POSTDOCTORAL POSITION – 18 MONTHS

Field geochemistry and reactive transport modelling of natural hydrogen migration in the shallow subsurface

Natural Hydrogen Observatory Group – ISTerre, Université Grenoble Alpes, in partnership with BRGM (French Geological Survey)

Position	Postdoctoral researcher (full-time, fixed-term contract)
Duration	18 months
Expected start	[Month 2027] – flexible
Location	ISTerre, Université Grenoble Alpes, Grenoble (France), with field work in the Western Pyrenees
Employer	Université Grenoble Alpes (UGA)
Funding	French National Research Agency (ANR) – DENHyMS project (PRCE)
Gross salary	From €3020 per month, adjusted to experience according to the UGA salary scale
Application deadline	[DD Month 2026/2027]

ABOUT US

The Natural Hydrogen Observatory Group at ISTerre (Institut des Sciences de la Terre, Université Grenoble Alpes / CNRS / IRD / USMB / Université Gustave Eiffel) studies how hydrogen is generated, migrates, accumulates and is consumed in geological systems. Co-led by **Prof. Laurent Truche** (geochemistry) and **Prof. Frédéric-Victor Donzé** (geomechanics and geophysics), the group combines field geochemistry, geophysics, structural geology, laboratory experiments and numerical modelling to build a holistic understanding of natural hydrogen systems, from deep source rocks to surface seepage.

Our field work spans contrasting settings, with a strong focus on ophiolites and exhumed mantle: the Western Pyrenean foothills (France), the Bulqizë ophiolite in Albania, where we documented intense H_2 degassing from a deep reservoir (Truche et al., 2024, *Science*), the Ronda massif (Spain), the Voltri massif (Italy) and the Tanjung Api seep (Indonesia), as well as helium-bearing systems in the European Cenozoic Rift System. Our mobile field laboratory allows on-site gas and water analyses, and our experimental facilities (autoclaves, gold capsules, gas chromatography) support process-oriented studies of fluid–rock–gas interactions. The group works with academic and industrial partners and is committed to rigorous, evidence-based science in a fast-moving and sometimes over-hyped field.

THE DENHYMS PROJECT

DENHyMS (Drilling to undErstaNd Hydrogen Migration in the shallow Subsurface) is a 48-month ANR project coordinated by **Dr Frédérick Gal (BRGM)**, bringing together BRGM, ISTerre, MIO (Aix-Marseille University), CVA Engineering, ENGIE, Storengy and Geostock. The project sets up an **in-situ laboratory** in the Sauveterre-de-Béarn area (Mauléon basin, Western Pyrenees), where soil H_2 anomalies associated with CO_2, CH_4, He and ^{222}Rn have been reported close to the North Pyrenean Frontal Thrust, above a mantle body likely undergoing serpentinization at depth (Lefeuvre et al., 2021, 2022). A deep origin, however, must be tested rather than assumed: without constraining vadose-zone processes (local H_2 production and consumption, transport, mixing with atmospheric air), shallow soil-gas anomalies cannot be interpreted unambiguously.

Two dedicated boreholes will be **drilled and instrumented** to monitor the unsaturated and saturated zones of the critical zone (0 to ~100 m) for at least two years. The aim is to understand how H_2 and associated gases migrate, are trapped or consumed (abiotic and microbial processes) on their way to the surface, with implications both for natural H_2 exploration and for leakage monitoring of underground hydrogen storage.

YOUR ROLE

Based at ISTerre, you will lead the geochemical monitoring and modelling activities of the ISTerre team in DENHyMS, working in close collaboration with Frédérick Gal (BRGM) and Frédéric-Victor Donzé (WP leader). Your main tasks will be:

1. Drilling and borehole instrumentation

- Contribute to the final design of the two monitoring wells (sampling depths, nested ports or packers, sensor layout) together with BRGM and the drilling contractor.
- Ensure geochemical follow-up during drilling: on-site analysis of gas and water with the ISTerre mobile laboratory, sampling of cuttings and cores under strict contamination control for geochemical, gas-degassing and microbiological analyses.
- Commission the in-line degassing set-up of the saturated-zone well (membrane module, portable mass spectrometer, gas chromatograph, radon monitor).

2. Field geochemical monitoring

- Run repeated soil-gas surveys (concentration profiles, surface fluxes of H_2, He, CO_2, CH_4, ^{222}Rn) and quarterly groundwater sampling for dissolved gases and water chemistry.
- Deploy and test in the field passive H_2 samplers developed at ISTerre, alongside continuous sensors operated by partners.
- Interpret time series against environmental drivers (water table, temperature, pressure, humidity) and gas isotope signatures to discriminate deep versus near-surface H_2 sources and sinks.

