Title: From unthinned continent to ocean: The deep structure of the West Iberia passive continental margin at 38 degrees N

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Abstract: The crustal and lithospheric mantle structure at the south segment of the west Iberian margin was investigated along a 370 km long seismic transect. The transect goes from unthinned continental crust onshore to oceanic crust, crossing the ocean-continent transition (OCT) zone. The wide-angle data set includes recordings from 6 OBSs and 2 inland seismic stations. Kinematic and dynamic modeling provided a 2D velocity model that proved to be consistent with the modeled free-air anomaly data. The interpretation of coincident multi-channel near-vertical and wide-angle reflection data sets allowed the identification of four main crustal domains: (i) continental (east of 9.4 degrees W); (ii) continental thinning (9.4 degrees W-9.7 degrees W); (iii) transitional (9.7 degrees W-similar to 10.5 degrees W); and (iv) oceanic (west of similar to 10.5 degrees W). In the continental domain the complete crustal section of slightly thinned continental crust is present. The upper (UCC, 5.1-6.0 km/s) and the lower continental crust (LCC, 6.9-7.2 km/s) are seismically reflective and have intermediate to low P-wave velocity gradients. The middle continental crust (MCC, 6.35-6.45 km/s) is generally unreflective with low velocity gradient. The main thinning of the continental crust occurs in the thinning domain by attenuation of the UCC and the LCC. Major thinning of the continent al crust occurs in the thinning domain by attenuation of the UCC and the LCC. Major thinning of the MCC starts to the west of the LCC pinchout point, where it rests directly upon the mantle. In the thinning domain the Moho slope is at least 13 degrees and the continental crust thickness decreases seaward from 22 to 11 km over a similar to 35 km distance, stretched by a factor of 1.5 to 3. In the oceanic domain a two-layer high-gradient igneous crust (5.3-6.0 km/s; 6.5-7.4 km/s) was modeled. The intra-crustal interface correlates with prominent mid-basement, 10-15 km long reflections in the multi-channel seismic profile. Strong secondary reflected PmP phases require a first order discontinuity at the Moho. The sedimentary cover can be as thick as 5 km and the igneous crustal thickness varies from 4 to 11 km in the west, where the profile reaches the Madeira-Tore Rise. In the transitional domain the crust has a complex structure that varies both horizontally and vertically. Beneath the continental slope it includes exhumed continental crust (6.15-6.45 km/s). Strong diffractions were modeled to originate at the lower interface of this layer. The western segment of this transitional domain is highly reflective at all levels, probably due to dykes and sills, according to the high apparent susceptibility and density modeled at this location. Sub-Moho mantle velocity is found to be 8.0 km/s, but velocities smaller than 8.0 km/s confined to short segments are not excluded by the data. Strong P-wave wide-angle reflections are modeled to originate at depth of 20 km within the lithospheric mantle, under the eastern segment of the oceanic domain, or even deeper at the transitional domain, suggesting a layered structure for the lithospheric mantle. Both interface depths and velocities of the continental section are in good agreement to the conjugate Newfoundland margin. A similar to 40 km wide OCT having a geophysical signature distinct from the OCT to the north favors a two pulse continental breakup. (C) 2008 Elsevier B.V. All rights reserved.

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