

AQUIBEAT: Aquitaine basin geology for the energy transition

2022-2029

Jean-Paul CALLOT (UPPA), Olivier SERRANO (BRGM) and all the contributing institutions

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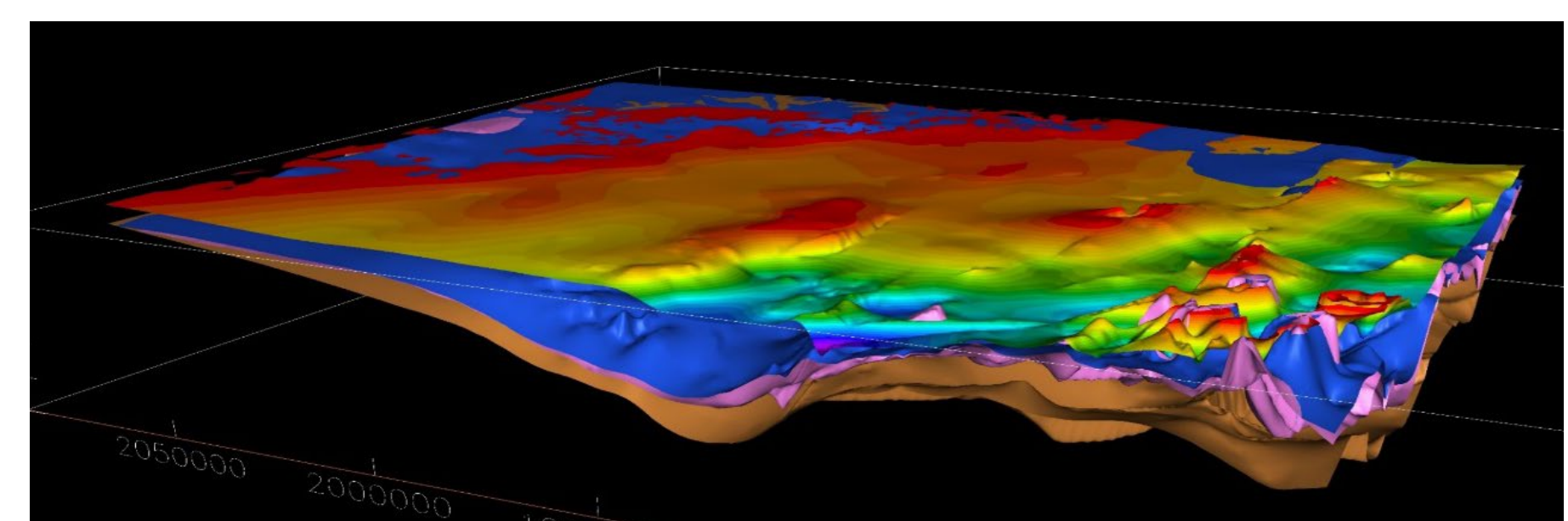
The AquiBEAT project aims to bring together an academic community on the subject of energy transition in the Aquitaine Basin. This region has seen a remarkable amount of subsurface exploration and exploitation, mainly focused on hydrocarbon resources. It is now moving towards energy storage (H2, compressed air), pollutants (CO2) and new, more sustainable resources (native H2, geothermal energy). This transition is being supported by public authorities, academics and industrial partners alike, as demonstrated by the remarkable range of industrial and academic R&D projects and public-private partnerships that have been carried out over the last ten years. Building on this knowledge base, AquiBEAT will focus on the fundamental issues raised by the development of new technologies, such as the estimation of new resources, and will make it possible to complete as far as possible the compilation of the body of knowledge required for the development and concatenation of subsurface information to inform the participants in the various projects and, ultimately, the industrial players and political decision-makers.

