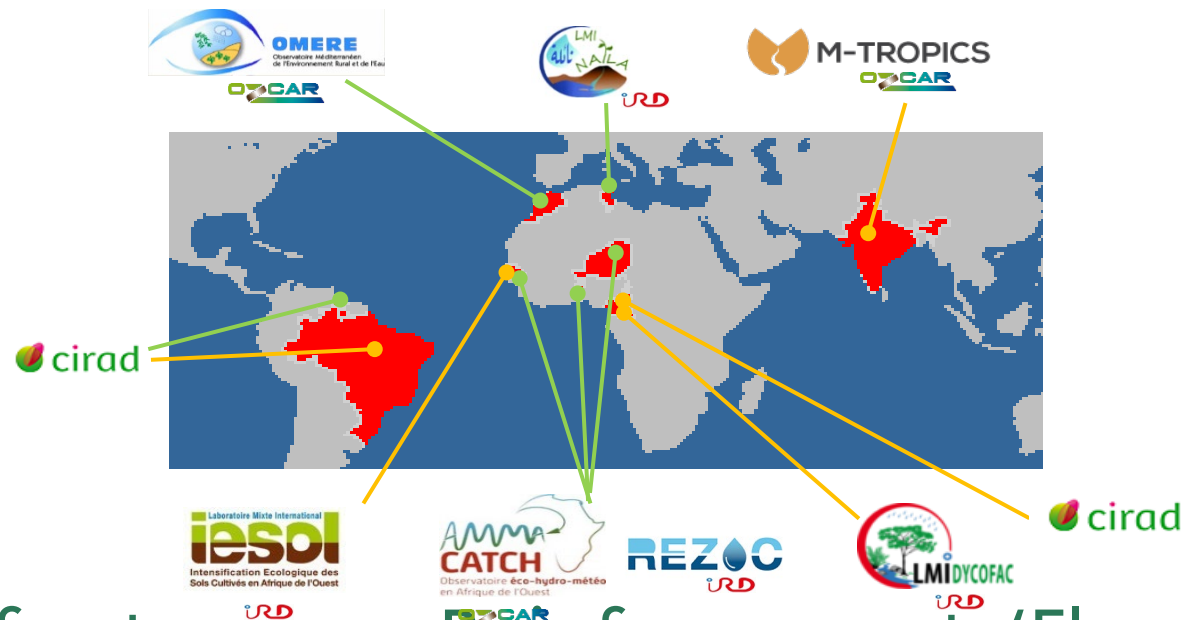
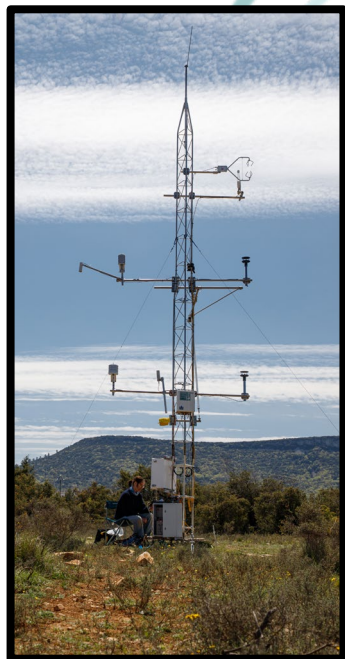




PC3: Infrastructure Reinforcement: 'Flux Towers' (RIFT)

Jérôme Demarty (IRD), Olivier Rousard (CIRAD) et Gilles Boulet (IRD)

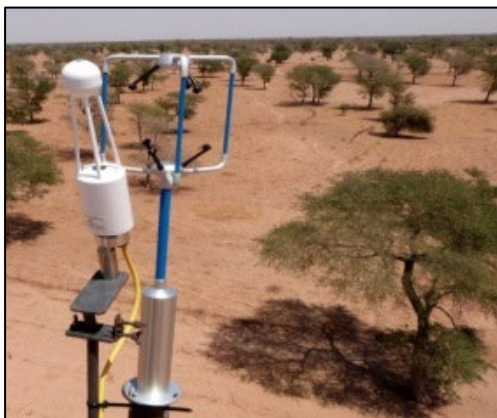
~60 participants, 10 countries, 12 MRUs or RUs



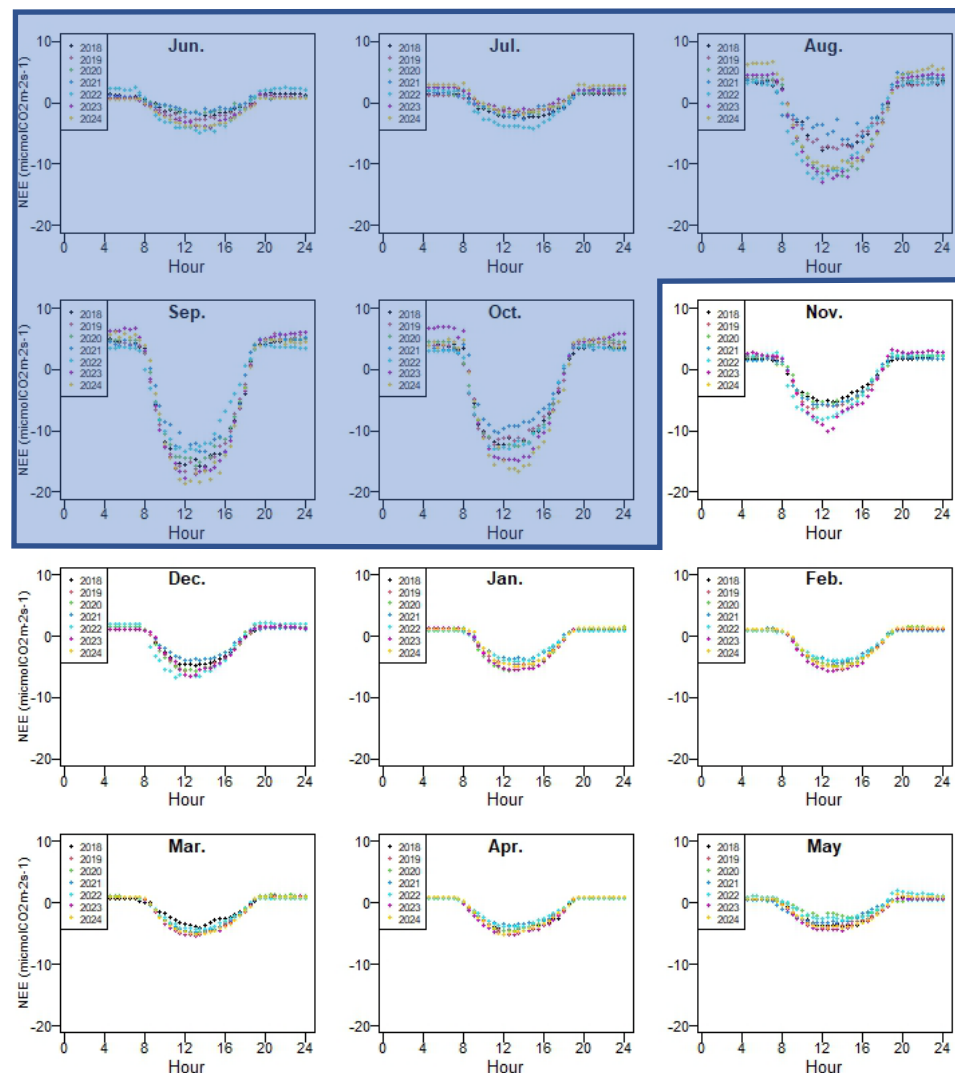


Why flux towers ???

Agroforestry example, in Senegal



Diel, seasonal and interannual course of the C net ecosystem exchange ($NEE, \mu\text{mol}_{\text{CO}_2} \text{ m}^{-2} \text{ s}^{-1}$).



Rainfall

2018: 454 mm
2019: 513 mm
2020: 599 mm
2021: 478 mm
2022: 825 mm
2023: 538 mm

- For the ecosystem scale
- For the time resolution
- For the monitoring
- For the C, water and energy balance closure

Beyond flux towers ??? partitioning, upscaling, modelling...

Agronomy, Proxy & Remote sensing...

New satellite



+ India, Tunisia, Morocco, Niger, Benin sites

Proxy and remote sensing



Deep root turnover...



Litter decomposition...



Tree sapflow, phenology, growth, Ψ ...



New flux towers



WAF-NET: International African network

Hydrology, piezometry...



Soil + plant GHG balance...



New geophysical surveys

Rift ambitions

- ➔ 13 sites around the world
- Historical (8) vs new sites (4) + 1 potential
- West Africa (7), Mediterranean (3), South America (2) and Asia (1)
- Site categories: Agriculture, agroforestry, forestry, pastoralism, agropastoralism

Network structuring and data enhancement

- Consolidation of existing sites & opportunities for new sites
- Resources for site operation, deployment and maintenance
- Production of high-quality, accessible data (FLUXNET standard)
- Inter-site synergy: complementary experiments, rotating experiments, instrument comparisons, etc.

N°	Pays (Site)	Systèmes/Ecosystèmes
1	Bénin (Belefoungou)	Forestier et cultural (2 stations)
2	Brésil (Mata flux)	Forestier / Eucalyptus (1 station)
3	Cameroun (?)	Forestier/ Forêt humide (1 station)
4	Cameroun (Cacao flux)	Agroforestier / Cacao (1 station)
5	Guyane (CARPAAG)	Pâturage / prairie humide (1 station)
6	Inde (Mule Hole)	Forestier (1 station)
7	Maroc (Tensift)	Agricole / Blé pluvial (1 station)
8	Niger (Wankama)	Agropastoral / culture et jachère (2 stations)
9	Sénégal (Niakhar)	Agroforestier champ de brousse / rotation mil arachide (2 EC haut et bas)
10	Sénégal (Niakhar-Sob)	Agricole / champ de case (1 EC bas)
11	Sénégal (Niakhar-Ragola)	Agroforestier champ de brousse / rotation mil arachide en opposition (1 EC bas)
12	Tunisie (Kamech)	Agricole (1 station)
13	Tunisie (Taous)	Verger / olivier pluvial (1 station)



Mid-term review (November 2025)

- 4 new sites, of which 2 are already operational: Cameroon (cocoa agroforestry); Senegal (agro-sylvo-pastoral), and 2 are almost ready to start: India (forest); French Guiana (pasture)
- Data Management Plan and Open Science: “**FLUXNET data system initiative 2025**”: successful sharing of data from 3 countries
- Network development: West African Flux Network (**WAF-NET**: <https://wafnet-351317.gitlab.io/>)
- 3 FairCarboN papers:

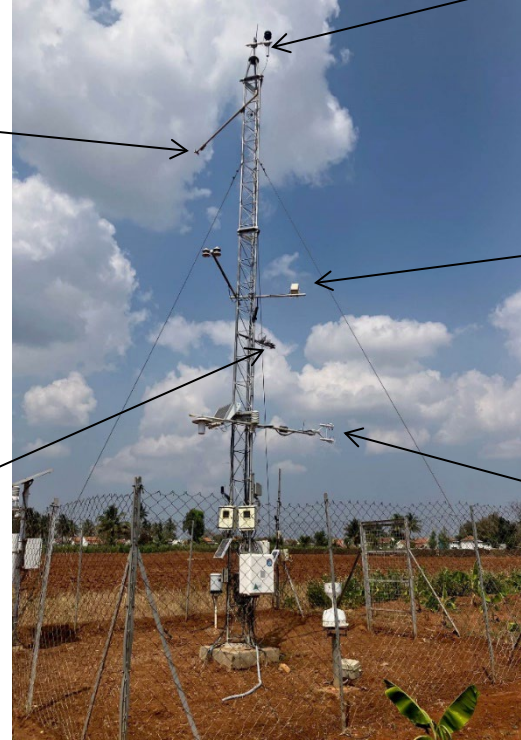
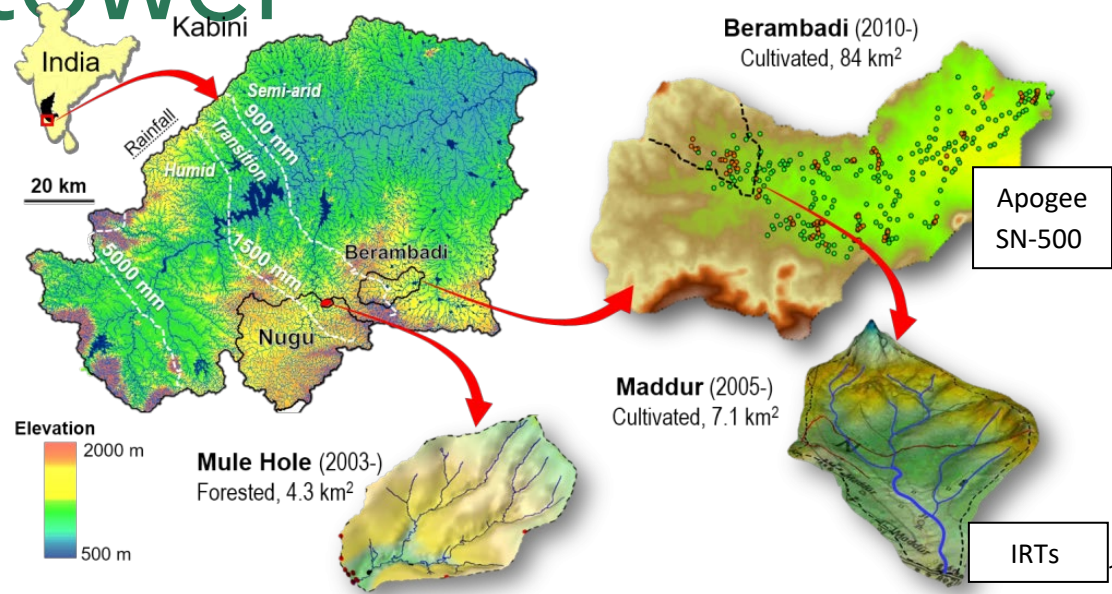
Agbohessou, Y., Audebert, A., Ndour, A., Leroux, L., Jourdan, C., Clermont-Dauphin, C., Sow, S., Pierre, C., Taugourdeau, S., Sarr, M. S., Diatta, S., Sanogo, D., Seghieri, J., le Maire, G., Vezy, R., Fonceka, D., & Roupsard, O. (2025). Proxydetection of the impact distance of trees on crops: An indicator of the Land Equivalent Ratio? **Agriculture, Ecosystems & Environment**, 394, 109918.

Etchanchu, J., Demarty, J., Dezetter, A., Farhani, N., Thiam, P. B., Allies, A., Bodian, A., Boulet, G., Chahinian, N., Diop, L., Mainassara, I., Ndiaye, P. M., Ollivier, C., Oliso, A., & Roupsard, O. (2025). Multiscale analysis of existing actual evapotranspiration products over agropastoral Sahel. **Journal of Hydrology**, 651, 132585.

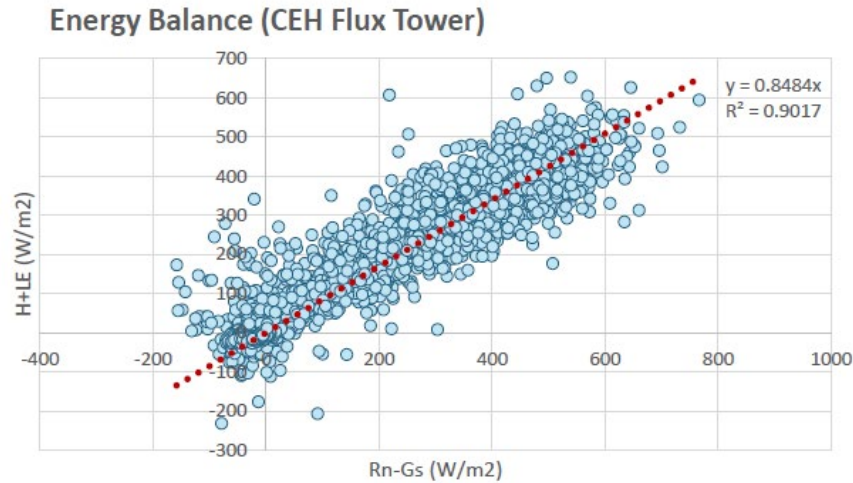
Farhani, N., Etchanchu, J., Boulet, G., Gamet, P., Oliso, A., Dezetter, A., Bodian, A., Chahinian, N., Mallick, K., & Ollivier, C. (2025). Spatially remotely sensed evapotranspiration estimates in Sahel region using an ensemble contextual model with automated heterogeneity assessment. **Science of Remote Sensing**, 11, 100229.



The M-TROPICS SNO Berambadi flux tower



Spectrometer next to the CEH Flux Tower, looking at Irrigated 1

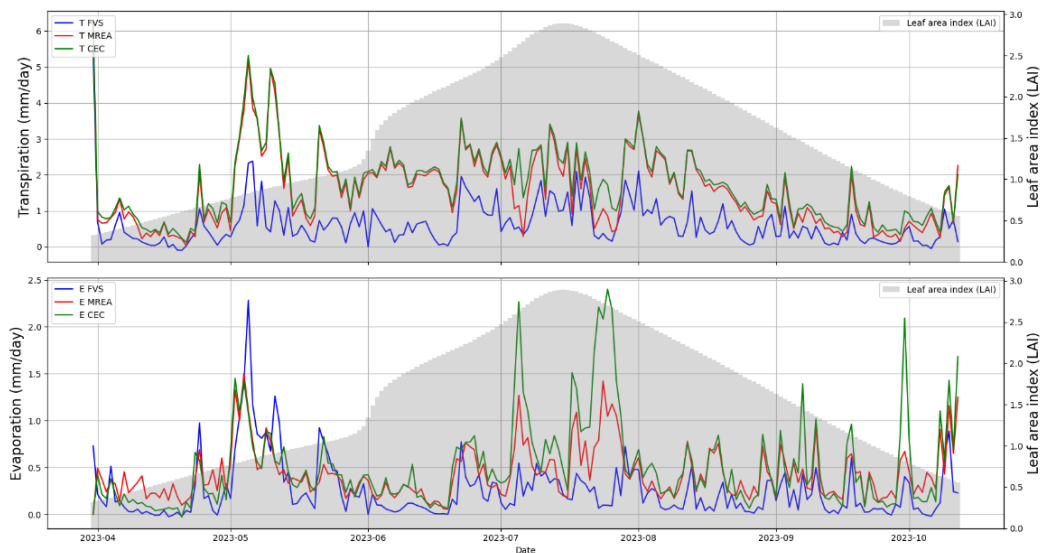


Flux tower, mostly over rainfed Sunflower equipped in 2023
Cal/Val Site for TRISHNA and NISAR, test site for FLEX (fluorescence)

Contact: Gilles Boulet (IRD)



Transpiration and Evaporation in daily time steps

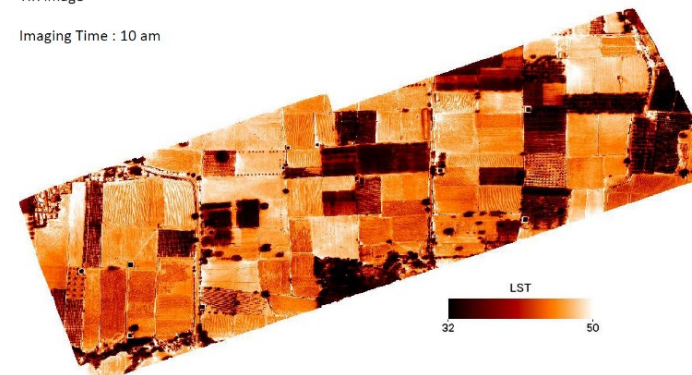


VIS/NIR/TIR UAV flights 2024 for TRISHNA ET Cal/Val



TIR image

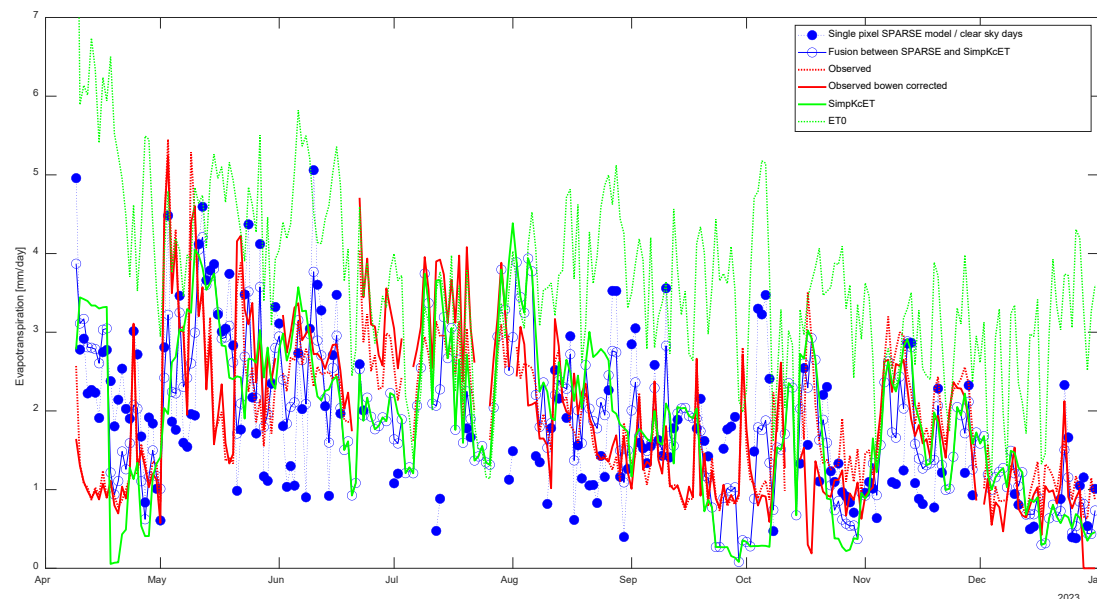
Imaging Time : 10 am



Eddy-Covariance based partitioning between evaporation and transpiration: testing several methods based on H_2O/CO_2 coupling

Test of a simple water budget model (SimpKcET) for gapfilling TIR-based ET retrieval for the TRISHNA L3 continuous ET product (cf. Monsoon Jun/Aug)

Contact: Gilles Boulet (IRD)

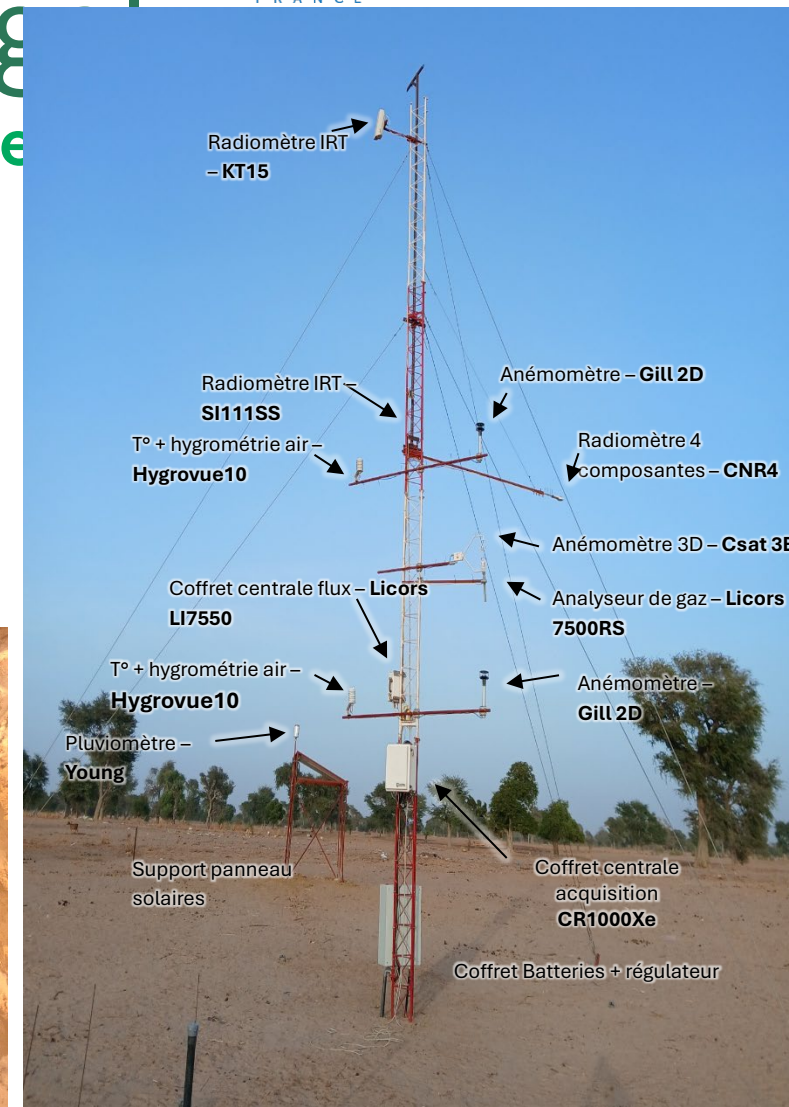




RIFT- Flux tower site in Senegal

Installation on the food crop fields in the village of Sob

- 4th flux tower deployed on the historical Niakhar agroforestry sites (April 2025)
- Impact of manure on the H₂O and CO₂ fluxes/bu
- TRISHNA CNES/ISRO mission (launch in 2027)
- Soil water content profile till groundwater (3m)
- A first season of watermelon cultivation less productive than millet...
- ❑ 2026: New field campaigns to add sensors and drone acquisitions (WP1 and WP4)
- ❑ Land surface modeling actions (WP3, post doc Taeken Wijmer)





RIFT- Flux tower site in French Guyana

Installation of a new flux tower in a permanent pastures,
near the Guyaflux (INRAE) flux tower in natural forest



© Aurélien

Guyaflux, ICOS associated ecosystem station,
Paracou station, French Guiana

The old flux tower



© Vincent



@LI-COR

Example of the new flux
tower





RIFT- Flux tower site in French Guyana



- ❑ Rainy season, impossible work outdoors (concrete slab, solar installation, flux tower installation)
- ❑ A new device broke down

Partne



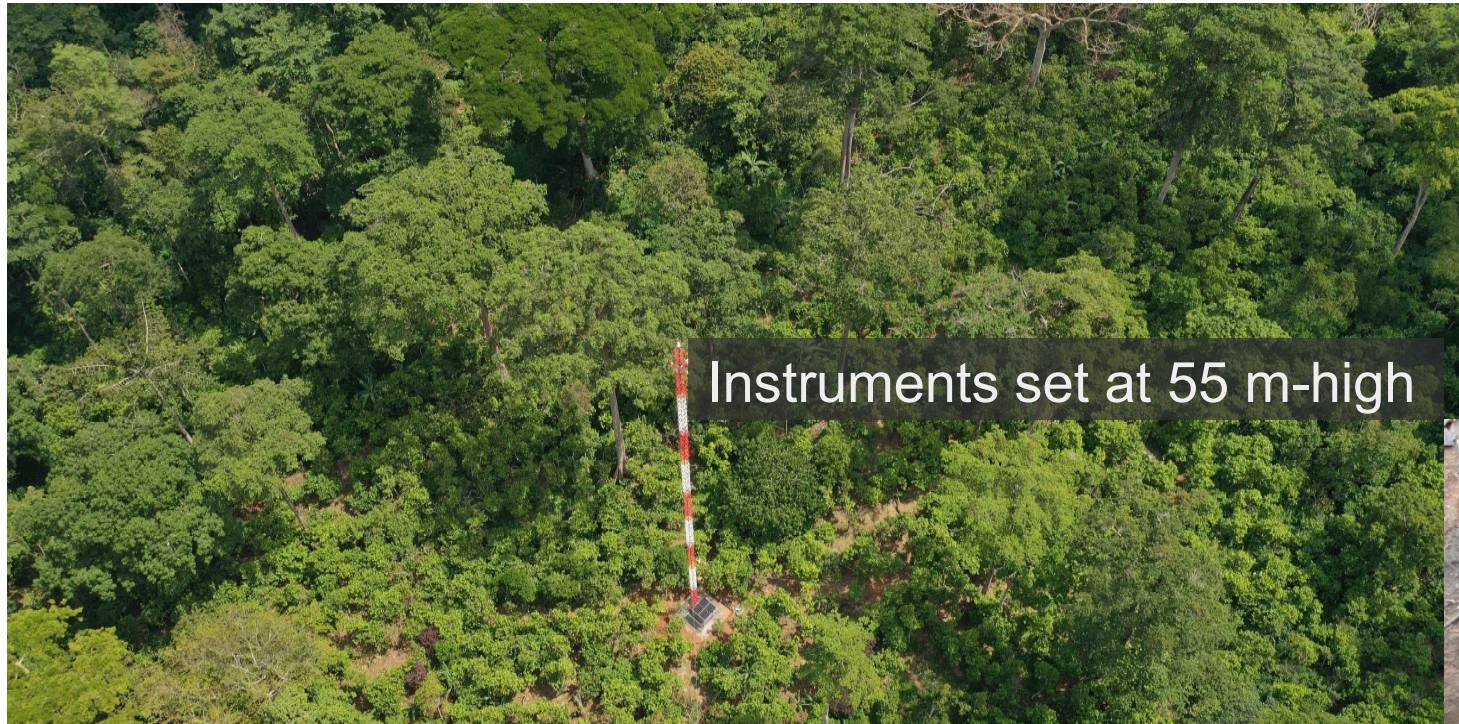
- Tropical pasture resulting from **deforestation in 1978**, main forage species *Brachiaria humidicola*.
- GHG monitoring system was active (2011-2018), resumption of GHG flux measurements → **Long-term monitoring**.
- Close (10 km) to the INRAE flux tower in native forest (Guyaflux) operating since 2003 → **Impact of forest conversion into pasture on the carbon cycle**.

➤ **Installation on the pasture planned for the end of 2025**



Cocoa-For-Flux : cocoa agroforest

Contact: Ivan Cornut (CIRAD)



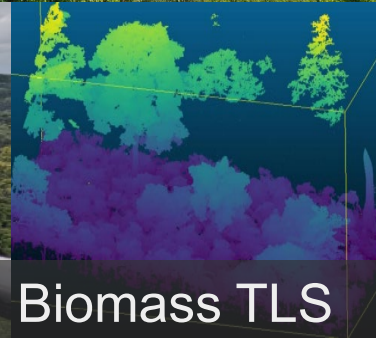
Instruments set at 55 m-high

Installation of a flow tower site in Cameroon on an agroforestry cocoa plot, fully funded by FairCarboN RIFT
A highly diversified agroforest and an old plot (>70 years old).

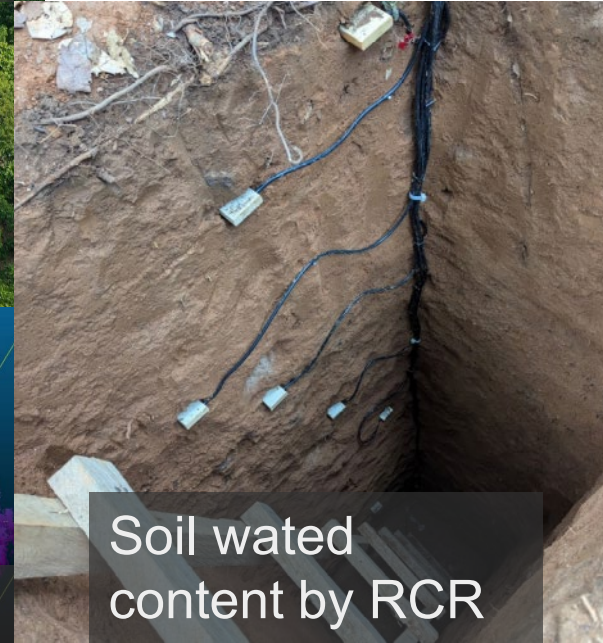
Measurements started in June 2025



Flux measurements by IRGASON



Biomass TLS



Soil water content by RCR

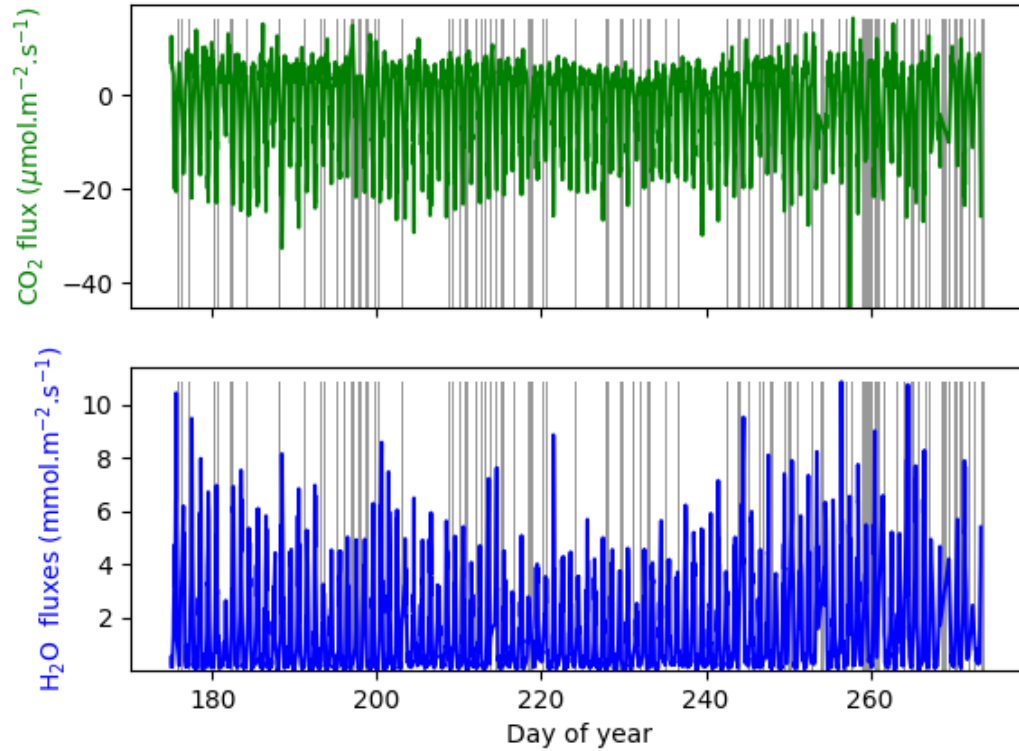


Soil respiration

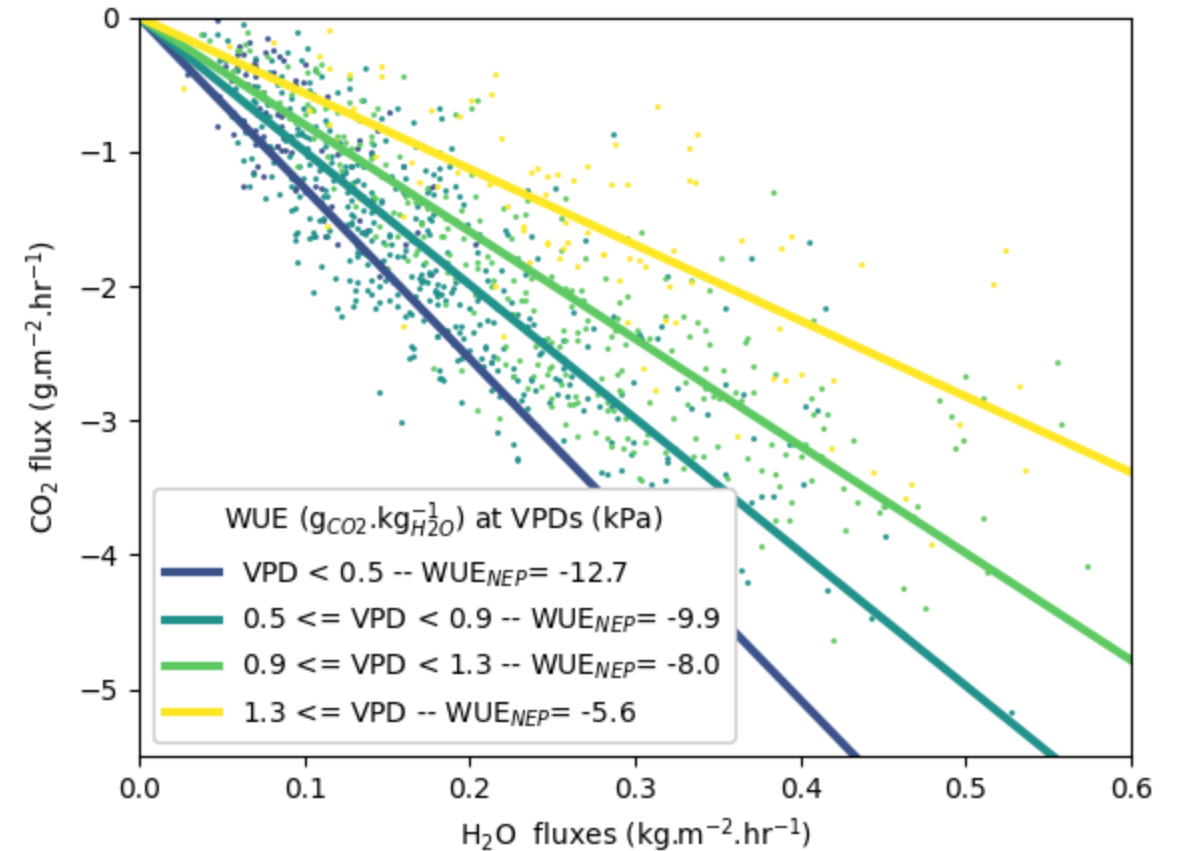


Cocoa-For-Flux : First Flux

Contact: Ivan Cornut (CIRAD)



First flows processed with LiCor EddyProC software. Greyed-out areas were removed based on flow quality criteria (QC >1).



Water use efficiency of net ecosystem production in different classes of water vapour pressure deficit



Rift News

- 4 new recruits: i) **Léna Collet**, 1-year thesis on modelling at the Niger site (UMR HSM); ii) **Louis Décline**, UMR SELMET, VSC Engineer supporting acquired data flows in French Guiana; iii) **Taeken Wijmer**, starting his post-doc on modelling agroforestry systems at the Senegal site; iv) **Renaud Koukoui**, completing his thesis at the University of Cotonou, research engineer position in WP1.
- Call for cross-cutting actions: Carbonium, ALAMOD, DROUGHT4C, SLAM-B
- **Call for post-doc NPP**: Net Primary Productivity : its partition between growth and litter between sites, consequences for the fate of C ?
- **Call for post-doc WUE** : Water Use Efficiency from leaf to landscape accross sites

Contact us !

