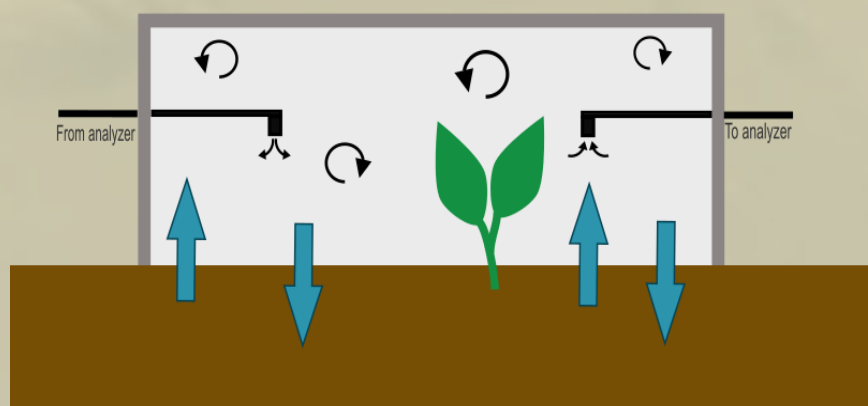


Continuous CO₂, N₂O and CH₄ soil fluxes from the footprint of the CongoFlux Eddy Covariance tower

Tropical rainforest soils are considered an important source of nitrous oxide (N₂O) and carbon dioxide (CO₂) and a sink for methane (CH₄). Although the Congo Basin is the second largest tropical rainforest, data of continuous in situ flux measurements are scarce. The CongoFlux eddy covariance tower is located in the Yangambi biosphere reserve, DRC, and labeled as an ICOS associated ecosystem station. In its footprint automated dynamic soil chambers have been installed since May 2022. The chambers have been continuously measuring CO₂, N₂O and CH₄ soil fluxes, which resulted in high frequency data covering the 4 different seasons.

Set-up

- 9 chambers, each with 2 collars
- Licor 7810 (CH₄, CO₂) and Licor 7820 (N₂O)
- temperature and moisture sensors (CS 650) at -5 cm and -15 cm
- closure time of 15 minutes



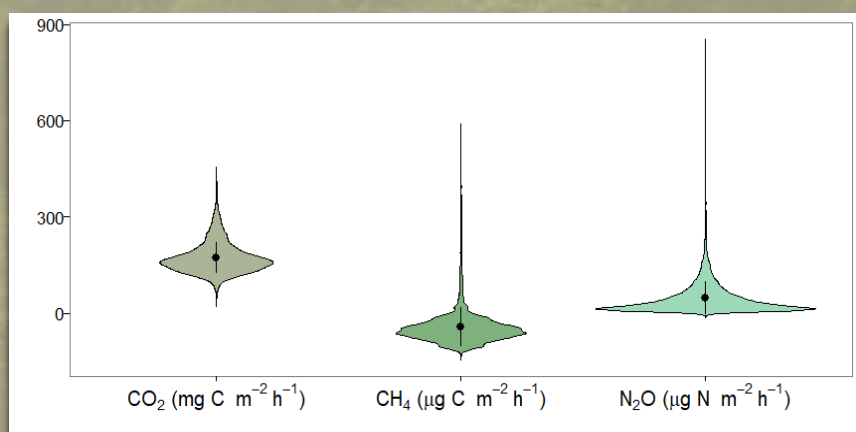
Annual budget

(kg CO₂ eq ha⁻¹ yr⁻¹)

55 490

-123

1935



172.8

-42.3

47.2

Future work

- Look into spatial variability with more chambers covering the footprint of the tower
- Upscaling of soil chamber data together with stem flux and leaf flux data