WP 1 – Geology of the Aquitaine Basin: construction of an integrated database

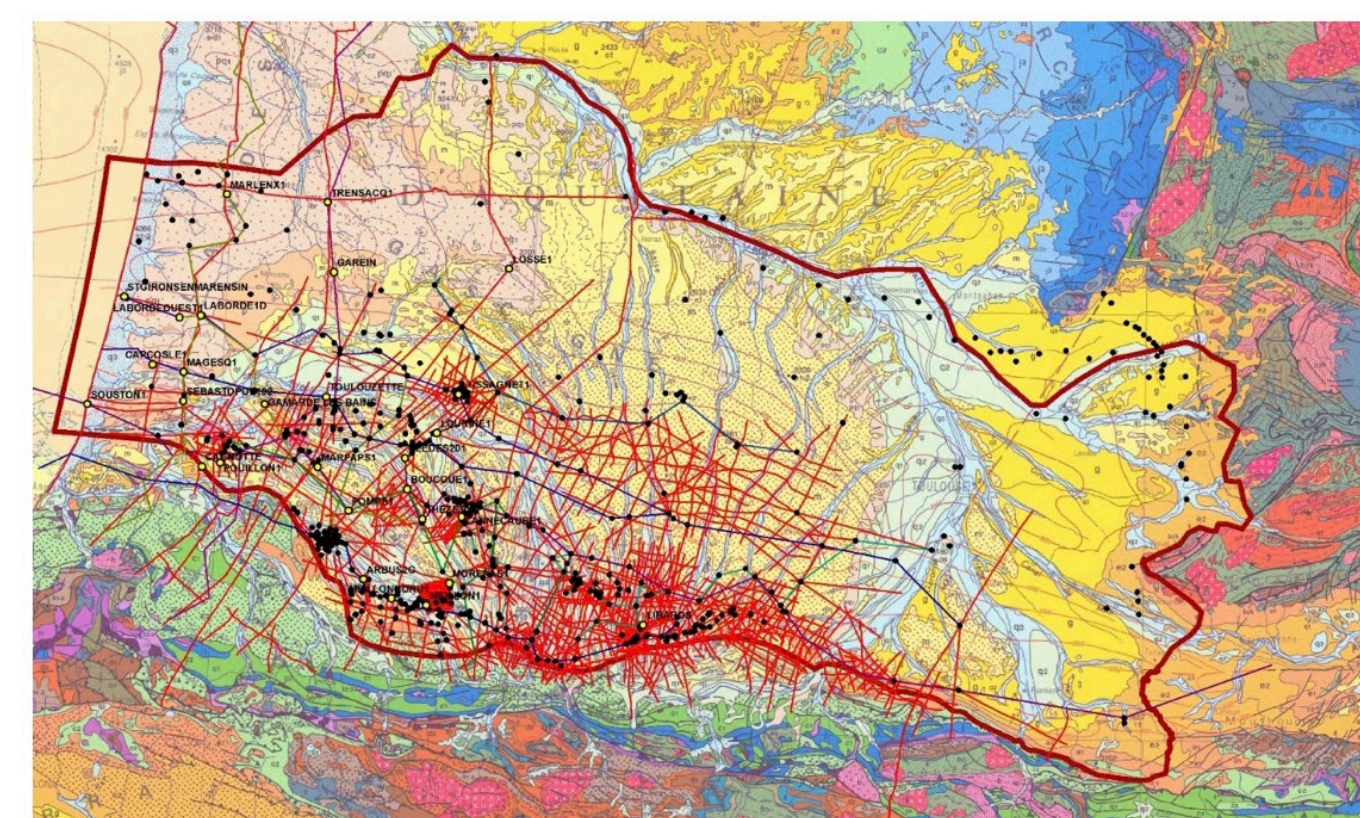
→ **Geological synthesis and deterministic modelling of the Mesozoic-Cenozoic series of the Aquitaine basin – BRGM, ENSEGID** : (1) implement the existing dataset, (2) harmonize the mapping of the main times lines of the basin infill and (3) perform a geological model at the Basin scale for the whole Meso-Cenozoic strata. *PI: E. Lasseur*

→ **Geological models and reservoir capacities for the Aquitaine Mesozoic sequence: application to geothermal energy. - ENSEGID, Univ Paris Saclay, BRGM**:

