Geophysical Research Abstracts
Vol. 19, EGU2017-8795, 2017
EGU General Assembly 2017
© Author(s) 2017. CC Attribution 3.0 License.

HT-LP thermometamorphism modelling : Agly massif, French Pyrenees.

Baptiste Tournaire Guille (1), Marie-Lola Pascal (1), Anne-Marie Lejeune (1), and Catherine Annen (2)
(1) ISTeP, université Pierre et Marie Curie, Paris, France (baptiste.tournaireguille@laposte.net), (2) Department of earth science, university of Bristol, Bristol, United kingdom (catherine.annen@bristol.ac.uk)

Owing to the strongly anomalous thermal gradients implied, HT-LP metamorphism is a worldwide type of processes in which magma emplacement and solidification at relatively high levels in the crust must be considered as a potentially major heat source. Thermal modelling (e.g. Annen et al. 2005) is an appropriate tool for constraining the part played by such processes in practical cases of thermometamorphism.
We study the Agly massif, an exhumed part of middle crust from the Variscan belt in the French Pyrenees. This massif is a classical example of HT-LP metamorphism (Vielzeuf 1996), composed of a metasedimentary cover, mainly micaschists aged from upper Cambrian to Devonian, unconformably overlying an older basement of para- and orthogneisses. The Variscan metamorphic facies extend from greenschists, in the upper part of the cover, to granulites in the basement (Fonteilles 1976). The apparent geotherm of about 110°/km in the metasedimentary cover (amphibolite and greenschist facies) has given way to contrasting interpretations.
Magmatic activity partly synchronous with and probably related to the Variscan thermometamorphism is observed at the outcropping level as at least 4 magmatic bodies of mantle origin (Touil 1994), of Stephanian age, including granodiorites and subordinate diorites and gabbros. Recent U/Pb datations on zircons (Tournaire-Guille et al., in prep) also reveal the presence of lower Cambrian magmatism in the gneisses, therefore confirming their interpretation as a pre-Variscan basement.
The location (depth), volume (thickness), temperature (composition) and timing of magma emplacement are the parameters controlling the thermal effect to be modelled with a Matlab® code (Annen et al. 2005). In order to constrain these parameters, we have updated the lithostratigraphy and the PT conditions of the Variscan metamorphism in the Agly area. Mineralogic and petrologic data exploited in thermobarometric analyses compared with thermodynamic Perple_X modelling yield P-T peak estimates of 4.5 $\pm$ 0.5 kb and 720 $\pm$ 50 °C in the lower part of the massif, followed by an uplift at still high temperatures. Such conditions leave no clear indication of the pre-Variscan metamorphic grade in the basement, a parameter probably most important in the thermal modelling. A supposedly anhydrous or almost anhydrous character of the basement has been considered as a clue to explain the observed high thermal gradient in the overlying micaschists ('basement effect', Fonteilles & Guitard 1968).

Annen, C. « Thermal Constraints on ... ». Journal of Petrology. Vol 47, n°3 , 2005.
Fonteilles, M. « Essai d'interprétation... ». Thèse Université de Paris VI. 2 Tomes, 1976.
Fonteilles, M., Guitard G. « L'effet de socle... ». Bull. Soc. Fr. Minér. Cristallogr. 91, 1968.
Touil, A. « Géochimie et minéralogie... ». Thèse Ecole Nationale Supérieure des Mines de Paris, 1994. https://tel.archives-ouvertes.fr/tel-01052964/document.
Vielzeuf, D. « Les massifs nord-pyrénéens à soubassement granulitique » in Barnolas, A., and Chiron J.C., eds., Synthèse géologique et géophysique des Pyrénées : Introduction, Géophysique, Cycle hercynien, Ed. BRGM - ITGE, v.1, p. 502–521. 1996