

CRITEX's seismic workpackage

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<https://www.critex.fr/critex-tools/wp6-subsurface-exploration/task-6-1-seismic-methods/>

WP6.1 -- 96 channels seismic recorder :

- > travel-times and dispersion measurements
- > simultaneous 1D-2D VP&VS estimations
- > combined with ERT (1D-2D resistivity)
- => *lithology/heterogeneities + water content contrasts*



Experimental validation of the approach :

- > 1 PhD (Sylvain Pasquet 2011-14), 4 papers, more than 15 int. communications
- > 1 open-source toolbox + tutorial in Geophysics <https://github.com/SWIPdev/SWIP/releases>

Time-lapse developments + combined measurements/hydrodynamic modelling :

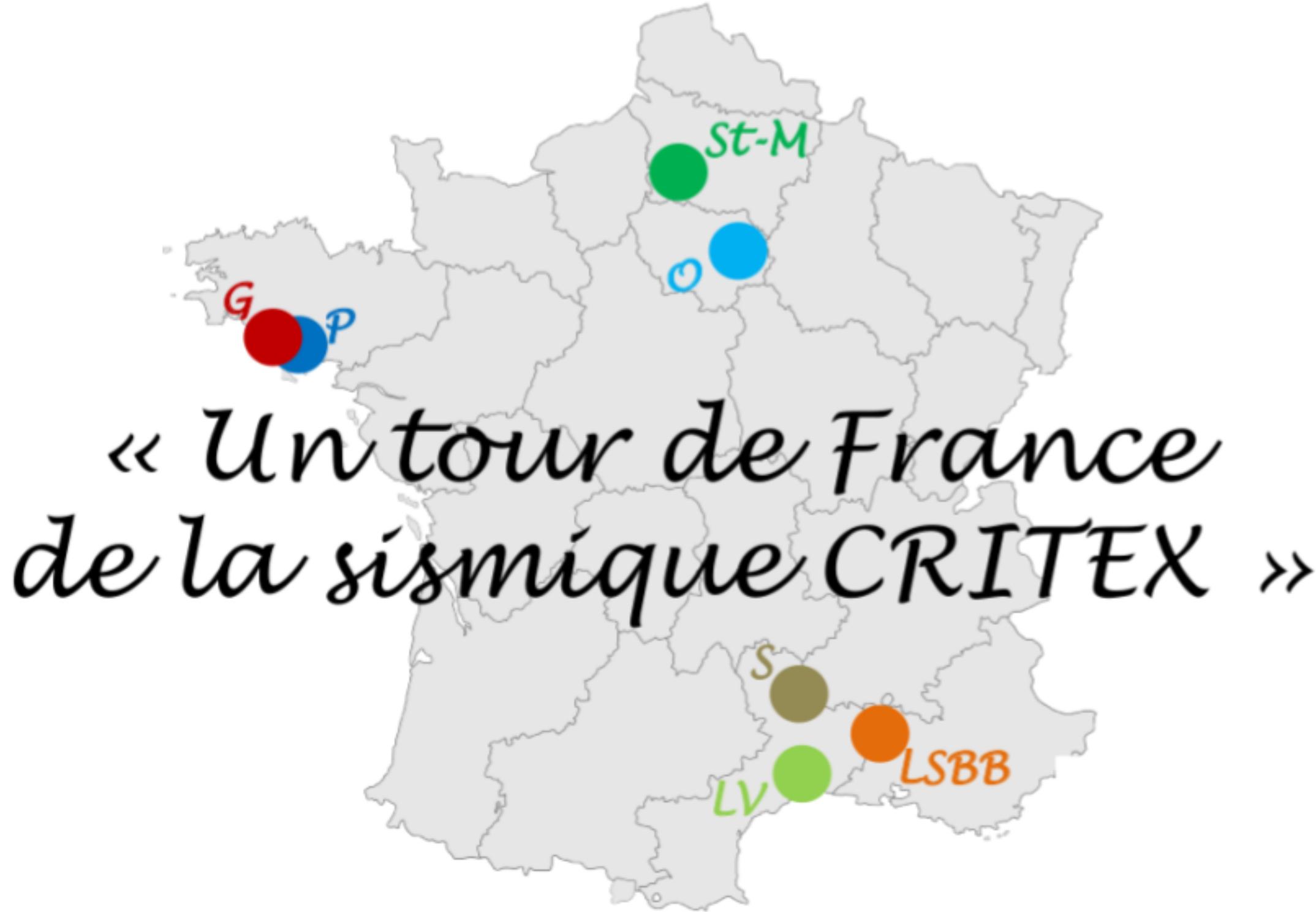
- > 1 PhD (2015-18), 1 MS student, 1 report, 8 int. communications, 1 sub. paper, 3 in prep.
- > combined experiments (7 sites so far, with resistivity/temperature/NMR/SP/chemistry)
- > new sensors to be used soon for passive acquisitions