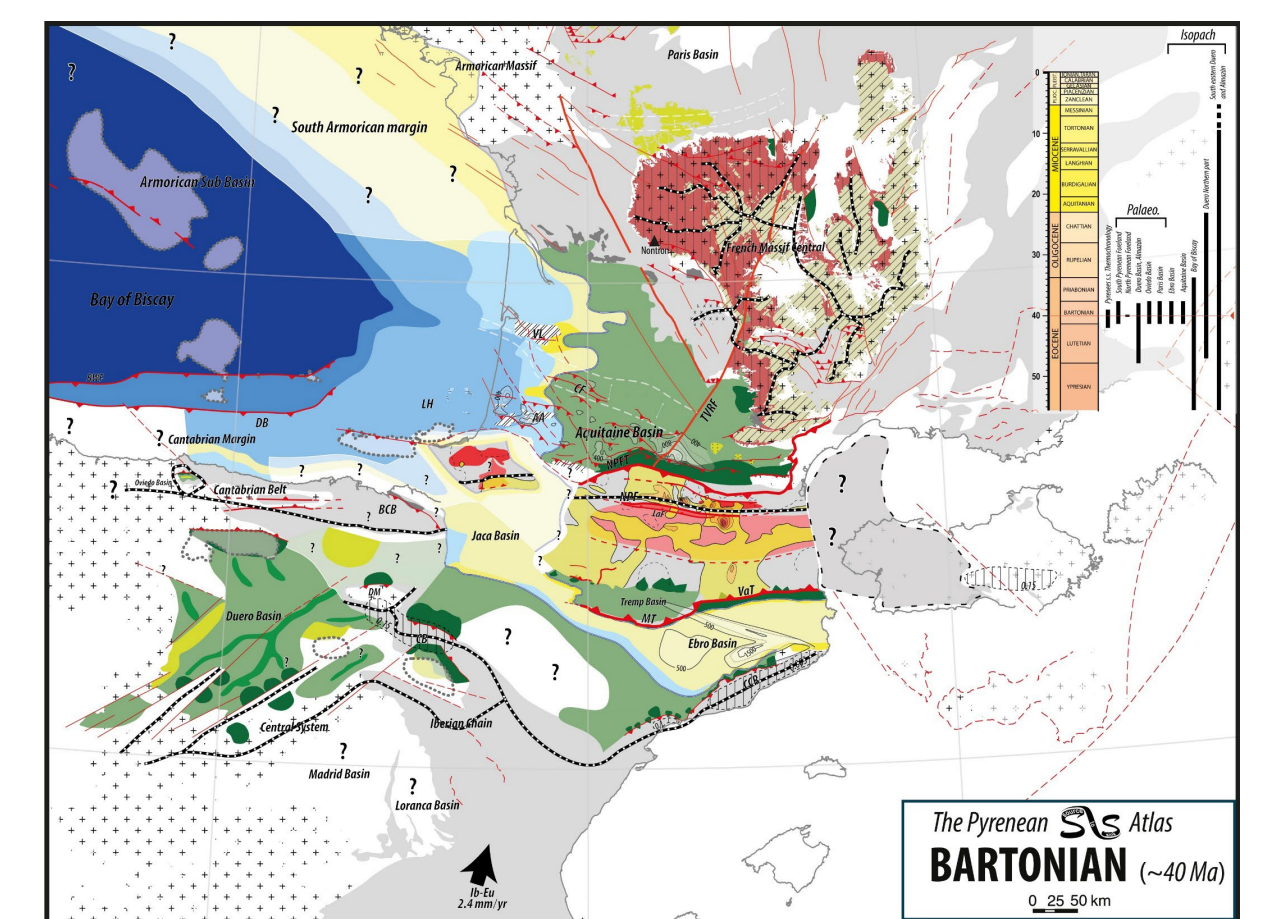
- Improve the geological model of the Cretaceous of the northern Aquitaine Basin, targeting future applications on deep aquifers for geothermal energy. *PI: P. Razin – BRGM referent: A. Bordenave*
- Reservoir capacities of the Jurassic formations of the Aquitaine basin and understanding of the episodes of burial dolomitization and associated fluid circulations on a regional scale. *PI: J Barbarand – BRGM referent: A. Ortiz*



