Geophysical Research Abstracts
Vol. 20, EGU2018-15317, 2018
EGU General Assembly 2018

Mantle upwellings below the Ibero-western Maghrebian region: constraints from teleseismic traveltime P- and S-wave tomography

Chiara Civiero (1), Vincent Strak (2), Susana Custódio (1), Graça Silveira (2), Nicholas Rawlinson (3), and Pierre Arroucau (4)

(1) Instituto Dom Luiz (IDL), Faculdade de Ciências, Universidade de Lisboa, Lisboa 1749-016, Portugal (cciviero@fc.ul.pt), (2) Department of Earth Sciences, Vrije Universiteit Amsterdam, Amsterdam 1081 HV, Netherlands, (3) Bullard Laboratories, Department of Earth Sciences, University of Cambridge, Cambridge, CB30EZ, UK, (4) Dublin Institute for Advanced Studies (DIAS), Dublin D02 Y006, Ireland

Cenozoic volcanism within the Ibero-western Maghreb region results from the interplay between mantle dynamics and the complex geodynamic evolution of the area. This volcanism has been attributed to both passive (e.g., small-scale convection at rifted margins, edge-driven convection) and active (e.g., mantle plumes) mantle upwelling processes. However, no general agreement on what triggers these mantle upwellings has yet emerged.
Here, we use data which comes from stations that cover the area from Pyrenees to Canaries to obtain a new P and S-SKS relative travel-time tomography model below the Iberia, Canaries and western Morocco. The aperture of the integrated dataset allows us to image for the first time structures of $\sim$200 km length scale down to depths of $\sim$700 km beneath this region. Our images provide evidence of three low-velocity structures with diameters of the order of 150-250 km below the Canaries, the Atlas ranges and the Gibraltar arc that continue through the transition zone. Taking into account seismic sensitivity to temperature, we interpret these features as multiple upwellings from below the mantle transition zone with excess temperatures within the range of $\sim$ 50-300 K consistent with previous geophysical/geochemical studies. Combined with global tomographic images, our results suggest the ponding of deep-plume material from Canaries below the transition zone which may generate smaller upwellings in the upper mantle.