

Post-Doctoral Position in Airborne Fire Observation

Recruiting organization Universitat Politècnica de Catalunya (UPC)

Short Description

This position is part of the European Interreg project EUBURN and focuses on processing airborne fire data from both scientific and operational aircraft to derive fire behavior metrics such as Fire Radiative Power (FRP) and Rate of Spread (ROS). Development in an operational context will be carried out in collaboration with the Civil Security Agency of Andalusia (AMAYA-INFACO), a project partner of EUBURN. The primary objective is to develop a machine learning algorithm for delineating of fire fronts using operational infrared (IR) observations, enabling the estimation of ROS in near real time. In addition to operational applications, the role of the Universitat Politècnica de Catalunya (UPC) in EUBURN aims to generate high-resolution event-scale fire behavior datasets from scientific aircraft IR observation to support ongoing efforts in the fire science community towards the development of coupled fire-atmosphere modeling systems.

Starting date Q4 2025 (October–December)

Position Duration until the end of the project: 31/05/2028

Background information

EUBURN (The southern EUrope biomass BURNing project) is a research program aimed at improving knowledge of extreme wildfires occurring in southern Europe, their current and future impacts on climate change, and at developing tools for forecasting both direct risks (on-the-ground fire spread) and indirect risks (air quality). Its objective is to strengthen the region's excellence in wildfire observation and modeling through an innovative and comprehensive approach to the issue, by coupling processes across different interfaces (biodiversity, fire, atmosphere) and at various scales (from local to regional) that have so far been considered independently.

The program initially aims to acquire the data necessary to improve scientific knowledge related to wildfires, as well as to calibrate and evaluate the digital tools developed within the project, through the organization of unprecedented measurement campaigns across French, Spanish, and Portuguese territories. One of the project's innovations will be the deployment of a wide range of transnational observation systems covering all relevant scales of the issue:

- the local fire scale, with airborne surveillance platforms equipped with miniaturized sensors;
- the regional scale, through the deployment of the SAFIRE ATR-42 research aircraft and several mobile ground-based platforms equipped with a wide array of advanced instruments;
- the territorial scale, by strengthening observations from European atmospheric monitoring infrastructures and using satellite observations of fires and the atmosphere.

An open transnational database will be developed to facilitate data sharing and exchange between operational teams and research groups.

A first campaign, named SILEX (Smoke from European wILdfires EXperiment), is planned from mid-July to early August 2025. Its goal is to test new measurement instruments, train new technical personnel, and obtain initial scientific results on the 3D extent of atmospheric pollution plumes, the relevant properties of gases and aerosols in terms of toxicity, air quality, and climate, and the underlying processes necessary to improve numerical models and the satellite data processing of fire and atmospheric plume products. At this stage, the campaign is expected to focus on the deployment of the SAFIRE research aircraft, which will be based in southern France to sample wildfires occurring in France and possibly northern Spain.

A second campaign, named EUBURN-RISK, is scheduled for summer 2027. It will involve the full deployment of the previously described measurement systems: drone-mounted payloads for surveillance, the research

aircraft, mobile ground-based platforms, and enhanced long-term European observations of the territory. The research aircraft will be based in Portugal to sample wildfires in Portugal and southern Spain.

The second major action of the program aims to develop a territorial numerical modeling capacity that can represent both the multitude of factors driving wildfire spread and the concentrations and properties of atmospheric pollutants generated by those fires, while accounting for the specific features of the territory (in particular the geographic distribution of biodiversity). This work will focus on improving and implementing regional numerical tools for fire spread modeling, emissions and transport of gases and aerosols, air quality, and climate. These tools include operational models (MOCAGE, MONARCH) as well as research models (MESONH, CNRM-ALADIN, CNRM-ESM, etc.).

Fundamentally collaborative, the EUBURN program is based on a transnational cooperation strategy between research teams, public agencies, and operational wildfire response services. The goal is to establish a structure that enables the pooling of operational and research observation resources, data sharing, and the joint development of observational platforms and digital tools, for the benefit of all stakeholders.

As of now, the program includes: Météo-France and its research center CNRM (FR) as coordinating institution, AEMET (ES), IPMA (PT), the Andalusian Civil Protection agency AMAYA-INFOCA (ES), Entente Vallabre (FR), University of Évora (PT), University Polytechnic of Catalonia (ES), University of Valladolid (ES), LaMP (FR), LATMOS (FR), CERFACS (FR), LAERO (FR), University of Corsica (FR), LOA (FR), BSC (ES), LMV (FR), IGE (FR), and SPE (FR).

