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Introduction

Following a Science Foundation Ireland (SFI) infrastructure award (€3.0 M), with contributions from the Geological Survey of Ireland (GSI), we will establish the first Broad Band Seismo-Acoustic sensing network in the N.E. Atlantic. It will comprise approximately 20 OBS/acoustic pressure sensing units, 17 of which will be mobile (moved on a yearly basis) and three permanent. A pilot tsunami observation system will form part of the network.

Rationale

Continuous seismic sensing can be used for:

- (i) sub-surface passive & active imagery
- (ii) local earthquake characterisation
- (iii) slope stability studies/ocean floor pressurisation
- (iv) emergent storm tracking

Continuous acoustic sensing can be used for:

- (i) Environmental monitoring of noise
- (ii) Monitoring Cetaceans & other biological activity
- (iii) Monitoring sea surface mechanical processes (e.g. bubble entrainment)
- (iv) Studying near-sea floor sediment properties through seismo-acoustic coupling.

Timelines

- * Tender for the mobile OBS system has just closed
- * Tenders for the fixed OBS system are currently open
- * Tenders for the acoustic network will be opened by end 2016
- * We expect to have a mobile OBS system in place by Autumn 2017

What is a Broad Band (BB) OBS?

- * BB OBSs can detect ground vibrations over a large frequency range (e.g. 120 sec period to 100 Hz)
- * Typically the instruments can record continuously, for up to one year.
- * They sit on the sea floor and are usually deployed in “free fall” mode from a ship
- * They are recalled using an acoustic transponder

What is a BB marine acoustic sensor?

- * BB Marine acoustic sensors can detect pressure changes in the water, over a broad range of frequencies. (Tidal frequencies to KHz)
- * It can either sit on the sea floor or be suspended in the water column

Pilot Deployment

We undertook a pilot OBS deployment (Figure 1) from Jan-Sept, 2016. OBSs were from the German equipment pool. Initial data look rich (Figures 1 - 6), but are yet to be analysed.

