**Crossdating quality assessment via X-ray CT densitometry: *Terminalia superba***

T. De Mil1, 2, H. Beeckman2, J. Van Acker1 and J. Van den Bulcke1

1 *UGCT - Laboratory of Wood Technology (Woodlab-UGent), Faculty of Bioscience Engineering, Ghent University (UGent), Belgium*

*2 Service of Wood Biology, Royal Museum for Central Africa, Belgium*

**Corresponding author:** [tom.demil@ugent.be](mailto:tom.demil@ugent.be)

**Keywords:** crossdating accuracy, densitometry, tropical dendrochronology, X-ray CT

**Traditional dendrochronology relies on visual inspection of the wood surface, ring width measurements and statistical analysis to construct crossdated series. X-ray CT scanning allows to add intra-annual information to tree ring data from tropical trees. The aim is to apply these intra-annual density data for archiving, screening and selection and assisted crossdating of cores. We focus on Limba (*Terminalia superba*), a brevi-deciduous tree species with proven annual growth rings [1]. Cores were taken from trees of the Nkulapark (study area established in 1947) in the Luki Reserve, located in a semi-deciduous forest at the southernmost edge of the Mayombe forest (DR Congo). A set of increment cores was scanned using the NanoWood CT facility [2].** An efficient sampling procedure from field to lab was elaborated and this without the need for surface preparation. This allows fast screening of specimens and visualization of the general tree ring structure. Large sample sets can be scanned for digital archiving of X-ray core volumes consisting of approximated density values [3]. Deviations in ring and fibre direction are corrected for **[4] and** volumes are averaged to microdensity profiles, which are useful for both growth trend analysis and dendrochronology. Intra-annual information is maintained and, if synchronous, can be incorporated as an additional reference in the crossdating procedure. Both visual crossdating as well as statistical crossdating are used, of which the latter is based on pattern matching of profiles. This high-throughput technique is thus useful as screening method to assess whether samples have dendrochronological potential and could improve crossdating accuracy in tropical regions.

**References**

[1] De Ridder, M. (2013). Tree-ring analysis and stem biomass estimation of limba (*Terminalia superba* Engl. & Diels) in the framework of sustainable forest management. Ph.D. dissertation, Ghent University Ghent, 167p.

[2] Dierick, M. et al. (2014). Recent micro-CT scanner developments at UGCT. *Nuclear Instruments and Methods in Physics Research Section B: Beam Interactions with Materials and Atoms* 324:35-40.

[3] De Ridder, M. et al. (2011). High-resolution proxies for wood density variations in *Terminalia superba*. *Annals of Botany* 107:293-302.

[4] Van den Bulcke, J. et al. (2014). 3D tree-ring analysis using helical X-ray tomography. *Dendrochronologia* 32:39-46.