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Seasonality of tree growth and carbon uptake through assessments of the cambial phenology in the Biosphere Reserve of Yangambi in the Democratic Republic of the Congo

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Tropical forests play a significant role in the global carbon cycle. The carbon is taken up through the xylogenesis, a key mechanism resulting from the division, differentiation, and lignification of tree cells in the cambial zone. This periodic process depends on environmental and genetic drivers that influence wood structure and anatomy. Yet patterns of seasonal cambial growth remain poorly understood for tropical forests, especially for those experiencing low seasonality. However, detailed information on the xylogenesis complements assessments of radial growth, measured through on-the-ground inventories, and the quantification of ecosystem carbon sinks and sources, assessed by eddy-covariance sensors. This is gaining relevance in the context of Congo Basin forests, because of the operationalization of the first flux tower (Congoflux) in semi-deciduous African forests and the increasing number of classic, intensive, and large-scale permanent inventory plots. Cambial phenology monitoring is therefore mandatory to link effective tree growth and permanent carbon sequestration. To meet this goal, we first need to better understand the tree growth cycles. For this purpose, we monitored the cambial phenology of six representative species of Yangambi forests (Democratic Republic of Congo) over the seasonal transition for which we suppose the onset of cambial activity. We characterized the cambial phenology among and within species through a study of the cells and tissues in the cambial zone over time. The description of xylogenesis phases over climatic variations is required to grasp how environmental changes affect ecosystem dynamics and their ability to provide ecosystem services. Studying the cambial phenology is therefore essential for a better understanding of the carbon cycle in a forest ecosystem.