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Fractured reservoir analogs: case study of paelocirculation markers on Tamariu's Granite.

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In fractured crystalline reservoirs, the grain matrix has in general a very low permeability and the fluid flow is localized in the fracture pattern. The flow in such fracture network is generally complicated to characterize, in on hand because many parameters (length, connectivity, aperture, tortuosity,...) are acting on the fluid flow, in other hand because the fractures at a reservoir scale using seismic data are not easy to characterize. In fact, the only information we have on fracture in buried reservoir are at a local scale with boreholes and at a kilometric scale with seismic. The study of field analogs is one way to establish a better comprehension of the fracture pattern between those two scales. Regional and outcrop studies on Tamariu's granite, which outcrops on the Catalonian Coastal Ranges, has permit the characterization of the faults and fractures at different scales. The faults network defines different sizes of structural blocks bordered by faults. In an unfaulted structural block, the granite exhibits a fracture network filled with hydrothermal carbonates, markers of important paleofluid circulation. These carbonates were analysed at different scales using fracture mapping, calcimetry and microscopy on thin- sections in order to define the location and the volume of the carbonates precipitation and to have an estimation of the paleo-porosity used by the fluids in the fracture network. With precise fracture maps, we analysed the principal flow direction and the nature of the hydrothermal deposits. The same maps, combined with calcimetry measurements, allow us to quantify the 2D volume of porosity used by the paleofluids. We have quantified the carbonates in different areas of percolation: the main veins, breccias cimented by carbonates, fractured granite and poorly fractured granite. The percentage of paleofluids markers reaches to 3% of the granitic rock, and the main part of them are localized in some fractured corridor composed of mains veins and breccias. This allow the definition of double porosity reservoir, with the veins acting as main fluid pass and the host rock poorly fractured where a part of the fluids can be stocked. The thin sections show that the carbonates crystallization is polyphased, with different shape and organization of the carbonates and iron oxides. In order to define the residual porosity and permeability, we have collected samples with different degrees of fracturation and cementation and a petrophysical analysis has been done.