Calibrating oceanic circulation models using average sound speed variability determined from seismic reflection surveys

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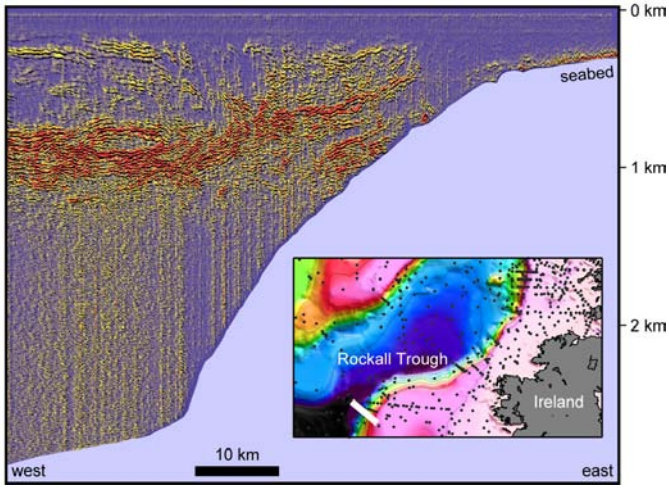
Research Area In the past decade it has been recognized that conventional marine seismic reflection data can be used to image large volumes of the interior of the ocean. At present the seismic oceanographic community is learning how to interpret these images. Most research has concentrated on interpreting the geometry of reflections on individual seismic profiles. This project will take a different approach by measuring the statistical variation in average water layer sound speed over the footprint of *entire* seismic surveys. The footprint of a typical hydrocarbon prospect-scale 2D or 3D seismic survey is similar to the cell size used in many oceanic circulation models (OCMs). Average sound speed variability measurements across such areas can be compared directly with basic OCM outputs, and can therefore be used to validate OCMs. Better and more widespread validation will improve OCM predictions supplied to commercial users and employed in climate modelling studies.



Aims and objectives The project will begin by analyzing new joint 3D seismic reflection and oceanographical datasets collected in 2013 over Galacia Margin and in 2009 over Porcupine Basin, offshore Ireland. Average sound speed variability will be quantified both from the direct temperature, salinity and sound speed measurements and also from analysis of seabed and water layer seismic reflections. The variability measurements will be compared with OCM predictions and discrepancies between data and models will be investigated.

Requirements and Training This project will suit a geologist, geophysicist or oceanographer interested in seismic reflection imaging, ocean modelling and climate prediction. Training in the use of the seismic interpretation software and OCMs will be provided. Although not directly required by this project, it is anticipated that the student will have the opportunity to participate in research cruises related to seismic oceanography. We anticipate that further joint datasets will become available during the project, and the successful student will be involved in survey selection. Interested candidates are invited to contact Stephen Jones (**s.jones.4@bham.ac.uk**) for further information.

Background reading

Jones SM, Sutton C, Hardy RJJ, Hardy D, Seismic imaging of variable water layer sound speed in Rockall Trough, NE Atlantic and implications for seismic surveying in deep water, *In*: Vining BA, Pickering SC (eds) *Petroleum Geology: From Mature Basins to New Frontiers – Proceedings of the 7th Petroleum Geology Conference* (2010) 549–558, doi: 10.1144/0070549.

Holbrook WS, Páramo P, Pearse S, Schmitt RW, 2003. Thermohaline fine structure in an oceanographic front from seismic reflection profiling. *Science* 301, 821–824.

Jones SM, Hardy RJJ, Hobbs RW, Hardy D, 2008. The new synergy between seismic reflection imaging and oceanography, *First Break* 26(8), 51–57.

Krahmann G, Brandt P, Klaeschen D, Reston T, 2008. Mid-depth internal wave energy off the Iberian Peninsula estimated from seismic reflection data, *Journal of Geophysical Research* 113, C12016, doi:10.1029/2007JC004678.

Applicants with BSc, MSci or MSc in Earth Science, Oceanography or Physics are invited to contact Stephen Jones (s.jones.4@bham.ac.uk) to discuss the project

Applicants should apply via http://www.birmingham.ac.uk/postgraduate/courses/research/gees/earth-sciences.aspx where they should click on 'Apply now' and choose the option 'PhD in Department of Earth Sciences' and give the PhD title in the 'Funding details' section of the online application.