FACULTY OF BIOSCIENCE ENGINEERING

UGent WOODLAB

LABORATORY OF WOOD TECHNOLOGY (UGENT-WOODLAB)

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XYLODYNACT: INTRA-SEASONAL WOOD FORMATION DYNAMICS USING AN X-RAY CT-BASED TOOL-CHAIN

Intra-seasonal wood formation is still understudied because the conventional measuring method (analysis of cellular anatomical traits) is labor-intensive and requires extensive manual skills. The phases of wood formation have been overlooked and are understudied, but the last phase (lignification) has been particularly neglected, resulting in a lack of understanding of tree autumn dynamics.

This study aims to address two objectives: (1) develop a new method to study wood formation based on high-resolution X-ray Computed Tomography (XμCT) and (2) use the new method to test, at a continental scale, the hypothesis that leaf senescence is triggered when wood formation ceases in autumn or, in case of factors limiting growth in summer, when a fixed day of the year is reached (photoperiodic threshold).

The first objective can be accomplished by automating the XμCT process, identifying the degree of lignification and assessing intra-seasonal wood traits such as cell size and cell wall thickness.

The second objective will be achieved by analyzing data on leaf senescence and wood formation of the 10 most common deciduous species in Europe along several transects of varying environmental conditions (e.g. photoperiod, temperature, drought).
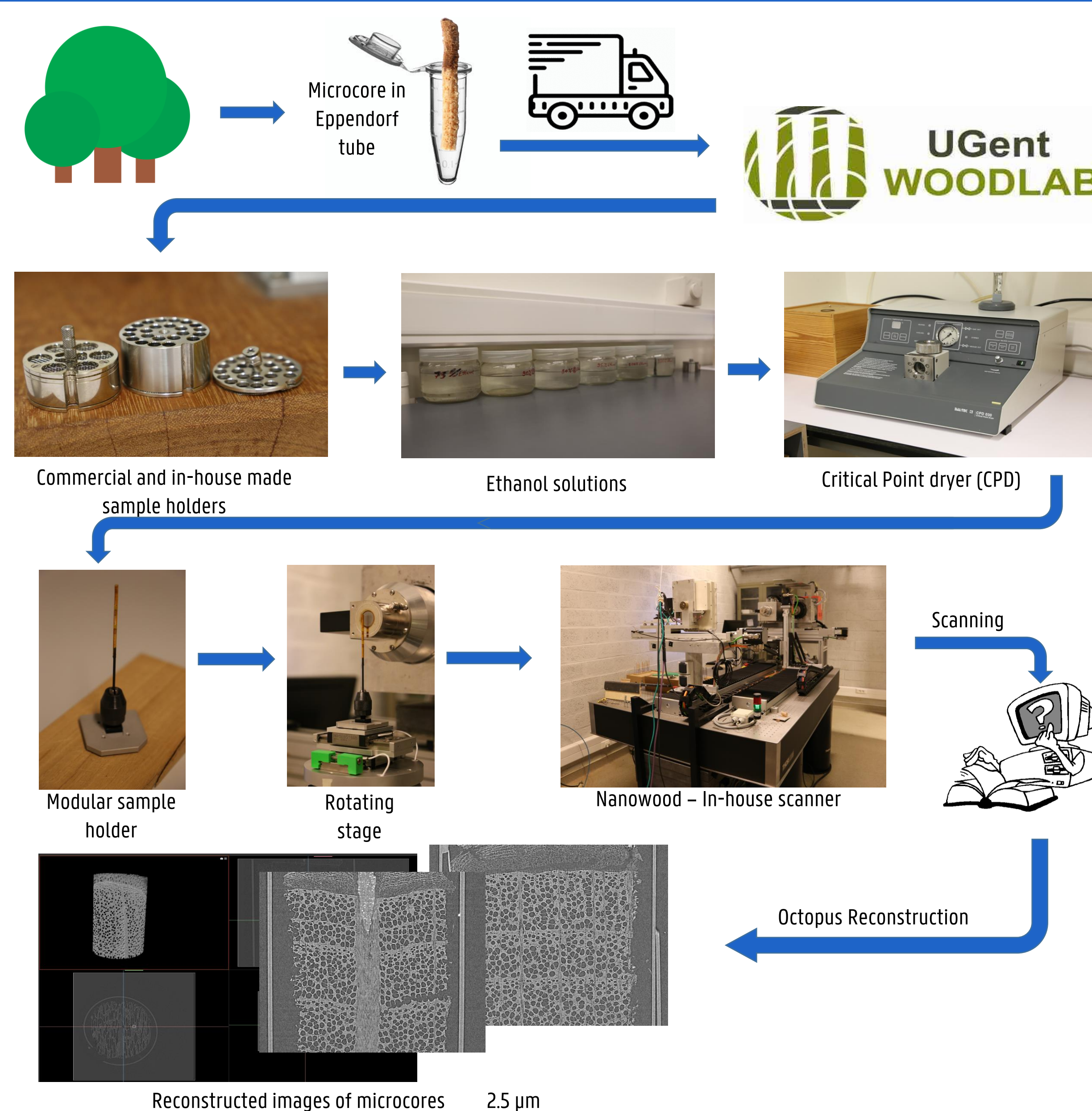
Workflow for processing microcores

