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Session 1

**Application of structural geology in the
geothermal systems**

The three areas have an association in common where σ_1 is oriented NW-SE. The associated fractures are found both far away and close to large-scale faults, without change in intensity. The plunge of σ_1 is parallel to the dip of the bedding, so this association formed prior to folding.

We conclude that this fracture association formed a regional background network prior to localization of deformation in large-scale faults, and thus predict its presence in the subsurface of the Geneva Basin. Preliminary results of well log images confirm this prediction.

The next step is to use present-day dynamic well data from Geneva wells to analyse the flow response of the background fracture networks based on outcrop data and hence predict the specific impact of this network on fluid and heat dynamics in the subsurface.

Keywords: Fractures; Stress; Geneva

Structural Characteristics of the Geothermal Reservoir in the Karabağ Geothermal Field, Büyük Menderes Graben (Western Türkiye)

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The Büyük Menderes graben is one of the most important geothermal resource areas, particularly for the electrical energy production. In this study, we present structural characteristics of the high-temperature (>150 °C) geothermal basin of the Karabağ geothermal field (KGF) situated in the western part of the east-west trending Büyük Menderes graben. The study area is located in the Menderes Massif, which is represented by the Precambrian crystalline core and Paleozoic-Mesozoic metasedimentary cover series. In the KGF, distinct from the typical stratigraphy of the Menderes Massif, the crystalline core series rocks are tectonically located on the cover series. The basement rocks are unconformably overlain by Neogene-Quaternary terrestrial sedimentary rocks. In the KGF, the primary reservoir lithologies are composed mainly of marble, calcschist, and micaschist alternations within the cover series of the Menderes Massif, while the core series gneiss and schist, along with Neogene sedimentary rocks, form the cap rocks. Hydrothermal fluid circulation is predominantly controlled by intensely fractured fault segments that developed during active north-south extensional tectonics. The detachment and high-angle normal faults significantly contribute to facilitating the upward migration of geothermal fluids along a fractured network, enabling the transportation of heat from the crystalline basement into a shallower geothermal reservoir. In the KGF, three major fault systems are identified as crucial for the development of suitable geothermal reservoirs: (i) the tectonic zone between the core and the cover series of the Menderes Massif, (ii) the south-dipping detachment fault zone (known as the Büyük Menderes Detachment Fault) intersecting the schist-marble of the cover series, and (iii) east-west trending high-angle normal

faults that form the northern margin of the Büyük Menderes graben and intersect with the detachment fault. Magnetotelluric geophysical surveys suggest the presence of low-resistivity zones corresponding to these major tectonic elements.

Keywords: Büyük Menderes graben; Karabağ geothermal field; Menderes Massif
