

Master project Title: Relationship Between Fluids and Tectonics: The Montsec Thrust.

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Abstract: The Montsec thrust at the front of the Montsec thrust sheet in the southern Pyrenees, developed during Alpine compression from Paleocene to Late Ypresian. This study was done to understand the relationship, effects, possible origin and evolution of fluids with the tectonic deformation in the Montsec thrust sheet. Using structural fracture analysis six fracture sets were identified F1 strike slip, F2 bed parallel sliding, F3 N-S decametric joints, F4 N-S centimetric joints, F5 E-W joints and finally F6 WNW-ESE and NW-SE fractures and joints with strike slip movement. Petrographic observation and geochemical data from fracture filling cements, allow us to identify seven generations of calcite cement associated with different fluid flow and fracturing events. Four cements generations in hanging wall from Cc2 to Cc5, and in footwall three generations Cc0a, Cc0b and Cc1 have been identified. The study of oxygen and carbon isotopes in the calcite cement, provided information about type of fluid and fluid-rock interactions. A trend of depletion was observed precipitating cements in hanging wall Cc2 to Cc4, but then an enrichment was indicated by $\delta^{18}\text{O}$ of the fluid precipitating Cc5. The progressive depletion in $\delta^{18}\text{O}$ is related to mixing between hydrothermal and meteoric fluids, and the enrichment could be interpreted as dilution of the fluid or change in temperature of fluids that lead to disequilibrium.