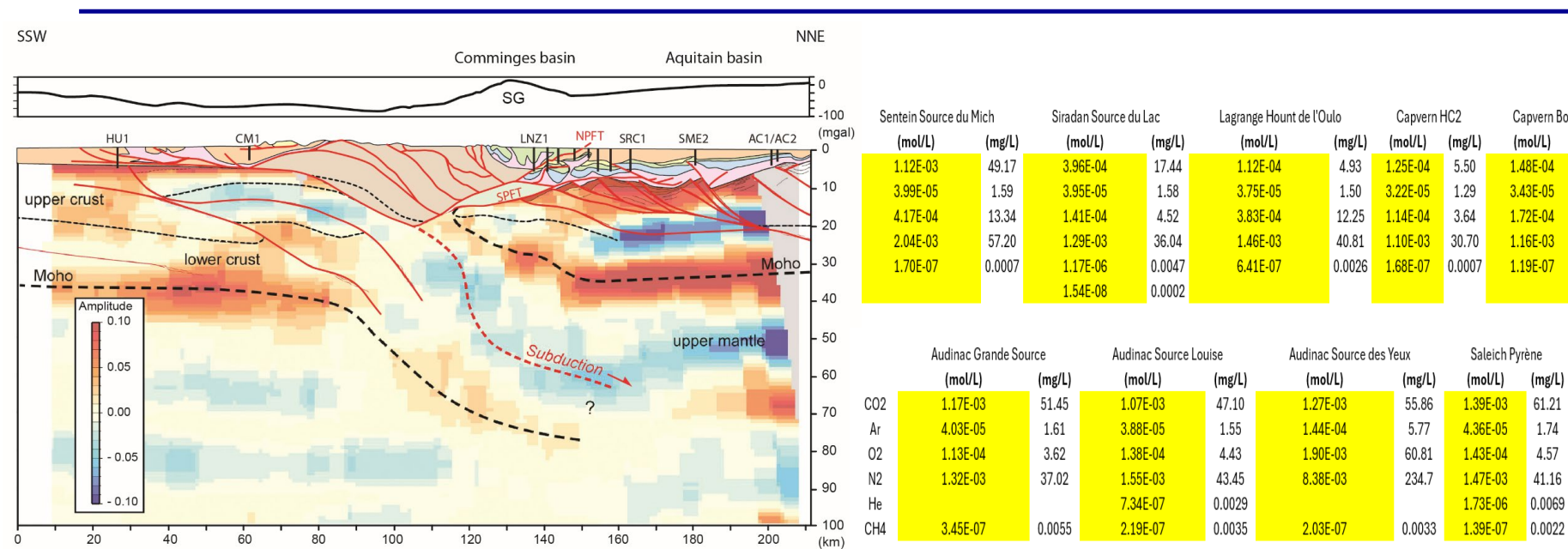
Thre D geomodel of the Aquitaine basin



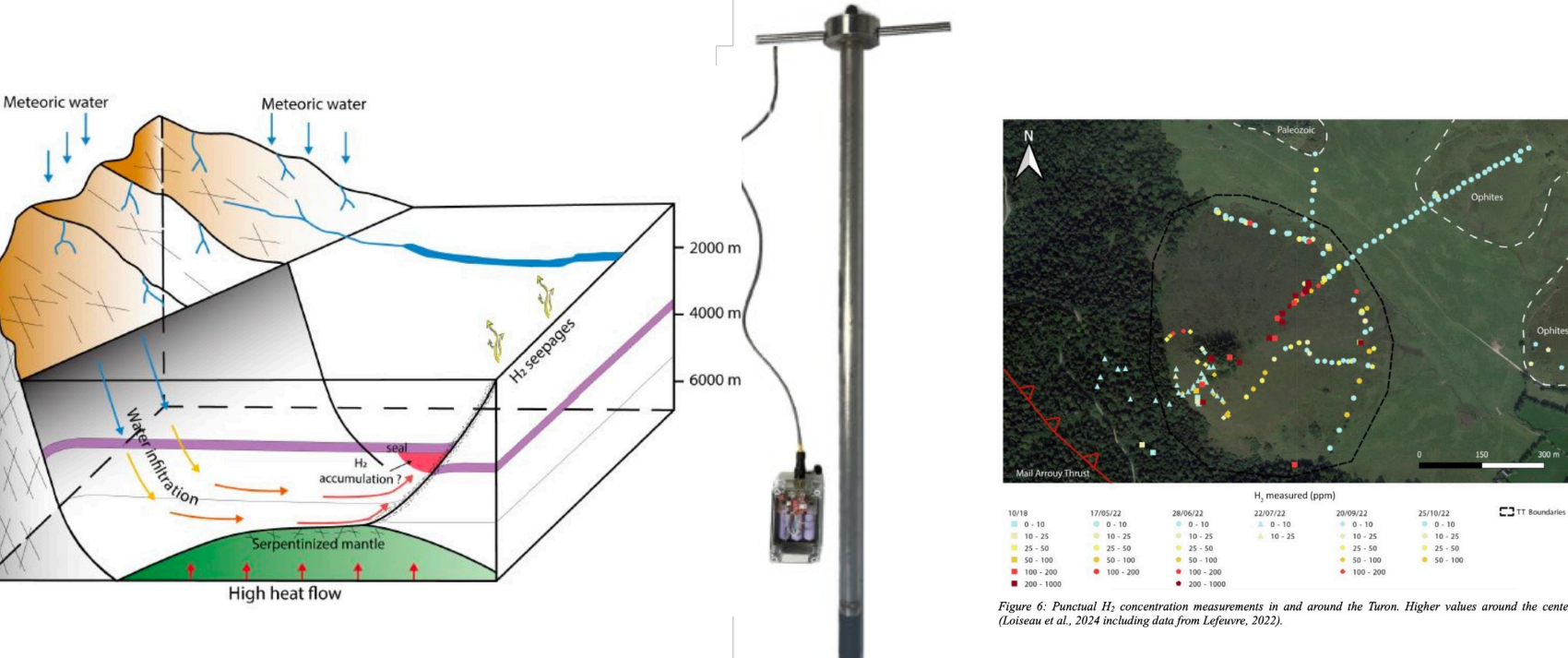
Existing seismic database



Existing seismic database

