourg, Switzerland



Afforestation sequence (40 to 130yr) with Norway spruce (*Picea abies* L.) in Jaun, Fribourg, Switzerland  
(IQ-SASS project; <http://p3.snf.ch/Project-188684>)

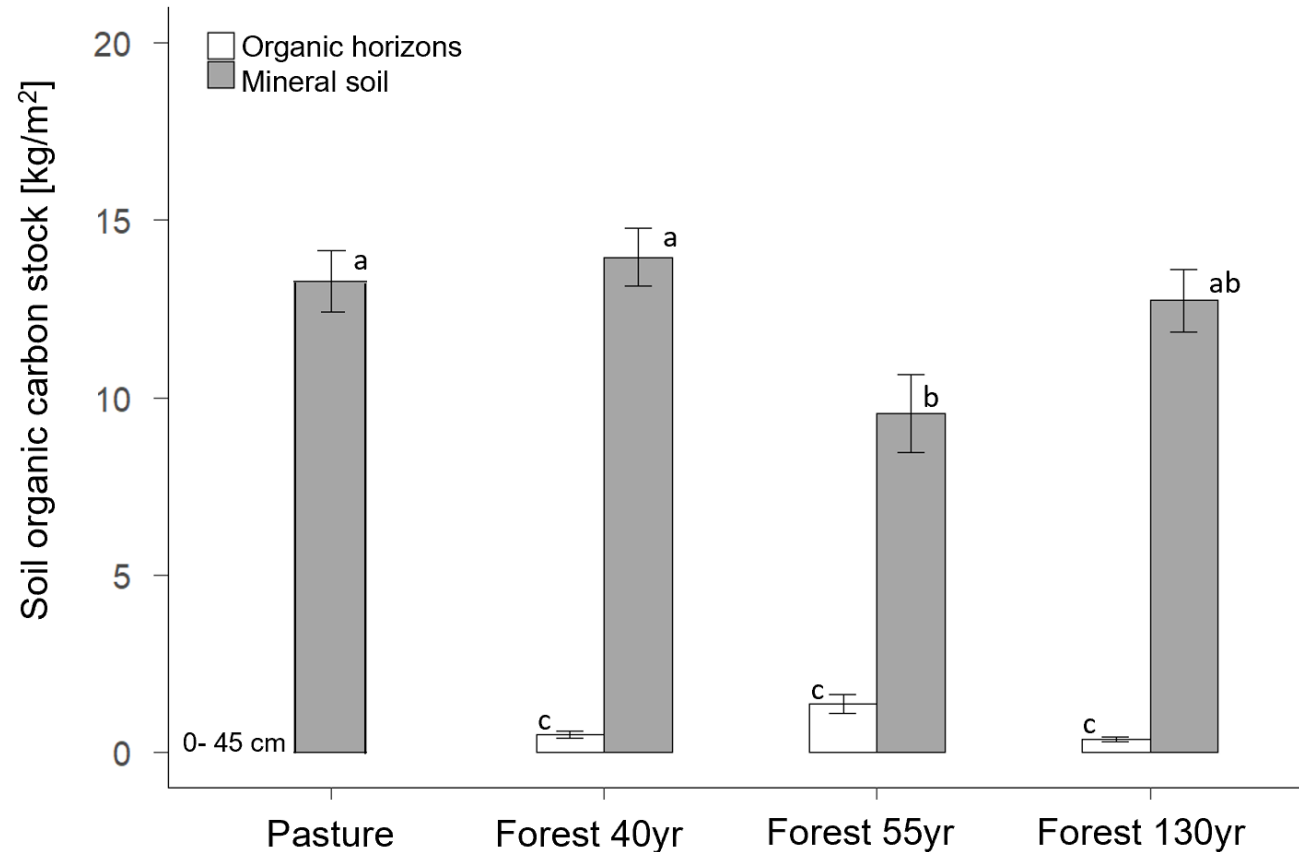
### Following afforestation...

- How much **carbon** is **sequestered** in the long-term?
- What is the **source of SOM**?
- How does the **composition of SOM** change?

