

Structural analysis of the Valence basin (SE France) based on kriging and borehole data: implications for hercynian fault zone behaviour in geothermic reservoirs.

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The Valence basin is a 130 km-long and 60 km-wide Tertiary sub-basin situated north to the SE basin of France, in the central part of the European Cenozoic Rift System (ECRIS). That structural key position in a naturally fractured hostrock associated with a favorable thermal regime make that basin a good target for geothermal exploitation in France. The structure and kinematics of the Valence basin is controlled by a several kilometer-scale hercynian fault system that may have a strong influence on fluid flows and thermal anomalies within the basin. This study aimed to constrain the geometry of deposits and the way they fracture regards to the major faults, to determine their diagenetic evolution and to characterize the hydraulic behavior of the major faults. We thus performed a structural model of the basin and analyzed the Montoisson borehole.

Kriging on data pointed on 348 boreholes from BSS, synthetic boreholes calculated from two seismic lines and isohypses from existing models allowed modeling the geometry of basement and the cenozoic unconformity. Basement is structured by two pluri-kilometer long fault corridors striking N/S to NE/SW. The central extends laterally on around 1 kilometer and has been identified as a segment of the Cevennes fault. The maximum depth of the basement is around 6000 m and is situated between the two corridors. Interpretations on seismic lines highlight a westward migration of Cenozoic depocenters within time.

A structural analysis of the Montoisson borehole confirms it is affected by a major fault interpreted as the Cevennes fault. Fault zone cuts across the Keuper and is characterized by an heterometric breccia within marly layers. The entire sedimentary pile recorded 2 sets of fractures: perpendicular and parallel to the borehole axis. Both sets are recrystallized. Nature of recrystallization (quartz, calcite and dolomite) strongly depends on the hostrock. An important thread of barite is located under the fault zone, putting forward the potential role of drain of that fault in the fluid flows across the basin.