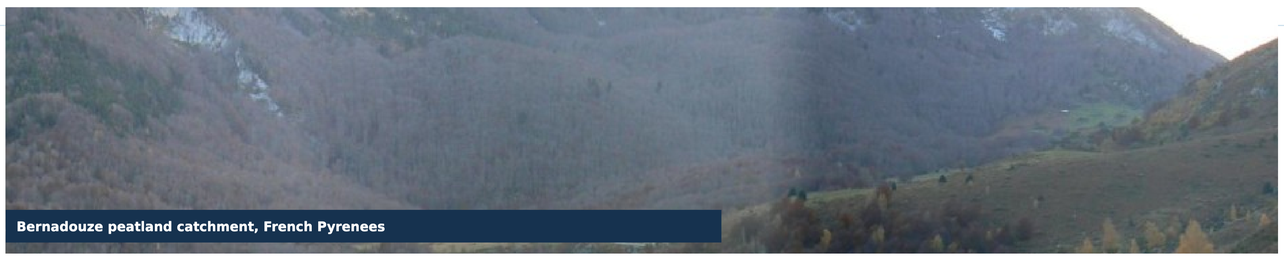
# LIVING LAB OF FRANCE

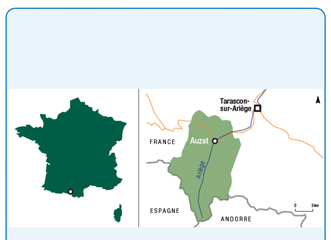
**Bernadouze mountain peatland — long-term monitoring of water and carbon cycles**

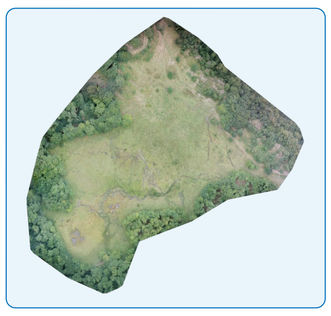

Bernadouze peatland catchment, French Pyrenees

**Long-term, high-frequency observations show that hydrological extremes strongly control both riverine carbon export and peatland–atmosphere carbon exchange.**

## 1 OUR LIVING LAB

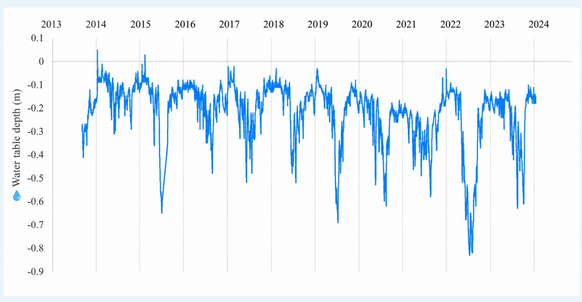
### WHERE?



### THE CHALLENGE

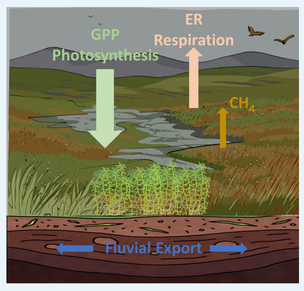
At 1,343 m a.s.l., the 3.6-ha Bernadouze peatland lies in a monitored headwater catchment. The challenge is to understand how drought, climate change and catchment pressures alter water and carbon cycling.



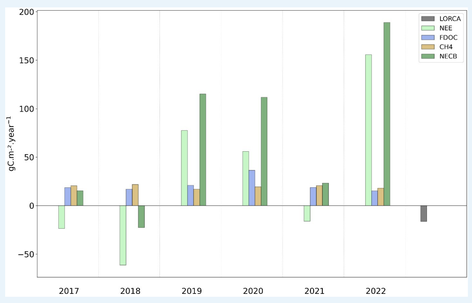

**Long-term water-table record: 2022 shows a prolonged drawdown.**

$$NECB = -(GPP + ER) + CH_4 + FE$$

NEE




NECB < 0  puits de C




**Multi-year carbon balance: strong interannual variability, with 2022 becoming a major atmospheric carbon-source year.**

### WETLAND TYPES

Mountain Sphagnum peatland
Headwater wetland and stream network
3.6 ha peatland (3% of catchment)
Mean annual precipitation: 1,582 ± 172 mm

### SELECTED REFERENCES


Rosset et al. (2019), JGR: Biogeosciences 124, 3448–3464.
Garisoain et al. (2023), JGR: Biogeosciences 128, e2023JG007403.
Garisoain et al. (2024), JGR: Biogeosciences 129, e2024JG008041.

