Age and duration of the extensional deformation recorded by the proximal parts of a rifted area which led to oceanisation

Romain Augier*[1], Hugues Raimbourg[1], Agathe Jullien-Sicre[2], Yves Missenard[2], Thomas Blaise[2], Michel Séranne[3], and Saskia Erdmann[1]

[1]Institut des Sciences de la Terre d'Orléans - UMR7327 – Bureau de Recherches Géologiques et Minières, Institut National des Sciences de l'Univers, Université d'Orléans, Centre National de la Recherche Scientifique – France

[2]Géosciences Paris Saclay – Institut National des Sciences de l'Univers, Université Paris-Saclay, Centre National de la Recherche Scientifique, Centre National de la Recherche Scientifique : UMR8148, Université Paris-Saclay : UMR8148, Institut National des Sciences de l'Univers : UMR8148 – France

[3]Géosciences Montpellier – Institut National des Sciences de l'Univers, Centre National de la Recherche Scientifique, Université des Antilles, Université de Montpellier – France

Résumé

The recent development of U/Pb LA-ICP-MS analyses on carbonates opened the way to unambiguously constrain the timing of deformation in the brittle field using crystallization of syn-tectonic calcites from fault planes/rocks whatever their size or finite displacement. It appears therefore possible to date increments of slip on a fault plane, to estimate duration of fault activity or the field stress responsible of deformation and ultimately to propose rates of deformation.
In order to explore the deformation record associated with rifting tectonics, a wealky deformed portion of the Golfe du Lion passive margin was selected. Providing exceptional outcrop conditions, the Corbières area displays the most proximal meso-scale normal faults associated with a dense microstructure array.

In a first step, meso-scale structures that are often characterized by thick breccia bodies, were mapped, while their local kinematics were determined. In parallel, microstructures were used to derive robust palaeostress field reconstructions. Results show a quite homogeneous paleostress field in which meso-scale structure integrate well despite a potentially strong tectonic inheritance and a subsequent reactivation. This detailed structural analysis was used as the base for the calcite sampling strategy allowing to select calcite samples from both microstructures and meso-scale fault breccias. Textures, growth history and an evaluation of the geochronological potential of the sample were conducted using conbined catholuminescence and LA-ICP-MS mapping tools on polished 2mm-thick oriented rock-sections.
Geochronological results show a quite large and common age span from ca. 28 Ma to 14 Ma, a dominant between ca. 28 to 21 Ma and a subbordinate between 17 to 14 Ma for both meso-scale structures and microstructures in distinct two age clusters. Taking into account

*Intervenant

errors, it seems that extensional field stress appears immediately recorded by the activity of meso-scale structures. Proximal portions of the margin far away from the hinge line do record the whole thinning history of the continental crust. The whole volume of the extended domain therefore remained active with dratically different bulk strain rates and fault slip rates. Conversely, it appears tempting to ascribe the ca. 21 to 17Ma period of inactivity to the spreading period in the Algero-Provençal Basin.

Mots-Clés: U/Pb on calcite, Paleostress, Rifting, Passive margin, Golfe du Lion