Role of storage reserves in new tissue growth quantified using bomb ^{14}C at the alpine treeline

Boaz Hilman, Emily Solly, Frank Hagedorn, Iris Kuhlman, David Herrera-Ramírez, and Susan Trumbore

Max Planck Institute for Biogeochemistry

WSL Swiss Federal Institute for Forest, Snow and Landscape Research WSL

ETH zürich

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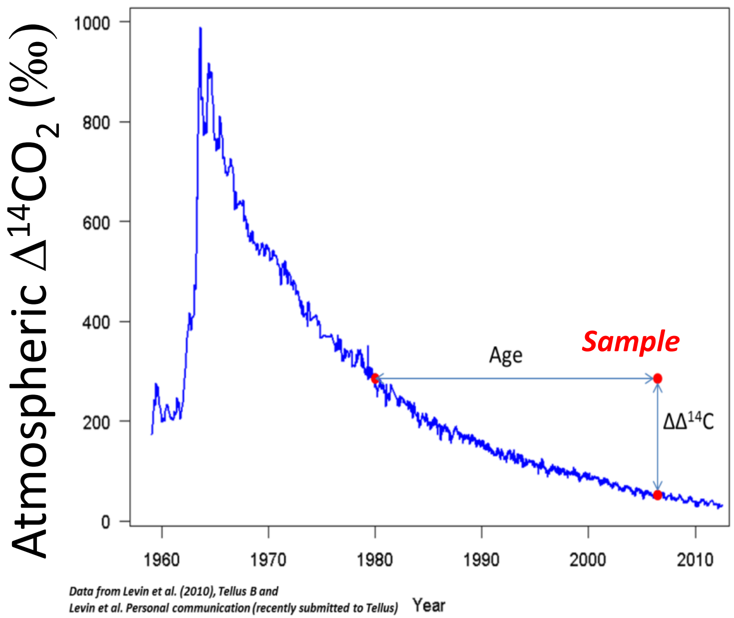
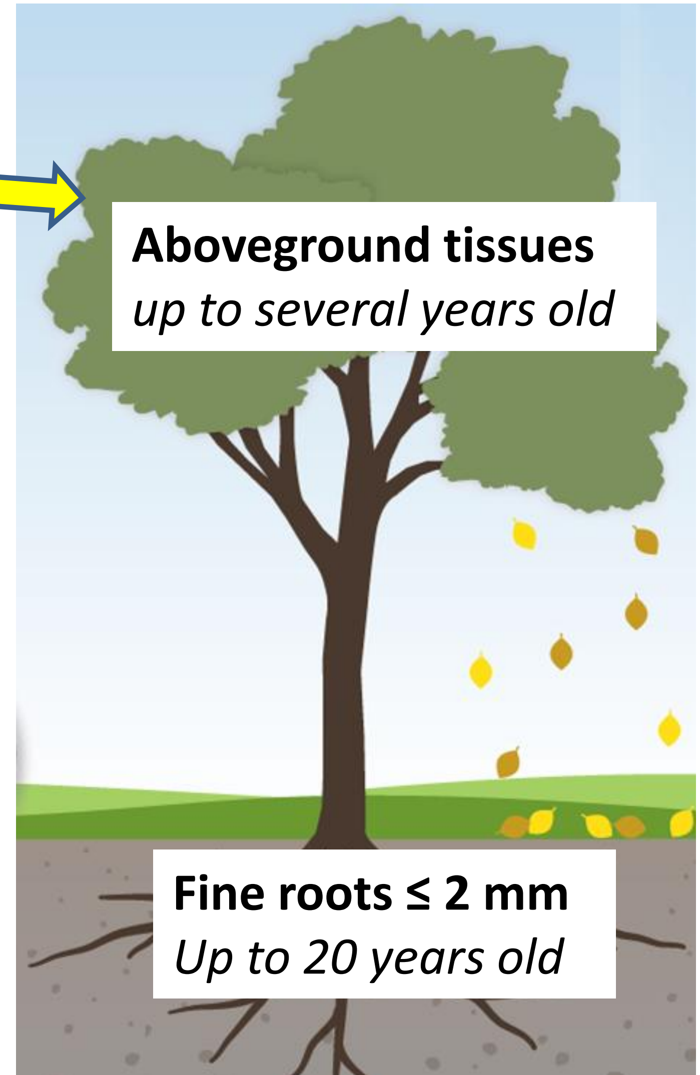
The bomb-radiocarbon clock