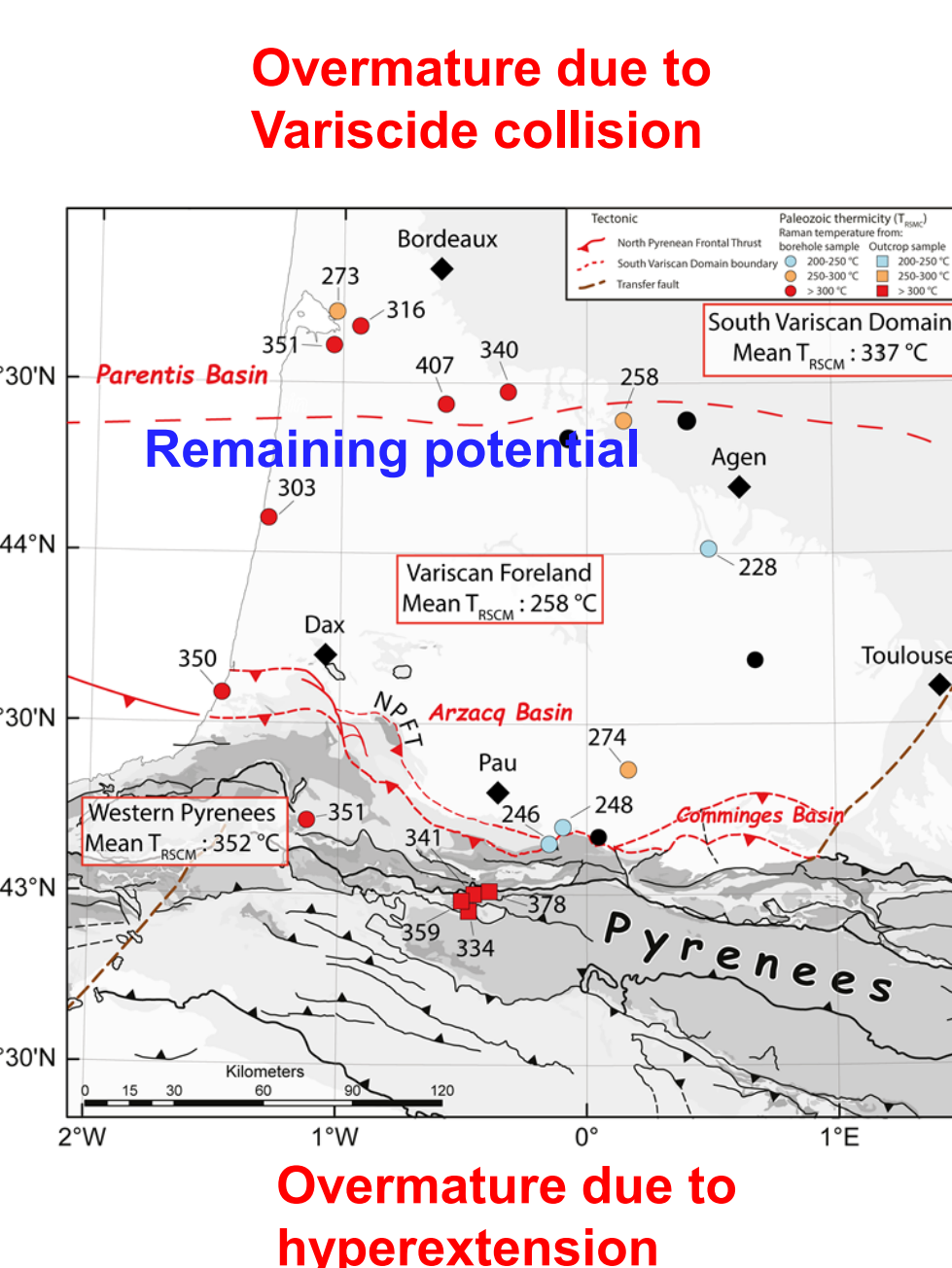


Existing seismic section from the Tresp basin to the Aquitaine basin, and first gas analysis results from the Comminge domain