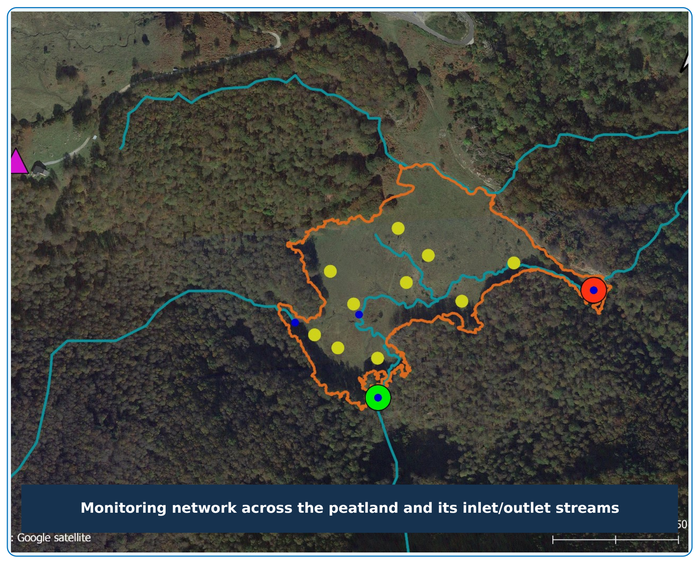


**CONTACT: Laure Gandois• CRBE / CNRS • laure.gandois@cnrs.fr**


## 2 WHAT WE DID

### ACTIONS

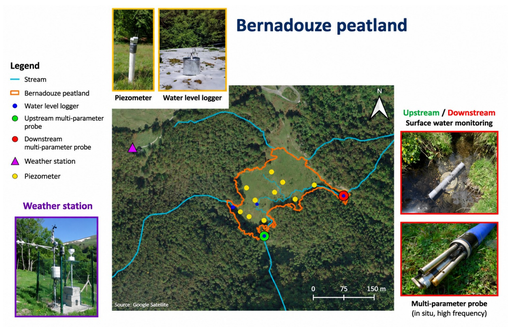
- **Continuous water-table and meteorological monitoring**
- **High-frequency inlet/outlet water and organic-carbon monitoring**
- **Monthly greenhouse-gas flux measurements**
- **Long-term integration with Pyrenean sentinel peatland sites**



Monitoring network across the peatland and its inlet/outlet streams

### WHAT WAS MEASURED?

Climate • Water-table level • Surface waters DOC and riverine carbon export • $CO_2$ and $CH_4$ fluxes
Net ecosystem carbon balance




### CO-CREATION

CRBE, CNRM, ISTO and AEAG jointly maintain the site wirthin the Pyrenees human environment obervatory and the french peatland monitoring network., linking research teams, observatory infrastructure and water-management partners. Bernadouze also anchors the Pyrenean sentinel peatland network.

## 3 RESULTS & LEGACY

### KEY FINDINGS

✓ Flood events account for ~50% of riverine organic-carbon exports.

✓ The peatland contributes 64–85% of total catchment carbon exports.

✓ $CO_2$ exchange varies strongly between years; in 2022 the peatland became a large atmospheric carbon source.

✓ The 2022 drought caused a prolonged lowering of the water table.

### BENEFITS & TRADE-OFFS

| | |
|---|---|
| Climate mitigation | +/- |
| Biodiversity | ++ |
| Water quality | + |
| Production | n/a |
| Management costs | n/a |
| Stakeholder acceptance | ++ |

++ strong positive
\+ positive
+/- mixed
− negative / trade-off

n/a = not assessed in this monitoring poster

### LESSONS

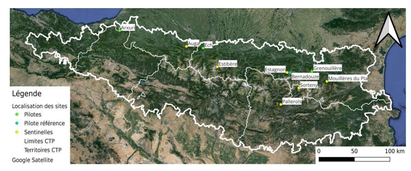
High-frequency measurements capture flood-driven export pulses.

Long records reveal drought-induced reversals in carbon balance.

Paired catchment/peatland monitoring quantifies the peatland contribution.

### LEGACY AND NEXT STEPS

Bernadouze remains a reference pilot site in the Pyrenean Sentinel Peatland Network (2024–2031): long-term monitoring at 3 pilot and 6 sentinel sites will test how ecological, hydrogeological and climatic context controls vulnerability.




Co-funded by the European Union

### ONE KNOWLEDGE GAP

How will more frequent droughts and hydrological extremes alter the long-term carbon balance and riverine carbon export of mountain peatlands?


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