### Microcore processing using X-ray CT
By creating specialized sample holders and automatizing the scanning and digital processing of the samples, the workflow has been greatly improved.
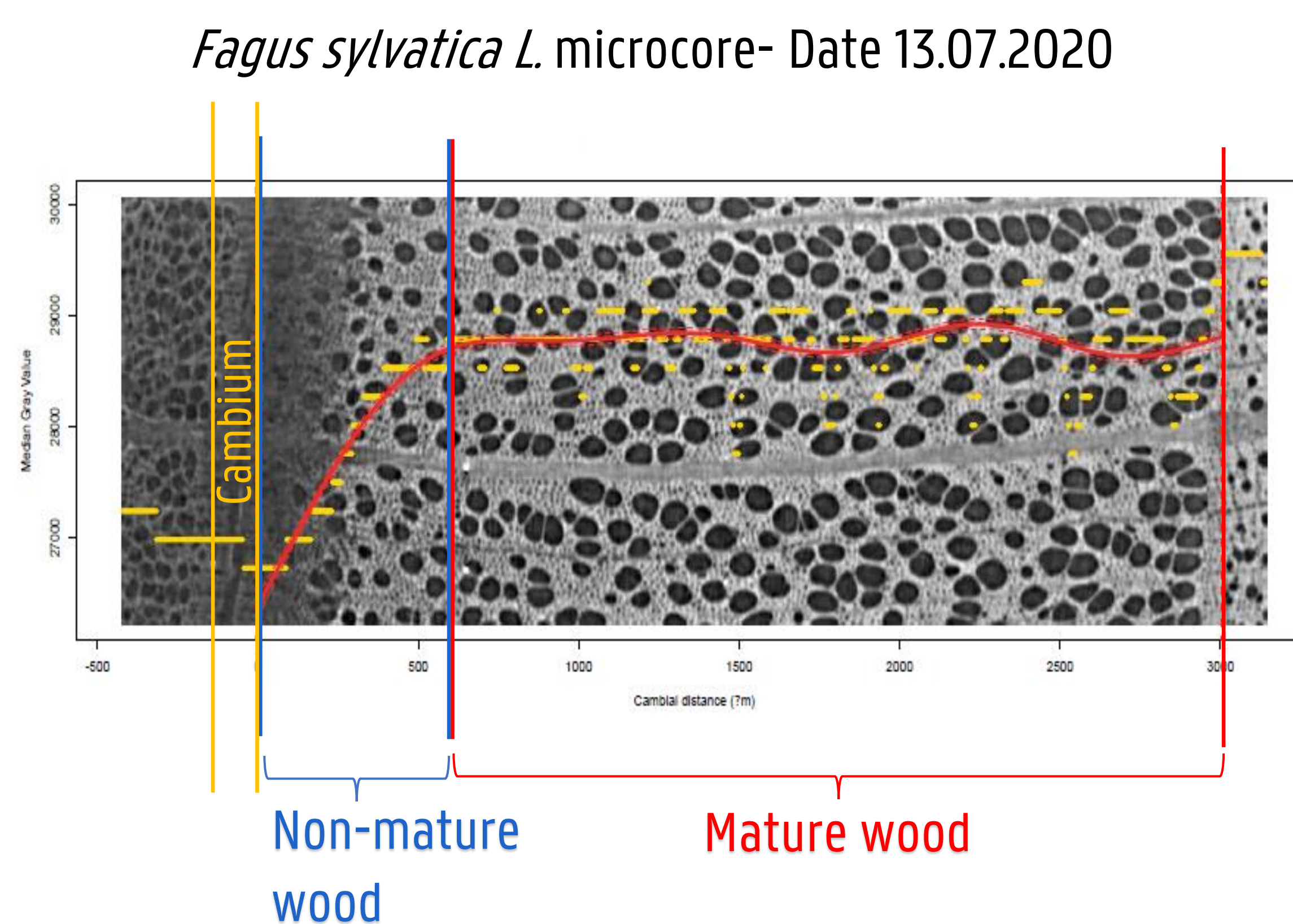
Grey-value profiling
With the help of grey-value profiles, density can be determined, and in consequence, mature and non-mature tissue can be identified. Density correlates with the degree of lignification of the cell wall, which gives us the first proxy for identifying lignin.

