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On the origin of the anisotropy observed beneath the westernmost Mediterranean region

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The Iberian Peninsula and Northern Morocco region provides an excellent opportunity to investigate the origin of subcrustal anisotropy. Following the TopoIberia-Iberarray experiment, anisotropic properties have been explored in a dense network of 60x60 km spaced broad-band stations, resulting in more than 300 sites investigated over an area extending from the Bay of Biscay to the Sahara platform and covering more than 6000.000 km2.

The rather uniform N100ºE FPD retrieved beneath the Variscan Central Iberian Massif is consistent with global mantle flow models taking into account contributions of surface plate motion, density variations and net lithosphere rotation. The origin of this anisotropy is hence globally related to the lattice preferred orientation of mantle minerals generated by mantle flow at asthenospheric depths, although significant regional variations are observed.

The anisotropic parameters retrieved from single events providing high quality data show significant differences for stations located in the Variscan units of NW Iberia, suggesting that the region includes multiple anisotropic layers or complex anisotropy systems have to be considered there. The rotation of the FDE along the Gibraltar arc following the curvature of the Rif-Betic chain has been interpreted as an evidence of mantle flow deflected around the high velocity slab beneath the Gibraltar Arc. Beneath the SW corner of Iberia and the High Atlas zone, small delay times and inconsistent FPD have been detected, suggesting the presence of vertical mantle flow affecting the anisotropic structure of the asthenosphere.

Future developments will include a better integration with the anisotropic estimations provided by Pn tomography and, in particular, with those arising from surface wave tomographic inversions using TopoIberia-Ibearray results. Additionally, the contribution of crustal anisotropy could be estimated from the analysis of receiver functions. The detailed knowledge on the anisotropic structure of this area could be used to test the recently developed multiparametric modeling methods inverting jointly observables as surface waves dispersion, receiver functions, surface heat flow, geoid height, elevation and anisotropy. (partially founded by: MISTERIOS project, CGL2013-48601-C2-1-R)