Geophysical Research Abstracts
Vol. 17, EGU2015-5981-6, 2015
EGU General Assembly 2015

Constraints of mapped and unfolded slabs on Oligocene to present-day Western Mediterranean plate reconstructions: potential role of north Iberia continental delamination

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Seismic tomographic images of subducted lithospheric remnants under the western Mediterranean have provided new constraints for Oligocene to present-day plate reconstructions. In this study, we mapped slabs under the western Mediterranean and Iberia from regional seismic tomography (Chevrot et al., 2014; Bezada et al., 2013) and from MITP08 global tomography (Li et al., 2008). A newly developed method was used to unfold (ie. structurally restore) the mapped slabs to a model spherical Earth surface, minimizing area and shape distortion. Slab constraints were input into plate tectonic reconstructions using Gplates software.

Our mapping confirms the existence of western Mediterranean slabs including the Betic-Alboran, Algerian, and Calabrian slabs that were previously identified by Spakman and Wortel (2004). When unfolded these mapped slabs fit together in an Oligocene plate reconstruction, within tomographic resolution limits. Slab stretching was not required. Slab segmentation supports the existence of a North Balearic transform.

Here we emphasize the potential importance for western Mediterranean tectonics of antoher slab under Iberia that we call the ‘mid-Iberia slab’. This slab was first identified by Sibuet et al. (2004) and interpreted to be a Neotethyan suture. We have mapped this slab in detail from recent regional tomography (Chevrot et al., 2014). Our mapped slab is sub-vertical and strikes E-W under the southern margins of the Duero and Ebro basins. We newly interpret this slab to be delaminated northern Iberian continental lithosphere. We propose that continental delamination occurred during the Oligocene and produced uplifted Iberian Meseta topography, internally-drained basins, and high mean elevations that still persist today. We show how Oligocene northern Iberian continental delamination could have initiated subduction and rollback of the western Mediterranean