Important dates and biomass accumulation
The start and end of wood formation can explain the behaviour of different tree species across space and time. As important is the date when the newly-form tissue starts lignifying. It gives us an insight into how trees accumulate biomass concerning their environment.
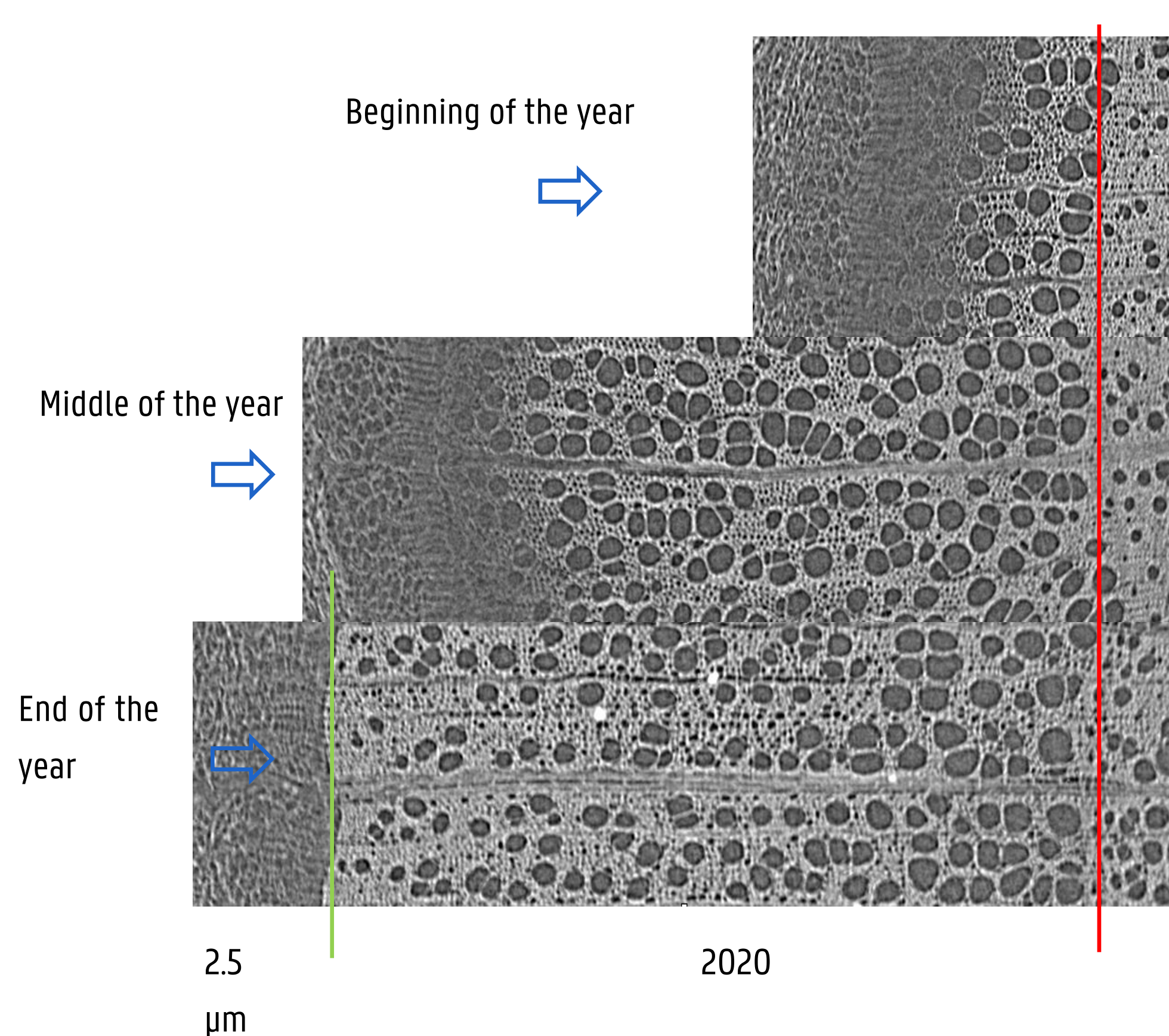
*Biomass accumulation throughout the year*

