

# Geosciences for the energy system transition | GeoT

The **interdisciplinary thematic institutes** of the **University of Strasbourg** & **CNRS** & **Inserm**

## Activity report brief

Université de Strasbourg

2021-2022



ITI GeoT is managed by a team of scientists who ensure effective coordination, administrative and financial management as well as strategic development:

- ◆ **Direction committee**  
Includes director, deputy director and manager
- ◆ **Executive committee**  
Includes all working group leaders
- ◆ **Steering committee**  
Includes all partners' representatives
- ◆ **Orientation committee**  
Includes international scientists

The ITI GeoT is one of the 15 projects labeled for 8 years (2021-2028) by the University of Strasbourg. Launched in January 2021, the ITIs are based on a unique structuring "research-education" link. The ITI GeoT relies on the scientific expertise acquired by the "Labex G-eau-thermie profonde" during its 8 years of existence (2012-2020) in connection with industrial and institutional players. The ITI is supported by the University of Strasbourg, in partnership with the CNRS and Inserm, as part of the initiative of excellence "Beyond Borders" and the Stras'us project.

## Organisation & partners

### 7 research labs:

- École et Observatoire des sciences de la Terre (EOST) including the national seismic survey (BCSF-RENASS)
- Institut Terre et Environnement (ITES)
- Laboratoire des sciences de l'ingénieur, de l'informatique et de l'imagerie (ICube)
- Laboratoire Inter-universitaire des Sciences de l'Éducation et de la Communication (Lisec)
- Centre de recherche sur les médiations (CREM, Université de Lorraine)
- Sociétés, Acteurs, Gouvernement en Europe (Sage)

### 2 engineering school :

- École et Observatoire des sciences de la Terre (EOST)
- IFP School (IFPEN)

### 1 doctoral school :

- Sciences de la Terre et l'Environnement (ED413)

**9 working research groups + 1 Master of Science**



## Objectives

**The establishment** of deep geothermal energy as a major contributor to the European energy sector by improving the economic viability and profitability of these systems.

**The rationalisation** of the exploration and characterisation of crustal reservoirs, by developing low-cost methods that repurpose geophysical imaging techniques and integrate emerging technologies to more efficiently assess temperature and fluid-flow in the crust.

**The optimization** of how we exploit deep groundwater resources, which requires robust on-site workflows to maintain resource production, while monitoring seismic risk in real-time.

**The improvement** of how we manage risk by improving how we monitor aseismic deformation and anthropogenic seismicity.

**The understanding** of public perception and enhancing public engagement in geo-energy projects.

## Research projects

9 working groups equally financed

11 projects submitted to the ITI "call for project" financed

Influence of the intermediate principal stress on inelastic compaction and compaction localization in porous sandstone (PI: Patrick Baud)

Architectural Characterization of the Upper Triassic Buntsandstein Formation (PI: Guilherme Bozetti)

Governing risks: Analysis of the political and discursive reconfigurations induced by the Strasbourg earthquakes (PI: Philippe Chavot)

New insights on the nature, age and origin of the URG lower crust (PIs: Benoît Petri & Francis Chopin)

Permeability anisotropy in the Buntsandstein (PI: Michael Heap)

Hybrid gravity applied to the monitoring of the Theistareykir geothermal reservoir (PI: Jacques Hinderer)

Experimental study and modeling of the Si isotope fractionation and particle size growth during silica precipitation (PI: Damien Lemarchand)

An improved optical fiber DAS technology (PI: Jian Lin)

Enhanced native hydrogen generation by CO<sub>2</sub> injection into a deep granitic geothermal reservoir in the Rhine Graben (GEOH<sub>2</sub>ERMIE) (PI: Yann Lucas)

Continuation of the CDGP (PI: Marc Schaming)

Passive 4D monitoring of the Strasbourg deep reservoirs using ambient seismic noise and earthquake interferometry (PI: Jérôme Vergne)

9 national and international projects financed by ANR, EU or national grants

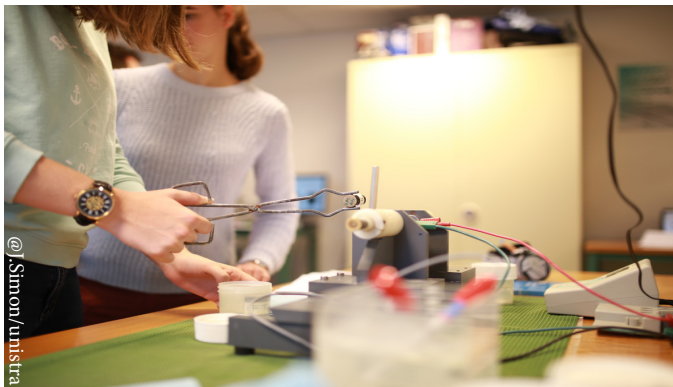


## Education program

The ITI GeoT supports a new education program within the EOST Master's degree "Earth and Planetary Sciences, Environment".

