Postfire Forest Carbon Dynamics from Remote Sensing

Project context

This internship is part of the **QWERTY project**, one of the ten laureates of the **PEPR FORESTT** (*Programme et Équipements Prioritaires de Recherche – Forêts et leurs Transitions*), a national French program promoting interdisciplinary research on forest transitions and resilience under climate change.

QWERTY aims to **quantify the vulnerability of forest ecological values to wildfires**, including carbon storage, biodiversity, and structural attributes. Within this framework, the LSCE team focuses on characterizing how forest biomass and carbon stocks change after fires across different regions and forest types.

Objectives

The intern will analyze **annual above-ground biomass (AGB) maps** to quantify how forest carbon stocks evolve after fire events.

The study will focus on:

- Comparing **postfire AGB (N+1)** to **prefire AGB (N−1)** to assess immediate carbon loss.
- Extending the analysis to **N+2, N+3, …** to identify **forest recovery trajectories**, **postfire harvesting**, or **delayed tree mortality** (decomposition or structural collapse).
- Evaluating how these patterns vary by **fire severity, region, and forest type**.

This work will contribute to a better understanding of the **carbon consequences of fires** and **post-disturbance forest dynamics** using time series of remote sensing–derived biomass maps.

Main tasks

- Extract time series of **AGB maps** (e.g. from 2010–2025) over areas affected by fire events.
- Compute temporal indicators such as postfire/pre-fire AGB ratios, recovery rates, and delayed biomass losses.
- Visualize and analyze trends across bioclimatic zones or management contexts.

- Optionally, test **statistical or machine learning models** to relate postfire trajectories to environmental variables.

Desired profile

- M2 student (or equivalent) in Ecology, Geography, Environmental Science, Remote Sensing, or Data Science.
- Solid skills in **Python** (NumPy, pandas, xarray, matplotlib).
- Familiarity with spatial data processing (rasterio, geopandas, GDAL) and raster datasets.
- Interest in forest ecology, carbon cycle, or disturbance ecology.
- Motivation to work with large spatial datasets and perform quantitative analysis.
- Curiosity, autonomy, and ability to communicate within a research team.

Location

Laboratoire des Sciences du Climat et de l'Environnement (LSCE) – located in the Orme des Merisiers research campus (Saclay).
LSCE is a joint research unit of **CEA**, **CNRS**, and **Université de Versailles Saint-Quentin (UVSQ)**, hosting about 300 researchers, engineers, and students working on climate, carbon cycle, and environmental monitoring.

Conditions

- Duration: 4–6 months (flexible)
- Location: LSCE, Saclay (91), France

Application

Send your application (CV, motivation letter, and contact information for one or two references) to:

- **Philippe Ciais** – philippe.ciais@lsce.ipsl.fr
- **Agnès Pellissier-Tanon** – agnes.pellissier-tanon@lsce.ipsl.fr

Applications will be reviewed continuously until the position is filled.