Dominant role of soil water content

$$\log(\text{Flux}) \sim \text{SWC} + \text{Temp} + (1|\text{Chamber}_{nr})$$

Conditional R² = 0.71

SWC change of 1% causes 1.96% change in Flux

CO₂

Temp change of 1°C causes 10.68% change in Flux

$$\text{Flux} \sim \text{SWC} + (1|\text{Chamber}_{nr}) + (1|\text{Season})$$

Conditional R² = 0.65

SWC change of 1% causes 1.9 µg C m⁻² h⁻¹ change in Flux

CH₄

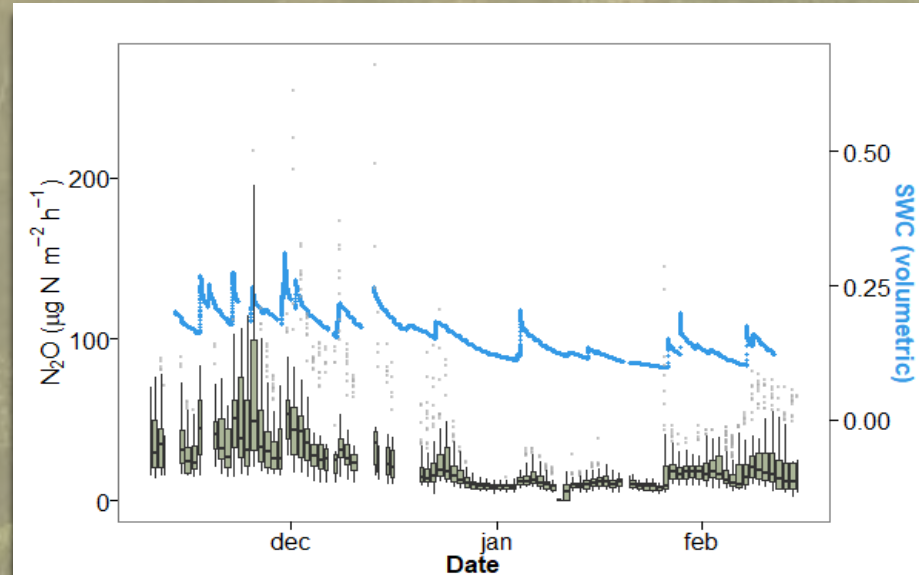
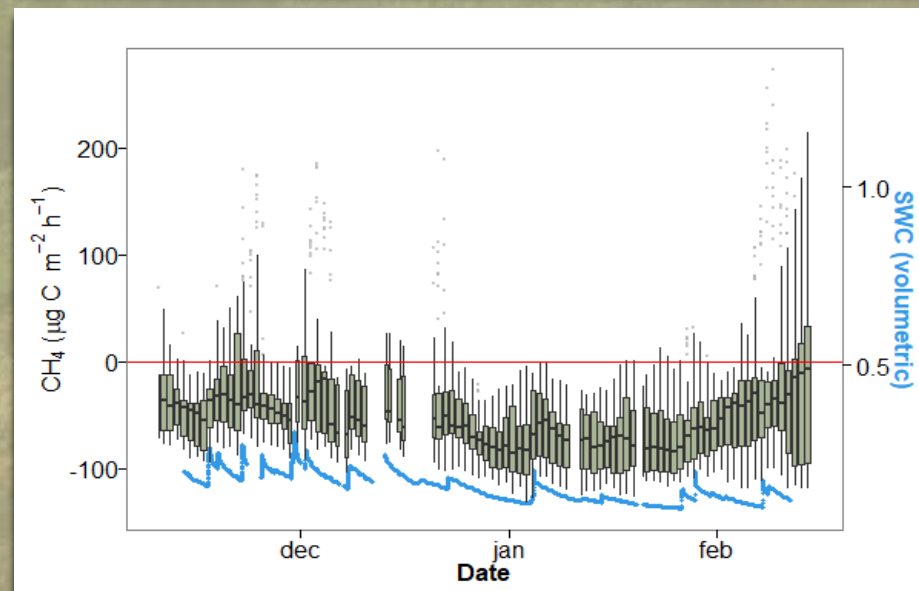
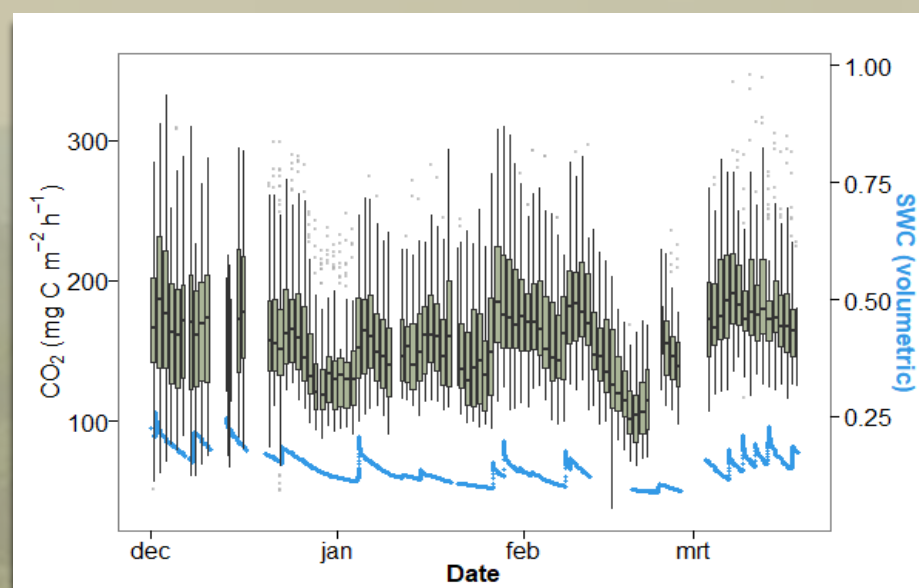
$$\log(\text{Flux}) \sim \text{SWC} + \text{Temp} + (1|\text{Chamber}_{nr}) + (1|\text{Season})$$