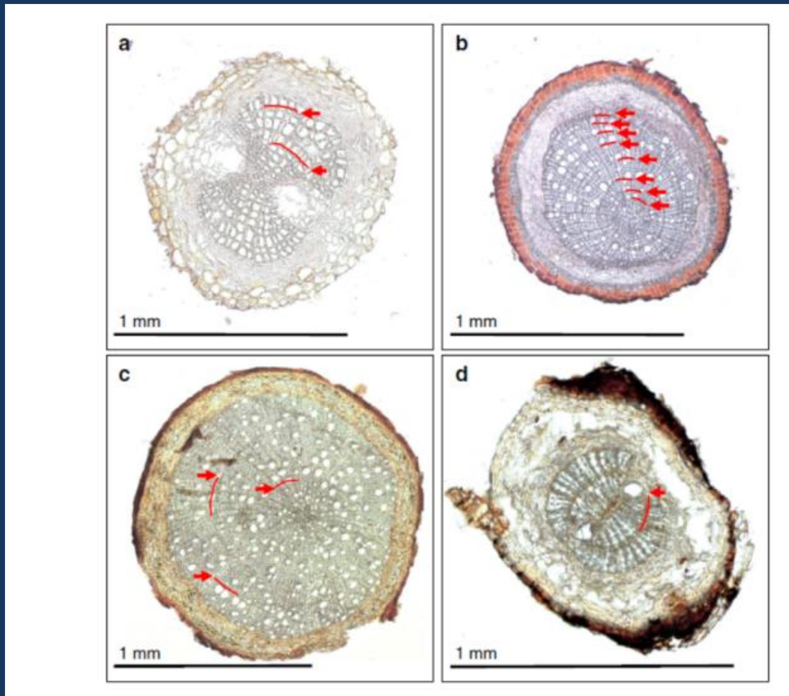
$\Delta^{14}CO_2$



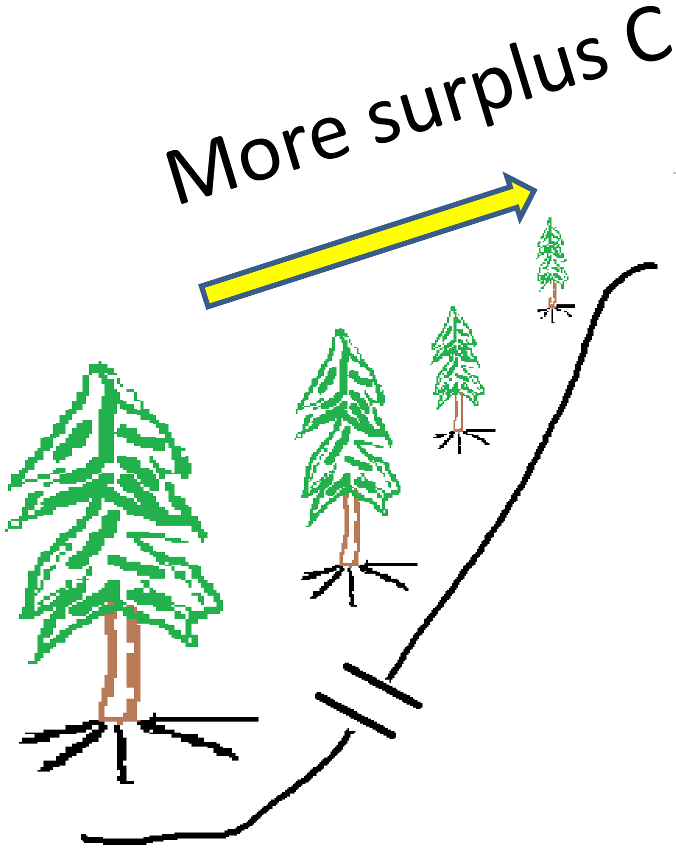
^{14}C age ≠ Longevity

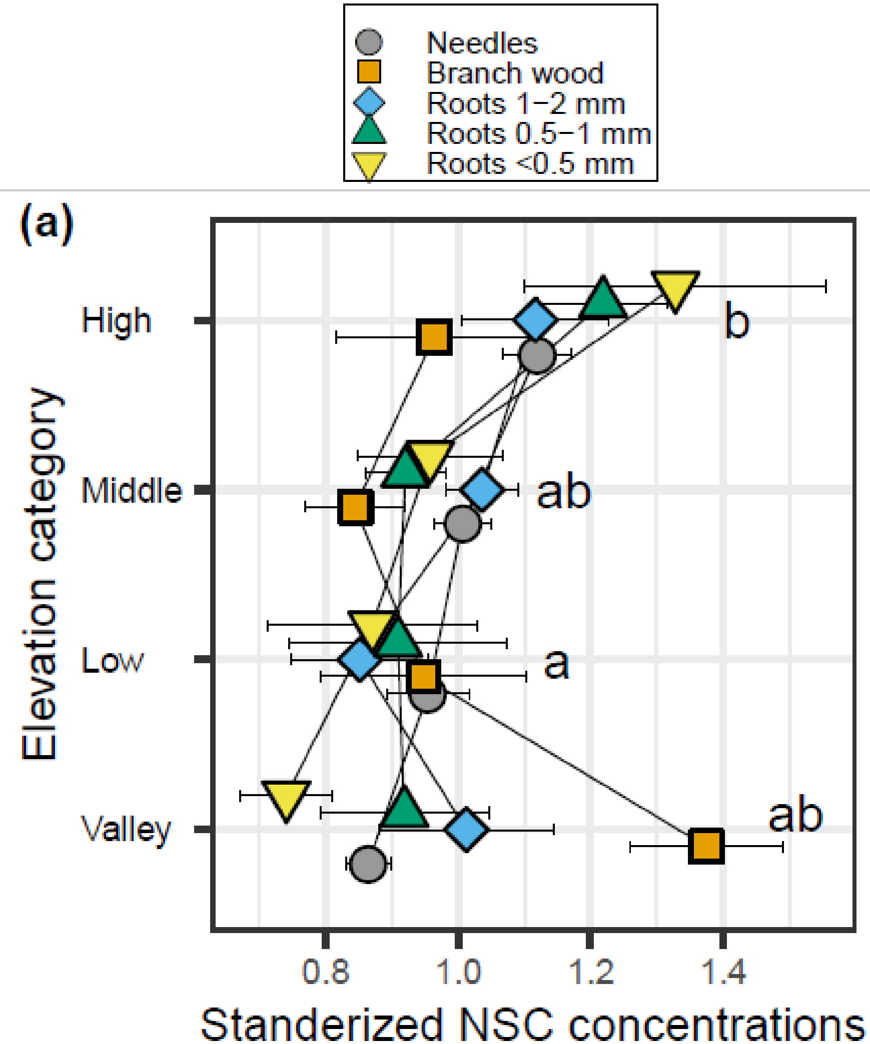
- ^{14}C age > chronological age determined by annual ring count
- Substrate with old ^{14}C age can support new growth

What controls the variability in the ^{14}C age of the substrate?