Conceptual model of H2 generation/migration, the H2 probe MONHYTOR and the distribution of the first measurement (Turon)

Maturity domain regarding H2 from palaeozoic in the Aquitaine basin (Lefevre et al., subm. MPG 2025)



WP 2 – Exploration of frontier resources

→ **Passive Hydrogen Monitoring (PHyM) – UPPA : Coupling passive seismic monitoring (background noise) and novel geochemical sensors to monitor the Bénou plateau and Rébénacq domain for H2 (Vallée d'Ossau).** *PI: D. Brito*

→ **Hydrogen exploration along the foothill fault system of Comminges basin - ISTERre, GET, Géosciences Montpellier, BRGM** : Multimethod study (geochemistry, geophysics, mineralogy and microbiology) to build an exploration guide for H2 based on the Comminges basin. *PI: L. Truche – BRGM referent: F Gal*

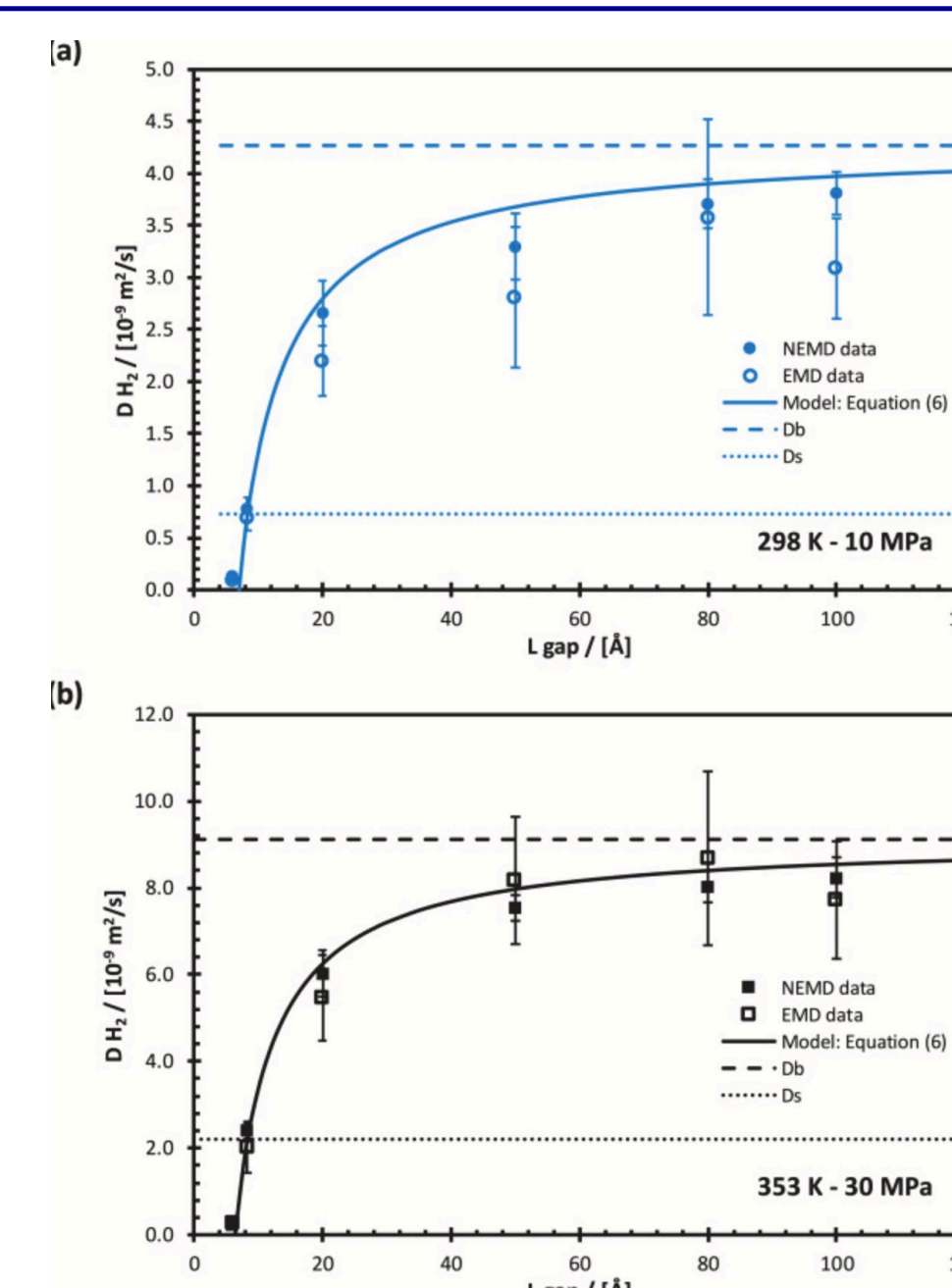
→ **Role of the Paleozoic in the H2 system of the Pyrenees and surrounding basins – UPPA** : Simulation of the geodynamic history of Paleozoic formations in the Pyrenean context, testing of hypotheses on P-T-t path for burial and maturation of organic matter and potential for H2 generation and migration in overlying formations. *PI: C. Aubourg*

