



Geothermix Conference



29 November - 01 December

Pisa - Department of Earth Science

THE SESSIONS

S01 - APPLICATION OF STRUCTURAL
GEOLOGY IN GEOTHERMAL SYSTEMS

S02 - GEOCHEMISTRY APPLIED TO
GEOTHERMAL SYSTEMS

S03 - GEOPHYSICAL METHODS APPLIED TO
GEOTHERMAL SYSTEMS

S04 - MONITORING, MODELLING AND
IMPACTS ASSESSMENT

S05 - DIDACTIC AND DISSEMINATION OF
GEORESOURCES

Partial refunds are foreseen for 10 Phd students
from Unione Geotermica Italiana (UGI)



Abstract submission:
25th June to 30th July

More information



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S01 - APPLICATION OF STRUCTURAL GEOLOGY IN GEOTHERMAL SYSTEMS

Keynotes:

- **Tsegaye Abebe, Senior Geologist**
- **Anette Mortensen, Geothermal Geologist in Iceland**
- **Domenico Liotta, Professor at the University of Bari**

The Earth's crust deforms as a result of plate motion and magmatic activity, creating tectonic structures (fractures). They appear on the surface of the earth aligned to the direction perpendicular to their extension and have vertical extensions from a few to several depths. Because fractures control the paths for the transport of fluid into and out of the reservoir in accordance with the orientation of the existing stress field, structural geology is crucial in investigating and evaluating surface and subsurface structures for geothermal exploration and utilization.

Structure is one of the most important aspects of a geothermal system because it controls the three main elements: the heat source, reservoir, and fluids (recharge). Structural studies begin with the initial phase of exploration and continues through the drilling phase. There are several reasons to study structural geology for geothermal systems, chiefly the characterization of the reservoir. Structure plays a role in relation to permeability, and their interconnections lead to a desirable permeable reservoir and thus facilitate hydrothermal fluid circulation. Hence, structural geology helps estimate possible fluid flow. In addition, fractures are the only way for the surface geothermal indicators to manifest from the deeper part of the Earth.

A detailed structural study is critical for site selection for the production and fluid injection wells and drilling strategies. Accordingly, this session aimed to encompass the application of structural geology to geothermal systems and the assessment methods.



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S02 - GEOCHEMISTRY APPLIED TO GEOTHERMAL SYSTEMS

Keynotes:

- **Andri Stefánsson, Professor at the University of Iceland**
- **Monia Procesi, Researcher at INGV-Roma**
- **Marco Taussi, Researcher at the University of Urbino**

Geochemistry is a fundamental tool when studying geothermal systems. It can be used to infer past and present reservoir temperatures through the application of geothermometers and fluid inclusion analysis, among which the latter can give information also on the composition of the fluids. Furthermore, the study of the recharge and circulation of the geothermal fluids in the system plays an important role. This can be done analysing water and gas samples.

The above-mentioned are just some of the applications of geochemistry in this field. In fact, there are other important parameters of these systems, as, for example, the CO₂ diffusion. In such zones, CO₂ can be emitted either from fumaroles, boiling pools or directly through soil diffusion. This parameter is useful to estimate the heat associated to the convection of geothermal fluids, in particular during the exploration phase.

The application of geochemical methods is thus fundamental not only during its exploration, but it's even more important during the use of the resource. On one hand, the establishment of the system has to be reconstructed, while on the other, during its utilization the evolution should be monitored. The latter is a crucial aspect when considering a proper managing of the resource.

This session aims to share new methods that are applied to the study of the evolution of geothermal systems, as well as the related outcomes that are being achieved.