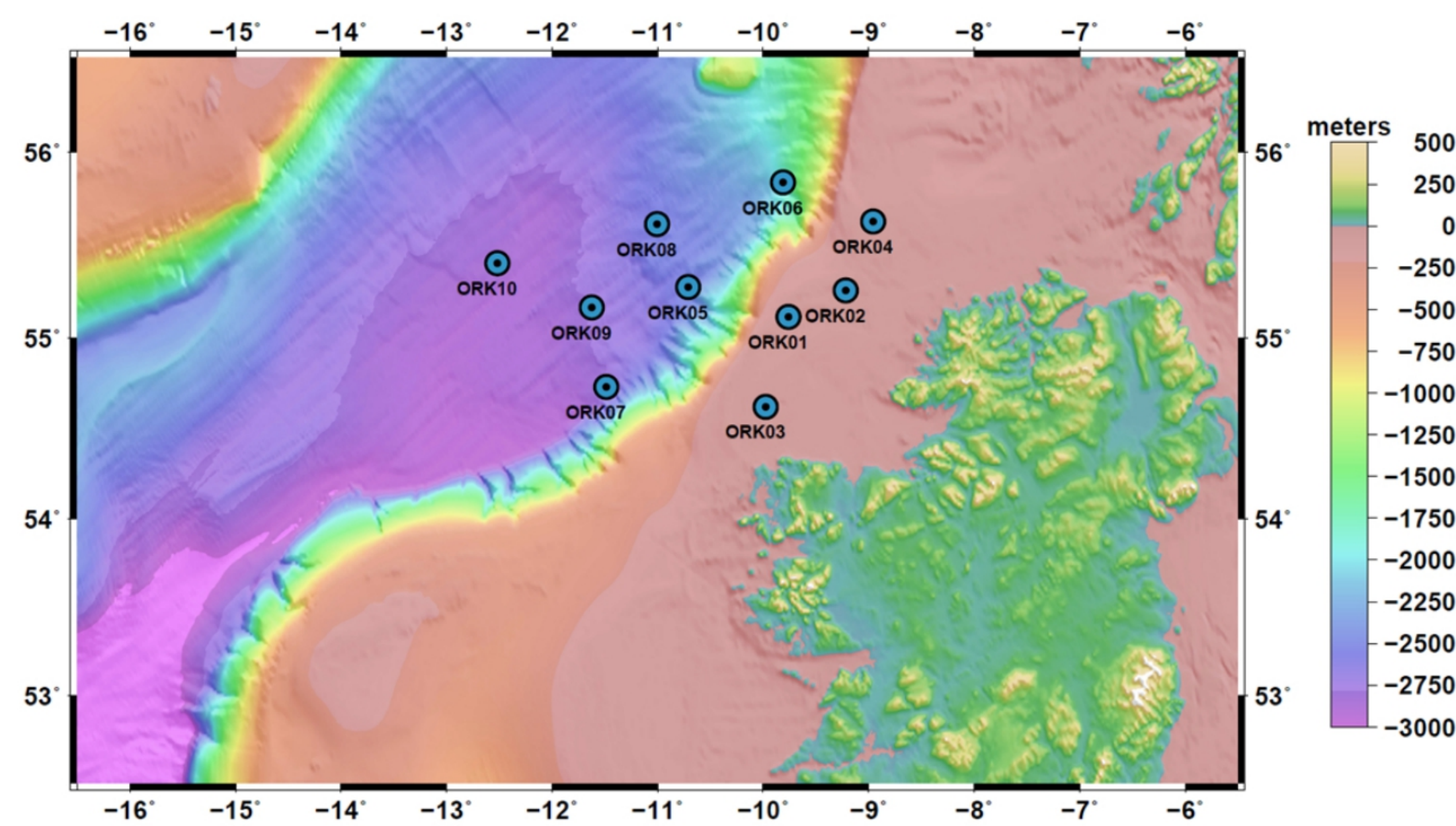


Figure 1: OBS station locations

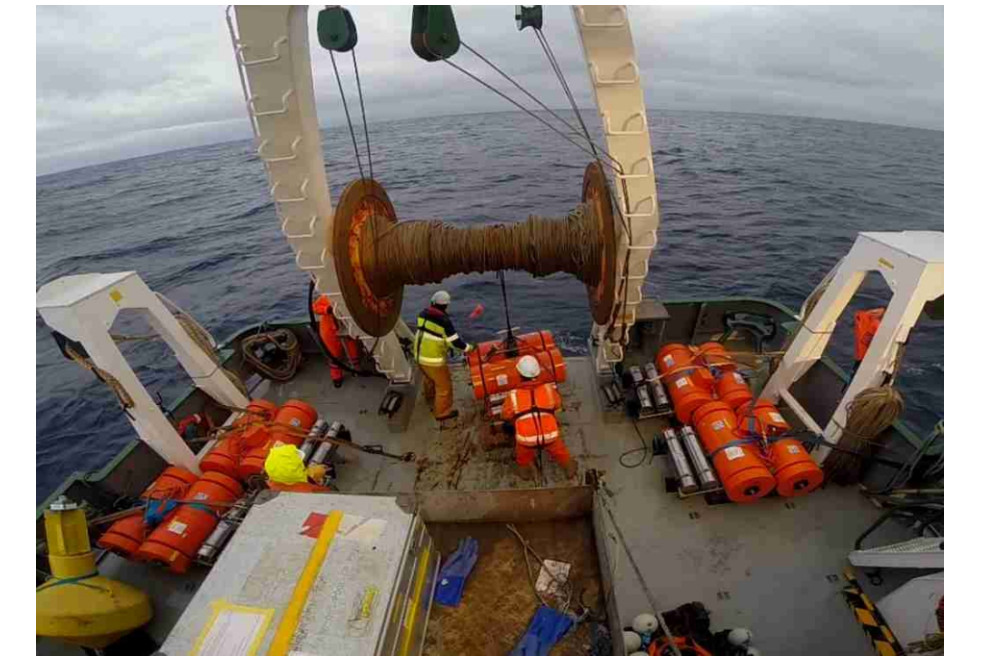