About UPC

The Universitat Politècnica de Catalunya · BarcelonaTech (UPC) is a public institution of research and higher education in the fields of engineering, architecture, sciences and technology, and one of the leading technical universities in Europe. Every year, close to 6,000 bachelor's and master's students, more than 300 doctoral students and 1,600 continuing education students graduate.

The position is hosted at **CERTEC** a research group in the Department of Chemical Engineering of UPC, located on the EBEE campus. CERTEC's mission encompasses research, education, and technology transfer in the fields of risk and safety, addressing both public and private sector needs at local and international levels. The center's research areas includes: Process Industry Risk Analysis: Investigating safety in chemical and industrial processes; Compartment Fires: Studying fire dynamics within enclosed spaces; Wildland and Wildland-Urban Interface Fires: Research in fire behavior in natural and transitional zones between wildlands and urban areas; Fire Observation: Developing methodology and data processing for fire behavior observation; Fire Modeling: Developing computational tools for fire behavior prediction.

The successful candidate will principally get involved in the Fire Observation research effort and will be working with Dr. Ronan Paugam.

Job description

UPC is involved in EUBURN to support the different aspects of fire activity monitoring. The tasks of the position include:

- Processing of data collected during the 2025 **SILEX** campaign. Calculation of FRP from Middle Wave Infra Red Camera operated onboard the SAFIRE ATR42 aircraft. Comparison with available satellite data from sensors including VIIRS onboard Suomi-NPP and NOAA-20/21 satellites, SLSTR onboard the Sentinel3 fleet or FCI onboard the MeteoSat Third Generation (MTG) satellite.
- Fire Front delineation and ROS computation from IR Observation. Using previous experiences from Ronan Paugam on ROS calculation from helicopter airborne observation, the goal is here to extend its applicability in the context of operational operation. This task is main challenge of UPC participation to EUBURN. A key step in ROS algorithm is the delineation of fire front out of the IR observations. It is already a product in itself that will help operational operation. Its development will be conducted in collaboration with AMAYA-INFACO. Using their archive of manually delineated fire front, a machine learning approach will be developed to leverage the segmentation of fire front at the time of the observation. The machine learning architecture will be developed as part of this work.
- development of a payload for fire activity observation during drone night time flight. The objective is to investigate a methodology to detect fire hotspot location and intensity on the go during night time flight drone patrol conducted operationally by AMAYA-INFACO. The main challenge is to geolocalized the fire activity during the drone flight. Onboard drone Inertial Measurement Unit (IMU) are usually not providing enough accuracy. Prescribed burn in spring 2026 in Andalusia will be used to estimate the required precision of the IMU, and a first system will be tested in the summer 2026 with AMAYA-INFACO.

- EUBURN collaboration with the modeler teams. Effort will be made to make fire observation available to the fire modeling team to support the modeling objective of EUBURN.
- Preparation and participation to the 2027 EUBURN field campaign.
- Tasks will also include the dissemination of results through scientific publications, conference presentations, and stakeholder communications. The candidate is expected to contribute to peer-reviewed articles, project reports, and participate in workshops or meetings to ensure effective communication within the consortium and with the broader scientific and operational communities.

Qualifications/experience

- **Education:** A Master's degree (PhD preferred) in Remote Sensing, Atmospheric Science, Computer Science, Environmental Engineering, Fire Science, or a related field.
- **Experience in remote sensing data analysis**, especially in the context of fire activity monitoring using airborne and satellite-based sensors (e.g., VIIRS, SLSTR, FCI).
- **Strong programming skills**, particularly in Python, with demonstrated experience in scientific computing, image processing, and geospatial data analysis (e.g., use of libraries such as NumPy, SciPy, xarray, GDAL, rasterio, OpenCV).
- **Experience with Linux-based environments**, including shell scripting, file system management, and the configuration of scientific software tools.
- **Experience with machine learning techniques**, especially deep learning for image segmentation (e.g., convolutional neural networks, U-Net architectures).
- **Familiarity with infrared imaging data**, including calibration, orthorectification, and quantitative analysis (e.g., FRP calculation, thermal hotspot detection).
- **Scientific writing and communication skills**, with a track record of contributions to scientific publications and participation in conferences or project meetings.
- **Proficiency in English** (spoken and written); knowledge of Spanish is a plus for field collaboration in Andalusia.
- **Availability for field campaigns**, including participation in airborne or drone campaigns and data collection efforts.

How to apply

Send a CV and a cover letter to ronan.paugam@upc.edu.

Salary 36 k€

The successful candidate will be hired until 31/05/2028 under contract by Universitat Politècnica de Catalunya (UPC), with a annual gross salary of 36k€. This amount will be divided into 14 payments: one each month, plus two extra payments in June and December.

Application deadline 30/09/2025