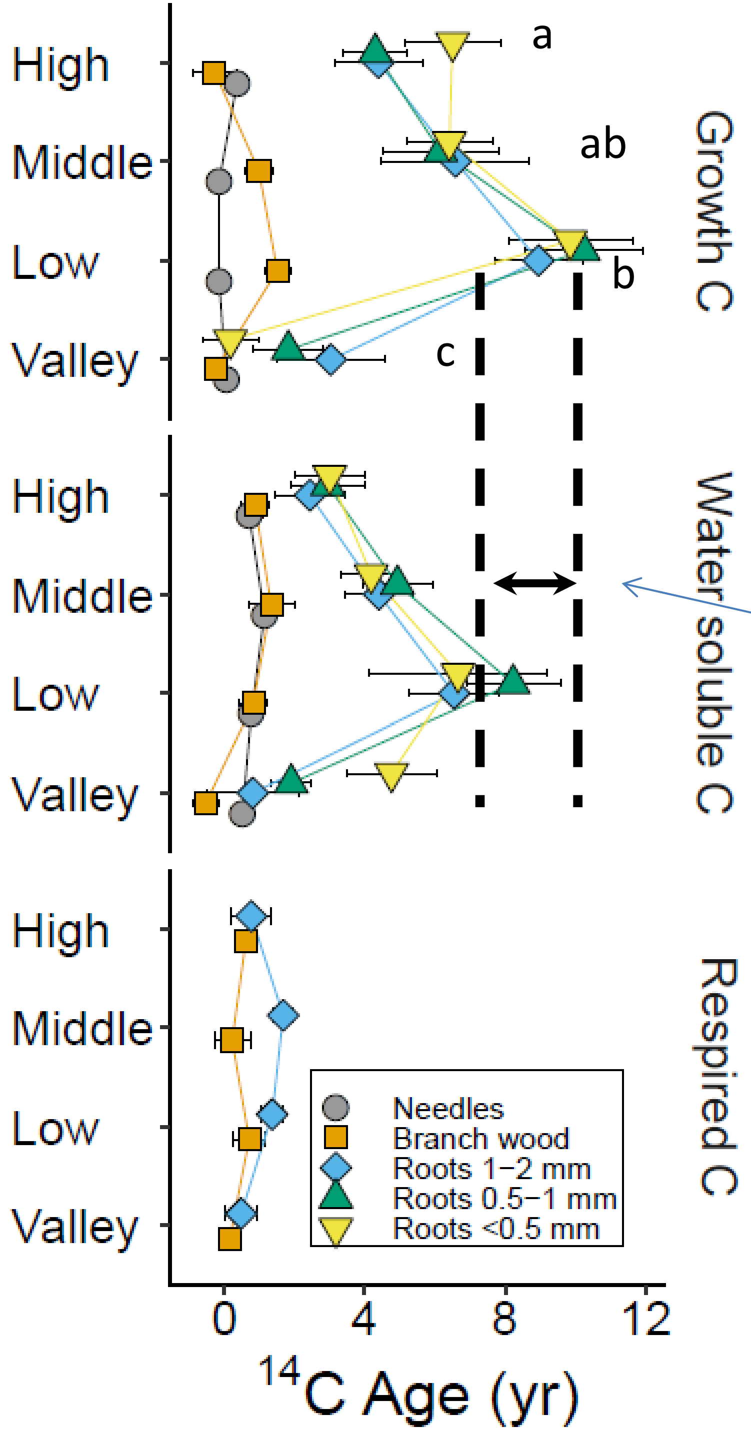
Solly et al. 2018



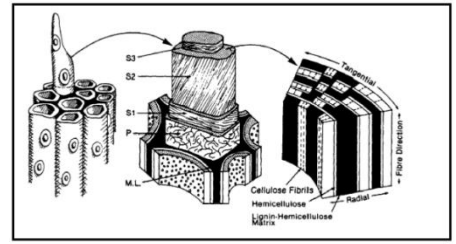


High altitude treeline ecotone

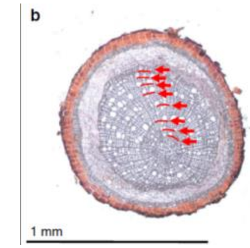
Larger mobile pool → slower NSC turnover rate → older ^{14}C age



