

**Multiscale characterization of fracture zones and the role of fluids:
Geophysical and petrological study of the Vallès fault in Samalús (NE
Spain)**

Gemma Mitjanas Colls

Project Directors: Gemma Alías López
Juanjo Ledo Fernández

ABSTRACT

Samalús area, located at the Neogene Vallès fault, has been the aim of the study during the last thirty years due to its interest for geothermal resources exploration.

The geothermal system of Samalús has its recharge area in the Montseny, above Paleozoic materials. Meteoric water runs down through these fractured materials while the temperature increases, approximately, 10°C every 100 m (on the first 600 m). Afterwards, this hot water ascends, having its principal path through the fault plane, but also through the fractured granodiorite. However, water that ascends through the granodiorite remains trapped under the Miocene basin limit.

This work aims to create a geological model of the area and understand its evolution in order to know how the geothermal system works. To achieve this, a multi-scale and multi-method approach has been done based on the integration of MT and ERT profiles, fractures mapping and thin section analysis.

The electrical resistivity methods have allowed a better constraint of the Vallès fault and the recognition of three other minor related faults, which are located in the Miocene-basement limit. Petrographic analysis, together with the quantification of fracture density, has allowed the characterization of a thin core fault of 10 m, represented by cataclasites, and a damage zone of fractured granodiorite of, at least, 350 m. Finally, a possible deep-water reservoir has been delimited, probably related with a weathered granodiorite.