Geophysical Research Abstracts
Vol. 21, EGU2019-7445, 2019
EGU General Assembly 2019
© Author(s) 2019. CC Attribution 4.0 license.

Deformation, metamorphism and U-Th-Pb geochronology in the Agly Massif (Pyrenees): deciphering between late-Variscan and Alpine tectonics

Jonas Vanardois (1), Pierre Trap (1), Françoise Roger (2), Philippe Goncalves (1), Didier Marquer (1), and Jean-Louis Paquette (3)

(1) UMR 6249 Chrono-Environnement, Université de Bourgogne-Franche-Comté, Besançon, France (jonas.vanardois@univ-fcomte.fr), (2) UMR 5243, Laboratoire Géosciences Montpellier, Université de Montpellier2, Montpellier, France, (3) CNRS–UMR 6524 Magmas et Volcans, Université Blaise Pascal, Clermont-Ferrand, France

The Agly Massif (AM), located in the northern Pyrenean zone (NPZ), consists of a Proterozoic to Paleozoic sediments that have been metamorphosed during the Variscan orogeny leading to a migmatitic and gneissic core mantled by an upper crustal sequence of marbles, schists and micaschists. Like most of the Variscan massifs in the NPZ, it is characterized by a very high metamorphic gradient in the upper crustal sequence (up to 60-70°C/km). This anomalous metamorphic gradient was recently debated, with two main geodynamic models: (1) a Variscan late-orogenic extension or (2) a Cretaceous hyper-extension. The most debated point is the age and the tectonic significance of several mylonitic zones that may have accommodated extensional deformation.

The structural analysis shows that the ductile finite strain pattern results from three superimposed deformation events. An early N-S trending S1 foliation is recognized in the whole metasedimentary sequence as a preserved structure in low-D2 strain areas. Kinematics and strain regime of D1 are unknown. In response to D2 vertical shortening, S1 is folded and subsequently transposed into a flat lying S2 foliation, bearing a N20 stretching lineation, that constitutes the prevailing planar fabric observed in the massif. D2 deformation is also characterized by the development of conjugate mylonitic zones in the gneissic core, with preferred top-to-the-north shearing. The D2 event is coeval with the high-temperature low-pressure M2 regional metamorphism present in the whole massif. In the gneissic core, M2 is suprasolidus in Sill-Cd-Grt bearing migmatites. In the metasedimentary cover, M2 is evidenced by the successive appearance of Bi, Cd, And and Sill index minerals that emphazises the HT-LP gradient. The D3 event is defined by a km-wide vertical E-W trending high-strain corridor throughout the entire massif, with up-right F3 folds and S3 vertical foliation. The few L3 horizontal stretching lineations and shear criteria argue for horizontal shortening and dextral shearing. From field observation, D3 deformation and related M3 metamorphism are coeval with the emplacement of the Variscan Tournefort diorite.

The U-Th-Pb LA-ICP-MS dating of zircon/monazite grains from migmatites and magmatic rocks reveals that the partial melting linked to D2/M2 started before ∼305 Ma and was still active at ∼290 Ma. The magmatic activity began around 308 Ma with a charnockite and granitic intrusives, and finished at ∼290 Ma with late pegmatites and leucogranites intrusions. Our results also indicate that D3/M3 event overlaps D2/M2 tectono-metamorphism in time.

None of our results is consistent with a Cretaceous extensional event responsible for the flat lying D2 foliation and mylonitization in the Agly massif. Our results rather indicate a late-Variscan evolution with an early D1 deformation (crustal thickening?) followed by a subsequent D2 crustal thinning during late-Variscan collapse or transtensional regime. The late-D2 evolution may have occurred in a regional dextral strike-slip regime, responsible for the development of D3 local corridor during the ascent of the late magmatic intrusives.