Grey-value profiles for identifying lignified tissue
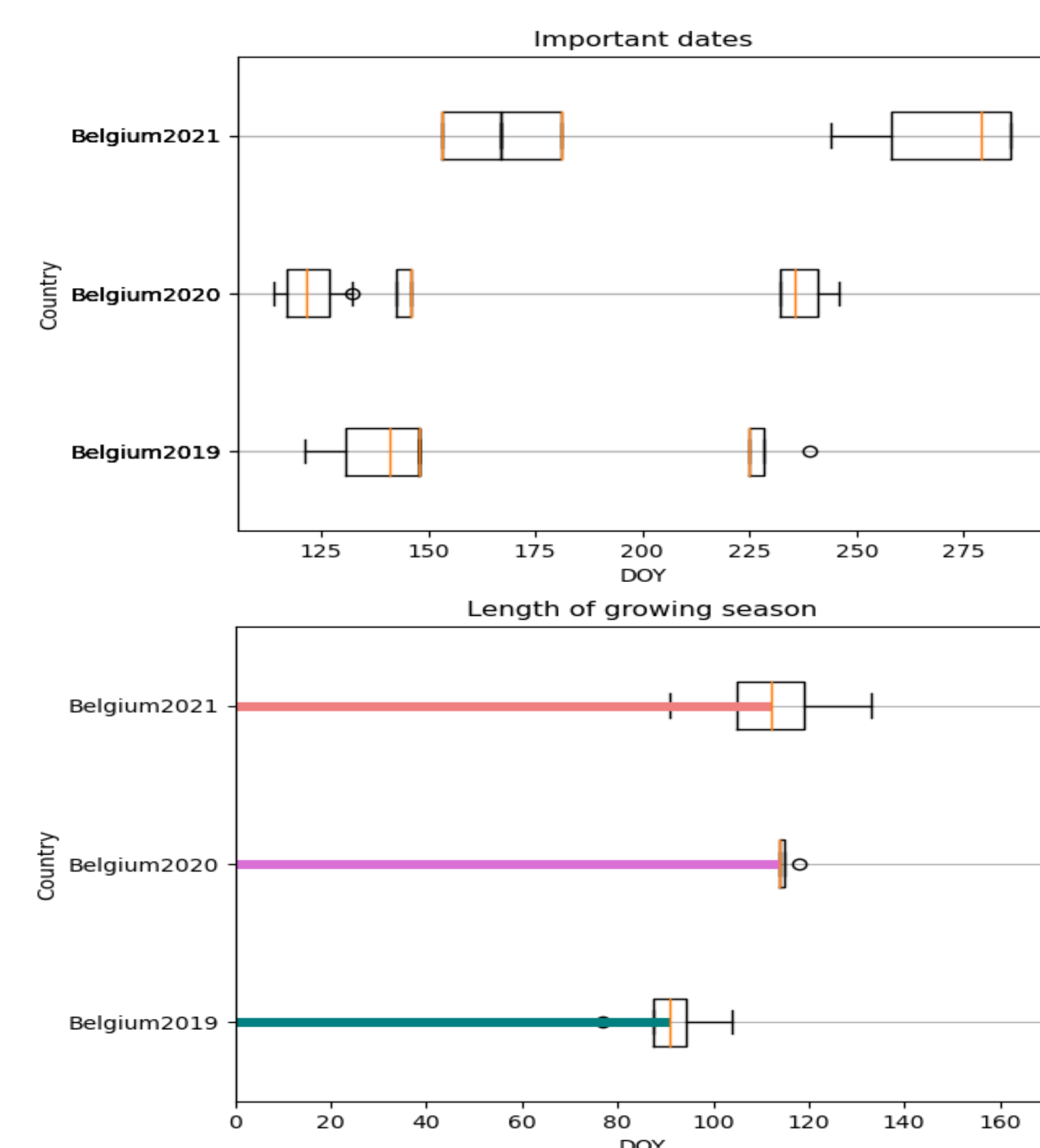
Important dates and length of vegetation season

