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***pheno*PET: Observing Carbon Transport within Individual Plants**

Matthias Streun¹, Benedikt Scherer¹, Ralf Metzner², Gregor Huber², Daniel Pflugfelder², Antonia Chlubek², Robert Koller², Claudia Knief³, Peter Wüstner¹, Egon Zimmermann¹, and Ghaleb Natour^{1,4}

¹Institute of Technology and Engineering, ITE, Forschungszentrum Jülich, Jülich, Germany (m.streun@fz-juelich.de)

²Institute of Bio- and Geosciences, IBG-2: Plant Sciences, Forschungszentrum Jülich, Jülich, Germany

³Institute of Crop Science and Resource Conservation – Molecular Biology of the Rhizosphere, University of Bonn, Bonn, Germany

⁴ISF, Faculty of Mechanical Engineering, RWTH Aachen University, Aachen, Germany

Individual plants vary in their ability to respond to environmental changes. For dynamic responses in plants, long-distance carbon (C) transport is required to support growth. Therefore, investigating C allocation in plants is crucial for developing a mechanistic understanding of plant functioning. However, little is known about short-term assimilate transport patterns and velocities, as literature values from singular and invasive measurements are hard to interpret for a highly susceptible system. To study the transport of photo assimilates within plants, we developed *pheno*PET, a plant dedicated positron emission tomography (PET) scanner. While PET scanners have been widely used in medical science since decades, their use in plant research is less common. For tracing the transport, carbon dioxide containing the short-lived positron-emitting isotope carbon-11 (¹¹C) is applied as ¹¹CO₂ to a single leaf or the whole canopy of a living plant. The plant fixes CO₂ and the ¹¹C is subsequently transported in the form of photosynthates towards C sinks, e.g. through leaf and stem towards the root system. The decaying tracer can then be located inside the plant by detecting its radiation. To this end, the living plant is placed in the field-of-view of the scanner, which is a volume with a diameter of 18 cm and a height of 20 cm. A lifting table can move the scanner vertically and allows for repeated measurements of different regions of interest along the plant axis. The *pheno*PET system is located in a climate chamber equipped with LED panels in order to create defined environmental conditions.

In our presentation, we will highlight our workflow for gathering quantitative data on C tracer transport velocities between different plant types, single plants, for different plant parts, during a day, and over days. We believe that this will provide new insights into the functioning and dynamics of C transport processes in in the plant-soil system.