Geophysical Research Abstracts
Vol. 18, EGU2016-7731, 2016
EGU General Assembly 2016

Metamorphic and tectonic evolution of Ceuta peninsula (Internal Rif): new interpretation in the framework of arc and back arc evolution

Emmanuelle Homonnay (1), Jean-Marc Lardeaux (1), Michel Corsini (1), Bénédicte Cenki-Tok (2), Delphine Bosch (2), Philippe Munch (2), Adrien Romagny (3), and Mohamed Ouazzani-Touhami (4)

(1) Géoazur, Université Nice Sophia Antipolis, Valbonne, France, (2) Géosciences Montpellier, Université de Montpellier 2, France, (3) ISTO, Orléans, France, (4) Earth Science Department, University of Tétouan, Morocco

In the last twenty years, various geophysical investigations have established that the Western Mediterranean opened in a subduction con@text as a back arc domain. In the Alboran basin the dip of the subduction plane is eastwards or southeastwards depending of considered models. If the geological records of back-arc opening are well-known, the arc-related tectonic and petrologic evolutions are still poorly documented. In order to decipher these markers, we focalised structural, petrological and thermo-chronological studies on the Ceuta peninsula located in the Rif belt, on the western part of the Gibraltar arc to the North of Morocco.

The present-day tectonic pile is constituted by: (1) the upper Ceuta unit, composed of High Pressure and High Temperature metapelites retromorphosed under Amphibolite-facies condition, with Ultra-High Pressure relicts, and pyrigarnite and spinel bearing peridotites boudins at its base, (2) the lower Monte Hacho unit, with orthogneisses metamorphosed under Amphibolite-facies conditions.

Structural analysis indicates a polyphase tectonic evolution: (1) an earlier deformation phase only observed in the UHP metapelites and characterized by a steep S1 foliation plane, (2) a main deformation phase associated to a pervasive gently dipping S2 foliation plane bearing a L2 stretching lineation and synschistose folds whose axes are parallel to L2 and (3) a late deformation phase which developed S3 foliation plane and L3 stretching lineation coeval with development of narrow normal ductile shear zones.
A zone of increasing deformation, several dozen meters wide, is identified as a major ductile shear zone involving the peridotitic lenses at the base of the metapelites of the Ceuta unit and overlaying this upper unit on top of the orthogneisses of the Monte Hacho lower unit. The attitude of mylonitic foliation and stretching and mineral lineations as well as the numerous shear sense indicators observed in the shear zone are consistent with a thrusting toward the NE. Furthermore, biotite-sillimanite bearing S2 foliation affecting the whole of crustal rocks is contemporaneous with the movement on this main ductile thrusting.

We combined garnet-biotite and GASP thermo-barometers with thermodynamic modelling (Theriak-Domino) in order to constrain pressure and temperature conditions of D2 and D3 tectono-metamorphic events. P-T conditions of D2 deformation are in the range 7-10kbar and 770-820°C and are compatible with syn-tectonic partial melting. D3 deformation event occurred at 1-7kbar and 400-550°C. These metamorphic conditions reflect abnormally high geothermal gradients during both shortening and thinning and are clearly compatible with the thermal evolution recognized in continental arcs.
Preliminary U-Th-Pb (monazite, zircon and xenotime) and previous Ar39/Ar40 (micas) analyses, furnished similar ages around 21 Ma for D2 and D3 events, suggesting a very fast transition from arc to back-arc dynamics.