WP 3 – Key questions for secured geologic storage and monitoring

→ **REDOX processes In Saline Hydrothermal systems (REDISH) – BRGM, ISTO** : Methodology for characterising the redox state and dynamics of hot saline systems. Application to H2 generation experiments by serpentinisation. *PI: A. Lassin*

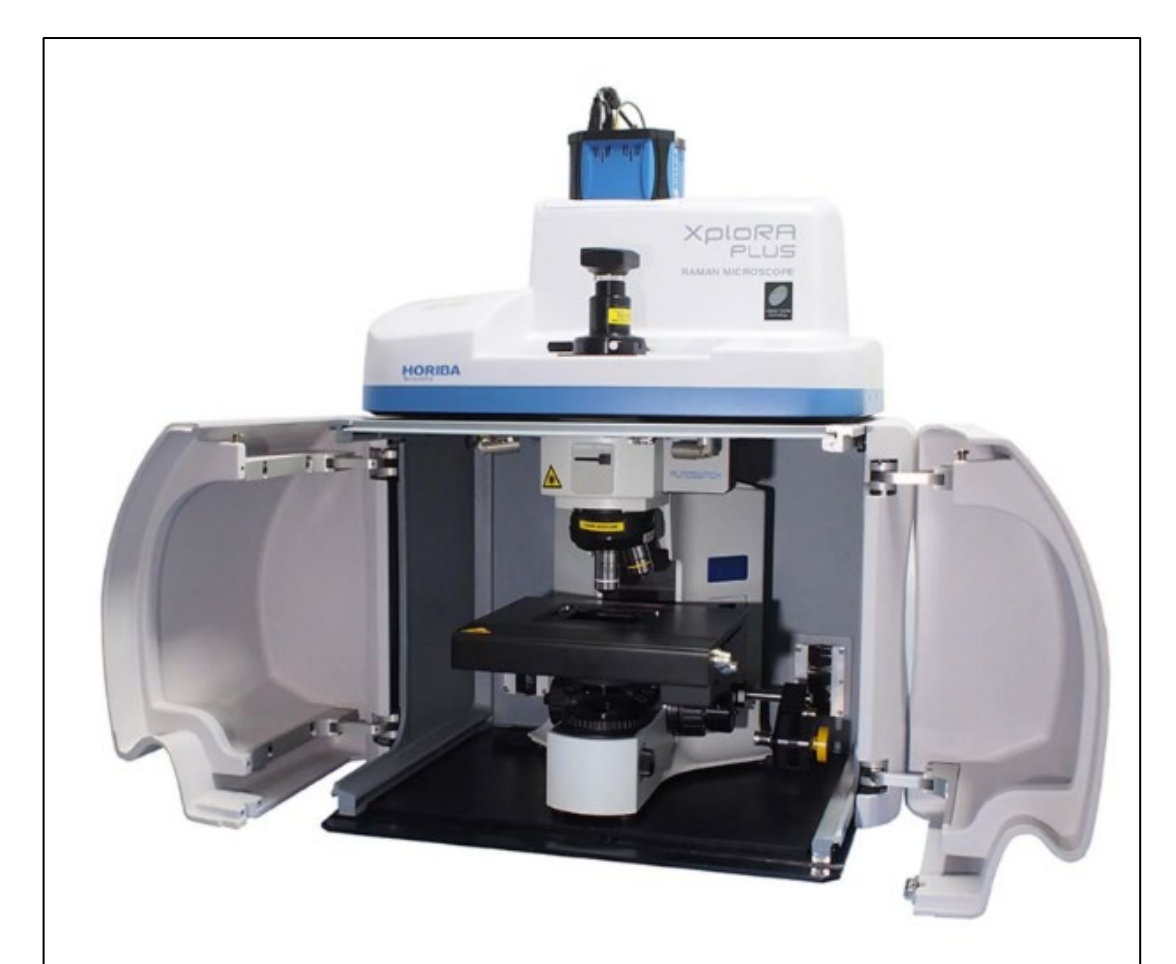
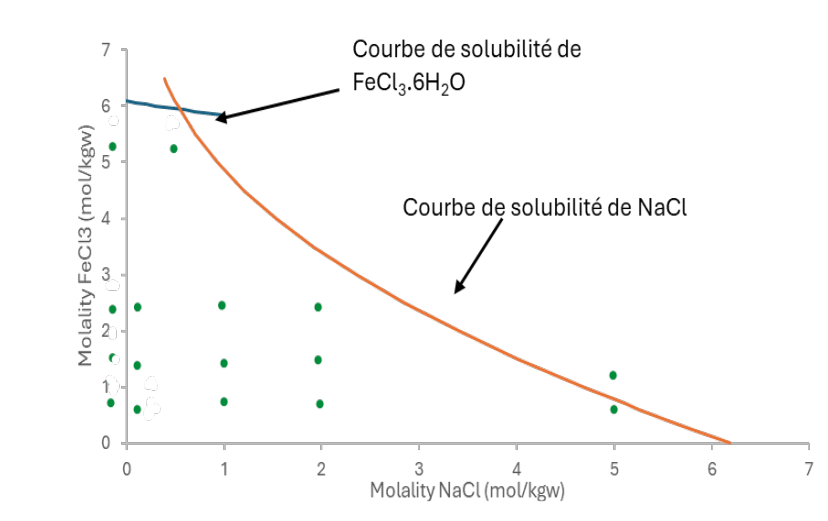
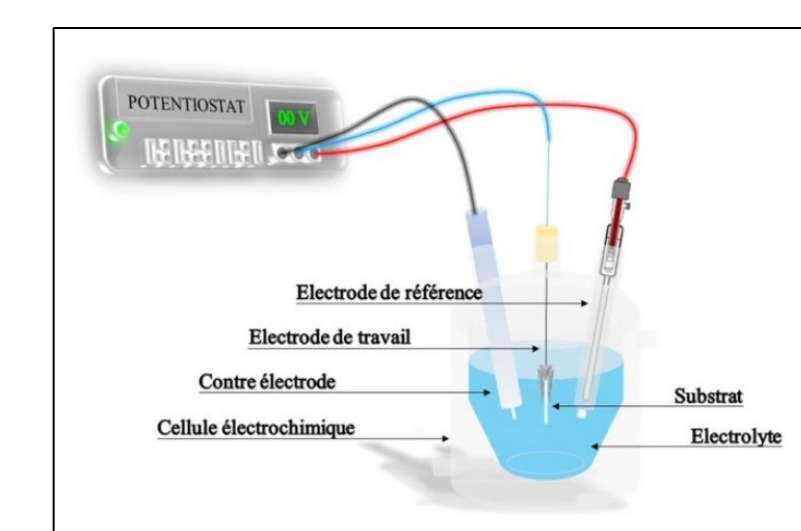
→ **Hydrogen storage and migration in clays– UPPA** : Quantify the underground storage capacity of reservoirs containing clays and constrain the identification of the nature of the native H2 resources (type of accumulation and/or type of continuous flow/production). *PI: G. Galliero*

→ **Investigation of biogeochemical conditions suitable for underground hydrogen storage and its combination with CO2 - GeoRessources, BRGM, ICMCB** : Methodology for understanding how biogeochemical conditions can affect gases stored underground (H2, CO2 or a combination of the two): methanation, cousin gas, etc. *PI: F. Golfier – BRGM referent : F. Mathurin*



Self diffusion coefficient of hydrogen vs. pore size. Thermodynamic conditions: (a) T=298.15K and P=10MPa. Solid lines represent the arithmetic model, dashed lines represent the bulk diffusivity, and dotted lines represent the surface diffusivity. The solid and open symbols represent the results of the NEMD and EMD simulations respectively (Kerkache et al., JHE, 168, 15133, 2025)

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