The "Geosciences for the Energy System Transition | GeoT" program will train the next generation of scientists specialized in georesources for a low-carbon future. During its first two years, the ITI has developed an adapted training program, interdisciplinary and rich in practical experiences. The ITI GeoT can count on its member laboratories and proposes courses from EOST, Lisec and Icube.

Also, during 2021 and 2022, a partnership with IFP School has been elaborated in order to offer to our future students a more varied pedagogical offer.



**Eucor and the geothermal field school:** students coming from three French and German universities focusing on theory and practical examples of geothermal energy.

In 2022: this field trip has been proposed to PhD students as a training of the doctoral school. A total of 20 students, including 5 EOST PhD students, participated in the course during October 2022.

Starting 2023: this field trip will be part of the program for M2 students of the GeoT master program.



## Young researchers training



The ITI GeoT is committed to providing quality training to future generations of researchers through the hosting of students and young researchers within their research team. For this purpose, a part of its budget is dedicated to the financing of research projects carried out by students, PhD students, and post-docs as well as engineering contracts.

During 2021 and 2022, we have welcomed:

- 8 PhD students,
- 2 post-docs,
- 8 internship students,
- 3 young engineers.

## 2 PhD defended



- Qinglin Deng, 2019-2022,  
"Multi-scale hydro-mechanical behaviour of rough fracture: implications for EGS reservoir stimulation"
- Monica Aquino-Guerra, 2019-2022  
« Joint inversion of passive geophysical data »

## Dissemination

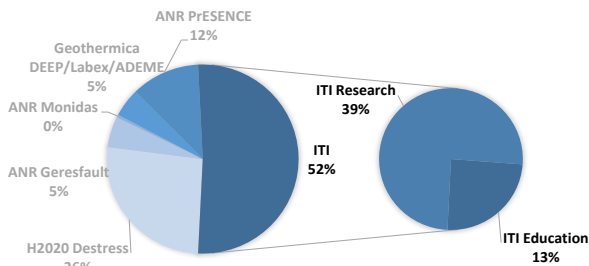


- 13 Publications in scientific journals
- 23 presentation in conferences & workshops around the world

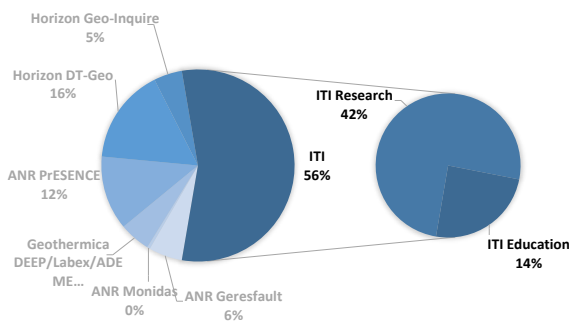
## Budget

8 years budget reaching 2,771,200 € for research and 903,040 € for education to which other fundings can be added from external projects.

BUDGET 2021



BUDGET 2022



## Events

**February 2021 to May 2022.** ITI members involved in the expert committee investigating the Strasbourg seismic events (2019-2021) and the implication of the geothermal site of Vendenheim.

**May 2021.** The Pr. Hayrullah Karabulut and ITES | ITIGeoT are awarded by the "Eurométropole de Strasbourg" and "Région Grand-Est" with a "Chaire Gutenberg" that helps research units welcoming high grade researchers. It will be financed over 2023-2024 with 50k€.

**September 2022.** DT-Geo european project starts with 19 partners. It will be financed over the period 2022-2025 with more than 494k€ for ITI GeoT.

**October 2022.** Geo-INQUIRE european project starts with 52 partners. It will be financed over the period 2022-2026 with more than 182k€ for ITI GeoT

**December 2022.** The SismoCité project in participatory research is awarded by Idex "Université & Cité" of the University of Strasbourg. It will be financed over the period 2023-2024 with 50k€.

## Perspectives

### Research

One important perspective for ITI GeoT is the leadership of the "Rhine Graben" project (PCg) of the national exploratory PEPR (Programme et Equipement Prioritaires de Recherche) program "Sous-sol, bien commun" in collaboration with BRGM. This project is an unique opportunity to develop the research activity of ITI GeoT by initiating multiple national collaborations with numerous teams and to promote the activity of the program while obtaining new co-funding to stimulate fundamental research on deep geothermal energy and the associated exploitation of related resources such as Lithium or Hydrogen.

### Education

Our ambition is to create a course of international scope recognized by academic and industrial professionals. The GeoT program will open in 2023 for both M1 and M2. We will welcome students to whom we will be able to offer interesting internships and subsequent thesis projects. The total funding, by the ITI GeoT, of two PhD fellowships has been voted in response to the 2022 "call for projects" for 2023.

### Contact

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