Geophysical Research Abstracts
Vol. 17, EGU2015-3768, 2015
EGU General Assembly 2015

Insights on fluid-rock interaction evolution during deformation from fracture network geochemistry at reservoir-scale

Nicolas Beaudoin (1), Daniel Koehn (1), Olivier Lacombe (2,3), Nicolas Bellahsen (2,3), Laurent Emmanuel (2,3)

(1) School of Geographical and Earth Sciences, University of Glasgow,Gregory Building, Lilybank Gardens, G128QQ Glasgow, United Kingdom (nicolas.beaudoin@glasgow.ac.uk), (2) Sorbonne Universités, UPMC, Univ Paris 06, UMR 7193, ISTeP, F-75005 Paris, Franmce, (3) CNRS, UMR 7193, F-75005 Paris, France

Fluid migration and fluid-rock interactions during deformation is a challenging problematic to picture. Numerous interplays, as between porosity-permeability creation and clogging, or evolution of the mechanical properties of rock, are key features when it comes to monitor reservoir evolution, or to better understand seismic cycle n the shallow crust. These phenomenoms are especially important in foreland basins, where various fluids can invade strata and efficiently react with limestones, altering their physical properties. Stable isotopes (O, C, Sr) measurements and fluid inclusion microthermometry of faults cement and veins cement lead to efficient reconstruction of the origin, temperature and migration pathways for fluids (i.e. fluid system) that precipitated during joints opening or faults activation. Such a toolbox can be used on a diffuse fracture network that testifies the local and/or regional deformation history experienced by the rock at reservoir-scale.

This contribution underlines the advantages and limits of geochemical studies of diffuse fracture network at reservoir-scale by presenting results of fluid system reconstruction during deformation in folded structures from various thrust-belts, tectonic context and deformation history. We compare reconstructions of fluid-rock interaction evolution during post-deposition, post-burial growth of basement-involved folds in the Sevier-Laramide American Rocky Mountains foreland, a reconstruction of fluid-rock interaction evolution during syn-depostion shallow detachment folding in the Southern Pyrenean foreland, and a preliminary reconstruction of fluid-rock interactions in a post-deposition, post-burial development of a detachment fold in the Appenines. Beyond regional specification for the nature of fluids, a common behavior appears during deformation as in every fold, curvature-related joints (related either to folding or to foreland flexure) connected vertically the pre-existing stratified fluid system. The lengthscale of the migration and the nature of invading fluids during these connections is different in every studied example, and can be related to the tectonic nature of the fold, along with the burial depth at the time of deformation. Thus, to decipher fluid-fracture relationships provides insights to better reconstruct the mechanisms of deformation at reservoir-scale.