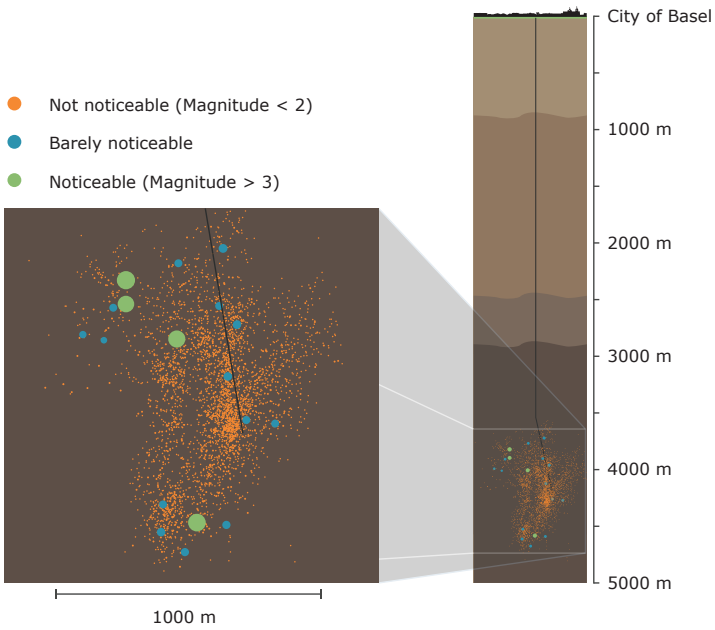
Schweizerischer Erdbebendienst
Service Sismologique Suisse
Servizio Sismico Svizzero
Swiss Seismological Service

ETH zürich

GEOBEST-CH

Competent Earthquake Consulting for Deep Geothermal Energy Projects



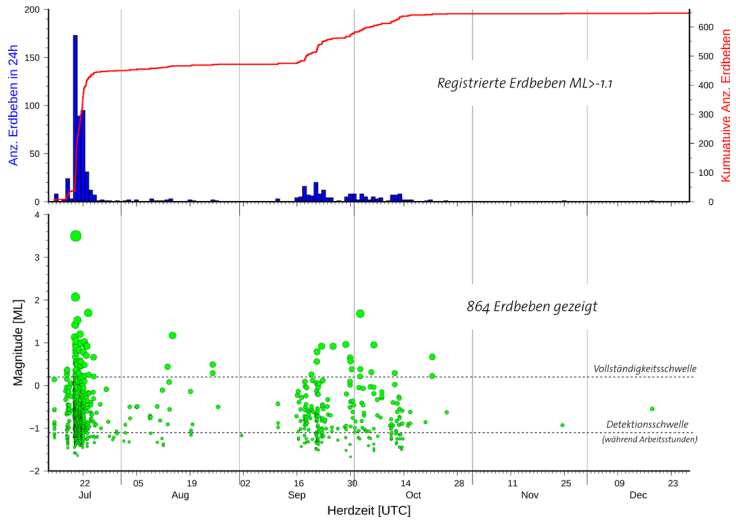
Earthquakes due to the geothermal energy project in Basel, 2006

With the Support of
swissenergy

In Brief

Induced earthquakes in Basel and St. Gallen highlight how important it is to competently and independently assess seismic hazard and risk for the approval and implementation of deep geothermal energy projects.

The Swiss Seismological Service (SED) at ETH Zurich aims to support the involved authorities and industries in establishing uniform quality standards across cantonal borders regarding earthquake-related issues, approval procedures, and project implementation. With this aim in mind, the SED offers competent, project-based earthquake consulting and monitoring services through the GEOBEST-CH project, supported by SwissEnergy.

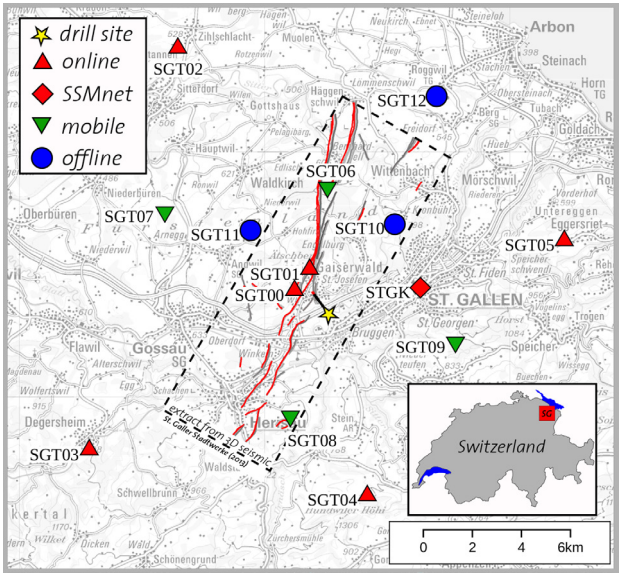


Earthquakes geothermal project SG, 2013

SED Services

Seismic Monitoring

Expert seismic monitoring is required when it comes to evaluating the seismic reaction of the subsoil to the intervention associated with a deep geothermal energy project, and to taking any appropriate measures to minimize this reaction. GEOBEST-CH has a pool of surface and borehole seismometers that the SED can use to provide active support on selected projects in this important task. This enables the SED to contribute its expertise and experience in the areas of network planning and operation, real-time seismic analysis, and automatic notification of the relevant authorities and stakeholder groups in an optimal manner, and without significant additional costs for the cantons or operators. At the same time, it also makes it possible to avoid insufficient seismic monitoring due to cost pressure or lack of competence.



