Faculty of Geology – Master's degree in Reservoir Geology and Geophysics

Final Project

Integrated study of the Coll de Nargó area (South Pyrenees): Evolution of sediments, fractures and fluid flow regime.

Student: Nicholas Nardini

Tutor: Anna Travé

Academic year 2016-2017

Abstract:

The study area comprises the southern limb of the eastern sector of the fault related Sant Corneli-Bóixols-Nargó anticline and its related footwall Coll de Nargó syncline. Structurally speaking, the Sant Corneli-Bóixols-Nargó anticline is the leading edge of the Bóixols thrust sheet, corresponding to the oldest emplaced thrust sheet of the South Pyrenean unit. Bóixols thrust itself is buried by synorogenic sediments deposited during anticlinal building, as consequence, blinded fault's propagation was accommodated through a complex deformation pattern in his fossilizing sediments. Joints and strike-slip faults resulted mineralized by calcite cements, testifying that such structures allowed the fluid-flow in the studied anticline. $\delta^{13}C$ *values of calcite cements show correlation with stratigraphic units and highlight a strong control of lithology on the fluid isotopic signature. On the other hand calcite cements* $\delta^{18}O$ *values results constantly depleted when compared to adjacent host rock. Thanks to the petrographic study combined with* $\delta^{18}O$ *and* $\delta^{13}C$ *analysis, 4 types of fluids have been identified, flowing in different times during the evolution of the anticline. During the beginning of folding process a strongly* ^{18}O*-depleted fluid is recorded, and later a more* ^{18}O*-enriched fluid flew along the syn-folding joints. Afterwards, when the anticline reached her maximum amplification and could not easily accommodate any further orthogonal shortening, deformation found his expression trough the generation of a complex strike slip faults' conjugate set. Cements precipitated in strike slip faults are strongly depleted in* ^{18}O*. Precursor elements of strike-slip fault resulted filled by cements with two distinct isotopic signatures: first, by cements in isotopic equilibrium with the affiliate host rocks and then by cements having same isotopic signature of the ones encountered in faults. This data suggest a paleo-hydrological closed system during pre-slip fracturing stage, and attribute to strike-slip faults the responsibility to bring-in a new ascendant hotter fluid. Strike-slip faults here confirm themselves as elements that could enhance fluid circulation bringing vertical connection.*