... in relation to forest age



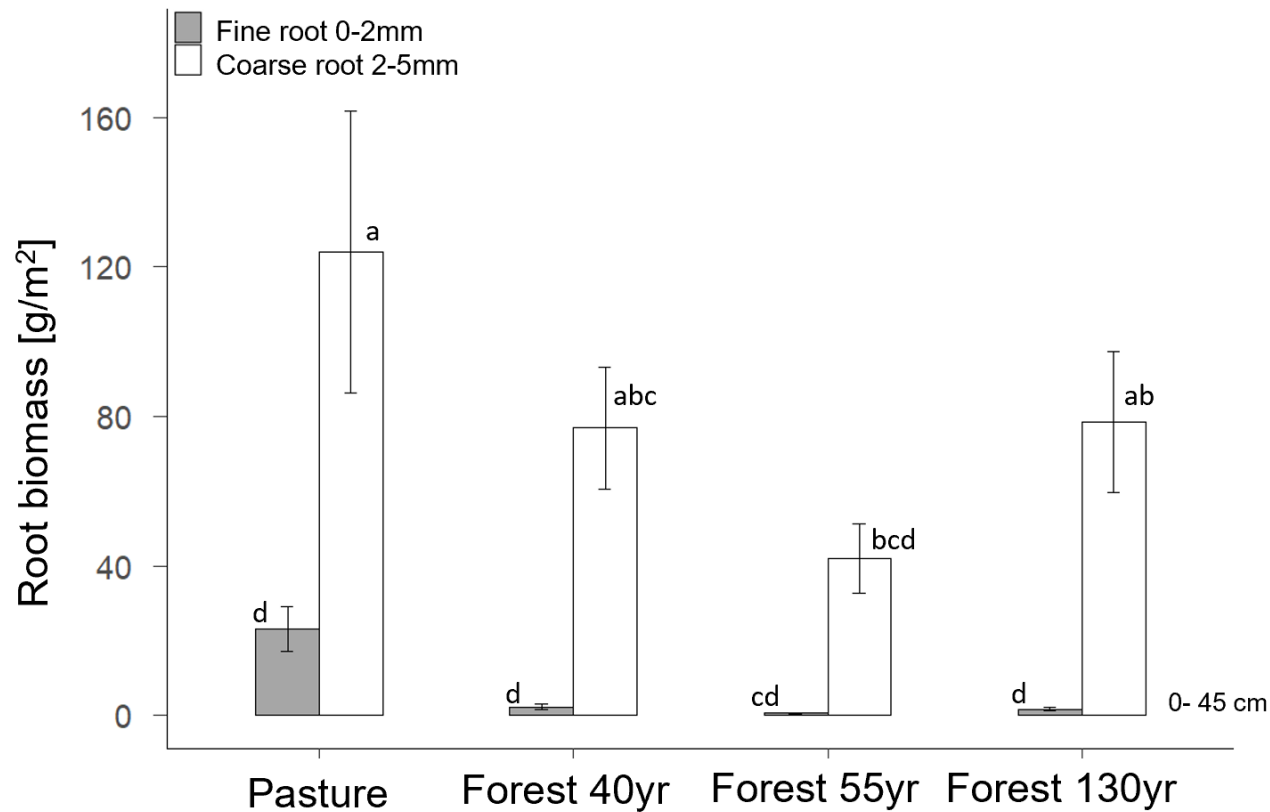
## How much carbon do we have in the soil?



**130 years of spruce afforestation does not result in changes in soil organic C stocks (*ns*,  $p=0.55$ ) in the mineral soil**



## What role do roots play?



Speckert et al., in preparation

Compared to the forest sites, the **pasture** shows a **higher fine** ( $p < 0.001$ ) and **coarse root biomass** ( $p < 0.01$ ) suggesting a **C input via roots** as a major source of **organic matter**

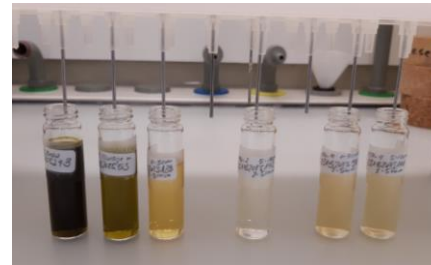
## How much carbon is sequestered in the long-term?

**130 years of spruce afforestation of a former pasture results in only minor changes in the SOC stock in the mineral soil. The carbon stored in the organic horizons in the forest sites contributes only slightly to the total SOC stock**

- What is the **source of SOM**?
- How does the **composition of SOM** change?



Extraction of phospholipid fatty acids (PLFA),  
Tatjana Speckert 2022



Extraction free extractable lipids; fatty acids  
and alkanes, Tatjana Speckert 2022