FACULTY OF BIOSCIENCE ENGINEERING

LABORATORY OF WOOD TECHNOLOGY (UGENT-WOODLAB), FOREST & NATURE LABORATORY (UGENT-FORNALAB)

Louis Verschuren, Jan Van den Bulcke, Joris Van Acker, Pieter De Frenne

WOOD ANATOMY AND TREE GROWTH IN THE FACE OF CLIMATE CHANGE

Scope of the research

Climate change will imply a higher frequency and severity of extreme climatic events like **droughts and heat waves**. This will have a negative effect on the **vitality and performance of trees**. However, it remains difficult to assess where and how critical tree species are under pressure due to the changing climate. Therefore, there is an urgent need to assess the impact of climate change on vegetation, associated ecosystems, and their feedback on the climate system.

The **growth-ring pattern** of trees can be considered as an archive of the past and biosensors of the present since they offer a unique view of tree response to fluctuating environmental conditions. This makes them extremely useful for accurately estimating the growth rate and vitality of tree species in the context of current and future climate change. Using dendrochronological principles, we can examine the past performance of trees during and their response on extreme climatic events. Within this Ph.D. we will look at the effect of these extreme climatic events on trees and investigate if the **landscape** surrounding these trees can have a **buffering effect**.

In addition to tree ring width, we will also look at the **density** profiles within these rings. Density is related to the **wood anatomy** within the ring and gives additional insights into the performance of trees during and after extreme climatic events. Traditionally, tree ring densitometry in **broadleaf tree species** has been difficult due to their anatomical complexity and the difficulty of density measurements. An innovative in-house developed technique using X-ray computed micro-tomography will facilitate the high-throughput processing of large numbers of increment cores, resulting in accurate density and tree ring width measurements on a large scale.

Figure 1: My research focuses on tree-growth during droughts and heatwaves and the buffering effect of the surrounding landscape in forests (left) and on large solitary trees in rural and urban landscapes (right). The bottom image is an X-ray micro CT slice of the increment core that was extracted from the beech tree on the left.

Trees and climate change

Trees play an important role in forests and urban ecosystems where they also provide a wide variety of ecosystem services. Climate change threatens the growth and vitality of our current tree population and as such, will also impact the ecosystem services they provide. Understanding which species and which landscapes are most vulnerable to these changes is thus of paramount importance.

Tree rings

Tree rings can be used to evaluate the growth and vitality of trees during and after extreme climatic events like droughts and heat waves. By taking increment cores from live trees, their growth history is revealed to us. We can use this past data to estimate their future growth within the context of climate change.

Wood anatomy using X-ray micro CT

Wood anatomical traits, like density, play a vital role in understanding tree growth during extreme climatic events. Using imaging techniques like X-ray micro CT, we can take wood anatomical research to the next level as it allows for large amounts of density measurements and high-resolution wood anatomy mapping in three dimensions.

Figure 2: a large beech tree in the Sonian forest being cored with an increment borer

Figure 3: a stem disk, showing tree rings of varying size and with varying anatomical characteristics

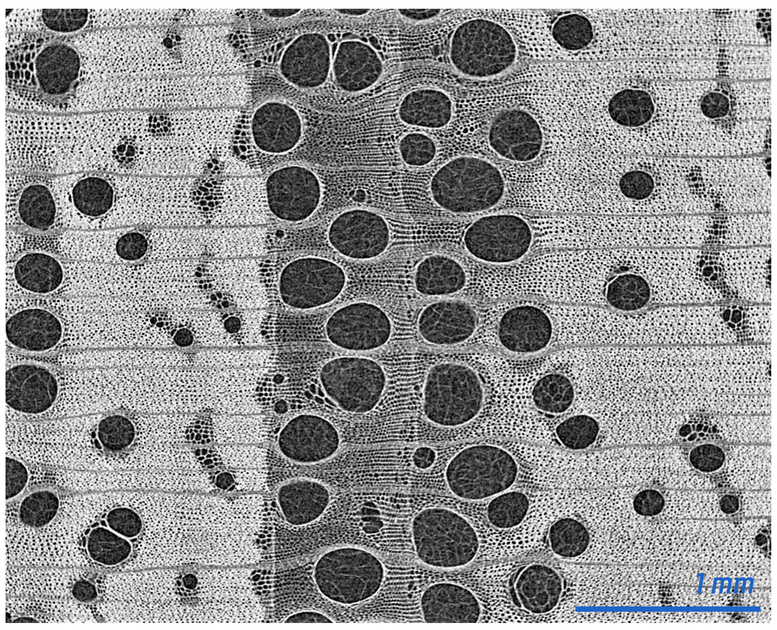

Figure 4: an X-ray micro CT image of Robinia pseudoacacia *with a resolution of 3 µm*

About me

I am a teaching assistant and Ph.D. student at UGent-WoodLab and ForNaLab. I assist in the bachelor course on herbology and in master courses on wood anatomy, nature inventory, and other wood-related master courses. My research aims to improve our knowledge of the growth of trees in the face of climate change. I combine dendrochronology, wood anatomy, and X-ray micro-CT imaging to get a deeper understanding of tree growth, particularly during droughts and heat waves.

Contact

Louis.Verschuren@ugent.be
http://www.woodlab.be

Ghent University- WoodLab

@WoodLabG

UGent-Woodlab