Geophysical Research Abstracts, Vol. 8, 08079, 2006
SRef-ID: 1607-7962/gra/EGU06-A-08079

Wide-angle seismic imaging of the West Hatton Continental Margin: Preliminary results from combined traveltime and full-waveform inversions

C. Ravaut (1), P.W. Readman (1), S. Operto (2), B.M. O'Reilly (1) and P.M. Shannon (3)

(1) Dublin Institute for Advanced Studies, Dublin 2, Ireland (e-mail: cr@cp.dias.ie), (2) Laboratoire Geosciences Azur, Villefranche sur mer, France, (3) UCD School of Geological Sciences, University College Dublin, Dublin 4, Ireland

The western seaboard of Ireland comprises a number of large Palaeozoic to Cenozoic sedimentary basins affected by several rifting episodes preceding continental breakup in late Paleocene time. The Hatton volcanic margin forms an excellent natural laboratory to investigate tectonic processes associated with widespread magmatism during continental rupturing and breakup in the early Cenozoic. However these igneous and volcanic rocks emplaced during the opening of the Atlantic Ocean severely limit the penetration and quality of near-vertical seismic reflection data. The HADES (HAtton DEep Seismic) experiment was thus carried out in this area to image better the Continent-Ocean Transition and the deeper part of this volcanic margin. Three new wide-angle seismic reflection/refraction profiles were acquired with 100 OBS (Ocean Bottom Seismometers) deployed on each profile with a very close spacing of about 3 km. The number and close spacing of OBSs make this survey exceptional and unique in Europe. To process this extremely large dataset, we are using a two-step tomographic approach specially designed for this type of multifold wide-angle acquisition: the first step consists of first-arrival traveltime tomography to define the large-scale velocity distribution in the medium. This derived velocity model is then used as a starting model to initiate frequency-domain full-waveform inversion of the data. Results from first-arrival traveltime tomography show that the oceanic crust is defined by a simple velocity structure with high velocities (Vp=7 km/s) at shallow depths (8-10 km) whereas the continental crust is characterised by sedimentary basins separated by basement highs. High velocity bodies (Vp=7.2-7.3 km/s) are also imaged at

the Continent-Ocean Transition and correlate well with Magnetic Anomaly C24. To define rapidly the thickness of these high velocity bodies, forward modelling of the PmP reflected energy phase was used to define the Moho position in these models. The detailed shape and seismic velocity structure of the bodies are, however, not completely resolved and application of full-waveform inversion is required to resolve the uncertainties. This project is funded by the Geological Survey of Ireland and the Irish Petroleum Infrastructure Programme.