



HYDRO-CHEMICAL FLUXES WITHIN THE CRITICAL ZONE

Application of Critex high-temporal -resolution instruments to the Long-term Environmental Observatory AgrHyS

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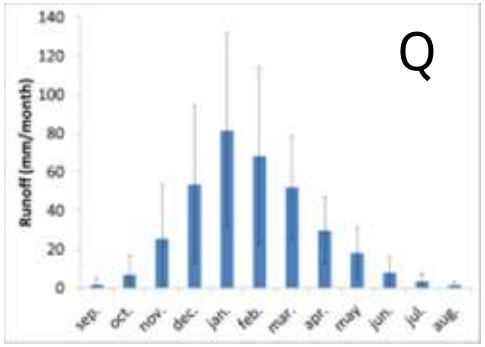
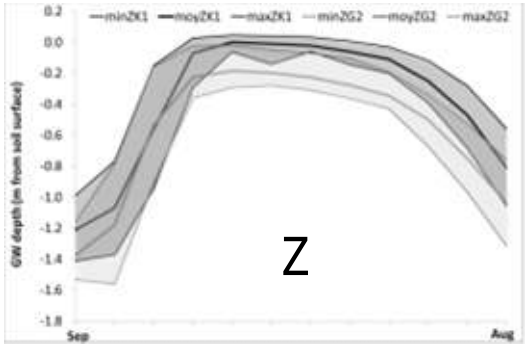
A LONG-TERM OBSERVATORY

5 km² catchment dominated by

- temperate humid climate
  - strong seasonal pattern
- groundwater fed stream
  - subsurface and overland flows (wetlands)
  - long transit times
  - vulnerability
- agricultural activities: mixed crop-farming systems
  - diversity and amount of nutrient inputs
  - crop rotations <> animal productions
  - landscape specificity (hedgerows)

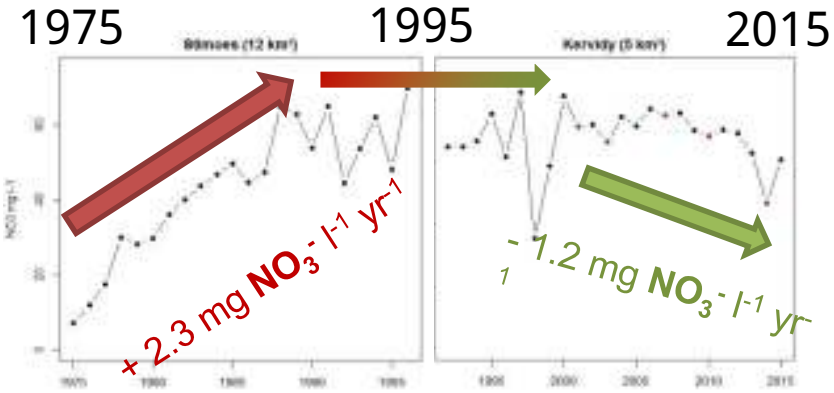


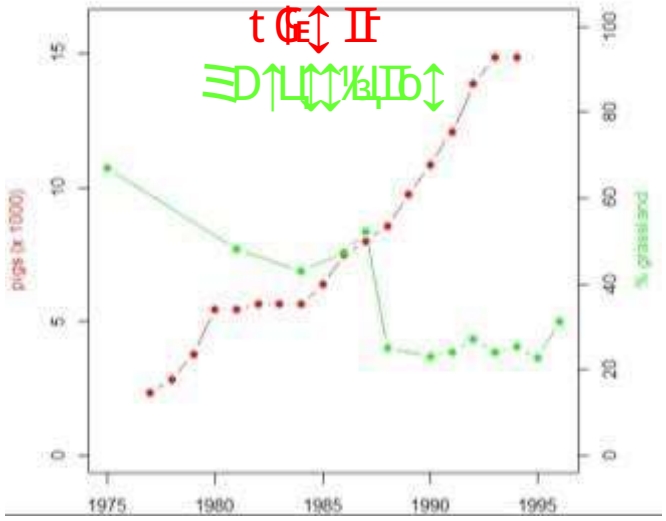


A LONG-TERM OBSERVATORY

Experiencing long term changes

- Of agriculture and landscape
  - reorganization of fields in 1975
  - sharp intensification of the production
- Of global drivers?
  - Ephemeral streams





