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Use of markers of paleo-circulations to characterize the porous network of fractured granite.

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Fractured reservoirs in crystalline rocks are well studied nowadays for their application in water resources, oil exploitation or geothermics. In this king of rock, the matrice has a very low permeability and the fluid flow is localized in the fracture pattern. Thus, the characterization and the modeling of such reservoirs require the good knowledge of the fractures, in particular the orientation, density or spatial distribution. In actual fractured reservoirs, the access on those parameters are with seismic and borehole data. The two prospection techniques are at different scale and dimensions, and correlations between them are difficult to make. In consequence, it is necessary to study field rocks analogues on the underground fractured reservoirs. Tamariu's granite, Catalunya, is one of those fields' analogues. Previous studies have highlighted a structuration of the granite in structural blocs of different sizes, separated by faults, and internal fracture patterns in each bloc. Markers of intense paleofluids circulations have been seen in the faults and fractures of those blocs. This study follows the structural characterization of the fracture pattern and as the aim to study the fluid circulation in those fractures. With precise fracture maps, we have analyzed the principal flow direction and the nature of the hydrothermal deposits. Aside from primary hydrothermal quartz, the main secondary minerals are calcite and dolomite, and a little part of iron oxides. This observation, combined on the fracture maps, has allowed us to try a semi-quantification of the usable volume by the fluid in the granite at the circulations time. The fracture pattern has been the host of fluids of around 3% of their volume. Therefore, we have identified a diffuse flow in the grain matrice and which creates primary minerals alteration. The volume of alteration represent around 0,1-0,3% of the rock. In consequence, this study highlights a double-porosity behavior of the granite. On one hand, 3% of the volume represents fluid circulation in the fracture pattern. This volume could have a significant importance in the fluid flow of the reservoir, by supplying the flows in the major faults system. On the other hand, a diffusive alteration affects the granite in a zone around the fractures, characterizing the width of this zone could be a next step in the potential reservoir characterization of this granite.