FACULTY OF BIOSCIENCE ENGINEERING

UGent WOODLAB

LABORATORY OF WOOD TECHNOLOGY (UGENT-WOODLAB)

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DETECTING LONG-TERM SHIFTS IN TREE SPECIES COMPOSITION OF THE CONGO BASIN FOREST THROUGH ANCIENT CHARCOAL ANALYSIS

The tropical forest in the Congo basin has been and still is an important sink of carbon dioxide. Despite covering only 2% of the global land area, it annually absorbs a quarter of all carbon dioxide captured by land ecosystems (Lewis et al., 2009; d'Annunzio et al., 2011). However, it is unclear how the sequestration capacity of this forest will evolve facing climate change. Currently, predictions of carbon sequestration in the region, based on the most up-to-date earth system and climate models, don't match field measurements (Hubau et al., 2020).

One way of improving these predictions is by delving into the past of the forest using ancient charcoal. Charcoal fragments found in soils are the remnants of forest fires that can date up to before the start of the Holocene (11,700 years ago). They provide snapshots of the forest in the past in a location because, based on their anatomy, we can infer which species were present at the time of the forest fire.

Which tree species were present and abundant in the past? How did the forest respond to climate change in the last 10 000 years? Which disturbance factors, of natural and/ or human origin, shaped the forest of today? Answering these questions will improve our understanding of the resilience of Central African tropical forests, it will help us know why these forests have different characteristics than tropical forests in other regions and it will shed light on the interaction between human culture and the environment in the past millennia.

Delving into the past of the Congo basin tropical forests to improve global climate predictions (image from worldwildlife.org, n.d.)

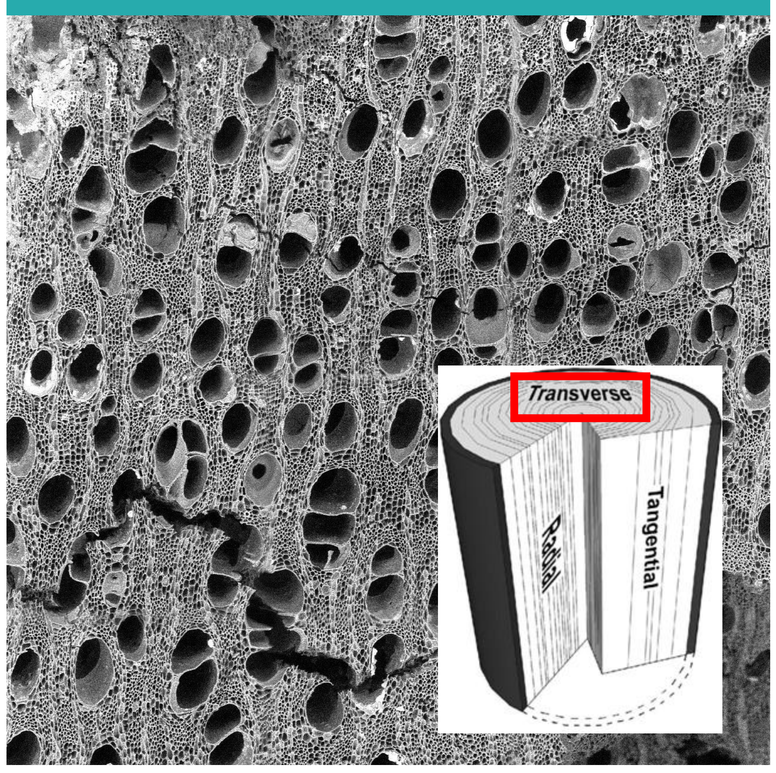
Managing a growing ancient charcoal collection and database

Charcoal is collected during fieldwork campaigns in various regions of the DR Congo, using a consistent protocol and in collaboration with Congolese research institutes and communities. Subsequently, it is transported to the Royal Museum of Central Africa (RMCA, Tervuren) where it is integrated in the largest existing collection of ancient charcoal from Central Africa.

A fieldwork team collecting charcoal fragments.

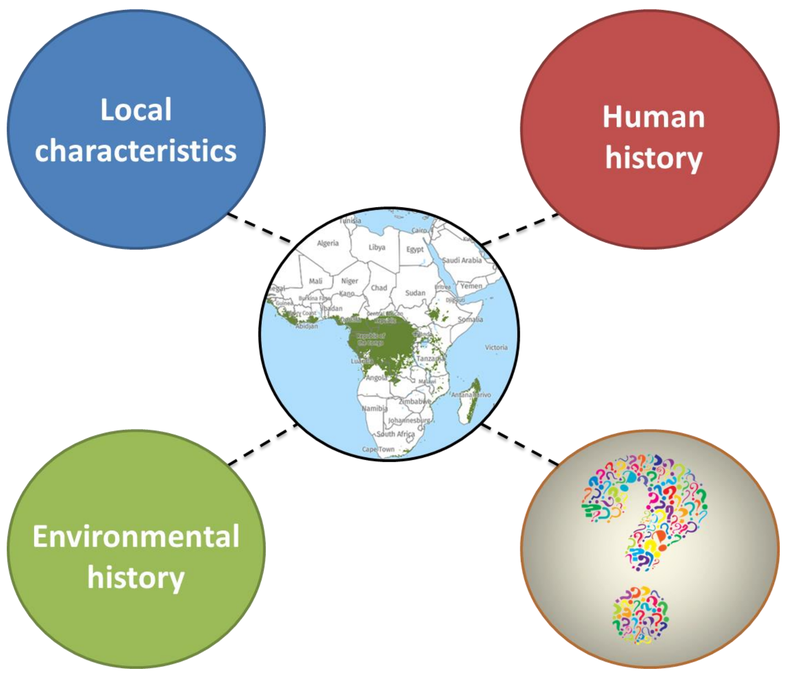
Characterising ancient charcoal fragments

First, the age of the charcoal is determined using 14C dating. Then the anatomy of the charcoal fragments is visualised and characterised using various microscopy techniques. This allows to perform taxonomic identifications of the fragments but also to derive ecological information of the site. In that way, we get an idea of how the forest was like in the past.



Transversal section of a charcoal fragment.

Linking forest history to the environmental and human history of the region.



Interpreting forest history

(map of the African tropical forest by Turubanova et al. (2018))

About me

PhD-student interested in linking environmental and human history with our common future. Being mesmerized by the beauty and diversity of wood anatomy is my daily occupation.
In April 2023, I started as a scientific collaborator in the Royal Museum for Central Africa (RMCA) as part of the BRAIN-BE 2.0 DAMOCO project funded by Belspo. This project aims to improve climate and vegetation models for the Congo basin by integrating forest inventory data, field trait data and paleodata.

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