

Workshop Knowledge's frontiers in water unsaturated hydrogeosystems:
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PIVOTS

Fluids transfers and hydrodynamics of the Vadose Zone of the O-ZNS platform site

(In collaboration with BRGM and INRA)

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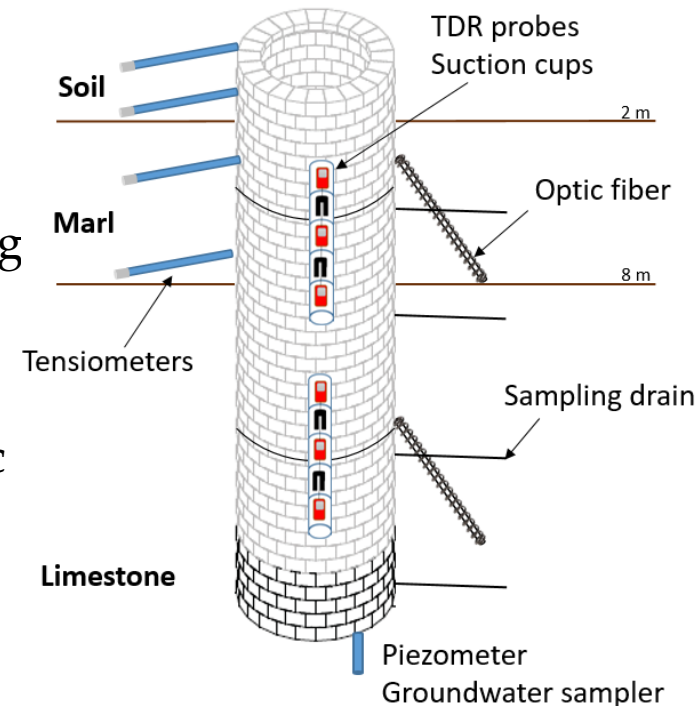


Avec le soutien de :



O-ZNS platform: hydrogeological approach

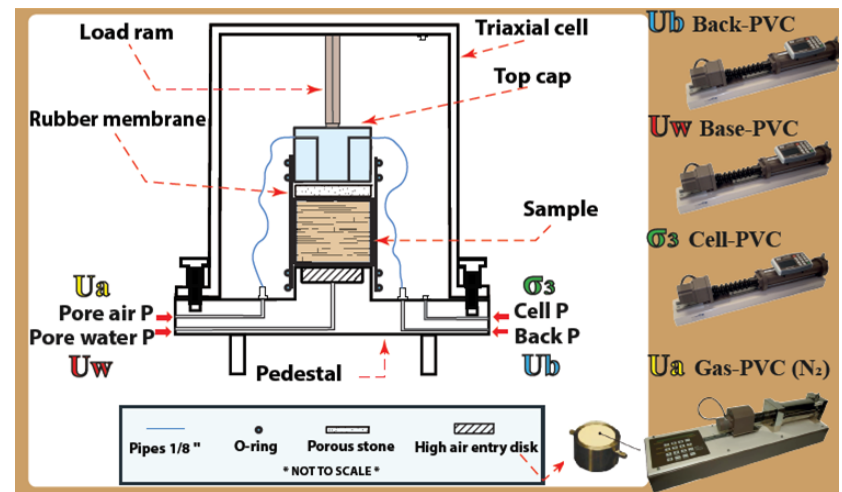
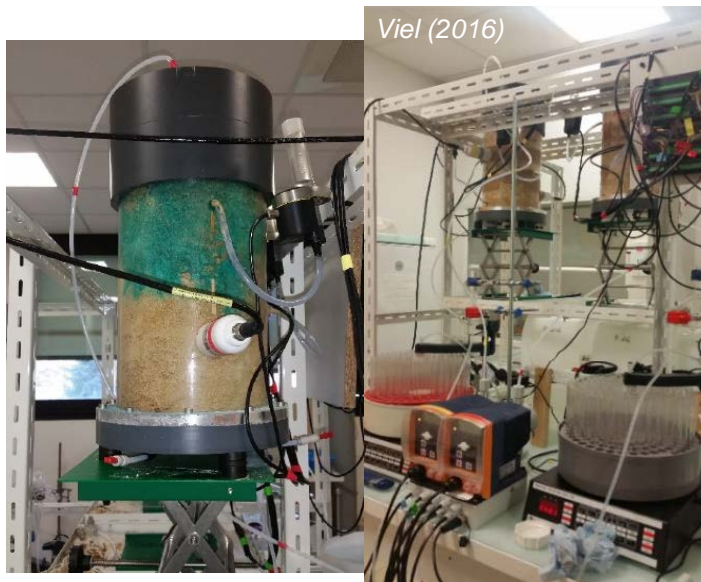
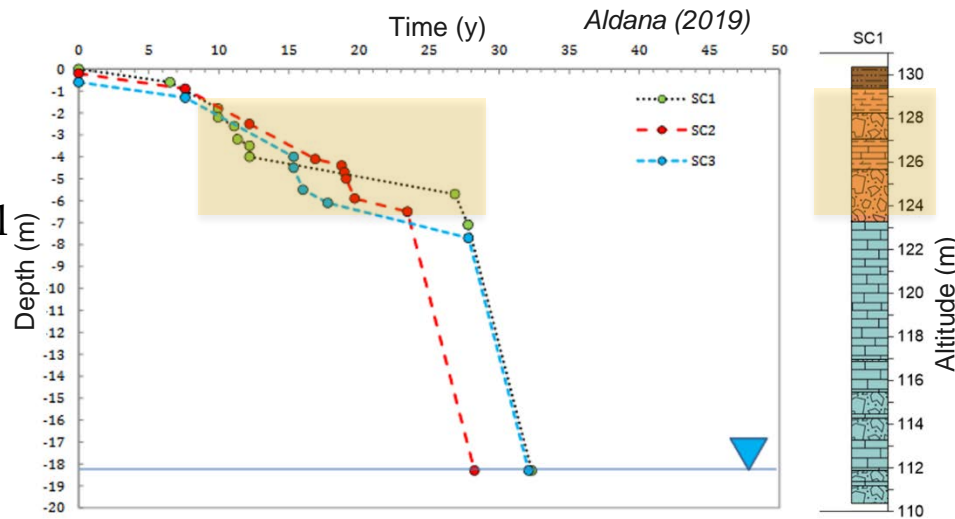
- Understanding the transport properties of the vadose zone (VZ) is a cornerstone in the preservation and management of aquifers under agricultural activity.
- Water retention and hydraulic conductivity are among the most important parameters governing water flow and solute transport in unsaturated porous media
- Numerous methods for estimating effective hydraulic properties of porous media at different scales
- Various sampling method for the collection of the solution moving through the VZ profile



