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3D crustal and lithospheric structure of the Pyrenean orogenic wedge

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The Pyrenean orogenic wedge is the consequence of the collision between the Iberian microplate and the southwesternmost part of the Eurasian plate from 55 to 25 Ma (Eocene to Oligocene). The shortening began since Late Cretaceous, about 100 My ago, leading to about 75 km from the west to 125 km to the east of continental crustal shortening. Before this period of time, the region was characterized by a sedimentary basin associated with a very important thinning that later controlled the deformation during the shortening process. Mantle outcrops are therefore present along and north of the North Pyrenean Fault with a scattered localization to the west toward the Mauleon basin. Today, the horizontal deformation rate is very low and the recent seismicity, mainly normal faulting mechanisms, is certainly caused by coupling between erosion and isostatic readjustments. Images from seismic reflection, gravity modeling, local and teleseismic seismic waves inversions and magnetotellurics inversions are in agreement with the subduction of Iberia beneath Aquitania. The 3D crustal structure reveals the presence of an important thickening of the continental crust associated with the subduction of the Iberian lower crust through the north beneath Aquitania at the favor of a detachment. Lateral variations of the geometry (including that of the Moho) and the wave propagation properties are important. In order to better analyze waveforms from local, regional or teleseismic earthquakes and to better constrain the geodynamical evolution of the Pyrenean chain over the time, PYROPE and TOPO-IBERIA projects were born. Two temporary seismic arrays (using broadband seismometers), on the French and Spanish sides, have been deployed between 2010 and 2013. We present here preliminary results on 3D crustal structures (approximately in the window 40˚N-45˚N and -4˚E and 5˚E) from arrival-times of about 20000 earthquakes recorded at about 200 seismic stations between 1978 and 2012 including temporary arrays data. The travel-time local and teleseismic tomography uses a 3D *a priori* crustal velocity model based on all available geophysical data as initial velocity model (Moho, Conrad, Basement, Topography and P-waves velocity gradients). Additional constraints from receiver functions and local tomography are used to converge toward the best Moho solution. The upper-mantle tomography takes into account the crustal structure from receiver functions to correct travel-times residuals. Combinations of receiver functions, upper-mantle tomography, 3D crustal tomography (V_P and V_S) and relocated seismicity give us new improved 3D images of the deep structures beneath the Pyrenees.