Figure 2: Deployment of an OBS instrument

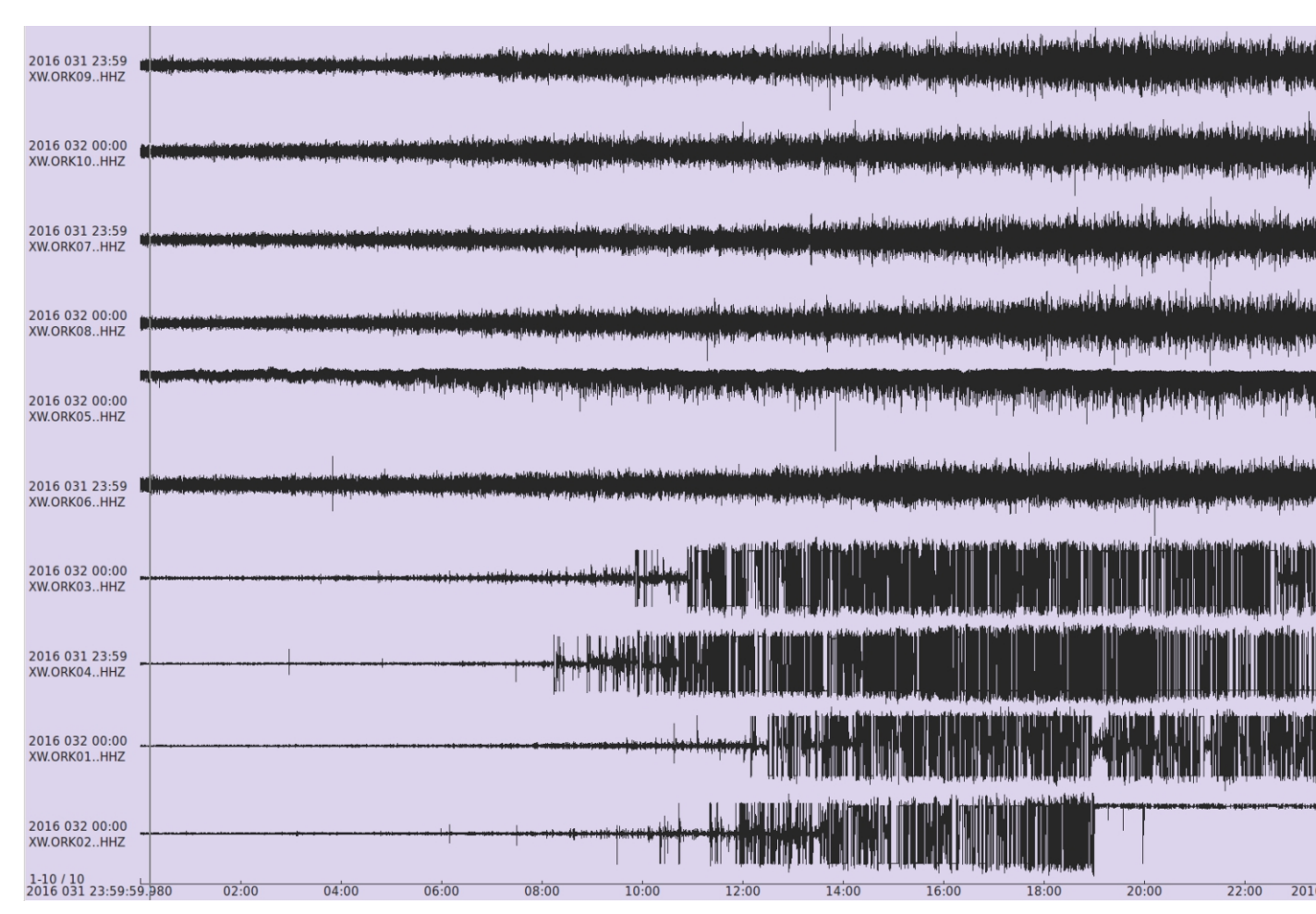


Figure 3: Example waveforms showing background activity