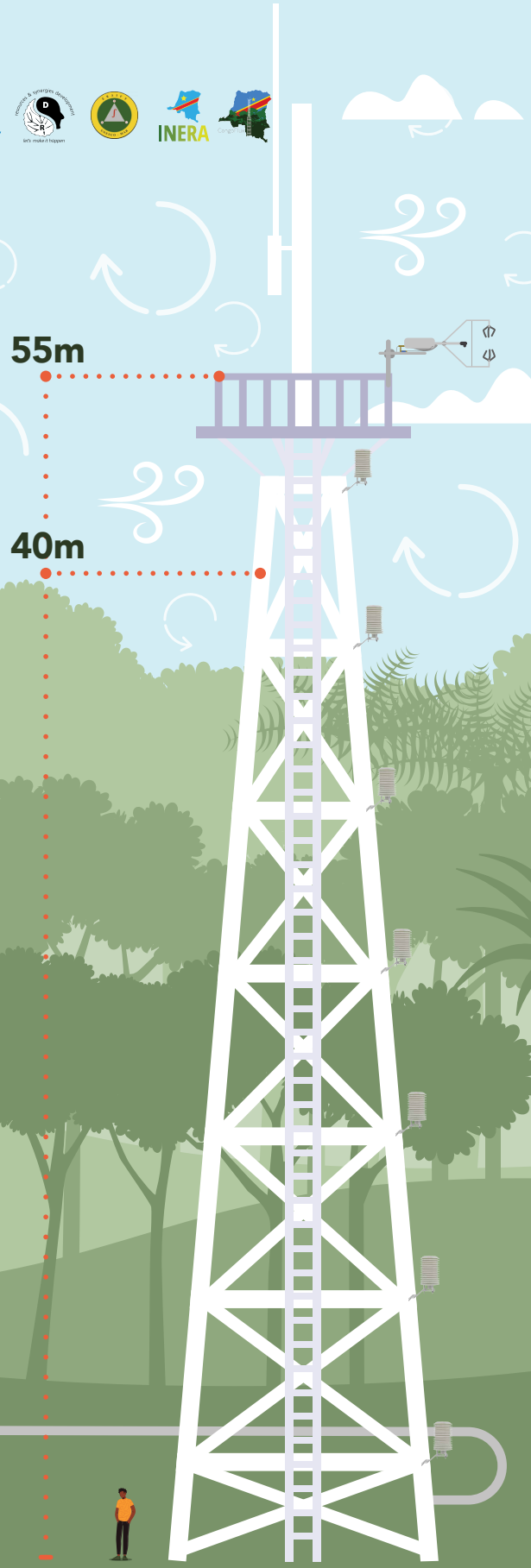
YANGAMBI
RÉPUBLIQUE DÉMOCRATIQUE DU CONGO

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



Yangambi, in the Democratic Republic of Congo, is now home to the Congo Basin's first eddy covariance station: the CongoFlux tower.

Reaching high above the canopy, this structure delivers continuous and accurate data on greenhouse gas exchange between the atmosphere and the forest, which is critical to better understand the role that tropical forests play sequestrating carbon and mitigating climate change.

Eddy covariance: measuring greenhouse gas fluxes

Greenhouse gases (GHG), such as carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O) are naturally present in the atmosphere and contribute to regulate the Earth's climate. Since the industrial revolution, however, there has been an increase in GHG concentration in the atmosphere due to human activities such as fossil fuel burning and land-use change. This sudden increase in atmospheric GHG concentration contributes to global warming.

Forests are both major sources and sinks for greenhouse gases and therefore contribute to regulating the atmospheric GHG concentrations. To understand exactly which role forests play and will play in the future, we need to better understand the processes that control GHG uptake and release by tropical forests.

The eddy covariance technique is a non-destructive technique used for continuous and accurate data measurement of GHG fluxes over large areas which can then be integrated to an ecosystem scale.

In this technique, GHG concentrations and three-dimensional wind speed are measured minimum 10 times per second, and decomposed into mean and fluctuating components measured above the canopy. By quantifying the covariance between the vertical wind speed and GHG concentration fluctuation, the overall ecosystem GHF fluxes are determined.

How does CongoFlux work?

