Data Center for Deep Geothermal Energy (CDGP) and EPISODES platform (EPOS TCS AH): adding GNSS and geological data

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Introduction

The Data Center for Deep Geothermal Energy (CDGP-Centre de Données de Géothermie Profonde, https://cdgp.u-strasbg.fr/) was launched by the LabEX G-EAU-THERMIE PROFONDE (http://labex-geothermie.unistra.fr) in 2016, now Interdisciplinary Thematic Institute for Geosciences for the Energy System Transition (https://geot.unistra.fr/).
The CDGP archives, preserves and distributes various types of data from geothermal sites in Alsace (Soultz-sous-Forêts, Rittershoffen and Vendenheim).
The CDGP retrieves seismological data from the Centre of Seismological Data (CDS), a transversal service platform at EOST, where seismological signals are stored for Renass, Resif, etc.

EPOS TCS Anthropogenic Hazards

The CDGP is the French node of EPOS TCS Anthropogenic Hazards that is accessible through the EPISODES (European Plate Induced Seismicity Observations & Datasets within EPOS Services, https://episodesplatform.eu/) plateform. This international facility gives access to different types of data and provides an environment (services and software) for research into anthropogenic risks associated with the exploitation of geo-resources.

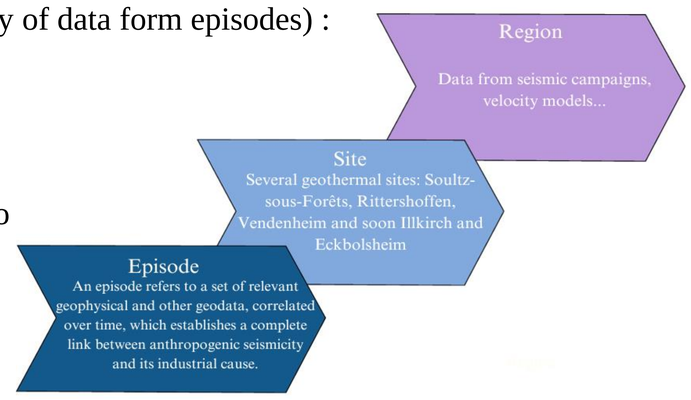
The EPISODES platform gathers data on environmental risks triggered by human activity (geothermal energy production, mining, hydrocarbon extraction, wastewater injections and underground gas storage).

Seismicity and ground deformation are just some of the risks associated with georesources development. Researching and understanding these man-made hazards requires an interdisciplinary approach. To this end, each episode provides different types of data (seismological data, well data, hydraulic data, geological maps, etc.).

Distributed data at CDGP

The CDGP distributes seismological (waveforms, catalogs, focal mechanisms) and hydraulic data from simulation and circulation phases at various geothermal sites (Soultz-sous-Forêts, Rittershoffen and Vendenheim). Furthermore, seismic, geological, and all other data related to anthropogenic hazards are distributed.

Data are classified as follows (the majority of data form episodes) :



Some data produced as part of a thesis or publication by ITI GeoT members are also distributed.

The data are distributed on a website based on GeOrchestra, an interoperable SDI composed of independent modules that provides metadata editing, data search functions and enables to edit, extract and visualize maps.

An Authentication, Authorization and Accounting Infrastructure (AAAI) has been set up to secure data access. This tool provides access to data according to data distribution rules and user affiliation (academic, industrial, etc.).

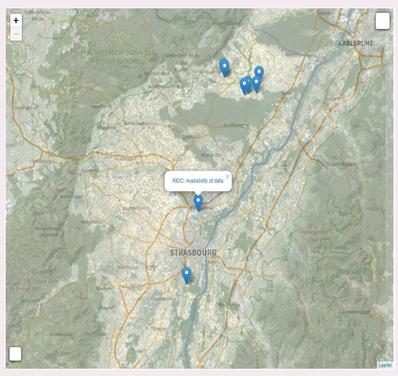
New data at CDGP

As part of the European Geo-INQUIRE project (GA n. 101058518, https://www.geo-inquire.eu/), which began in October 2022. The aim of this project is to provide, improve access to data and to overcome the cross-domain barrier. To this end, the CDGP adds new types of data.