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S03 - GEOPHYSICAL METHODS APPLIED TO GEOTHERMAL SYSTEMS

Keynotes:

- **Alfredo Mazzotti, Emeritus Professor at University of Pisa**
- **Federica Lanza, Researcher at ETH Zürich**
- **Antonio Pio Rinaldi, Researcher at ETH Zürich**
- **Alessandro Santilano, Resarcher at CNR-IGG Pisa**

The exploitation of geothermal energy requires many preliminary studies in order to evaluate the presence of a reservoir and the feasibility of a project. Geophysics provides the possibility of subsurface exploration and characterization through the reconstruction of physical properties distribution of the Earth's interior, and the study of physical processes that occur within it. Geophysical methods such as reflection seismic, electrical, magnetic, electro-magnetic, and gravimetry, are fundamental in providing quantitative information about the presence and location of fractures and faults. Indeed, they permit us to understand the permeability of rocks, to monitor production operations and environmental safety. In addition to conventional geothermal systems, characterized by the natural presence of high temperature fluids, Enhanced Geothermal Systems provide for the artificial generation of a reservoir in hot dry rock contexts. This approach makes geothermal energy a valuable resource no longer confined to volcanic or hydrothermal regions. Stimulation and production operations increase the necessity of reliable techniques for micro seismic monitoring. The Geophysics session hosts contributions on innovative methodologies for data processing and monitoring and on applications of geophysical techniques to geothermal areas, both surface and well methods.

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S04 - MONITORING, MODELLING AND IMPACTS ASSESSMENT

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Keynotes:

- **Franco Tassi, Professor at the University of Florence (UNIFI)**
- **Antongiulio Barbaro, Franco Giovannini, Forecast Modelling Sector (ARPAT)**
- **Cesare Pertot, Environment and Sustainability Product Leader at CESI**
- **Daniela Nuvolone, Unit of Epidemiology (ARS Tuscany)**

Like other human activities, the exploitation of geothermal energy can generate pressure on the environment in both drilling and operation phases of geothermal plants.

Proper monitoring of the pressure indicators is essential for preventing and assessing impacts on the environment and people's health. During the assessments, the context in which the plants are installed must be taken into consideration. For example, the geological context can influence the state of the environment and affect the background values of the monitored parameters. Furthermore, other anthropic activities, such as mining, can cause pressure and generate impacts on the environment in these geological regions. Diffusion models can be valid tools for planning the monitoring network and for evaluating the impacts of geothermal energy exploitation on the environment. The study of isotopic compositions can be also an effective aid in identifying the origin of pressures.

This session deals with the methodologies used in environmental sciences, starting by planning the monitoring of the selected parameters, including sampling and analyses, and ending up with the modelling. Case studies in geothermal areas will be shared, as well as actions to reduce pressures and impacts. Finally, epidemiological studies will be presented to evaluate the impact on human's health near geothermal areas.

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S05 - DIDACTIC AND DISSEMINATION OF GEORESOURCES

Keynotes:

- **Susanna Occhipinti, Researcher in didactic and communication of geosciences**
 - **Giulia Realdon, teacher trainer in Geosciences for EGU**
 - **Giovanna Lucia Piangiamore, Researcher at Istituto Nazionale di Geofisica e Vulcanologia - Sezione Roma 2, sede di Lerici**
 - **Jessica Maria Chicco, Researcher at University of Torino**
 - **Roberto Greco, associate Professor at Unicamp, Brazil**
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The different types of renewable energy, including geothermal energy, are one of the solutions to address problems, such as energy supply with low CO₂ emissions and climate change. In order to use these resources in an increasingly effective way, the geological, environmental and technological research are of great importance. On the other hand, the diffusion of knowledge about renewable energies and their potentialities among the new generations is also significant. Considering this, it is also essential to underline the economic and environmental importance of the use of geothermal energy. The theme fits very well within the Civic Education recently introduced (2019) in the Italian school as a curricular subject and which aims to "Form responsible and active citizens by promoting full and conscious participation in the civic, cultural and social life of the communities, in compliance with the rules, rights and duties". Geothermal energy, in fact, in the 2030 Agenda belongs to GOAL 7 "Affordable and clean energy" and to GOAL 13 "Climate action".

Therefore, it is of great importance to introduce all these concepts to the new generations: this session aims to share different teaching methodologies on these topics, in order to provide a further stimulus for teachers to address the topic of georesources with their students.



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