



Stress and strain around a multiply reactivated deep-seated fault zone and its impact on a potential geothermal reservoir – The Freiburg-Bonndorf-Bodensee fault zone

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The Swiss and German Molasse Basin is generally of high geo-economical interest as it is considered to host potential reservoirs for natural gas and geothermal energy production, as well as sites for radioactive waste disposal and CO₂ storage. Its successful exploration and eventually exploitation requires detailed understanding of its deep underground in particular its structural characteristics. Information of the rocks underlying the up to km thick Molasse sediments is mainly available from drillhole and seismic data. Outcrops of Mesozoic and Paleozoic sediments as well as the crystalline basement that could provide additional information on structural geological characteristics are very rare and mostly restricted to the borders of the basin.

This study focuses on the eastern part of the Freiburg-Bonndorf-Bodensee Fault Zone (FBBFZ; e.g. Paul 1948, Carlé 1955), a roughly 100 km long fault system, which runs approximately from the Kaiserstuhl in the Upper Rhein Graben across the Black Forest Massif to the Lake Constance. Its extensive present day surface trace allows to study the fault zone as it cuts through a wide range of lithologies from the Variscan basement of the Black Forest to the Tertiary sediments of the Molasse west of Lake Constance. As such, it can serve as natural analogue for the characterization of fault structures in the subsurface of the Molasse Basin. The Randen Fault is a well-exposed NW-SE trending fault segment of the FBBFZ, situated in NE Switzerland and SW Germany. In the field, as well as in seismic sections the structure shows the characteristics of a normal fault but there are indications for a dextral transcurrent overprint.

We presents a kinematic analysis of outcrop scale fracture systems collected along the various segments of the FBBFZ with a focus on the Randen Fault segment. The results indicate a perturbation of the regional fracture characteristics and the paleostress pattern in the vicinity of the fault zone. A recently drilled geothermal exploration well nearby showed similar stress and strain characteristics based on structural analysis of core material and in situ stress measurements and hence confirmed the results obtained during field work. The comparison shows the valuable input of tectonic surface investigations during the early exploration stage of geothermal projects.

Carlé, W. (1955). Bau und Entwicklung der südwestdeutschen Grossscholle, Geologisches Jahrbuch, Beihefte, 16, 272 pp.

Paul, W. (1948). Beiträge zur Tektonik und Morphologie des mittleren Schwarzwaldes und seiner Ostabdachung, Mitteilungen der Badischen Geologischen Landesanstalt, 45-49.