PLATEFORMES EXPERIMENTALES METROLOGIE ENVIRONNEMENTALE REMEDIATION

PIVOTS

Platforms for Environmental Technology Innovation, Development and Optimization

Dr C. Mouvet, Brgm/D3E

Avec le soutien de :

Cette opération est cofinancée par l'Union européenne. L'Europe s'engage en région Centre-Val de Loire avec le Fonds Européen de Développement Régional.

PIVOTS: what and who?

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What?

A comprehensive set of experimental and analytical facilities for environmental metrology and remediation

Designed for various scales (space and time), matrices (e. g. soils, sediments, water, air) and contaminants (inorganic & organic), *in vitro* and *in situ*

Open to both industry and academics

Who?

brgm – Géosciences pour une Terre durable

cnrs

INRA – SCIENCE & IMPACT

UNIVERSITE D'ORLEANS

DREAM – Eau & Milieux

anteagroup

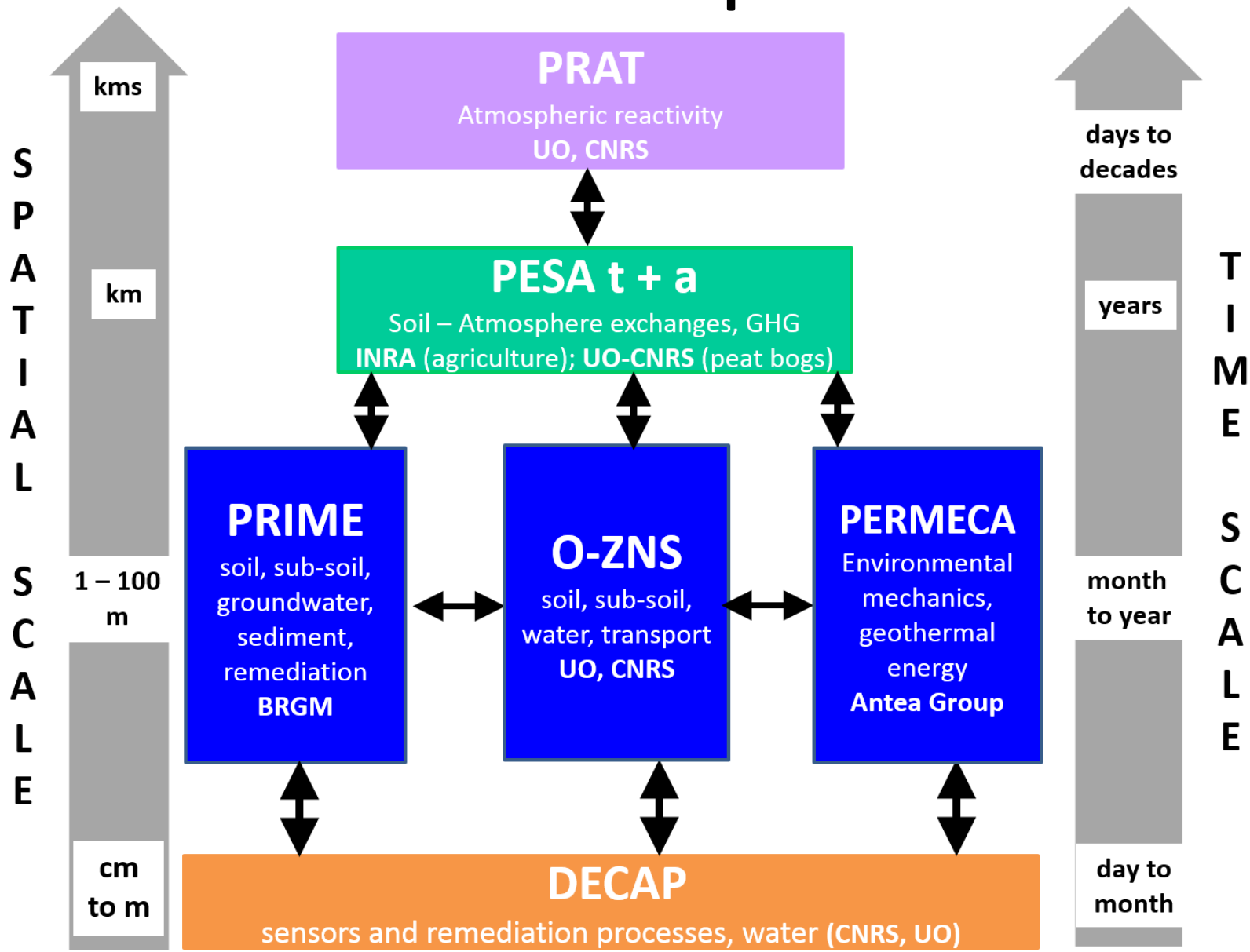
LE STUDIUM® – Loire Valley Institute for Advanced Studies

