A low-cost, open-source, wireless multi-sensor platform for monitoring hydrological and biogeochemical dynamics across land-stream interfaces

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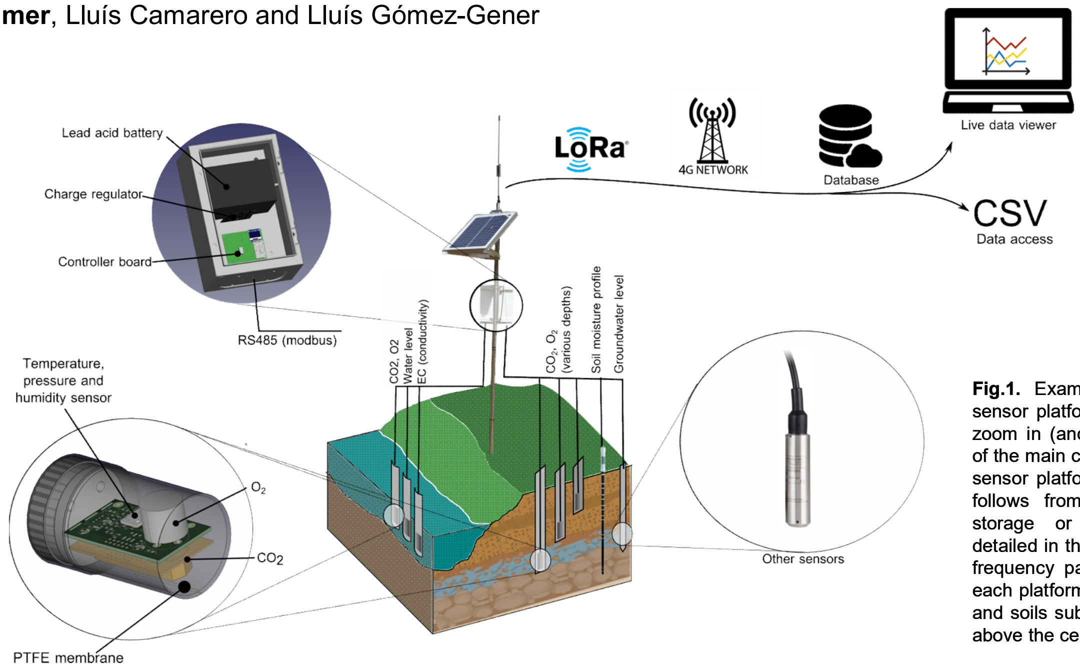


Fig.1. Example of wireless multi-sensor platform field set up. Circles zoom in (and provide more details) of the main components of the multi-sensor platform. The path that data follows from acquisition to either storage or live visualization is detailed in the upper right part. High frequency parameters measured at each platform (including the streams and soils sub-stations) are indicated above the central diagram lines.

Introduction

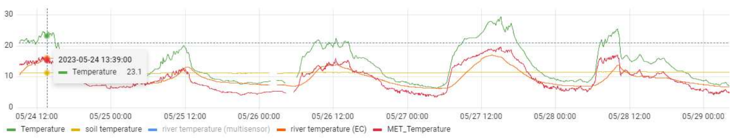
The recognition of global change impacts on catchments and the waters they drain emphasizes the need to better understand hydrological and biogeochemical dynamics across terrestrial-aquatic interfaces. To achieve this great endeavor, a key priority is to substantially increase the number of multi-annual time series, covering larger environmental gradients and filling existing geographical gaps (e.g., low-income regions in/and the Global South). However, commercial environmental sensors solutions are not affordable to everyone.

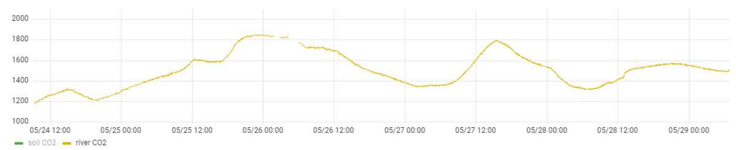
Goals

To design, build and optimize a DIY multi-sensor platform for monitoring hydrological and biogeochemical dynamics in fluvial ecosystems and their adjacent soils. This project revolves around these pillars:

- **Using self-made, low-cost solutions** to make it more afordable to everyone.
- **Adopting the open source hardware phylosphy** so that the broad community can freely use or modify the components to adapt them to their own needs.
- **Using open source hosting services for software development** to ensures the re-usability of the code.
- **Using open source web applications** for interactive visualization.

Data





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Calibration and QA/QC

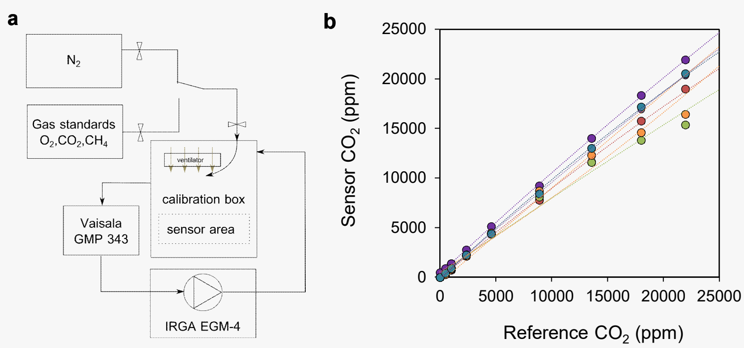

Fig.2. (**a**) Block diagram showing the experimental setup of the laboratory flow through calibration system. Gas standards are continually pumped into a gas calibration box. A semi-closed air loop is made between the gas detectors and the gas calibration box. (**b**) Relationship between CO_2 sensor responses and reference concentrations. Example of the calibration of six CO_2 sensors.

A little more about CARBINTER and C-InterMont projects

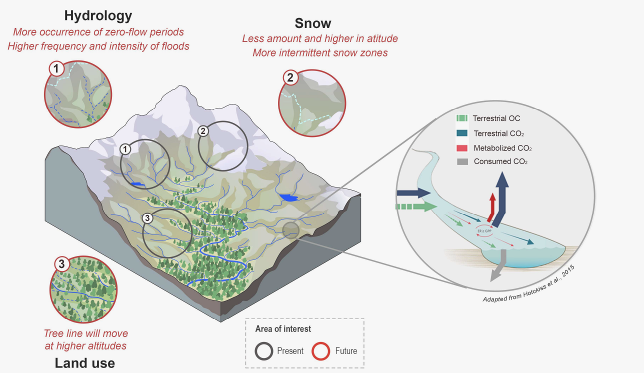

Fig. 3. Climate-induced perturbations on the carbon cycle of high-mountain watersheds. Black and red circles represent expected differences between respectively present and future times for a selection of elements influencing the C cycle and associated C exchanges in mountain catchments. Right panel represents most significant carbon fluxes and processes (both terrestrial and internal) operating at the scale of a stream segment (adapted from Hotchkiss et al., 2015).