at the various stations

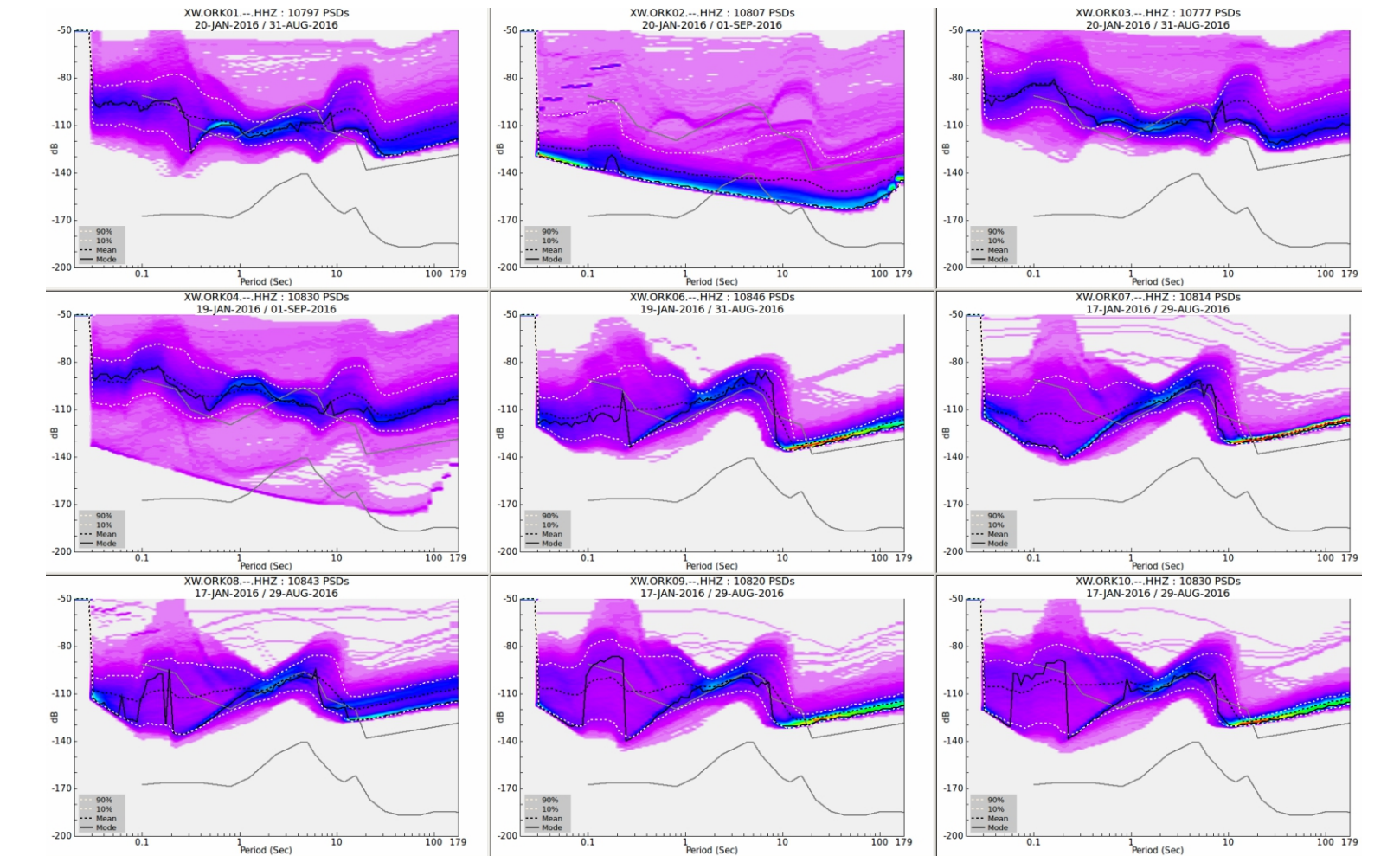


Figure 4: Spectral plots for all stations

