Photosynthetic Carbon Flux In The Tree Canopy

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RESEARCH QUESTIONS

Leaf level – specific measurements:

How is i) the potential and ii) diurnal course of leaf gas exchange (A, g_s, E) for *Pinus sylvestris* affected by elevated soil water availability - in comparison to natural drought conditions?

Canopy level – combined measurements:

How does the whole-tree CO_2 assimilation rate (A_{Tree}) perform under elevated soil water availability – in comparison to natural drought conditions.

METHODS

Approach:

Estimate whole-tree CO_2 assimilation rate (A_{Tree}) based on photosynthetic water-use-efficiency (WUE) (Farquhar *et al*., 1989; Hu *et al*. 2010)

Parameters:

Leaf gas-exchange (LiCor 6400): A, g_s, E_{needle}, A:C_i , A_{Light}, $A_{diurnal}$, SLA, …

$A_{Tree} = WUE * E_{Sap\ flow}$

$WUE = f(\delta^{13}C)$

$E_{Tree} = f$ (Sap flow)

20 trees: *12, 19, 38, 52, 87, 110,* ***124, 125, 189***

155, 169, 254, 255, 264, 267, 268, ***274***, ***275***, ***276***, *333*

PLANNED ANALYSES

- **Specific leaf-level analyses:**
  - **Physiological leaf level**
- **Combined / integrative whole-tree analyses:**
  - **Calibration / validation:**
    - **Whole-tree CO2 assimilation modeling**
    - **DO3SE – ozone flux modeling**

OUTLOOK

We are looking forward to …

- **integrative analyses**
- **to help disentangling carbon starvation from hydraulic failure**
- **better, safer, broader access into canopy**