CongoFlux: Measuring greenhouse gas exchange to better understand the contribution of the Congo Basin’s forests to fight climate change

How does CongoFlux work?

Fluxes need to be measured within the boundary layer above the canopy of the ecosystem. As the canopy in Yangambi reaches an average height of approximately 40 meters, CongoFlux has to reach a height of 55 meters to mount the equipment at a correct measurement height.

The tower also requires continuous power supply for uninterrupted operation, which is supplied by a solar park located 2.2 km from the tower site.

A combination of eddy covariance, radiation sensors, meteorological and soil sensors provide a full energy and water balance of the forest, linked to greenhouse exchanges measures. Additionally, several plots will be installed within the footprint of the tower to gather ancillary data, and in a later stage, ten automatic soil chambers will be installed within the site in order to allow soil GHG fluxes quantification.
The Congo Basin forest: a vast carbon sink

Tropical forests are huge reservoirs of carbon, storing 250 billion tonnes of carbon in their trees alone. This storage is equivalent to 90 years of global fossil fuel emissions at today’s level.\(^1\) The Congo Basin is the second largest tropical rainforest in the world, with almost 200 Mha of humid forest.\(^2\) This vast ecosystem takes up approximately 0.66 tonnes of carbon per year per hectare\(^3\) making it the region with largest carbon uptake per unit of area on the African continent.\(^4\)

Although ground-based studies are still not fully representative, the sheer magnitude of these values evidence the importance of the Congo Basin forests for the global greenhouse gas balance. They also call for further research on the processes that drive greenhouse gas fluxes to better understand the potential contribution of this vast ecosystem to mitigate climate change, and its response to a changing environment.

CongoFlux: the Congo Basin’s first eddy covariance tower

The CongoFlux station is located near the UNESCO Man and Biosphere (MAB) reserve of Yangambi, in the very heart of the Congo Basin, on the right bank of the Congo River roughly 100 km northwest of the city of Kisangani.

Since the 1930s Yangambi hosts an important research station specialized in forestry and tropical agriculture, currently managed by INERA (Institut National d’Études et Recherches Agronomiques). As such, the site has long-term records of meteorology, large scale forest experiments, and well-characterized permanent sampling plots.

The tower delivers the very first accurate and continuous data of biosphere-atmosphere GHG exchanges including CO\(_2\), CH\(_4\) and N\(_2\)O in the Congo Basin. Besides, additional data, including forest inventories, leaf area index, tree mortality and soil characterization, will be recorded within the footprint of the tower.

The CongoFlux tower is officially associated to the Integrated Carbon Observation System (ICOS) network, which ensures data quality, management and availability.

Yangambi: a development, research and conservation hub

CongoFlux is part of a wider effort by the international forestry community to consolidate Yangambi as a center for the study of the Congo Basin, where research and conservation activities contribute to the well-being of forest communities.

The tower was built with the support of the project YPS (Yangambi Pôle Scientifique), financed by the Kingdom of Belgium through delegated cooperation with the European Union. The objective of this project is to unleash the potential of Yangambi to become a scientific hub for the study of forest carbon storage, biodiversity, and climate change – all while supporting the creation of new livelihood opportunities and promoting the preservation of natural resources. This initiative is coordinated jointly by the Center for International Forestry Research (CIFOR), Ghent University (UGent), ERAIFT (École Régionale Postuniversitaire d’Aménagement et de Gestion intégrés des Forêts et Territoires tropicaux), and Resources and Synergies Development (R\&SD).

Bibliography: