RÉPUBLIQUE FRANÇAISE
Liberté Égalité Fraternité

FRANCE 2030 — PROGRAMME DE RECHERCHE CARBONE ET ÉCOSYSTÈMES CONTINENTAUX

Installation of a new flux tower in a permanent pasture in French Guiana

FairCarboN annual days: Ma Mission en 180s

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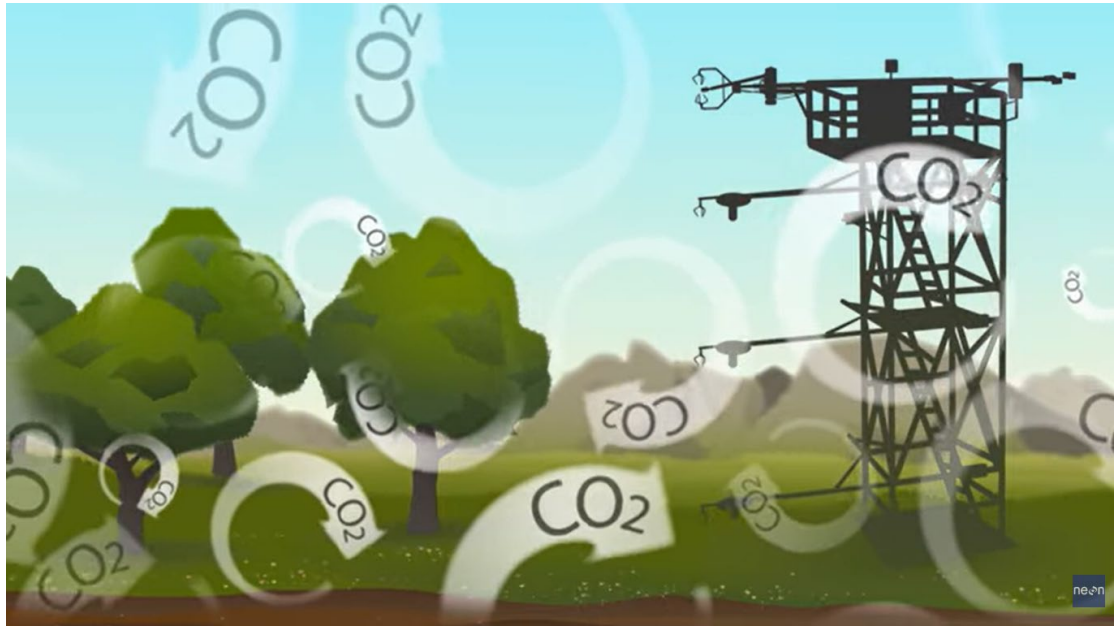
cnrs INRAE

Introduction

Flux tower

- Monitoring of **GHG fluxes (CO_2, CH_4 …) at the Soil-Vegetation-Atmosphere interface**
- 2 groups of sensors and instruments:
  - **Gas exchange**
  - **Local-scale hydrometeorological variables**
- Solar power system: **Autonomous**
- **Continuous** data recording (up to 20 measurements per second)

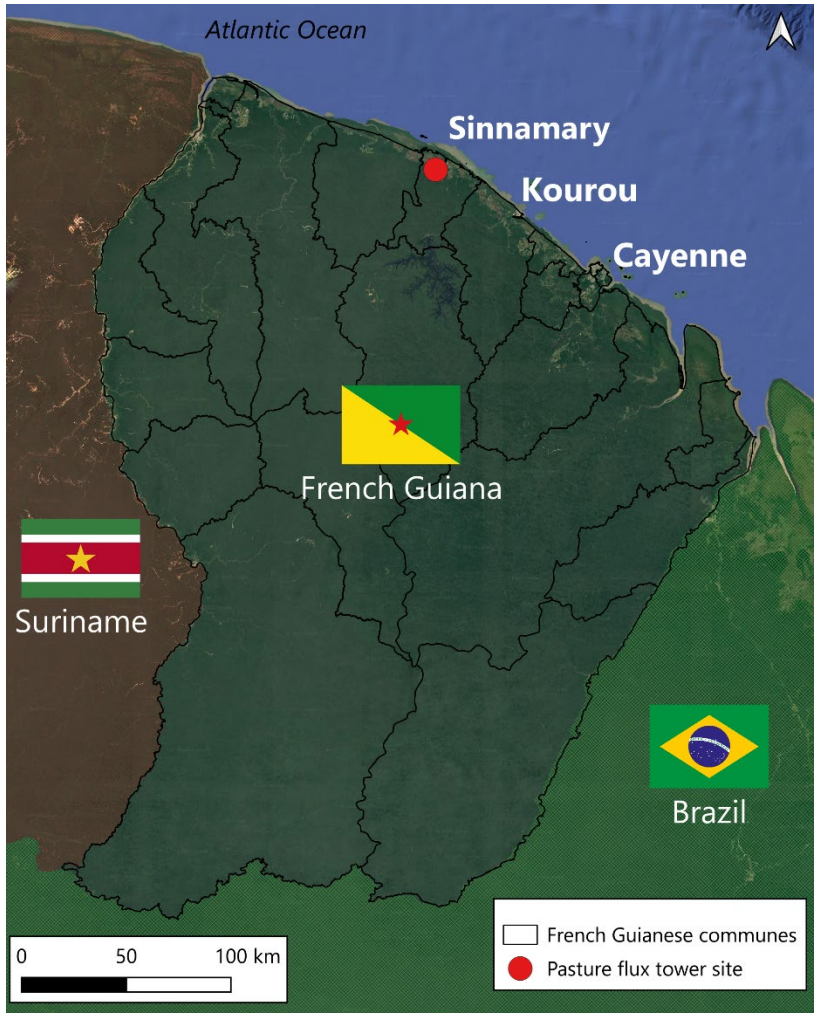


« Covariance des turbulences : mesurer le souffle d'un écosystème », YouTube, 1:26. 2017.

Project and the study site

- FairCarboN - **RIFT project**
-> Strengthening of infrastructure known as « Flux Tower »

- South America, in **French Guiana**



Pasture flux tower localization

Partners

cirad
AGRICULTURAL RESEARCH FOR DEVELOPMENT

INRAE

SELMET

UREP
Ecosystème Prairial

ECOFOG

Objective

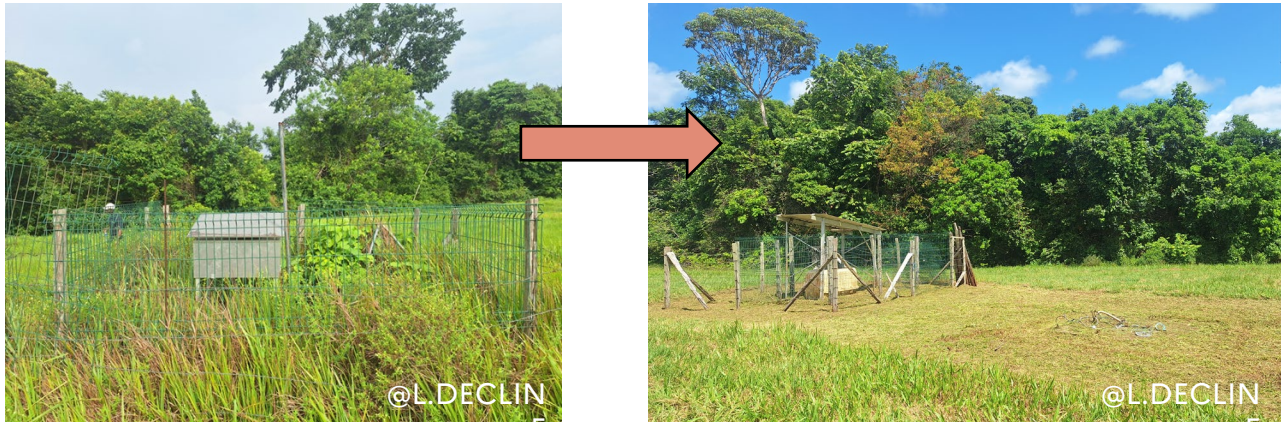
Installation of a **new-generation flux tower** in one of the two pastures in French Guiana where a **GHG monitoring system was active (2011-2018,** CARPAGG project).

CARPAGG: carbon and greenhouse gases in French Guiana's pastures

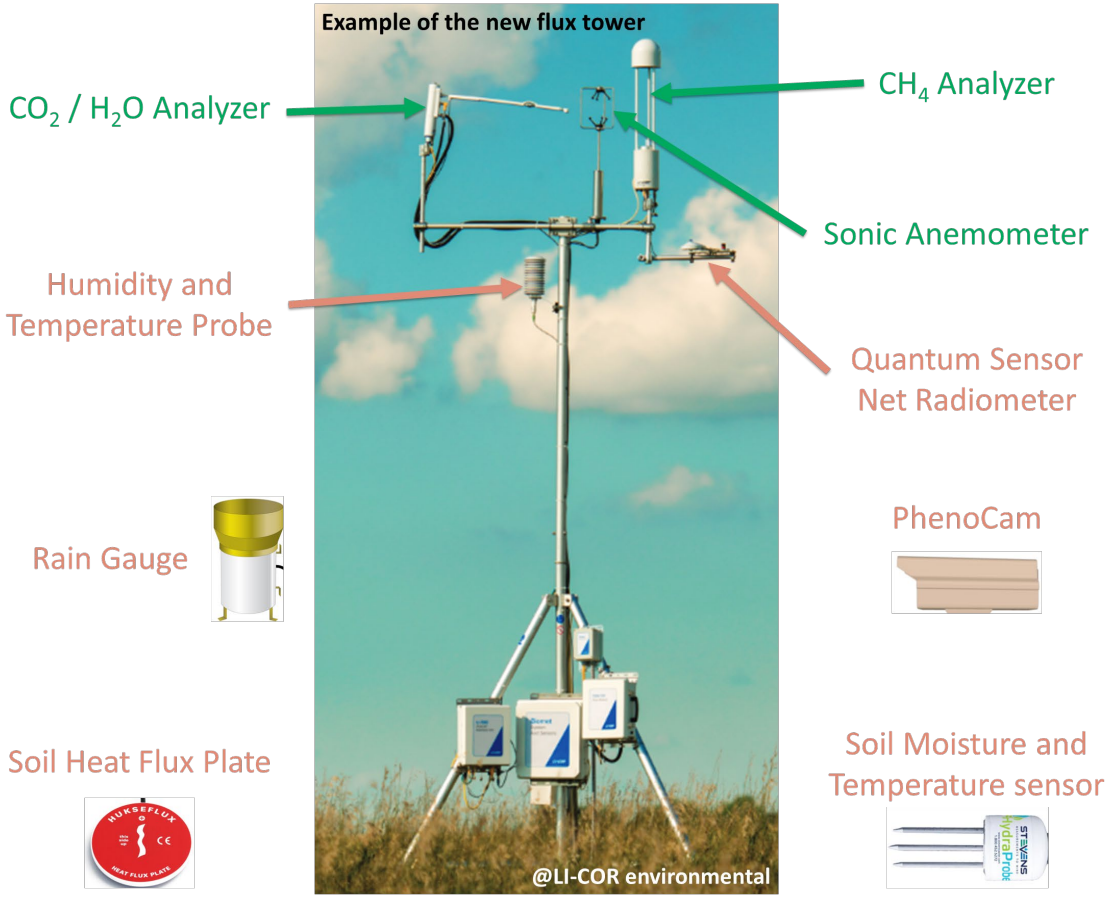
Old flux tower of the CARPAGG project in the pasture dating from 1978

1) Installation of a new flux tower

- ❑ Preparation of the study site
- ❑ Configuration
- ❑ Installation (**scheduled for the end of 2025)**
- ❑ Maintenance



Preparation of the study site



2) Data analysis and valorization

Resumption of GHG flux measurements

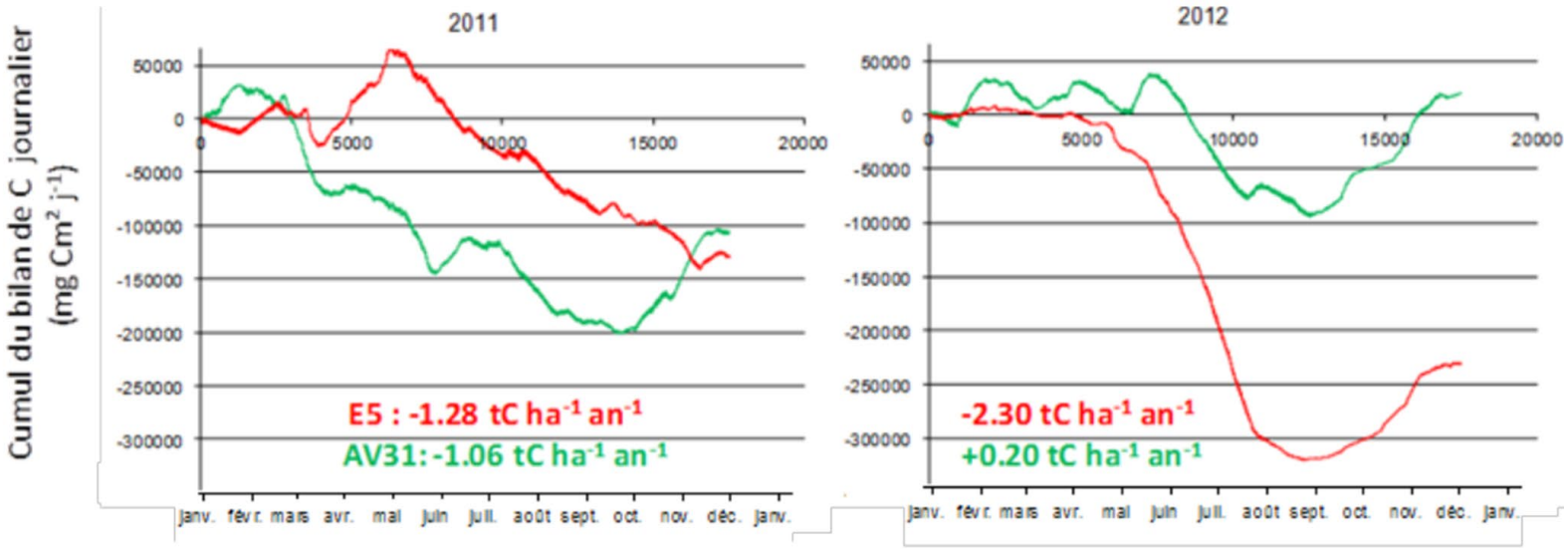


Figure: Cumulative daily carbon balances (mg C m² J-1) from 2011 to 2012 measured by the 2 flux towers in Guianese pastures [Blanfort et Stahl, 2013]

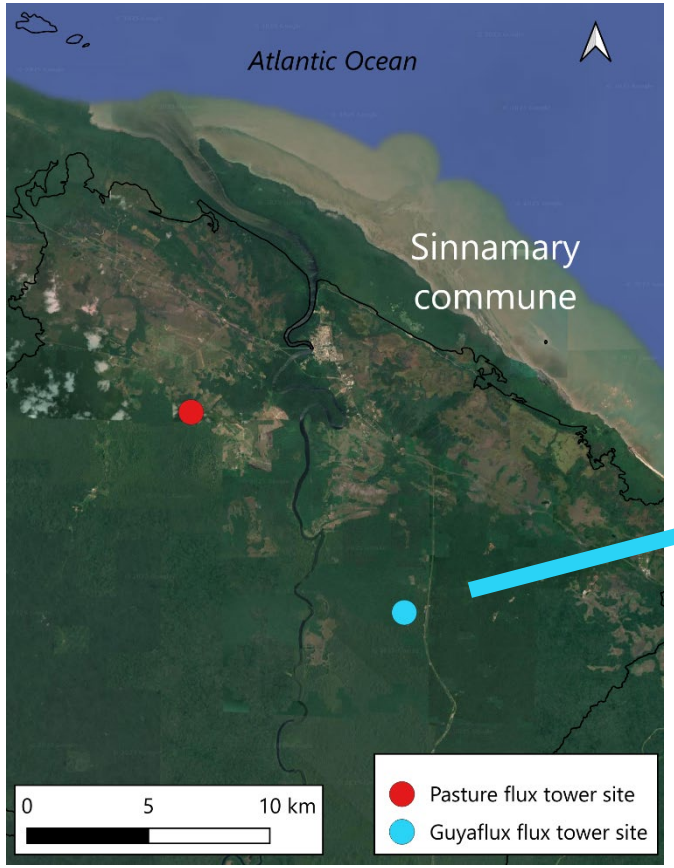
2011 -> 2018, 2026 ->

➢ **Long-term monitoring**

2) Data analysis and valorization

Compare pasture resulting from deforestation flux vs forest flux

Flux towers localizations



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

- ❑ The Guyaflux flux tower **operating since 2003**
- ❑ 10 km
- ❑ Similar soil and climate conditions

➢ **Impact of the conversion forest into pasture on the carbon cycle**

3) Acquiring additional data

Biomasse and floristic composition

Soil carbon

Soil macrofauna

Microbial activity

4) A network of expertise

Organize and lead a network of technical and scientific expertise

(1) UREP (INRAE) from Clermont-Ferrand : international expertise in the carbon and nitrogen cycles in grassland ecosystems.

(2) ECOFOG unit (GUYAFLUX project): operating a flux tower installed in a natural forest since 2003 in Paracou, French Guiana. w

(3) ECO&SOLS unit based in the São Paulo region, Brazil (projet EUCFLUX), which operates a flux tower installed in a commercial eucalyptus plantation.

(4) EMBRAPA unit (Eastern Amazon) which has had flux towers in the forests of the Cuieiras reserve near Manaus, Brazil, since 1999.

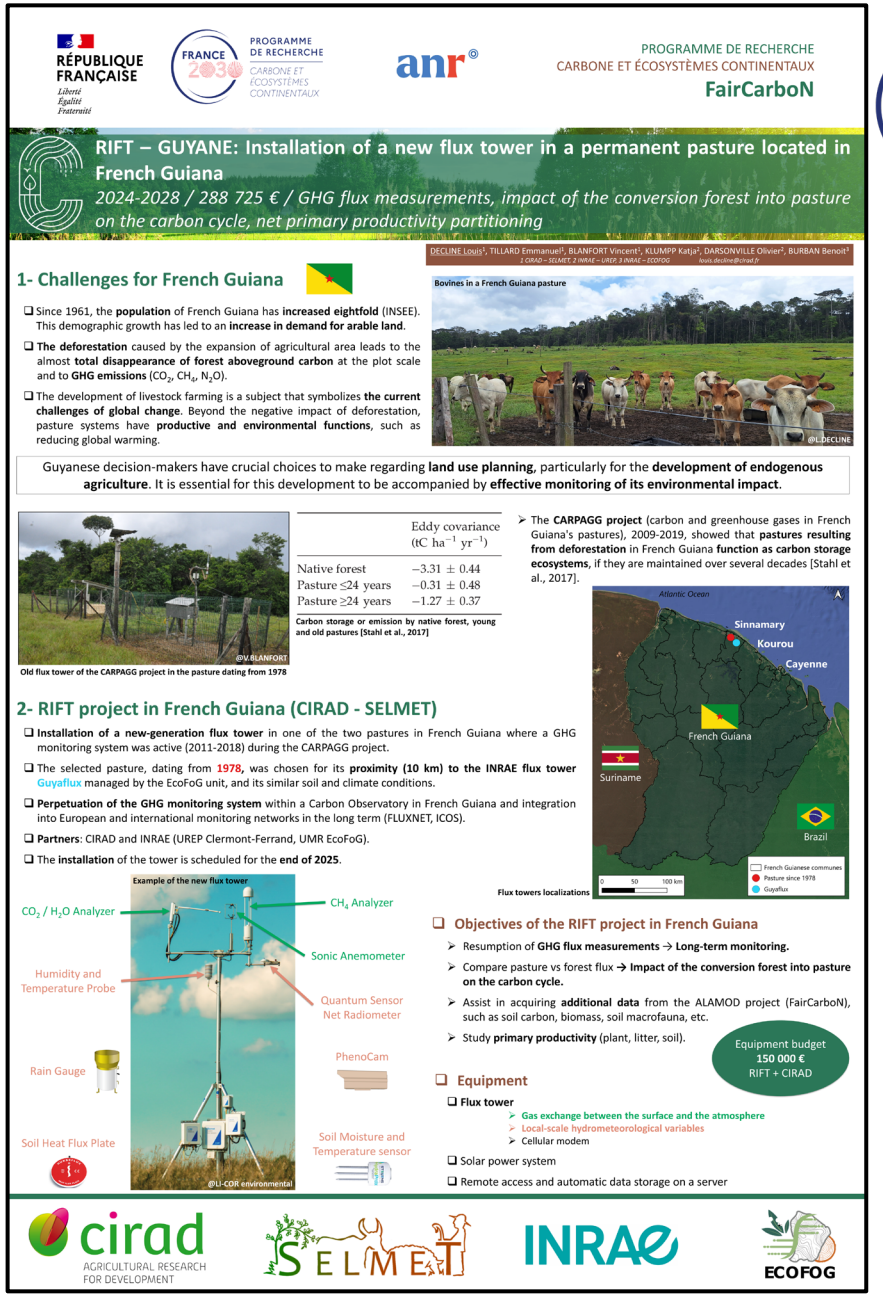
(5) CIRAD-SELMET unit based in Paragominas, Brazil, who are acquiring a flux tower

