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The Crust and Mantle Relationships Beneath Central and Southern Iberian Peninsula constrained by a 550 km long multiseismic transect

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A composite lithospheric cross section which is composed by data from controlled source multiseismic experiments strongly constrains the lithospheric structure of southwestern Iberia. The data includes coincident normal incidence and wide-angle profiles along an, approximately, 550 km long transect. This transect goes across, from North-to-South, the major tectonic zones that build up Southwestern part of the Iberian Peninsula (the Central Iberian Zone -CIZ-, the Ossa-Morena Zone -OMZ- and the South Portuguese Zone -SPZ-). The knowledge provided by these datasets constitutes the base to develop multidisciplinary models of the lithosphere. The multichannel deep seismic high resolution (60-90 fold) profiles, IBERSEIS & ALCUDIA were acquired in summer 2001 and 2007 are about 300 and 250 km long respectively. The transects image 20 s (TWTT), about 70 km depth. To address the crust and upper mantle structural relationships a reassessment of the normal incidence seismic reflection transect ALCUDIA has been carried out. We revised the key processing steps and applied advance analysis on the ALCUDIA transect with the aim to improve the signal to noise ratio especially in the deep parts and to produce a depth migrated image. The velocity model generated through wide-angle seismic survey (2003) was used to convert IBERSEIS time migrated stack image into depth. The new data processing flow provide better structural constraints on the shallow and deep structures as the current images reveal indentation features which strongly suggest horizontal tectonics. The ALCUDIA transect shows slightly less reflective upper crust about 13 km thick decoupled from the comparatively reflective lower crust. The reflectivity of the lower crust is continuous, high amplitude, horizontal and parallel though evidences of deformation are present as flat-ramp-flat geometry on the northeastern portion and a “Crocodile structure” wedging into the upper mantle on the southwestern portion of the ALCUDIA profile. The IBERSEIS transect characterizes the three different tectonic domains. In general, the upper crust is highly reflective and features numerous dipping reflectors which can be correlated to the surface geology and to the main tectonic contacts. The lower crust is less reflective for the OMZ, but deformation patterns are clearly visible under the CIZ and SPZ. An important feature of IBERSEIS transect is the Iberseis Reflective Body (IRB) at midcrustal level about 170 Km long and 2-3 km thick. The transects reveal a laminated, subhorizontal to flat, highly reflective to diffuse Moho indicating an average crustal thickness of 31-33 Km. From the detail image a large scale picture can be derived. This suggests three major horizontal limits/discontinuities, from top to bottom a horizontal discontinuity at approximately 13-15 km the Conrad discontinuity, the Moho discontinuity and the Hales discontinuity located within the upper mantle at 65-70 km depth.