
Outcomes from LA-ICP-MS datings on syntectonic calcite, a case study of the Corbières Area (France)

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Résumé

Absolute dating of an increment of deformation remains extremely challenging as the result of the complex behavior of the isotopic systems in geological environments. The unprecedented development of U/Pb LA-ICP-MS age dating of carbonates opened the way to unambiguously constraint the timing of deformation by dating syn-tectonic calcite from fault planes (regardless of their importance) or closely associated veins. One major advantage of constraining the absolute age of deformation features resides in the fact that microstructures are involved in the reconstruction of palaeostress field(s) experienced and recorded at the scale of large portions of continental crust. In order to test the potential of this structurally-constrained geochronological approach, we choosed the Corbières region (France) as a natural laboratory, exemplary in terms of polyphase tectonic evolution where at least effects of the Pyrenean shortening is partly overprinted by the Golfe du Lion rifting. In addition, the study area presents both microstructures used for palaeostress reconstructions and meso-scale fault systems allowing a straightforward scale transfer. In this study, the compilation of exiting palaeostress reconstructions was complemented by new structural measurements and new palaeostress calculations, particularly for the extensional structures. Meso-scale structures, often characterized by thick breccia bodies were also carefully mapped while their local kinematics were determined as much as possible.

The detailed structural analysis was used as the base for calcite sampling, permitting us to select microstructures and meso-scale fault breccias pertaining to well documented tectonic events whose relative chronology is known. LA-ICP-MS analyses were conducted on polished, 2 mm-thick oriented rock-sections, often preserving the kinematics of structures and the complete calcite growth history. Geochronological results show four very well characterized age-clusters at 45 ± 3 Ma, 22 ± 1 Ma, 16 ± 1 Ma and 5 ± 1 Ma. We will present 1) the sequence of deformation from layer parallel shortening to the development of meso-scale structures and 2) the time-scales of each tectonic event. New improvements for selecting calcite samples for successful U/Pb datings by LA-ICP-MS will be also presented.

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Mots-Clés: Polyphase deformation, Palaeostress reconstructions, Sampling strategy, LAICPMS
U/Pb dating, Syntectonic calcite