Geophysical Research Abstracts
Vol. 13, EGU2011-5849, 2011
EGU General Assembly 2011

Thermochronological evidence for significant Cenozoic exhumation in the Eastern Cantabrian Mountains

Charlotte Fillon (1), Luis Barbero (2), David Pedreira (3), Cecile Gautheron (4), and Peter van der Beek (1)

(1) ISTERRE,University Joseph Fourier, Grenoble Cedex 9, France , (2) Dpto. Ciencias de la Tierra, Universidad de Cádiz, 11510 Puerto Real, Cádiz, Spain, (3) Department of Geology, Univ. of Oviedo, Spain, (4) UMR Interactions et Dynamique des Environnements de Surface-CNRS 8148, University Paris Sud, 91405 Orsay, France

The Pyrenean-Cantabrian orogen has evolved in response to convergence between Iberia and Europe since the late Cretaceous. As a consequence, the Cantabrian Mountains, which record extensive Variscan deformation and a period of crustal extension in Mesozoic times, were reactivated during the Cenozoic. The most common interpretation is that north-verging subduction of the Iberian crust, well established under the Pyrenees, is continuous towards the West, under the Cantabrian Mountains. Indeed, the ESCIN-2 seismic profile in the eastern part of the range shows a single south-vergent wedge, structured by a crustal flat and thrust ramp, emerging at the southern front. To the south, the Duero foreland basin consists of Cenozoic syn- to post- orogenic sediments that are not precisely dated; therefore the age of deformation remains poorly constrained.

In the western part of the range, Apatite fission track data show Triassic to upper Cretaceous ages and do not record Cenozoic exhumation. There is a lack of data in the Eastern Cantabrians, however, where Cenozoic shortening is supposed to be most important. Thus, our goal is to provide constraints on the timing and amplitude of Cenozoic exhumation in the Eastern Cantabrians. To this purpose, we use fission-track (AFT) and (U-Th)/He thermochronology, both on in-situ and detrital Apatites. Fission-track analysis was performed at the Universities of Grenoble and Cadiz, while (U-Th)/He dating took place at Paris-Sud University. Samples were collected in the Central Coal Basin (CCB) south of Oviedo, and along the ESCIN-2 seismic section, in granodiorites and sandstones, mostly Stephanian in age.

AFT analysis provides two main sets of ages: four samples have Mesozoic ages from 184$\pm$11 to 124$\pm$10 Ma; and four other samples give record Oligocene-earliest Miocene ages (21$\pm$3 to 30$\pm$2 Ma). Oligocene ages are located along the ESCIN-2 profile and in the southern part of CCB, whereas Mesozoic ages are in the northern part of the CCB and near the southern deformation front, where the displacement along the frontal thrust is replaced by the development of a fault propagation fold that prevents large exhumations in the close proximity of the foreland basin. Track lengths of samples from the CCB and at the front were also measured. They are all very short, with mean values of 8 to 11 μm, showing that the samples remained a long time in the PAZ. T-t path modeling using HeFTy (Ketcham, 2005) confirms this assumption: these samples first experienced Mesozoic cooling and then stayed a long time at shallow depth in the PAZ to be finally exhumed during Cenozoic times.

Thus, the results clearly show a stronger Cenozoic exhumation imprint on the easternmost part of the Cantabrian Mountains and record a peak in exhumation during the late Oligocene. Apatite (U-Th)/He ages on the same samples (in progress) will allow us to define if those new data are representative of a clear Oligocene signal and to characterize the exhumation of this area. This presentation was supported by the EUROCORES programme TOPO-EUROPE of the European Science Foundation.