Poster

For more information and details, please come and see **my poster**:

"RIFT – GUYANE: Installation of a new flux tower in a permanent pasture located in French Guiana"

Thank you for your attention



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PROGRAMME DE RECHERCHE
CARBONE ET ÉCOSYSTÈMES CONTINENTAUX
FairCarboN

RIFT – GUYANE: Installation of a new flux tower in a permanent pasture located in French Guiana

2024-2028 / 288 725 € / GHG flux measurements, impact of the conversion forest into pasture on the carbon cycle, net primary productivity partitioning

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1- Challenges for French Guiana

- Since 1961, the **population** of French Guiana has **increased eightfold** (INSEE). This demographic growth has led to an **increase in demand for arable land**.
- **The deforestation** caused by the expansion of agricultural area leads to the almost **total disappearance of forest aboveground carbon** at the plot scale and to **GHG emissions** (CO_2, CH_4, N_2O).
- The development of livestock farming is a subject that symbolizes **the current challenges of global change**. Beyond the negative impact of deforestation, pasture systems have **productive and environmental functions**, such as reducing global warming.

Bovines in a French Guiana pasture

@L.DECLINE

Guyanese decision-makers have crucial choices to make regarding **land use planning**, particularly for the **development of endogenous agriculture**. It is essential for this development to be accompanied by **effective monitoring of its environmental impact**.

@V.BLANFORT

Old flux tower of the CARPAGG project in the pasture dating from 1978

	Eddy covariance (tC ha^{-1} yr^{-1})
Native forest	−3.31 ± 0.44
Pasture ≤24 years	−0.31 ± 0.48
Pasture ≥24 years	−1.27 ± 0.37

Carbon storage or emission by native forest, young and old pastures [Stahl et al., 2017]

- The **CARPAGG project** (carbon and greenhouse gases in French Guiana's pastures), 2009-2019, showed that **pastures resulting from deforestation** in French Guiana **function as carbon storage ecosystems**, if they are maintained over several decades [Stahl et al., 2017].

Flux towers localizations

2- RIFT project in French Guiana (CIRAD - SELMET)

- **Installation of a new-generation flux tower** in one of the two pastures in French Guiana where a GHG monitoring system was active (2011-2018) during the CARPAGG project.
- The selected pasture, dating from **1978**, was chosen for its **proximity (10 km) to the INRAE flux tower** Guyaflux managed by the EcoFoG unit, and its similar soil and climate conditions.
- **Perpetuation of the GHG monitoring system** within a Carbon Observatory in French Guiana and integration into European and international monitoring networks in the long term (FLUXNET, ICOS).
- **Partners**: CIRAD and INRAE (UREP Clermont-Ferrand, UMR EcoFoG).
- The **installation** of the tower is scheduled for the **end of 2025**.

Objectives of the RIFT project in French Guiana

- Resumption of **GHG flux measurements → Long-term monitoring.**
- Compare pasture vs forest flux **→ Impact of the conversion forest into pasture on the carbon cycle.**
- Assist in acquiring **additional data** from the ALAMOD project (FairCarboN), such as soil carbon, biomass, soil macrofauna, etc.
- Study **primary productivity** (plant, litter, soil).

Equipment budget
150 000 €
RIFT + CIRAD

Equipment

- **Flux tower**
  - Gas exchange between the surface and the atmosphere
  - Local-scale hydrometeorological variables
  - Cellular modem
- Solar power system
- Remote access and automatic data storage on a server

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