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# From crustal thinning to mantle exhumation: what the Pyrenean breccia formations tell us.

C. Clerc (1,2), A. Chauvet (2), Y. Lagabrielle (2), J.-Y. Reynaud (3,4), P. Boulvais (5), R. Bousquet (5), A. Lahfid (1,6), A. Vauchez (2), and S. Mahé (2)

(1) Laboratoire de Géologie de l'ENS, Ecole Normale Supérieure, Paris, France (clerc@geologie.ens.fr), (2) Géosciences Montpellier, Université de Montpellier 2, Montpellier, France, (3) Muséum national d'Histoire naturelle, Paris, France, (4) ISTeP, Université Pierre et Marie Curie, Paris, France, (5) Géosciences Rennes, Université de Rennes1, Rennes, France., (6) BRGM / LMA / MIN, Orléans, France

Several formations with various breccia types occur in Mesozoic basins disseminated along the North Pyrenean fault, on the northern flank of the French Pyrenees. Due to their location along the Iberia-Europa plate boundary, the North Pyrenean breccia formations represent complex archives documenting the tectonic and sedimentary evolution of the Pyrenean realm during the Aptian-Albian period. In particular, the North Pyrenean breccia formations have recorded the main stages of crustal thinning, continental break-up and mantle exhumation, which occurred along the North Pyrenean Zone (NPZ). We will review the main sedimentary, structural, metamorphic and geochemical characters of these breccias, based on new field investigations conducted in both the Western and Eastern Pyrenées (Agly, Aulus, Moncaup-St Béas and Urdach localities). Based on our new founding, we re-intrepret the significance of the breccia formations in the light of the most recent models developed for the pre-orogenic evolution of the Pyrenees.

In several places and mostly close to the contact between Paleozoic basement and Mesozoic cover, we systematically recognized the following three types of breccias: i) Semi-ductile syn-metamorphic breccias resulting from the boudinage of silicic or dolomitic beddings in ductily deformed marbles. ii) Cataclastic breccias disturbing the neighbouring host rocks and displaying a relatively monogenetic character. These tectonic breccias result from the disruption of the Mesozoic metamorphic platform under cooling conditions. They are dominated by cataclastic levels mainly located in the Triassic and Liassic weaker levels, iii) Polymictic sedimentary breccias, which composition is dominated by clasts of Mesozoic metasediments. Locally, close to subcontinental mantle bodies, the sedimentary breccias include numerous clasts of ultramafic and/or crustal basement rocks. Such breccias are the witness of the disruption of the sedimentary cover of the North Pyrenean Zone massifs followed by clastic sedimentation in a context of hyper-extended crust and mantle exhumation.

Improving the knowledge of the formation of the different types of breccia exposed all along the Northern Pyrenees brings important hints to decipher the tectonic history responsible for the formation of the metamorphic basins and the exhumation (and reworking) of deep crustal and mantle rocks in the NPZ.