



Intra-annual variations in the density and stable isotope composition of Norway spruce tree rings at the Tharandt FLUXNET site

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Long-term eddy covariance measurements of CO₂ and water fluxes are essential to validate forest ecosystem models. However, to test these models and improve our predictions over longer time frames, complementary datasets are required. In this respect, high-resolution intra-annual measurements of the carbon and oxygen stable isotope composition of cellulose in annual tree rings ($\delta^{13}\text{C}_{\text{cellulose}}$ and $\delta^{18}\text{O}_{\text{cellulose}}$, respectively) and wood density may provide a solution. This is because well-defined seasonal patterns of plant carbon and water dynamics are recorded in the tree ring cellulose over the growing season in response to climatic variability. We explored this potential solution by collecting a 14-year, high-resolution cellulose dataset from Norway spruce trees growing in the footprint of the Tharandt flux site located in Germany. The first results of this isotopic and density analysis will be presented and interpreted using the on-site climatic and physiological information monitored at the flux site for the past 14 years. In addition the potential of using this detailed information to interpret plant function and phenology back in time to the early 1900's at this site will also be explored.