O-ZNS approach aims to integrate observations over a wide range of spatial (nm- to km-) and temporal (minutes to decades) scales by combining several broad characterizations (laboratory experiments, geophysics imagery, field monitoring, lysimeters, fluid sampling, ...)

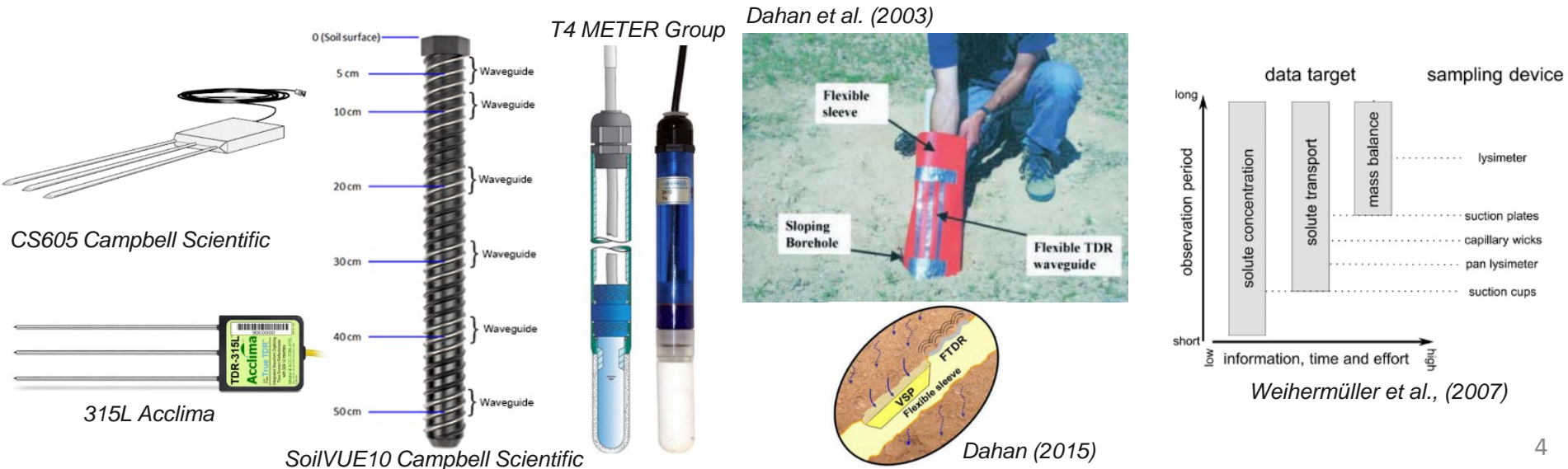
Laboratory experiments

- Instrumented column to study solute transport (preferential flows, dispersivity)
- Estimation of hydraulic functions $\theta(h)$ and $K(h)$ of soils and rocks using an unconventional triaxial system based on the multistep outflow
- First experimental approximation of the solute travel time of about 30 years and controlled by the inertial effect of the marly limestones located between 2 and 8 m deep

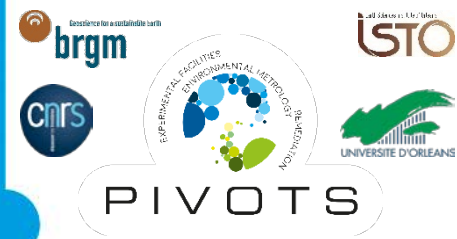


In situ instrumentation

- Numerous solutions regarding instrumentation of the well and the surroundings boreholes
- Estimation of permeability with boreholes permeameter and infiltrometer tests
- Real-time and continuous monitoring of water content (TDR probes) and matric potential (tensiometers) in shallow horizons. New monitoring methodology in deep vadose zone
- Sampling methods to collect solution in and below the root zone:
 - ✓ Zero tension applied : pan lysimeters
 - ✓ Tension applied: suction cups, wick lysimeters, suction plates, VZ sampling ports (VSP)
 - ✓ Aim of solution collection depends on specific scientific questions and targeted data
- Weather station (precipitation, evapotranspiration, etc.), piezometers, groundwater samplings



Overview of future steps (in collaboration with BRGM and INRA)



- Future studies with BRGM and INRA and by gathering data over the long term
- Measurement of water balance at the O-ZNS site scale and estimation of groundwater recharge at watershed scale considering the water flow in the VZ
- Impacts of crop management on water flow, nutrients and contaminants (agrochemicals, heavy metals, trace elements) transport
- Determination of hydrodynamic parameters of the VZ materials and modeling of fluid transfers in the VZ (1D to 3D), by taking into account geophysical and geological observations

This large monitoring program will help to better understand transport processes in the VZ of the Beauce hydrosystem for sustainable aquifer management and water resource preservation.