About me
My name is Victor, and I have always enjoyed being surrounded by nature. That's why, in 2012, I started my journey as a forestry engineer in Brasov, Romania. In 2016, I finished my BSc degree, and right after, I got hired as a research engineer at the National Institute for Research and Development in Forestry Marin Dracea in Romania. At the institute, I worked for the National Forest Inventory and on multiple research projects related to forest ecology in virgin forests. Simultaneously, I was working on my MSc degree in Forest Ecosystem Management. In 2019 I graduated and was eager to find my next challenge. This led me to this moment, where I am working as a PhD student specializing in wood formation dynamics. I started my PhD in 2020 at UGent-Woodlab in collaboration with PLECO at UAntwerp.
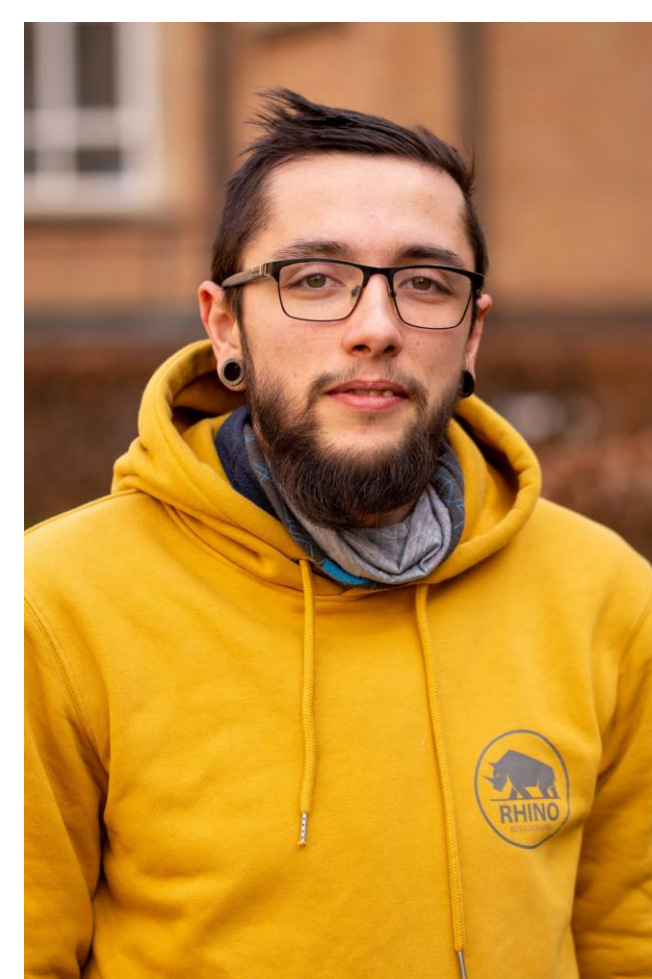
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