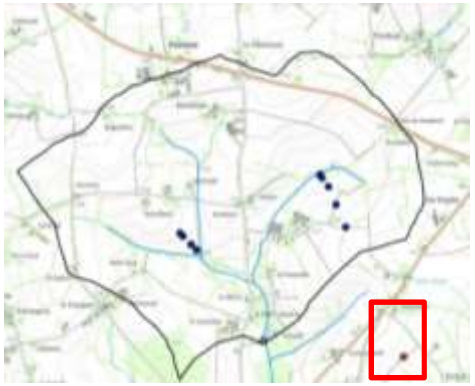
A SITE FOR CRITEX IMPLEMENTATION

High frequency monitoring for fluxes estimate and process understanding :

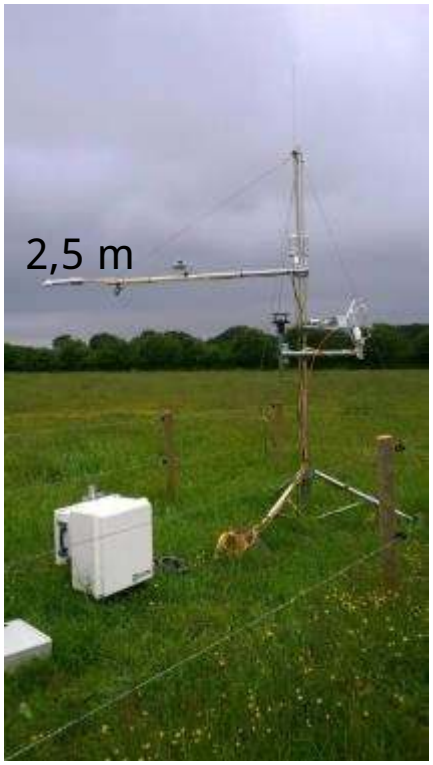
- Flux Tower
- River Lab
- Optic Fiber for DTS

Measuring the AET & CO_2 by Eddy-covariance

Critex Flux Tower installed in Winter 2015



Le Toullo
Station M¶t¶o AgroClim

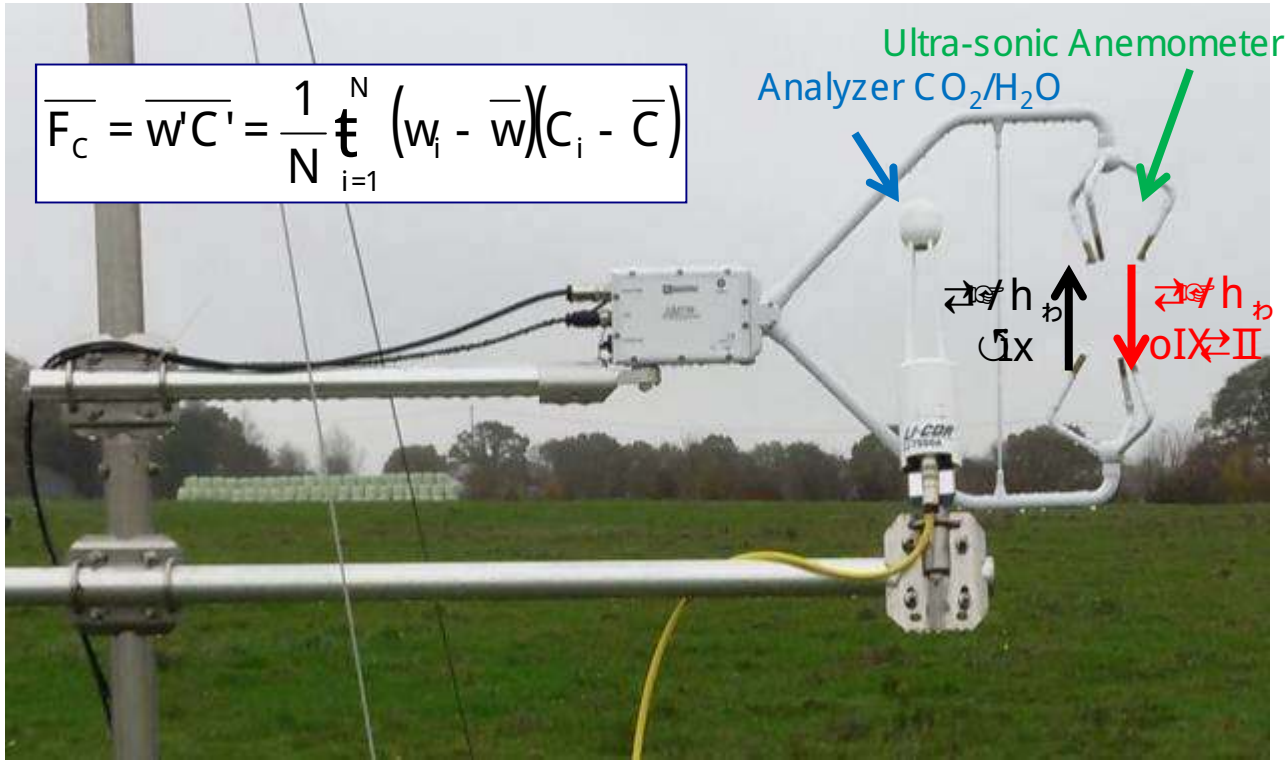


Measuring the AET & CO_2 by Eddy-covariance

Critex Flux Tower

Over a permanent grassland grazed by dairy cows (Organic Farm)

$$\overline{F_C} = \overline{w'C'} = \frac{1}{N}\sum_{i=1}^{N}(w_i - \overline{w})(C_i - \overline{C})$$



Measuring the AET & CO_2 by Eddy-covariance

Critex Flux Tower

Measuring the AET & CO_2 by Eddy-covariance

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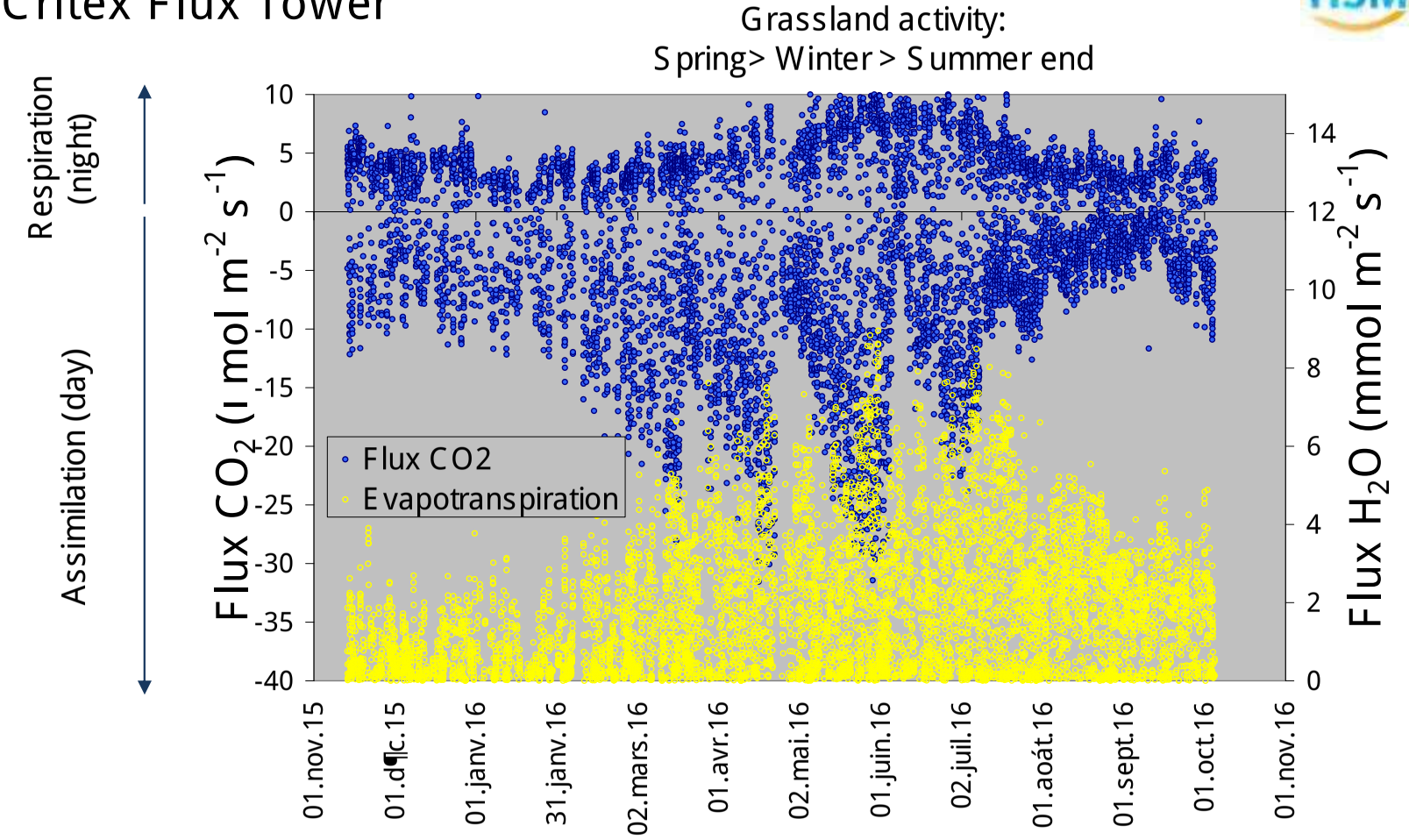

Measuring the AET & CO_2 by Eddy-covariance

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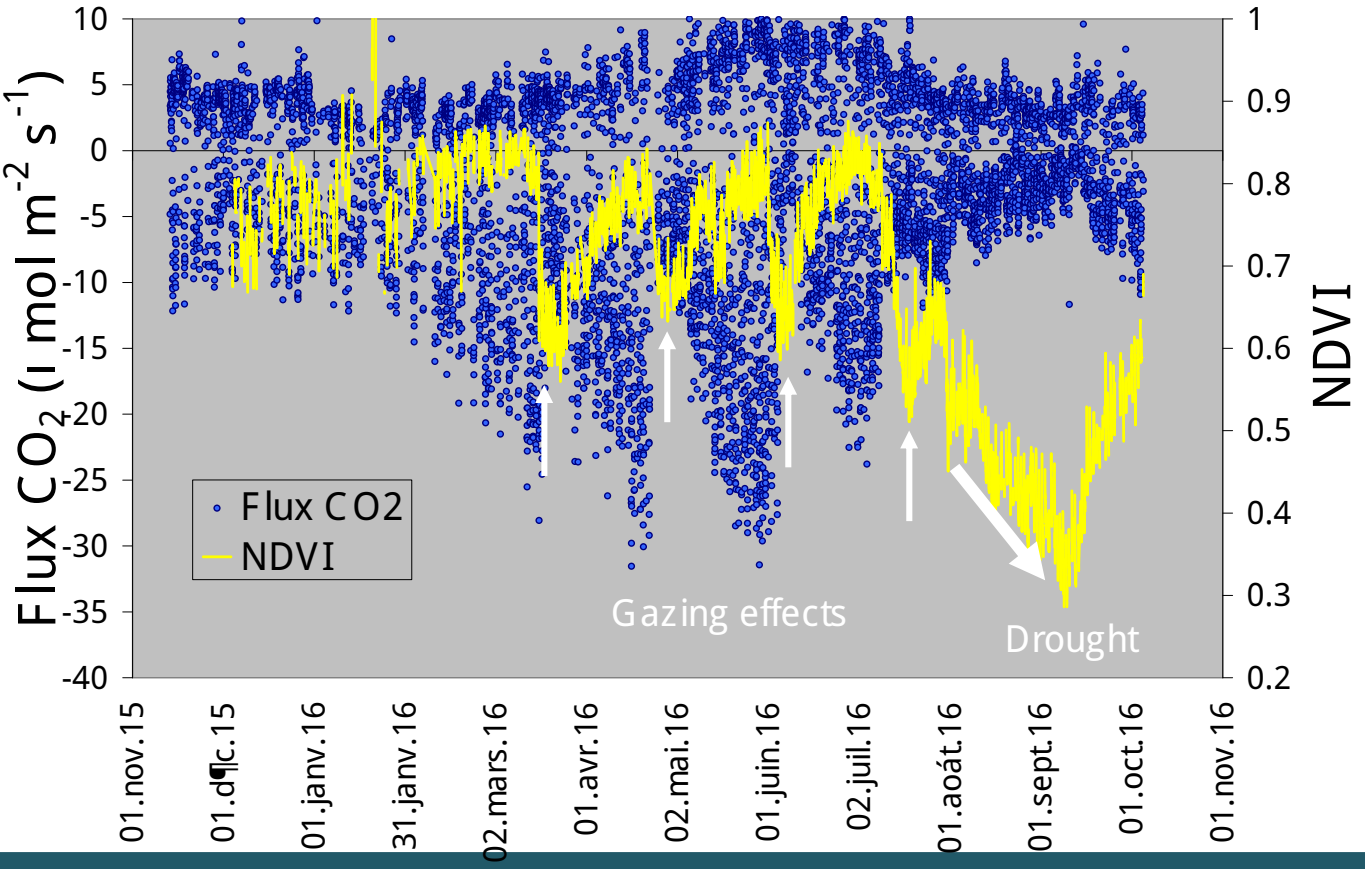


+ see poster!

Measuring the AET & CO_2 by Eddy-covariance

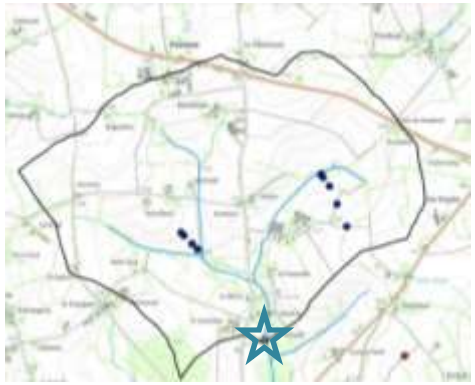
Scientific perspectives

- Validation of AET models on grasslands, impacts on catchment water budget

- Assessment of grassland ecosystem C budget and sequestration potential :
long-term eddy covariance CO_2 flux vs. estimates of lateral C fluxes (organic fertilization, grazing, harvest) & long-term variations of SOC content

Measuring stream water concentrations continuously

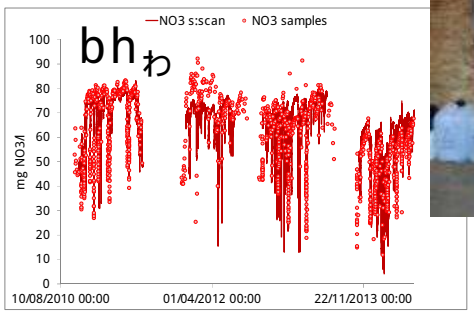
River lab installation planned in May 2017

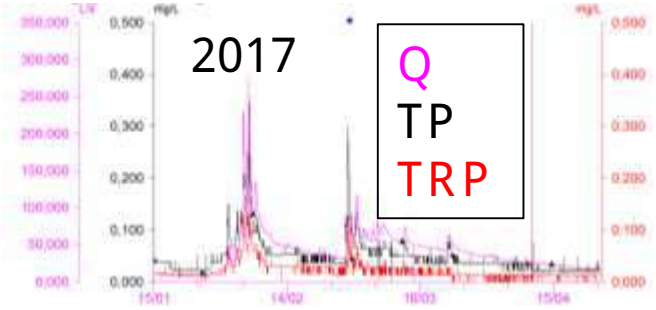


Kervidy
Outlet gauging station

Monitoring of
- Q and NO_3 since 1993
- Anions and Dissolved Carbon since 1999
- Phosphorus since 2007

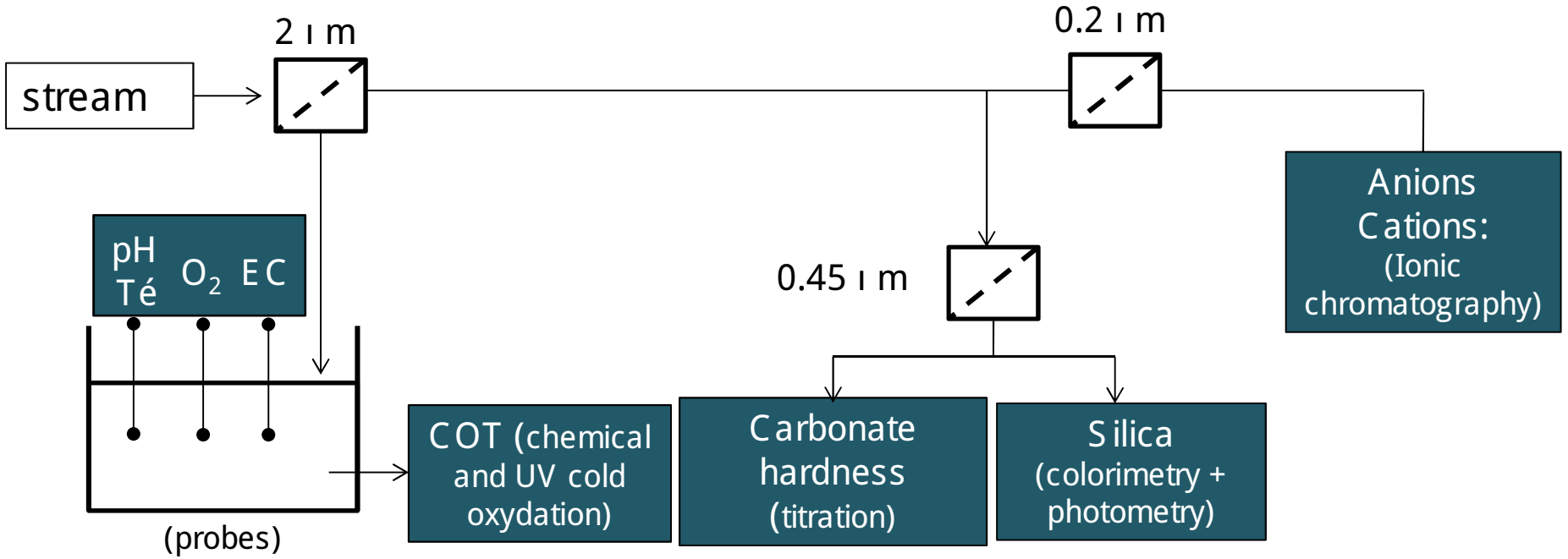
From ĭ Daily+storm ŏ to real continuous monitoring





Measuring stream water concentrations continuously

River lab installation planned in May 2017



- Levelling works + contracting with the land owner
- Data transmission facilities (compatibility with network) + increased power supply
- Technical staff involved: 3 technicians, 1 engineer, 2 researchers

Measuring stream water concentrations continuously

Scientific perspectives

- C:N:P:Si stoichiometry (temporal scales, climate)

- Variability of storm events

- Comparison between Orgeval, Strenghbach and Naizin

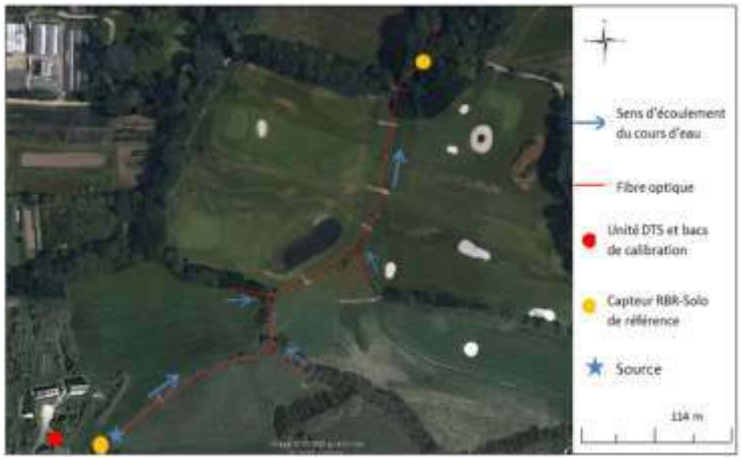
- Diurnal patterns : metabolism of 1^{rst} to 2nd order streams

Long-period & distributed measuring of water temperature by optic fiber

Critex Optic fiber firstly tested over 6 months in a 1rst order and intermittent stream (Kerbernez site)

Kerrien- Le Puits
40 ha catchment

Ultima XT (Silixa)
dt= 10 min, dx = 25 cm
ăT= Nov to Apr 2016
ăX= 500m



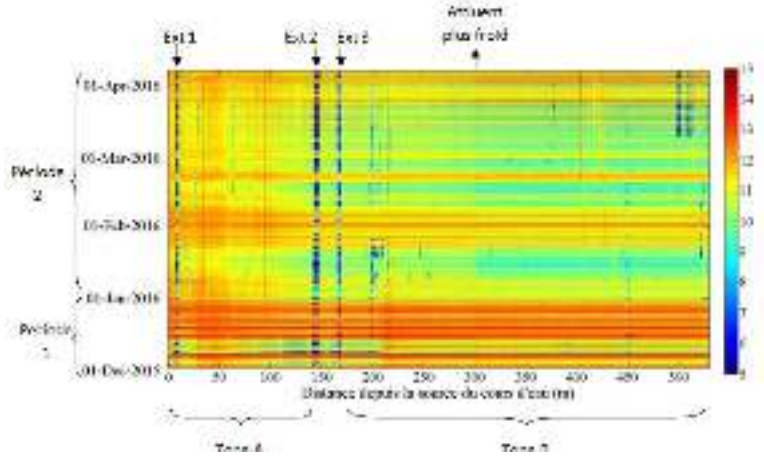
Long-period & distributed measuring of water temperature by optic fiber

Critex Optic fiber firstly tested over 6 months in a 1rst order and intermittent stream

> identifying hot spots of water mixing (gw, tributaries)

> identifying tipping points for hydrological connectivity

+ see poster!



Long-period & distributed measuring of water temperature by optic fiber

Next steps

- Naizin site (interference with the river lab?)

- Active method (heating)

Scientific perspective

- quantifying groundwater contribution

- téas an independent tracer of nutrient transfer