WSL Research Isotope Lab

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The new stable isotope lab at WSL provides state of the art technology for carbon, nitrogen, oxygen and deuterium stable isotope analyses. We provide **4 isotope ratio mass spectrometers (IRMS)** and two of them are dedicated to **compound specific stable isotope analysis.** We can e.g. determine $\delta^{13}C$ and $\delta^{18}O$ in sugars, organic acids, cellulose and other organic compounds. Moreover, the analytical spectrum covers $\delta^{18}O$ and $\delta^{2}H$ in water, isotope analyses in CO_2 and other trace gases as well as the full spectrum of light stable isotopes in bulk material. In addition, the lab hosts **isotope laser spectrometers** for online detection of CO_2 and H_2O isotopologues

Compound specific isotope analysis:

GC/C/Pyr-IRMS

- **1 IRMS with GC-Isolink** for compound specific ^{2}H, ^{13}C and ^{18}O analyses, additionally provided with Dual-Inlet for high precision ^{13}C, ^{15}N, ^{18}O, und ^{2}H analysis of purified gases
- **1 GC-Quadrupole MS** for compound identification

LC-IRMS

- **1 IRMS mit HPLC-Isolink** for component specific ^{13}C analyses of various organic compounds (without any derivatisation of the analyte)

Scope of Research: Such analyses of detailed isotope fractionation processes in plants are very helpful to improve our understanding of physiological and biochemical responses of trees to environmental conditions and thus their adaptation/acclimation potential to changing climate conditions

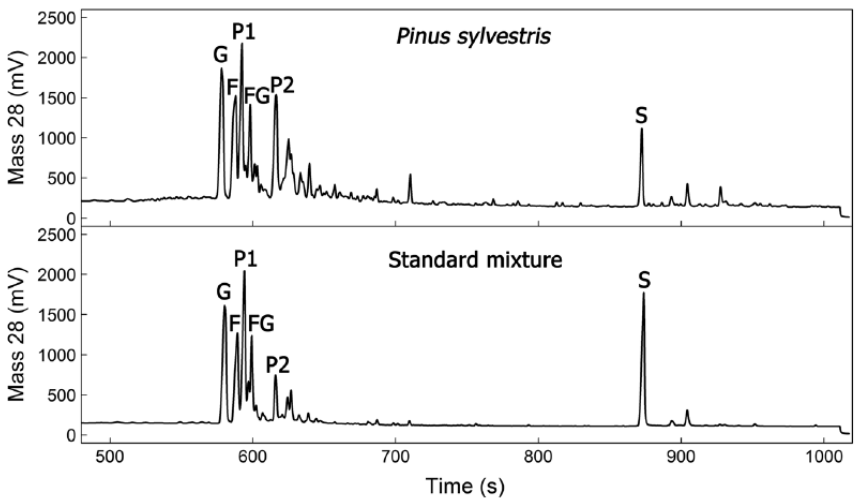

Figure 1. Comparison of GC-IRMS chromatograms of extracted leaf carbohydrates in *Pinus sylvestris* and of carbohydrates in a standard mixture (only mass 28). Letters indicate isomer peaks of individual carbohydrates: G =main glucose isomer, F =main fructose isomer, FG = double peak of fructose and glucose secondary isomers, P1 and P2 = main and secondary pinitol isomer, S = sucrose.

Lehmann et al. (2016) Rapid Communications In Mass Spectrometry 30:221–229.

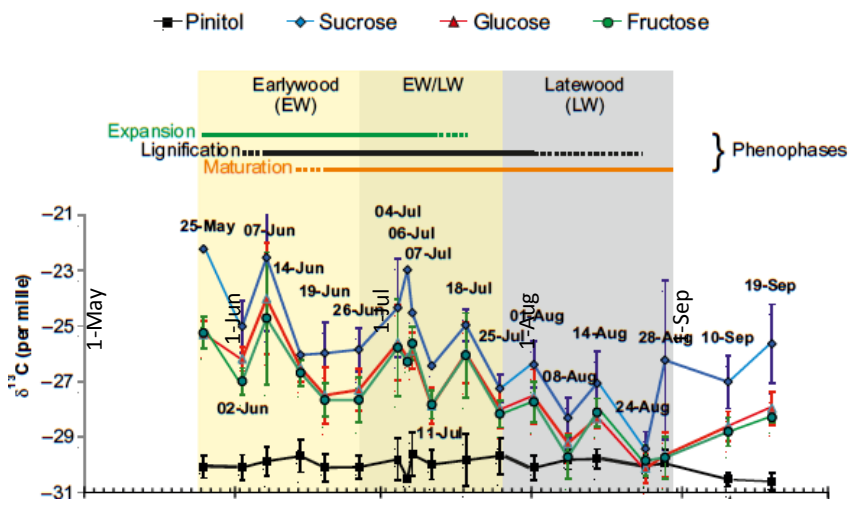

Figure 2. The $\delta^{13}C$ of seasonal sampling of needle sugars. Phenological data, consisting of the periods of stem expansion, lignification and maturation, are given. Periods of earlywood ('EW', yellow background) and latewood ('LW', in grey) formation are indicated. EW/LW indicates the transition zone between the two stages (in dark yellow).

Rinne et al. (2015) Plant, Cell & Environment 38:2340–2352.