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Petrophysical properties of fault zones in granite body, implication for deep geothermal reservoir behaviour.

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In EGS projects, fault zones are considered being the structures controlling deep flow at the reservoir scale especially in low porosity material like granite or metamorphic rocks . Using a large set of petrophysical properties (porosity, density, permeability, thermal conductivity) measured on cores collected along the EPS-1 borehole and from other outcropping analogues, a model of fault zone is proposed. A fault zone is a complex structure, showing different parts with different kinds of deformations and/or materials that could explain chemical and physical processes observed during fluid-rock interactions. The different parts composing the fault zone are 1) the fault core or gauge zone, 2) the damage zone and 3) the protolith; they are usually heterogeneous and show different physical properties. The damage zone is a potential high permeability channel and could become the main pathway for fluids if secondary minerals seal the fault core. Porosity is the lowest within the protolith, between 0.5 and 1%, but can go up to 15% in the fault zone. Permeability ranges from 10-20m2 in the fresh granite to, at least, 10-15 m2 in the fault core, and thermal conductivity ranges from 2.5 W.K-1m- 1 to 3.7 W.K-1m-1. Finally, variations in specific surface are set over two orders of magnitude. If the lowest values (permeability, porosity , specific surface)usually characterize the fresh granite far from fault zones, physical properties could show variations spread over their whole respective ranges within these fault zones. All of these results could be used to define the rule of each part in hydro-mechanical or chemical fluid rock interactions and the behaviour of fault zone during fluid flow.