Fluxes need to be measured within the boundary layer above the canopy of the measured 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.

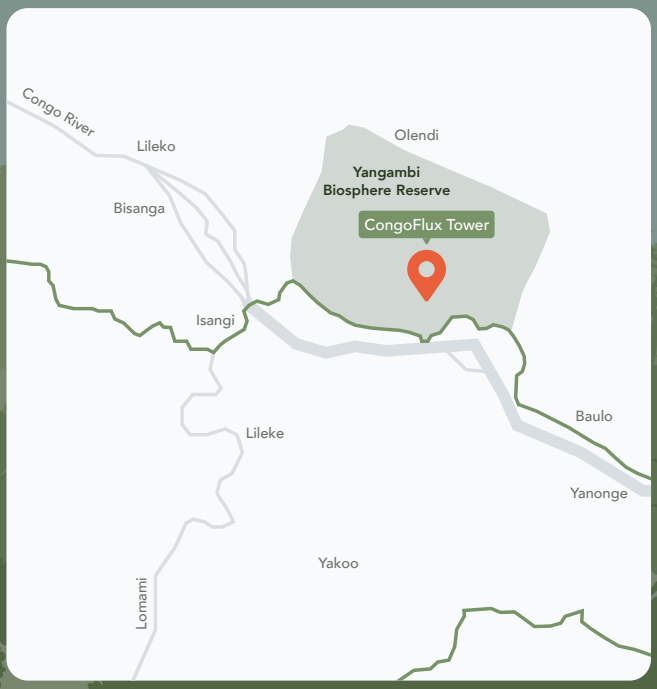
The tower also requires continuous power supply for uninterrupted operation, which is supplied by a solar park located 2.2 km from the tower site.

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, six automatic soil chambers will be installed within the site in order to allow soil respiration 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'Etudes et Recherches Agronomiques). As such, the site has long-term records of meteorology, large scale forest experiments, and well-characterized permanent sampling plots.

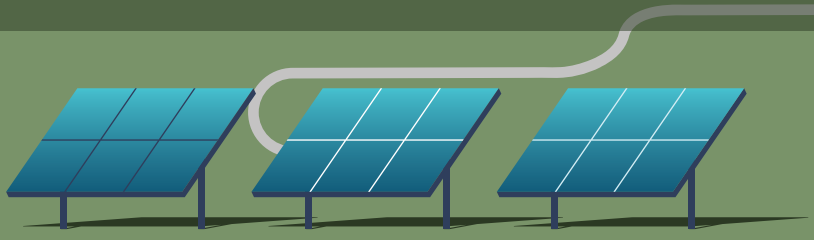
The tower delivers the very first accurate and continuous data of biosphere-atmosphere GHG exchanges including CO_2, CH_4 and N_2O in the Congo Basin. Besides, additional data, including forest inventories, leaf area index, tree mortality and soil characterization, will be recorded within the footprint 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).



www.cifor.org/yangambi

Bibliography:

1 "Tropical forests' carbon sink is rapidly weakening | Royal Museum for Central Africa - Tervuren - Belgium." [Online]. Available: https://www.africamuseum.be/en/research/discover/news/tropical_forests_carbon_sink. [Accessed: 04-Sep-2020].

2 "The Congo Basin Forest | Global Forest Atlas." [Online]. Available: https://globalforestatlas.yale.edu/region/congo. [Accessed: 04-Sep-2020].

3 W. Hubau, L. Simon L., P. Oliver L., and K. Affum-Baffoe, "Asynchronous carbon sink saturation in African and Amazonian tropical forests," vol. 27, no. January 1968, 2020.

4 P. I. Palmer, L. Feng, D. Baker, F. Chevallier, H. Bösch, and P. Somkuti, "Net carbon emissions from African biosphere dominate pan-tropical atmospheric CO2 signal," Nat. Commun., vol. 10, no. 1, pp. 1–9, 2019.

CongoFlux is scientifically and technically managed by the Isotope Bioscience Laboratory of Ghent University (Belgium) and INERA-Yangambi (DRC).
Further details can be requested via Prof. Pascal Boeckx (pascal.boeckx@ugent.be) or the ISOFYS website: www.ugent.be/bw/gct/en/research/isofys