Geophysical Research Abstracts
Vol. 12, EGU2010-4081-1, 2010
EGU General Assembly 2010


# Constraints on Paleocene-Eocene uplift of the northern Pyrenees from AFT, ZHe and Z(U/Pb) dating on detrital grains

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The Pyrenees are a doubly vergent orogenic wedge built by the convergence between the subducting Iberian microplate and the European plate lasting from late Cretaceous to early Miocene. The backbone of the Pyrenean belt (Axial Zone) consists in a stack of thrusts units composed of Paleozoic series intruded by late-Variscan granitoids. Both pro- and retro-wedge sides of the Pyrenees are fold-and-thrust belts made of Meso-Cenozoic sediments thrusted onto the Ebro and Aquitaine foreland basins. The deep structure, highlighted by the ECORS profile, shows a strong asymmetry caused by the southward migration of deformation associated with the development of a Paleogene antiformal stack emplaced during wedge growth in the Iberian plate.

The present study focuses on the synorogenic deposits of the retro-foreland basin in the northern part of the belt. To examine the source rocks and quantify the exhumation rates, we combine fission track thermochronometry on detrital apatites with Helium diffusion and U/Pb thermochronometry on zircons.

The U/Pb system on zircons has a very high closure temperature and therefore this method provides us the age of grain crystallization. In our sedimentary series, the wide range of age distribution is a powerful tool used to distinguish the multiples and various eroded sources feeding the North Pyrenean foreland basin during early Cenozoic times. Thus, we can separate very old recycled Paleoproterozoic grains from Variscan intrusive magmas with ages around 310 Ma or younger grains coming from Permian and Triassic to lower Jurassic volcanics.

Exhumation rates are estimated through apatite fission track grain-age distributions and (U-Th)/He dating for two Ypresian and Bartonian synorogenic sandstone samples of the North Pyenean foreland basin. The first results obtained with AFT dating show two main grain populations, with ages ranging from Albian (around 100 Ma) to Paleocene-Eocene (50-60 Ma). These cooling ages are interpreted as related to the Albian post-rift exhumation and the syn-collisional exhumation, respectively and exhumation rates constant through Lutetian (around 0.4km/Ma) are estimated for the sources.

Since U/Pb zircon ages in the studied Paleocene sandstones are essentially younger than in situ basement ages, we can conclude that the Paleozoic basement of the Axial Zone was not exhumed at the surface before the Lutetian. These results bring us new constraints on the timing of Pyrenean wedge growth, used in a thermokinematic numerical model along ECORS profile.