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The Galicia 3D experiment: an Introduction.

Timothy Reston (1), Sara Martinez Loriente (1), Luke Holroyd (1), Tobias Merry (1), Dale Sawyer (2), Julia Morgan (2), Brian Jordan (2), Mari Tesi Sanjurjo (2), Ara Alexanian (2), Donna Shillington (3), James Gibson (3), Tim Minshull (4), Marianne Karplus (4), Gaye Bayracki (4), Richard Davy (4), Dirk Klaeschen (5), Cord Papenberg (5), Cesar Ranero (6), Marta Perez-Gussinye (7), and Miguel Martinez (7)

(1) University of Birmingham, Geography, Earth and Environmental Sciences, Birmingham, United Kingdom (t.j.reston@bham.ac.uk), (2) Rice University, Houston, Texas, (3) Lamont-Doherty Earth Observatory, (4) School of Ocean and Earth Sciences, University of Southampton, (5) Geomar, Kiel, Germany, (6) Barcelona Center For Subsurface Imaging, Barcelona, Spain , (7) Royal Holloway University,

In June and July 2013, scientists from 8 institutions took part in the Galicia 3D seismic experiment, the first ever crustal -scale academic 3D MCS survey over a rifted margin. The aim was to determine the 3D structure of a critical portion of the west Galicia rifted margin. At this margin, well-defined tilted fault blocks, bound by west-dipping faults and capped by synrift sediments are underlain by a bright reflection, undulating on time sections, termed the S reflector and thought to represent a major detachment fault of some kind. Moving west, the crust thins to zero thickness and mantle is unroofed, as evidence by the “Peridotite Ridge” first reported at this margin, but since observed at many other magma-poor margins. By imaging such a margin in detail, the experiment aimed to resolve the processes controlling crustal thinning and mantle unroofing at a type example magma poor margin.

The experiment set out to collect several key datasets: a 3D seismic reflection volume measuring ∼20x64km and extending down to ∼14s TWT, a 3D ocean bottom seismometer dataset suitable for full wavefield inversion (the recording of the complete 3D seismic shots by 70 ocean bottom instruments), the “mirror imaging” of the crust using the same grid of OBS, a single 2D combined reflection/refraction profile extending to the west to determine the transition from unroofed mantle to true oceanic crust, and the seismic imaging of the water column, calibrated by regular deployment of XBTs to measure the temperature structure of the water column.

We collected 1280 km2 of seismic reflection data, consisting of 136533 shots recorded on 1920 channels, producing 260 million seismic traces, each ∼ 14s long. This adds up to ∼ 8 terabytes of data, representing, we believe, the largest ever academic 3D MCS survey in terms of both the area covered and the volume of data. The OBS deployment was the largest ever within an academic 3D survey.