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## Where do the buds get their water from during budburst? New perspectives from temperate forest species using water stable isotopes

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During winter dormancy in deciduous species, water stops flowing in the xylem and buds become isolated from the stem xylem conduits by a physical barrier made of callose deposits. During bud break, the plant builds new vascular connections between the growing buds and the xylem to support sap flow and transpiration in the developing leaves. However, little is known about the exact timing when these new vascular connections are made, or about the origin of the water supporting bud swelling prior to bud break. This information is particularly limited in forest tree species. We aimed to clarify the origin of the water entering the buds at different developmental stages in temperate forest tree species using water stable isotope tracing techniques to track water movement between soil, stem and buds. More specifically, we developed a method to collect sap water separately from water in other stem tissues (Barbeta et al. 2020). At different leaf phenological stages during the 2018 growing season, we collected soil, stem, bud and leaf samples from 5 adult trees and 3 species (*Fagus sylvatica*, *Quercus robur*, *Pinus pinaster*) growing in a riparian forest in Southwest France. We estimated the relative water content in each sample by extracting bulk water by cryogenic vacuum distillation, and also extracted sap water from stem samples using our new method. All water samples were then analysed for their stable isotope composition ( $\delta^{18}\text{O}$ ,  $\delta^2\text{H}$ ). These results, complemented by some additional labelling experiments, provide key information about the timing of hydraulic reconnection between the buds and the xylem and about the source of water supporting bud swelling and bud break, demonstrating the usefulness of water stable isotope measurements to understand water transport pathways during bud development and canopy leaf out.

### Reference:

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