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3D P-wave velocity structure of the deep Galicia rifted margin: A first analysis of the Galicia 3D wide-angle seismic dataset

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Galicia 3D, a reflection-refraction and long offset seismic experiment was carried out from May through September 2013, at the Galicia rifted margin (in the northeast Atlantic Ocean, west of Spain) as a collaboration between US, UK, German and Spanish groups. The 3D multichannel seismic acquisition conducted by R/V Marcus Langseth covered a 64 km by 20 km (1280 km2) zone where the main geological features are the Peridotite Ridge (PR), composed of serpentinized peridotite and thought be upper mantle exhumed to the seafloor during rifting, and the S reflector which has been interpreted to be a low angle detachment fault overlain by fault bounded, rotated, continental crustal blocks. In the 3D box, two airgun arrays of 3300 cu.in. were fired alternately (in flip-flop configuration) every 37.5 m. All shots are recorded by 44 short period four component ocean bottom seismometers (OBS) and 26 ocean bottom hydrophones (OBH) deployed and recovered by R/V Poseidon, as well as four 6 km hydrophone streamers with 12.5 m channel spacing towed by R/V Marcus Langseth.

We present the preliminary results of the first arrival time tomography study which is carried out with a subset of the wide-angle dataset, in order to generate a 3D P-wave velocity volume for the entire depth sampled by the reflection data. After the relocation of OBSs and OBHs, an automatic first-arrival time picking approach is applied to a subset of the dataset, which comprises more than 5.5 million source-receiver pairs. Then, the first-arrival times are checked visually, in 3-dimensions. The a priori model used for the first-arrival time tomography is built up using information from previous seismic surveys carried out at the Galicia margin (e.g. ISE, 1997). The FAST algorithm of Zelt and Barton (1998) is used for the first-arrival time inversion. The 3D P-wave velocity volume can be used in interpreting the reflection dataset, as a starting point for migration, to quantify the thinning of the crustal layers, and to determine the degree of the serpentinization of the uppermost mantle.