Geophysical Research Abstracts
Vol. 14, EGU2012-9127, 2012
EGU General Assembly 2012

Petrophysical characteristics and fluid flow zones in the Buntsandstein sandstones reservoir according well cores and outcrop analysis (Upper Rhine Graben, France)

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Buntsandstein Sandstones (Lower Triassic), located in the Upper Rhine Graben, appears as an easy target for geothermal exploitation. This sedimentary reservoir links more or less permeable argillaceous sandstones intersected by many major faults to the regional thermal anomaly.
Petrophysical analysis (permeability, porosity, thermal conductivity, P-wave velocity), performed on cores from several boreholes and samples from several outcrops in the Vosgian Mountain, drive us to characterise fluid and heat transfer capability of the different sedimentary facies present in the Buntsandstein sandstones. First data from well cores analysis indicate that the more permeable and porous (respectively >100mD & >15%) facies are the Playa Lake and fluvial and aeolian sand-sheet, and the fluvial-aeolian marginal erg, whereas the more common facies, the braided rivers within arid alluvial plain, presents permeability <10mD and porosity <10%. Thermal conductivities present high heterogeneities and values range between 1 and 5 W/m/K and their detailed analysis according a new proposed method, drive us to determine fluid flow at formation scale: major fault drive hot fluid flow and feed permeable levels. Second, outcrop analysis allows us to analysis fracturation dispersion and petrophysical modifications induced by fracture and fault in the sandstone series. Barite and quartz precipitation in fracture indicate us fracture orientation and position, compare to major fault position, in which fluid flow has occurs.
All data acquired allow us to build a schematic geological block model: this block represent the Buntsandstein sandstone reservoir at depth with the different facies, above the Palaeozoic Granit and below the Muschelkalk limestones, intersecting by faults according the regional major azimuth. According each particular direction the particular fracturation is raised according outcrop data. This bloc points the major zones in which fluid circulation occurs.