Conditional R² = 0.70 (without Temp: Conditional R² = 0.68)

SWC change of 1% causes 8.4% change in Flux

N₂O

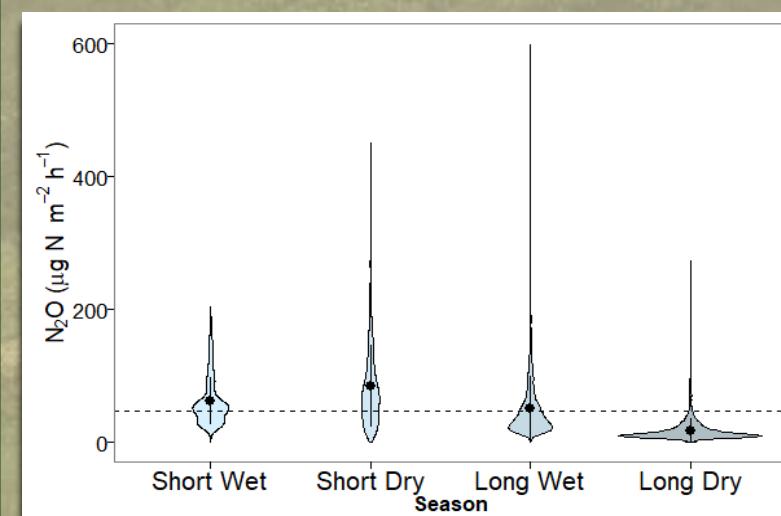
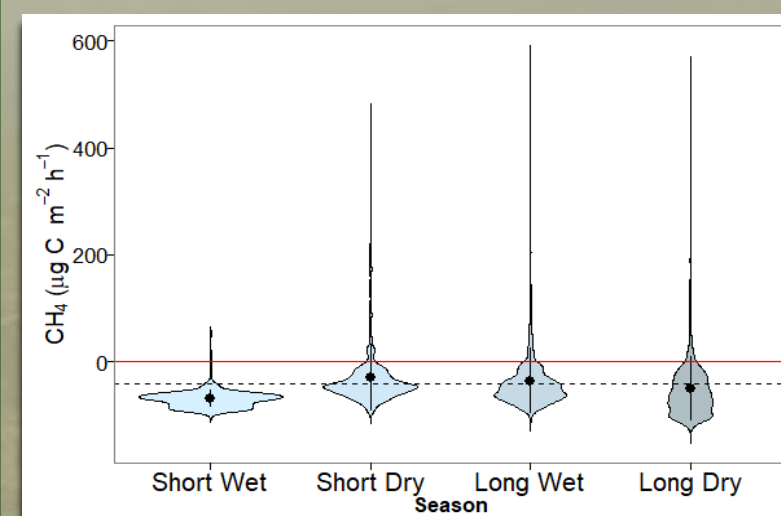
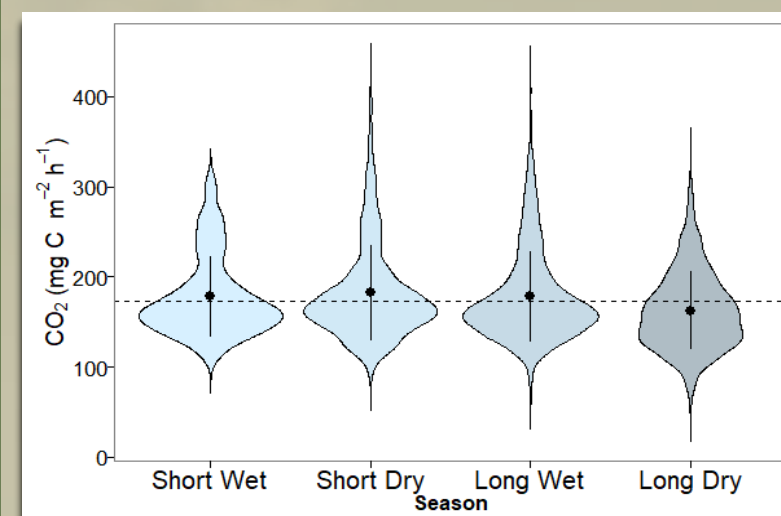
Temp change of 1°C causes 11.5% change in Flux



Seasonality

4 different seasons

- Long dry (Dec, Jan, Feb, Mar)
- Short wet (Apr, Mai) No full season yet
- Short dry (June, July)
- Long wet (Aug, Sept, Oct, Nov)



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