Growth C = cellulose ^{14}C age – chronological age



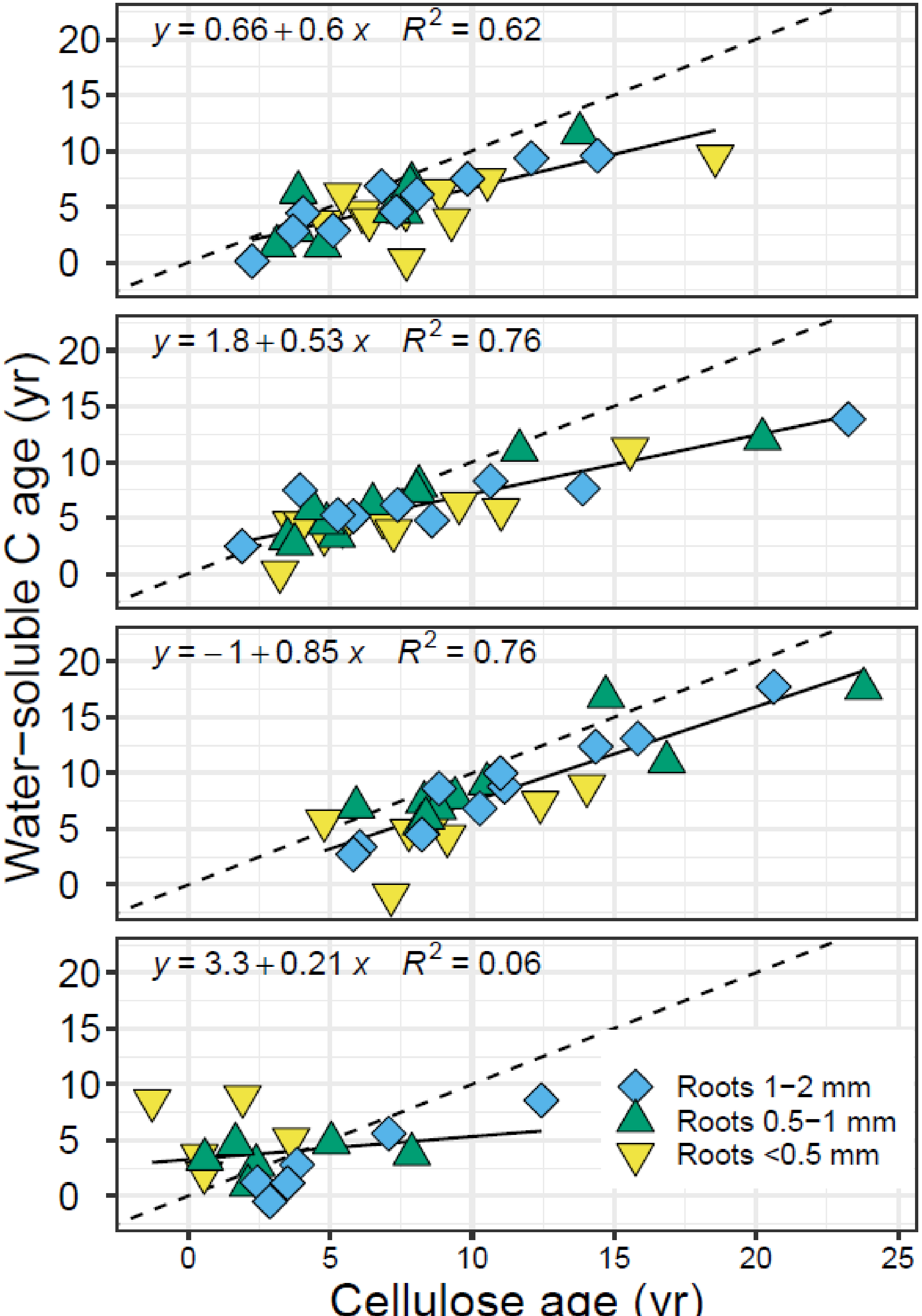
Kirk, 1985

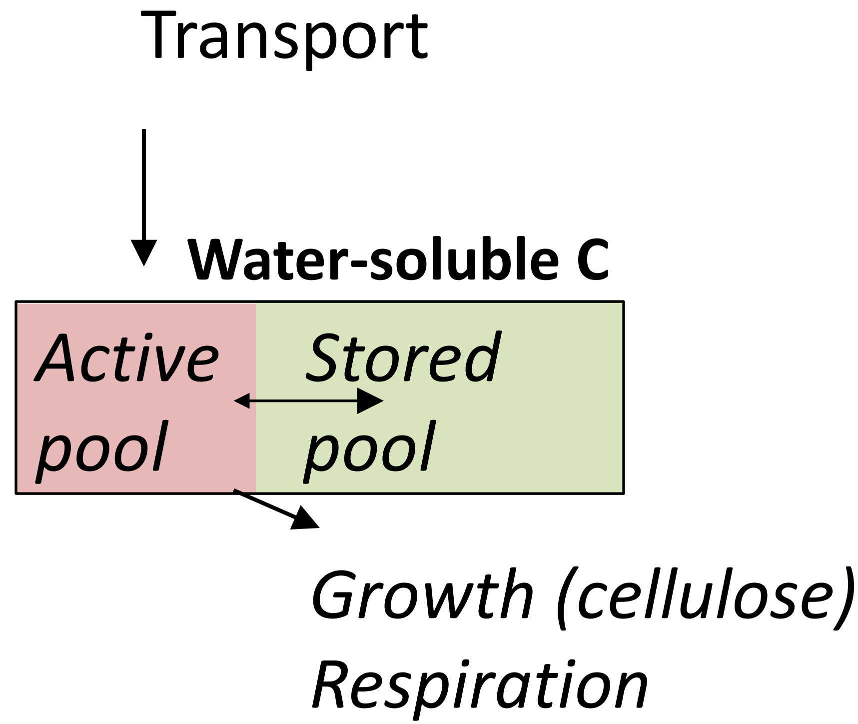


Solly, 2018

Mixing in of young C

Hilman et al. 2021

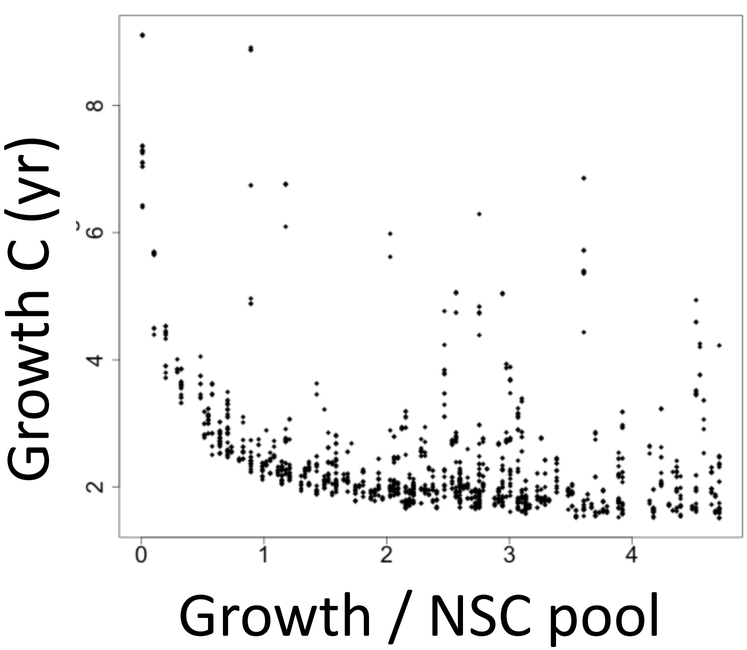


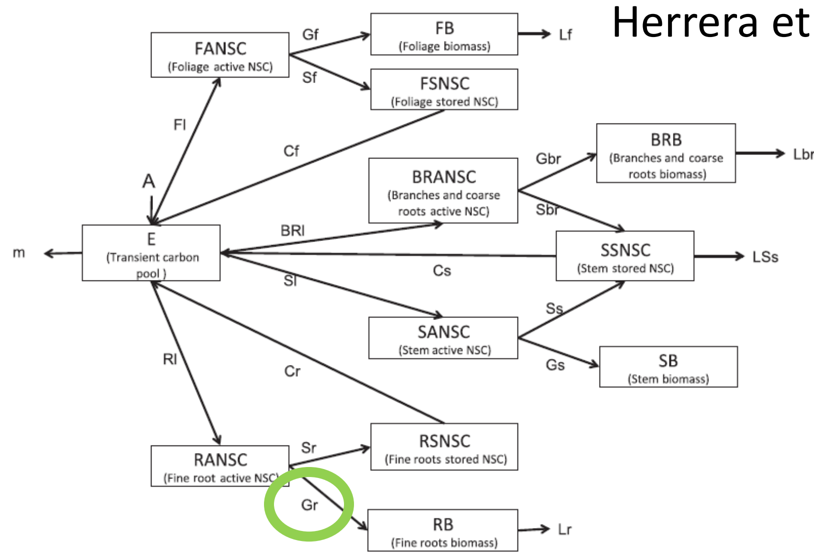


Group	Active fraction (GLMM)
All roots	40%
<0.5 mm	74%
Low	14%

Carbon allocation model

- Less C is allocated to roots (lower growth) – slower turnover time – older roots





Herrera et al. 2020

Previous studies found fine roots mass reduction with warming

Conclusions