GNSS data

Since 2022, the CDGP has been distributing on its website raw GNSS data (Rinex) from the various GNSS stations set up by operators and EOST near geothermal sites. These GNSS stations are permanent monitoring stations for the risk of induced seismicity. The 8 stations are shown on a map (Figure 1). By clicking on a station, it is possible to see the percentage of data available for each date from the station's start-up to the present day.

a)



b)

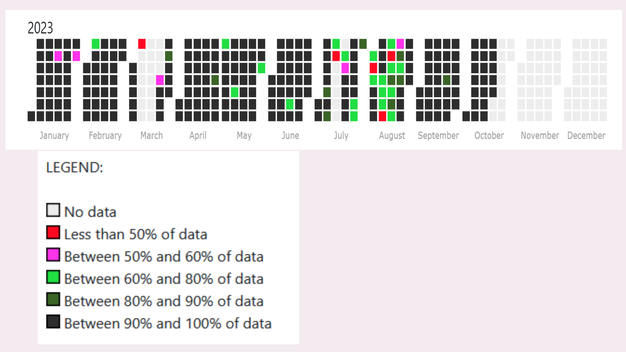


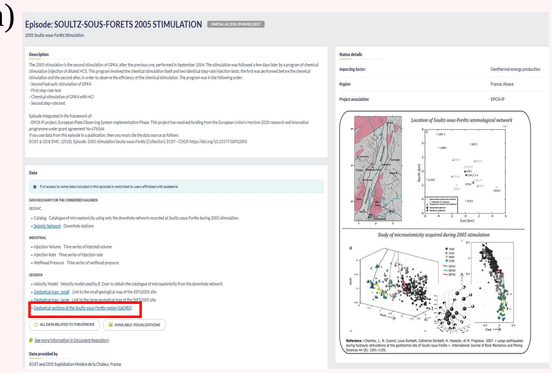
Figure 1 : a) Map showing GNSS station locations, b) Example of GNSS data availability for a station on the CDGP website

The CDGP plans to distribute GNSS products such as velocity and displacement. Adding these GNSS stations to the EPOS TCS GNSS (Global Navigation Satellite System) networks is a potential solution. This TCS provides access to a variety of European and regional geodetic data, metadata, products and software in support of Solid Earth Sciences. Another possibility is to use TCS GNSS processing procedures to distribute results locally.

Geological data

Geological sections for the Soultz-sous-Forêts episodes have been added to the EPISODES platform. These geological sections use the results of the GeORG project (Geopotentials of the deep Upper Rhine Graben,https://www.geopotenziale.org/home/index_html), whose aim was to create a 3D model of the geological structure of the Rhine Graben. These sections show the structure at depth, the distribution of geological layers and temperatures. Different sections were generated: vertical and horizontal sections at different depths (500 to 3000m) and synthetic logs.

a)



b)

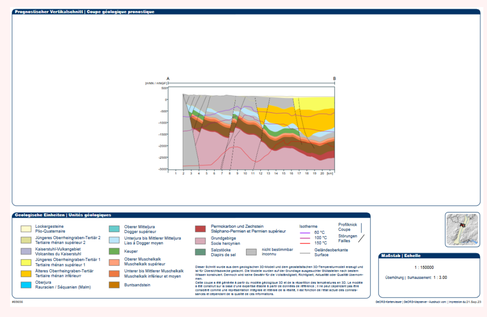


Figure 2 :a) Soultz-sous-Forêts episode distributed on EPISODES, b) Example of a geological section distributed on EPISODES

A collaboration with EPOS TCS GIM (Geological Information and Modeling) has been set up to produce maps and borehole data for geothermal sites. This TCS develops and consolidates the information and data infrastructures produced by the geological international community.
For the time being, the CDGP provides access to well sheets on InfoTerre. The aim of this collaboration is to distribute geological information based on TCS GIM data and services.

Conclusion

The Data Center for Deep Geothermal Energy (CDGP) provides an access to data from geothermal sites in Alsace, archive them and distribute them to the scientific community for R&D activities.
The CDGP is involved in large research projects EPOS Research Infrastructure and EPOS AH consortium, as well as two Horizon Europe projects DT-Geo and Geo-INQUIRE.

The CDGP is working to add new types of data (GNSS and geolocial) to complete the episodes concerning geothermal sites (Soultz-sous-Forêts, Rittershoffen and Vendenheim). The aim of this action is to provide the scientific community with all the elements needed to understand anthropogenic hazards.