Main funding: Centre-Val de Loire – www.regioncentre-valdeloire.fr

ARD 2020 strategy

+ national & FEDER funding

PIVOTS' 7 platforms



DECAP - Development of environmental sensors and pollutant removal process in waters

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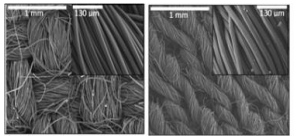
Elaboration of sensors and development of pollutant detection methods

Studies and development of:

- Support materials for sensors
- Sensitive organic layers for selective detection of target micropollutants
- Performing analytical methods for detection

Pollutants removal

- Regenerable materials for selective or wide spectrum removal of micropollutants.
- Processes based on coupling adsorption /Degradation of pollutants.
- Liquid effluent treatment and analysis of the degradation of organic compounds



Two laboratories CNRS : ICMN and GREMI- University of Orléans in strong interaction with industries

cnrs dépasser les frontières

ICMN Interfaces Confinement Matériaux et Nanostructures

GREMI

UNIVERSITE D'ORLEANS

High-tech equipment (AFM, RQCM, screen-printer, Electrochemistry equipment) and scientific and technical staff mobilized for studies from the design stage of sensors and decontamination processes until their validated on site.

PRIME – Platforms for Remediation and Innovation in the service of Environmental Metrology

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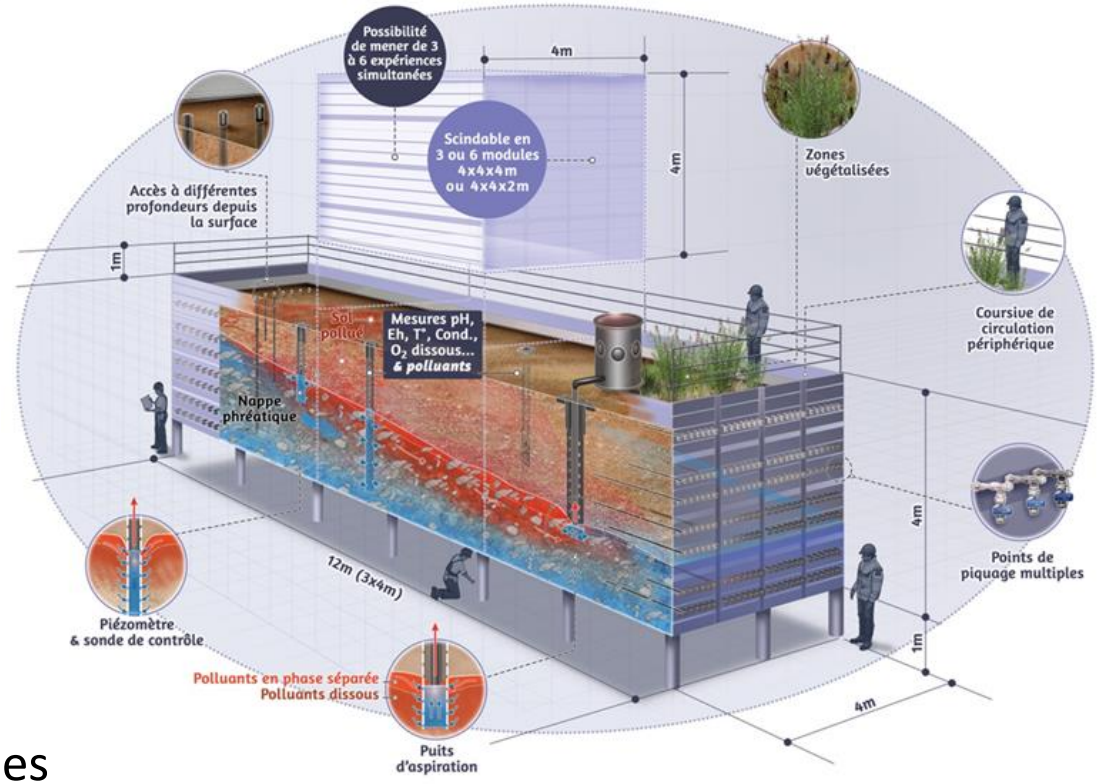
- Context & issues: **monitoring & remediation** water, soil, sub-soil & sediments, for **sustainable management**
- **Multi-metre** piloting facility + **sub-metric** and **metric scale pilots**. Simulating mechanisms in **natural conditions or remediation works**



- **Validation** of sensors and processes
- **Modelling** and integration at differents levels of the value chain (=> **eco-services** down the road)
- Support from **other Brgm platforms & equipments**

PRIME – submetric and metric platforms

O-ZNS - Observatory for Non-Saturated Zone transport : an infrastructure dedicated to the instrumentation of the whole vadose zone (VZ) of the Calcaire de Beauce aquifer

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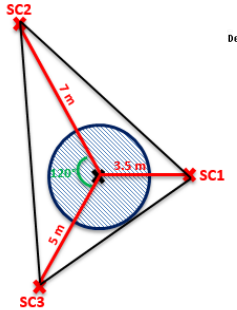
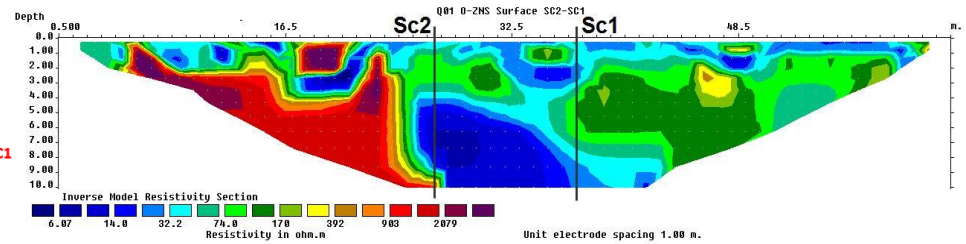
The O-ZNS platform will be located in the Beauce agricultural region

A preliminary study of the physical and mechanical characteristics of the VZ materials was performed

- Geotechnical investigations (core sampling, pressuremeter test)
- Geophysical measurements (density logs, cross-hole tomography)
- Laboratory experiments (triaxial tests, multistep outflow method)





Access wells to be drilled in 2019. *Challenges*: access to large equipment while preserving the mechanical strength

PIVOTS Take home messages

- Set of platforms with high level equipment and expertise for development & validation of sensors and remediation processes
- A wide range of contaminants, matrices and scales
- Open for collaboration at all stages & under various formats/contracts

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Thank you for your attention !

Questions welcome !

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PERMECA : Testing and Research Platform in Collaborative and Applied Environmental Mechanics

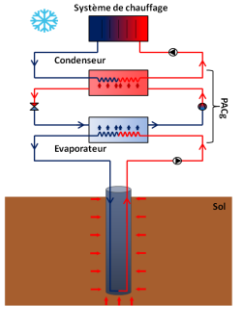
3 development axes and test protocols validation.

- **Infrastructures and soils, deformations.**

For best expertise of cyclical and dynamic phenomena impact, on soils and wide structures stability (earthquakes, swells, tides)

- **Energy optimization**

For modeling and optimizing thermomechanical exchanges, between soils and the energetics geostructures of the lasting city.



- **Second life materials**

To ensure hydro-mechanical and chemical quality of recyclable materials in circular economy.

With high-performance and innovative research methods.

- **Dynamic test devices** (dynamic triaxial, resonant column)
- **Geothermal pile simulation devices** with fluid circulation at different mechanical and thermal stresses
- **Development of new "large diameter" test devices** (triaxial, odometer, permea-meter)

PESAa 'Platform on 'Soil – Atmosphere' exchanges in agricultural soils : To improve irrigation water efficiency and to mitigate soil N_2O emissions

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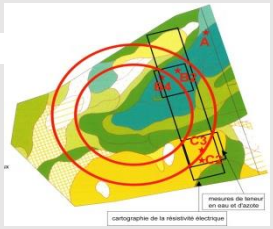
Equipments already available

Rainfall simulator

Laboratory dedicated to soil hydric properties characterisation

Equipments in construction

Precision irrigation coupled to maps of hydric soil properties



Continuous N_2O emissions mesurements

By chambers technics

Photo A,Vermue : device available in INRA Dijon

By µmeteorological technics (eddy covariance)

Photo O. Bertel : eddy covariance device available in INRA Grignon

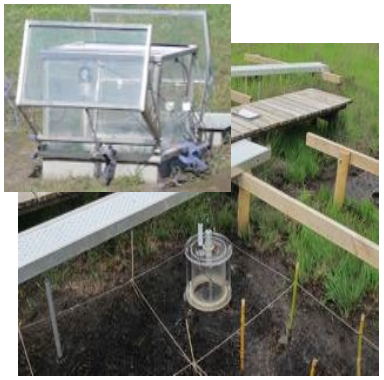
PESAt - Platform on 'Soil – Atmosphere' exchanges in peatlands'… a platform equipped with devices and experimental instruments for 3 main objectives:

⇒**1. To estimate carbon balance in peatlands (specific wetlands storing 1/3 of global soil carbon):**

High frequency eddy covariance measurements of CO_2, CH_4 et H_2O fluxes

⇒**2. To characterize the spatio-temporal variability of greenhouse gases:**

CO_2 measurements by automatic static chambers to be constructed



⇒ **3. To quantify soil respiration at different depths (CO_2 production):** need to develop *ad hoc* sensors

PESAt is integrated to various Observatories:

- **SNO Tourbières** (French Peatland Observatoryt))
- **IR ICOS** (International C Observatory System)
- **IR OZCAR** (Research Infrastructure on Critical Zone)

PRAT - ATmospheric Reactivity studies Platform

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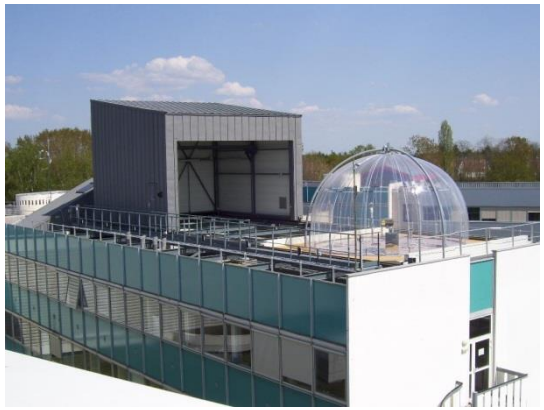
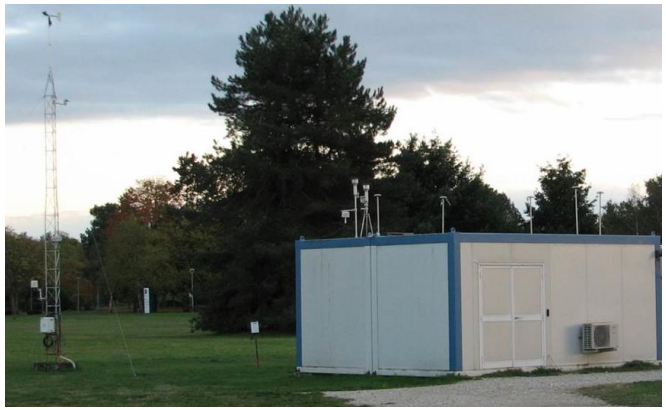
Air Quality and Impacts

- Indoor Air Quality
- Atmospheric Aerosol Formation
- Pollutants Deposition
- Climat effect of the degradation products of VOCs (including fluorinated)

From local to global pollution



HELIOS: Atmospheric Simulation Chamber with natural irradiation



Super-site Voltaire-HELIOS

Instrumental development