Seismic network geothermal project SG, 2013

Edwards, B., Kraft, T., Cauzzi, C., Kastli, P., Wiemer, S., 2015. Seismic monitoring and analysis of deep geothermal projects in St Gallen and Basel, Switzerland. Geophys. J. Int. 201, 1020–1037.

Cantonal and Federal Support

The SED has internationally-recognized expertise in seismic research and monitoring, and it maintains a task force that focuses specifically on the scientific and applied aspects of induced seismicity. GEOBEST-CH enables the SED to make this expertise available to cantonal and national supervisory authorities that currently lack this expertise themselves. This puts the SED in a position to provide advice and support in the evaluation of seismic issues with regard to the approval, construction, and running of deep geothermal energy projects.

Quality Assurance
With GEOBEST-CH, the SED contributes to quality assurance in the context of monitoring and risk assessment in deep geothermal energy projects. A particular aim in this regard is to achieve a standardized approach in dealing with seismic issues in the context of environmental-impact assessments across cantonal borders, and should in the future also enable commercial providers to offer high-quality products that are potentially suitable for certification.

Neutral and Competent Information
Independent and objective provision of information to all stakeholder groups is essential for an open risk dialog on the topic of deep geothermal energy and induced earthquakes. The SED makes a valuable contribution to achieving this in the context of the GEOBEST-CH project. It does this by compiling neutral and reliable background information on all aspects of the issue, publishing this information on its website in each of Switzerland's three official languages. At the same time, it provides real-time information on observed earthquakes and their interpretation during the course of a GEOBEST-CH-supervised deep geothermal energy project. Members of the public can register their own earthquake observations online.

Knowledge and Technology Transfer
The mechanisms that lead to induced seismicity in deep geothermal energy are not well understood. In particular, no reliable methods are currently known for predicting or even preventing induced earthquakes of excessive intensity. It is essential, therefore, that collaboration and exchange between research and industry on an international level increase with a view to developing suitable solutions. GEOBEST-CH intends to hold national and international workshops on the subject of induced seismicity aimed at promoting and ensuring knowledge and technology transfer between research, industry, and local stakeholder groups.

Training and Further Education
Thanks to its close links with ETH Zurich's lectures and postgraduate courses, the SED makes a significant contribution to training and further education related to deep geothermal energy. Bachelor's and master's theses at ETH Zurich on the topic of induced earthquakes can be supervised within the framework of GEOBEST-CH, ideally in collaboration with operators of the projects supported by the SED in the context of GEOBEST-CH and the cantonal and national authorities involved.

Background

Seismogram of an induced earthquake

Deep geothermal energy is a promising technology for use in low-CO_2 electricity generation capable of meeting base-load requirements. Therefore, in Switzerland and the rest of Europe, there is considerable interest in using this procedure with a view to achieving an import-independent supply of power and heat for municipalities and companies. Several feasibility studies have been carried out on this topic in Switzerland in recent years.

The standard option – hydrothermal deep geothermal energy – channels hot water from an existing groundwater supply, but the chances of success are closely associated with geological constraints and therefore vary greatly from one location to another. Petrothermal deep geothermal energy seeks to compensate for this disadvantage by creating the groundwater supply itself by means of hydraulic stimulation. The chances of success of this procedure thus depend extensively on whether the reservoir with the desired rock temperature can be reached by drilling. The earthquakes induced during geothermal projects in Basel (December 2006, petrothermal) and St. Gallen (July 2013, hydrothermal) showed that, alongside geological and procedural considerations, seismological risks also have a major influence on the prospects of deep geothermal energy projects. While awareness of this has increased among the authorities and industries involved, there is often a lack of expertise necessary for evaluating, implementing, or monitoring a deep geothermal energy project from a seismological perspective.

The SED aims to help establish uniform quality standards across cantonal borders with regard to the handling of earthquake-related issues in approval procedures and the implementation of deep geothermal energy projects. Within the framework of the GEOBEST-CH project supported by SwissEnergy, the SED therefore offers competent, project-based earthquake consulting and monitoring services for national, cantonal, and local supervisory authorities. Services are only provided to the industrial sector if these do not impact the independence of the SED in any way.

Any Questions? Contact Us!

For further information about the GEOBEST-CH project and the topic of induced earthquakes in deep geothermal energy, go to www.seismo.ethz.ch. Do you require seismic consulting or support in the evaluation of a deep geothermal energy project, or are you interested in seismic monitoring of your geothermal project as part of GEOBEST-CH? We would be happy to answer any questions you might have about GEOBEST-CH.

Contact
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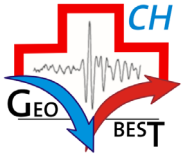
Project responsible seismologist of GEOBEST-CH

GEOBEST-CH is supported by SwissEnergy. A range of parties play an important role in the area of energy efficiency and renewable energies. SwissEnergy is the central platform for informing, networking, coordinating, and increasing awareness among these players, as well as supporting the exchange of expertise. SwissEnergy is managed operationally by the Swiss Federal Office of Energy.



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