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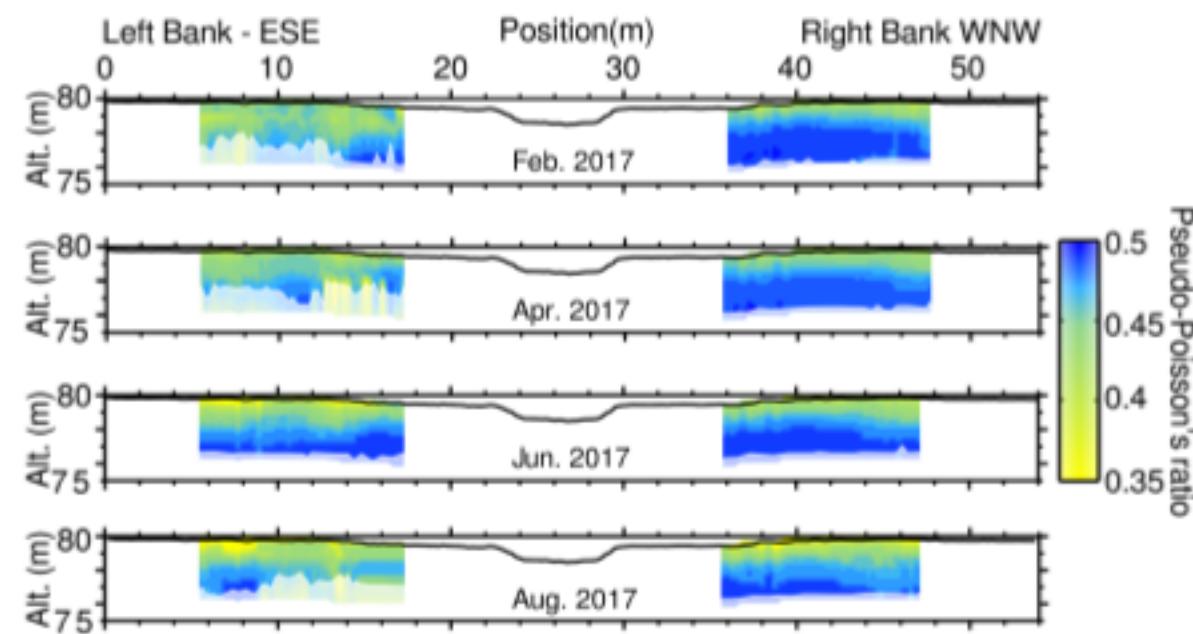
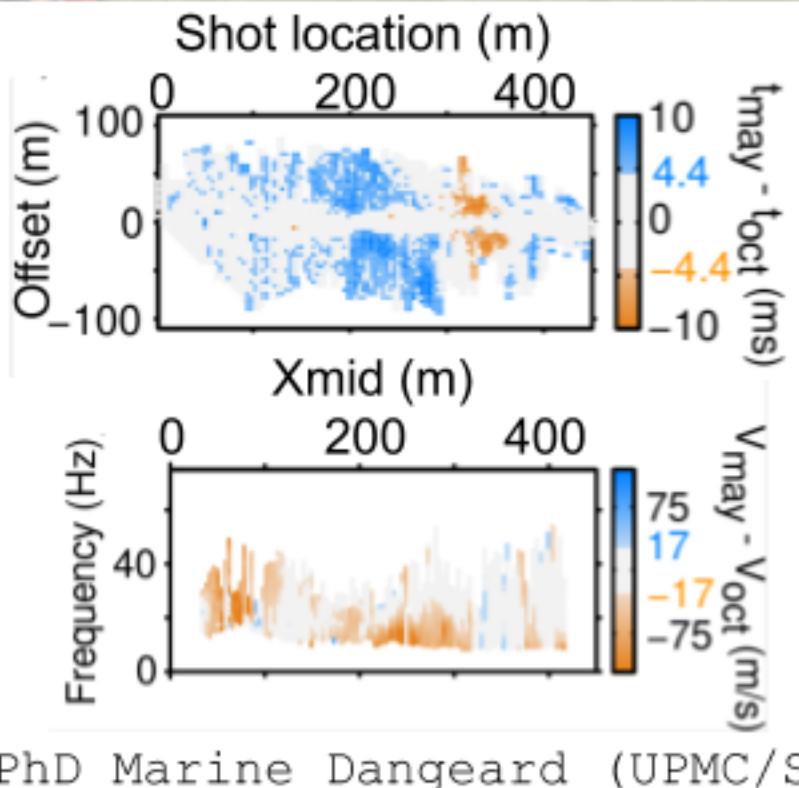
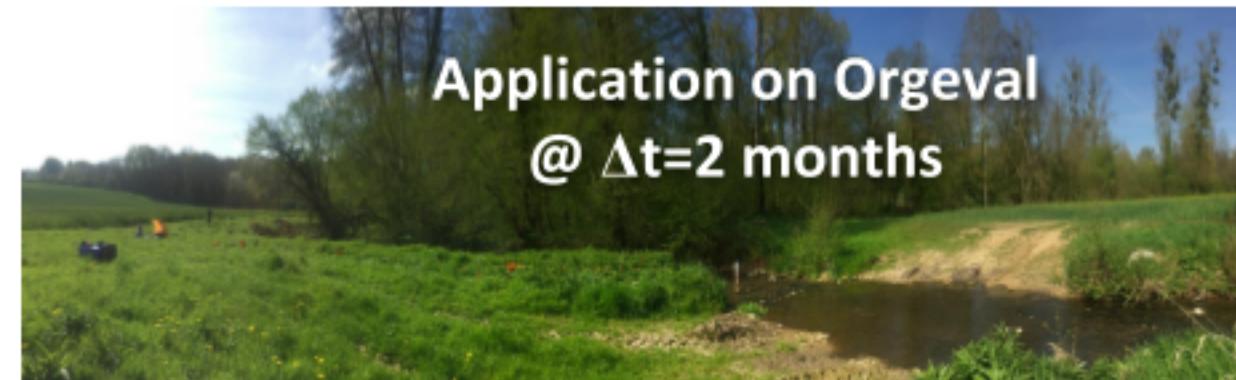
CRITEX's seismic in 2017: time-lapse approach

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Methodology + validation on
 Ploemeur data



Application on Orgeval
 @ $\Delta t=2$ months



MSc Solenne Schneider (UR1)
 PhD Marine Dangeard (UPMC/SU)

Spatial and temporal variability in recorded data and inverted parameters

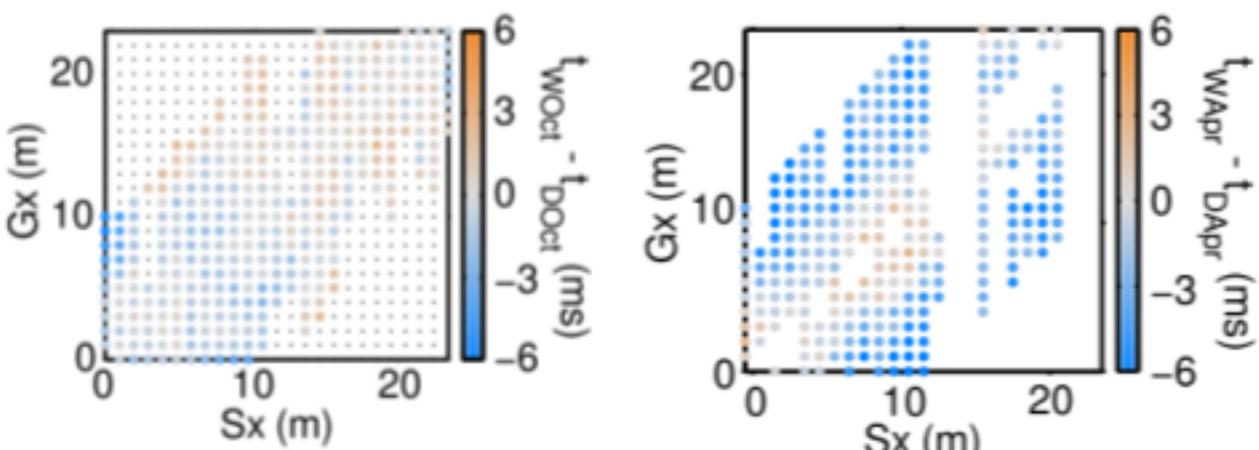
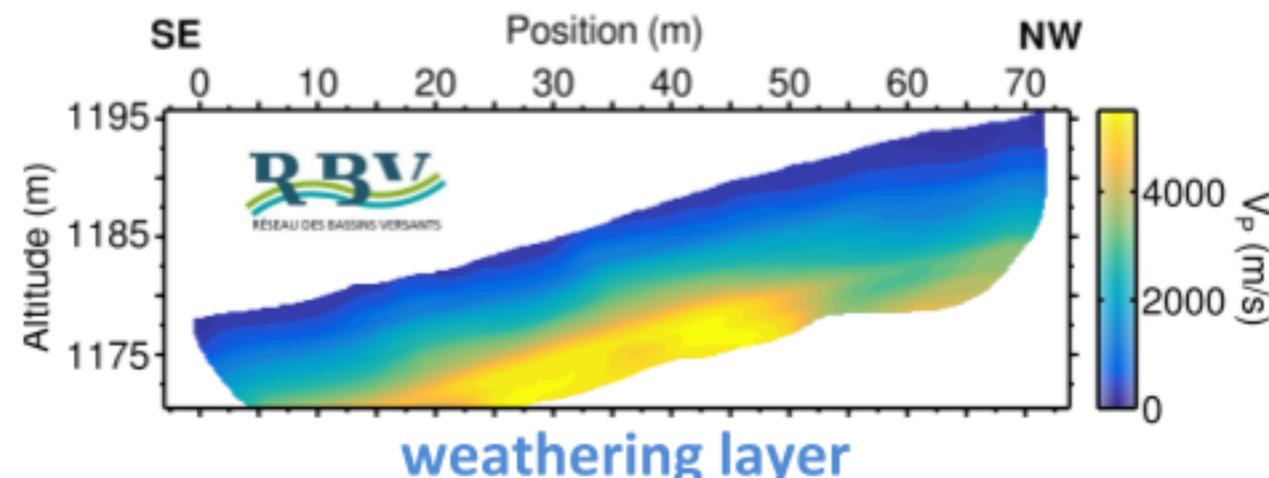
- > changes in the shallow ZC
- > interpolation of hydrodynamic parameters + constraints for modelling

[Dangeard et al. sub. to NSG + Dangeard et al. in prep. for JAG & WRR]

CRITEX's seismic in 2017: time-lapse approach

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Time-lapse seismic + water sampling during flood events



$\Delta t = 24\text{h} @ 6 \text{ month-interval}$

Heterogeneities of the shallow ZC and short-term variations/dynamic

- > new insights about both geometry (geomorphology) and hydro. processes
- > observed dynamic to be integrated with geochemistry / constraints for modelling

[Dangeard et al. + Kuessner et al. @ AGU 2017 / Dangeard et al. in prep]

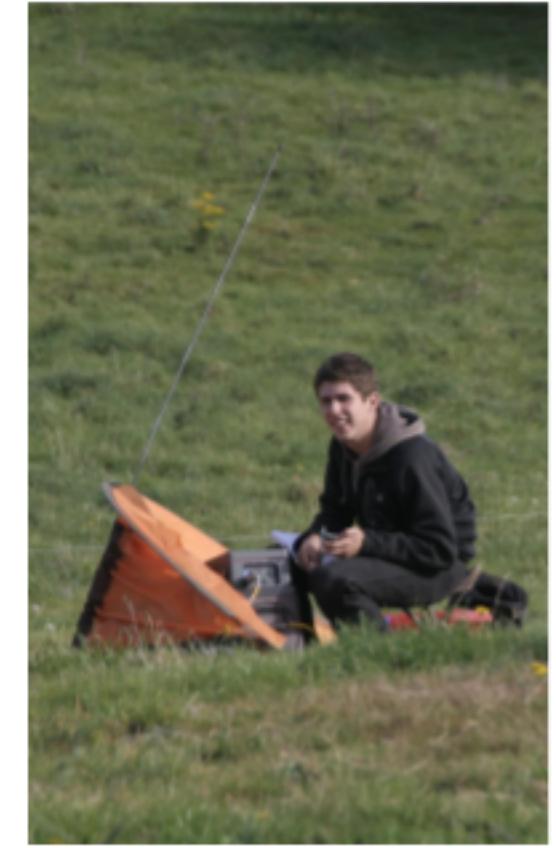
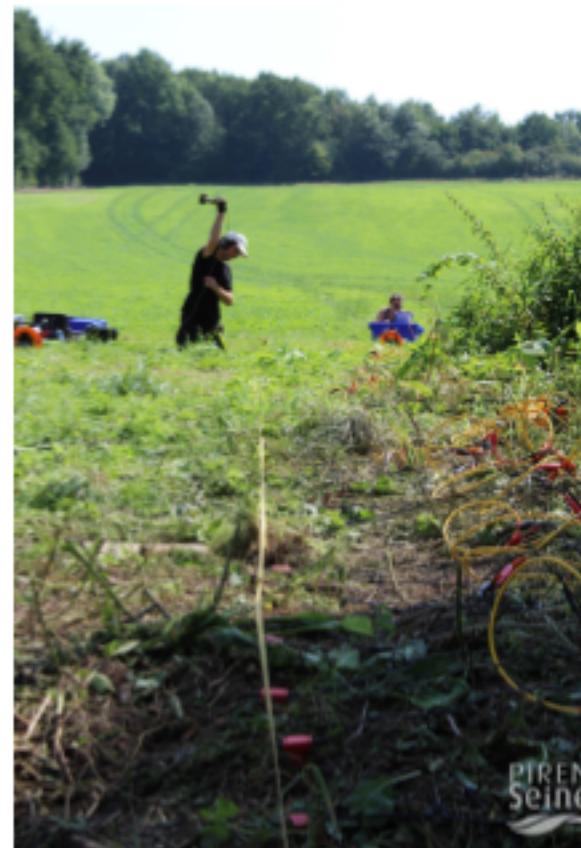
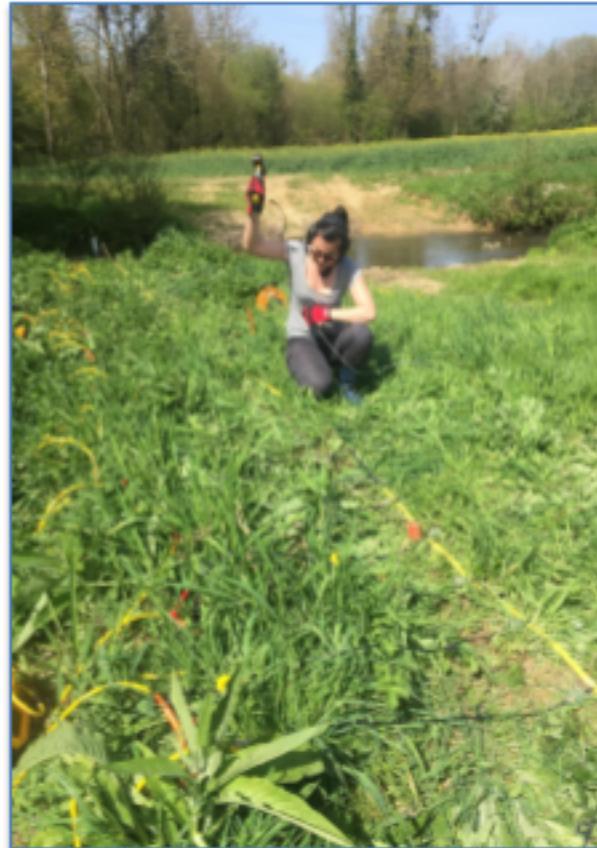
Upcoming experiments

May 2018: CZ architecture characterization and regolith thickness estimation at the Strengbach experimental catchment. Understanding controls on CZ structure and constraining flow models at the catchment scale.

June 2018: Pumping monitoring in fluvial sediment at the Sélune river site.

August 2018 - June 2019: Monitoring of the unsaturated zone at the LSBB (cf. May 2017 experiment). Passive and active geophysical methods. Mapping seasonal variations of water content within the UZ.

2018-19: CZ architecture characterization at the Saint Ferron underground tunnel. Assessing karst heterogeneity to image preferential flow paths.



Thank you!