3. Reactive transport modelling

- With Geostock, BRGM and Storengy, build a 1-D vertical model of the unsaturated and upper saturated zones (HPx, coupling Hydrus and PHREEQC) describing water and gas flow, H_2 dissolution, oxidation, sorption and microbial consumption.
- Integrate field data and kinetic constraints from microbiology (MIO) and rock-degassing experiments (BRGM) to reconstruct the deep H_2 flux feeding surface emissions.

4. Beyond DENHyMS

- Place the Pyrenean results in a broader comparative perspective with the other natural H_2 systems studied by the group, in particular ophiolitic settings, and take part in field campaigns where relevant.
- Publish in international peer-reviewed journals, present at conferences, contribute to project reporting and to outreach towards local stakeholders.

YOUR PROFILE

Required

- PhD in geochemistry, hydrogeology, environmental geosciences or a related field (obtained, or defended before the contract start).
- Hands-on experience in field geochemistry: gas and/or water sampling and analysis, ideally including soil gas or dissolved gas measurements.
- Experience with geochemical or reactive transport modelling (e.g. PHREEQC, HP1/HPx, TOUGHREACT, CrunchFlow or equivalent).
- Taste for field work in a multidisciplinary team, autonomy and good organisational skills; driving licence valid in the EU.
- Good written and spoken English. French is welcome but not required.

Appreciated

- Experience with drilling operations, borehole instrumentation or long-term monitoring.

- Knowledge of noble gases, stable isotopes, membrane-inlet or portable mass spectrometry.
- Interest in the interfaces between geochemistry, geophysics, structural geology and microbiology.

WHAT WE OFFER

- **Salary:** from €3020 gross per month (approx. €2,416 net before income tax), adjusted to the candidate's postdoctoral experience according to the salary scale of Université Grenoble Alpes for contract researchers.
- French public-sector social security and health coverage, partial employer contribution to complementary health insurance, partial reimbursement of public transport and a sustainable-mobility allowance for cycling.
- A stimulating environment in one of Europe's leading Earth science institutes, with access to state-of-the-art field, analytical and experimental facilities.
- A unique opportunity to take part in a full drilling-and-monitoring project from site characterisation to modelling, within a strong academic–industry network (BRGM, ENGIE, Storengy, Geostock, CVA Engineering, MIO).
- Support for career development: conferences, training, co-supervision of students, and visibility within the international natural hydrogen community.
- Life in Grenoble, a vibrant university city surrounded by the Alps.

EQUAL OPPORTUNITIES AND RESPONSIBLE RESEARCH

We are committed to equity, diversity and inclusion. Women are under-represented in field geoscience and drilling-related research, and we **particularly encourage applications from women**. The selection committee will be gender-balanced, and career breaks (parental leave, illness, etc.) will be taken into account when assessing a candidate's track record. Applications from candidates with disabilities are welcome, and reasonable accommodations will be provided.

We also pay attention to the environmental footprint of our research: travel to the field site and to meetings in Europe will favour train whenever reasonable, and field campaigns will be pooled with project partners to limit the number of trips.

In accordance with French regulations, the appointment may be subject to authorisation by the relevant authorities, as the host laboratory may be located in a restricted-access area (ZRR).

HOW TO APPLY

Please send, as a single PDF file, to laurent.truche@univ-grenoble-alpes.fr with the subject "DENHyMS postdoc application":

- a cover letter (max. 2 pages) describing your motivation and relevant field and modelling experience;
- a CV including a publication list;
- the names and contact details of two or three referees.

Review of applications continues until the position is filled. Shortlisted candidates will be interviewed in person or by videoconference. Informal enquiries are welcome.

Contact

Prof. Laurent Truche – ISTerre, Université Grenoble Alpes – laurent.truche@univ-grenoble-alpes.fr
in close collaboration with **Prof. Frédéric-Victor Donzé** (ISTerre, UGA) and **Dr Frédérick Gal** (BRGM, DENHyMS coordinator).

SELECTED READING

- Lefeuvre N., Truche L., Donzé F.-V., et al. (2021). Native H_2 exploration in the Western Pyrenean foothills. Geochemistry, Geophysics, Geosystems 22, e2021GC009917.
- Lefeuvre N., Truche L., Donzé F.-V., Gal F., Tremosa J., et al. (2022). Natural H_2 migration along thrust faults in foothill basins: the North Pyrenean Frontal Thrust case study. Applied Geochemistry 145, 105396.
- Truche L., Donzé F.-V., Goskolli E., et al. (2024). A deep reservoir for hydrogen drives intense degassing in the Bulqizë ophiolite. Science 383, 618–621.
- Donzé F.-V., Bourdet L., Truche L., Dusséaux C., Huyghe P. (2024). Modeling deep control pulsing flux of native H_2 throughout tectonic fault-valve systems. International Journal of Hydrogen Energy 58, 1443–1456.