P-T-time evolution of the continental crust during lithospheric extension: the Galicia Margin case (Spain).

Véronique Gardien*, G. Poupeau**, N. Arnaud***, B. Muceku** and E. Labrin**

*Université Lyon I, UMR 5570, 69622 Villeurbanne Cedex, France, vgardien@univ-lyon1.fr. ** UPRES-A 5025, CNRS, Institut Dolomieu, 38031 Grenoble, France. *** UMR 6524 CNRS, lab.Magmas et Volcans, 5 rue Kessler, 63000 Clermont-Ferrand, France.

The West Iberian Margin is subdivided into 3 segments formed during the northward propagation of the Atlantic ocean opening in Mesozoic. The segments are: the Tagus Abyssal Plain to the south, the Iberian Abyssal Plain (IAP) and the Galicia Bank (GB) to the north. All along the margin low-angle detachment faults bring into contact mantle material (serpentinized peridotites) with sheared gabbro and amphibolites in the Iberian Abyssal or granites and orthogneiss in the Galicia bank. This study presents the P-T- evolution of the upper and lower continental crust and the timing of their tectonic unroofing during the Mesozoic rifting.

The calculated P-T conditions from amphibolites evidence an early high T (650±50°C)-medium P (8±1 kbar) stage followed by a medium T (550±50°C)-medium P (5.5±1 kbar) stage obtained from the amphibole and the plagioclase elongated in the foliation plane dated at about 161 Ma (Turrin, 1999). The tectono-metamorphic evolution of the amphibolite ended under greenschist facies conditions as testified by the occurrence of chlorite elongated in the foliation plane or as patches after amphiboles. Magmatic zircons give a age of about 270 Ma (Rubenach et al. 1999) whereas retromorphic amphiboles and plagioclases give respectively 161 and 140 Ma ages (Turrin, 1999). We interpret this data as the Permian underplatting of the gabbroic rocks at the base of the Hercynian continental crust followed by the tectonic unroofing of the amphibolites during the Cretaceous rifting along a major ductile normal shear zone. Apatite fission track dating give central ages of 70±5 Ma for the amphibolites at the top of the cored section and 50±2 Ma for the weakly deformed amphibolites at the bottom of the hole. These cooling ages clearly are younger than the Cretaceous rifting. However the track lengths for apatite from the bottom of the section reveals a bimodal distribution, indicating that the amphibolites recorded a second thermal excursion below 120°C at about 50±5 Ma related to hydrothermal fluids circulation, but brief enough not to annealed older tracks occurring at about 130 Ma.

The $^{39}Ar/^{40}Ar$ dating obtained on alkaline granites of the Galicia bank give an age of 238 Ma on biotite, and ages between 126-150 Ma for the core of the K-Feldspar, the fission tracks on apatite give ages around 95 and 107 Ma. The biotite age suggest a Permian age for the emplacement of the granitic rocks foring the Galicia Bank. This magmatic stage is followed by the continental thinning occurring between 238 and 126 Ma associated with a very slow cooling. The thermal evolution of the rocks ended by a fast unroofing of the granites dated around 100-110 Ma and related to the continental break-up.

The P-T-t evolution of the rocks from IAP and the GB is in good agreement with the results obtained from the serpentinized peridotites and complete the thermal evolution through time of both the foot wall and the hanging wall of the low-angle lithospheric shear zone of the Galicia passive margin.