Geophysical Research Abstracts
Vol. 21, EGU2019-9922, 2019
EGU General Assembly 2019

Alpine ductile deformation in the Mesozoic cover of the Axial Zone of the Pyrenees (Eaux-Chaudes massif)

Norbert Caldera (1), Antonio Teixell (1), Albert Griera (1), Pierre Labaume (2), and Abdeltif Lahfid (3)

(1) Dept. de Geologia, Universitat Autònoma de Barcelona, 08193 Bellaterra, Spain, (2) Géosciences Montpellier, Université de Montpellier-CNRS, 34095 Montpellier, France, (3) Bureau de Recherches Géologiques et Minières, Orléans, France

The Eaux-Chaudes massif is a complex south-verging fold and fault structure located in the western Axial Zone of the Pyrenees. The stratigraphic succession consists of Upper Cretaceous limestones and shales lying unconformably on Paleozoic basement or Triassic pods of Buntsandstein, and featuring inliers of Keuper facies and ophites. The structure has been interpreted as a duplex in Cretaceous rocks with a roof thrust carrying allochtonous Paleozoic rocks, called the Eaux-Chaudes thrust (e.g. Ternet, 1965).

Our work has consisted on a revision of the structural style by field analysis and mapping, sample collection, microstructural analysis by Electron Backscattered Diffraction, and paleotemperature analysis by Raman Spectroscopy of Carbonaceous Material. Our preliminary results lead to a modification of the previous interpretation of the massif. Most significantly, a large allochtonous Upper Cretaceous unit has been identified in overturned bedding polarity, featuring high-strain shearing microstructures. The general structure is thus defined as a large basement-involved recumbent anticline with Paleozoic rocks in the core, much in the style of the Helvetic nappes of the Alps, locally affected by early diapirism testified by Keuper and ophites injected among Cretaceous rocks. This fold nappe overrides a right-way-up thin undeformed Upper Cretaceous panel that lies on the Axial Zone Variscan basement.

Kinematic indicators as stretching lineation, angular relationships between schistosity and bedding and S-C structures evidence a south-directed tectonic transport. As strain intensity increases in the overturned fold limb, recrystallization and strong grain-shape and lattice-preferred orientation of calcite grains appears. The recrystallized matrix grain size ranges between 10 and 35 μm. Fifteen samples have been analysed by RSCM and fitted by Beyssac method (Beyssac, et al. 2002), which yielded paleotemperatures from 325°C to 375°C in Upper Cretaceous rocks (i.e. lower greenschist facies) that are consistent with the ductile microstructures observed.

These unexpected results lead us to a reassessment of the thermicity and the Pyrenean deformation conditions in the northern Axial Zone, characterized by high ductility with a subordinate role of thrust faulting. Finally, we discuss the thermal and tectonic implications of these observations for the current models for the Pyrenean orogeny.

Ternet, Y. 1965. Etude du synclinal complexe des Eaux-Chaudes (Basses-Pyrénées). PhD Thesis, Univ. of Toulouse, 152 p.

Beyssac, O., Goffé, B., Chopin, C. and Rouzaud, J. N. 2002. Raman spectra of carbonaceous material in metasediments: new geothermometer. J. Metamorph. Geol. 20, 859-871.