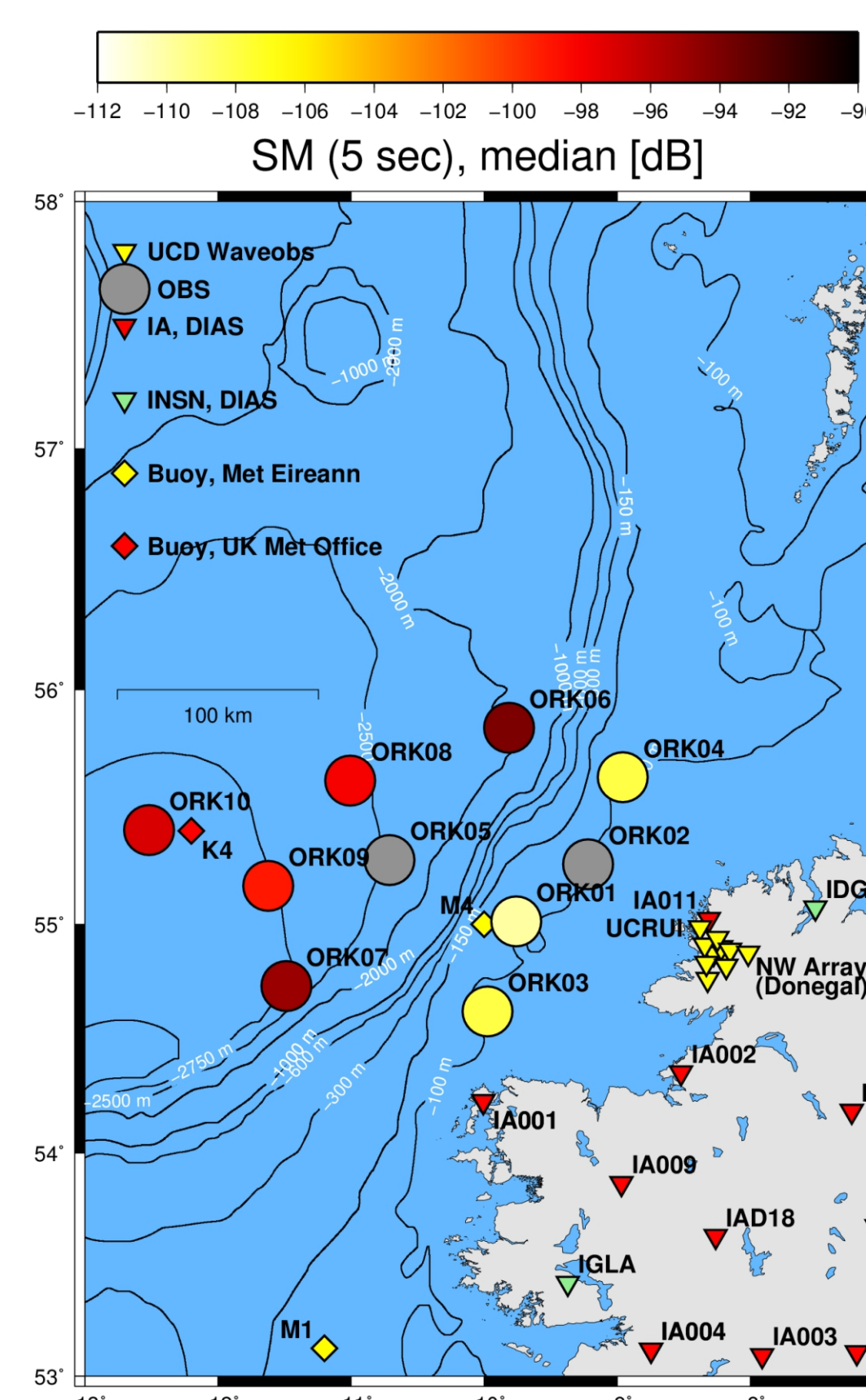


Figure 5: Amplitudes at 'low' frequencies during storm - note they are stronger in Rockall Trough

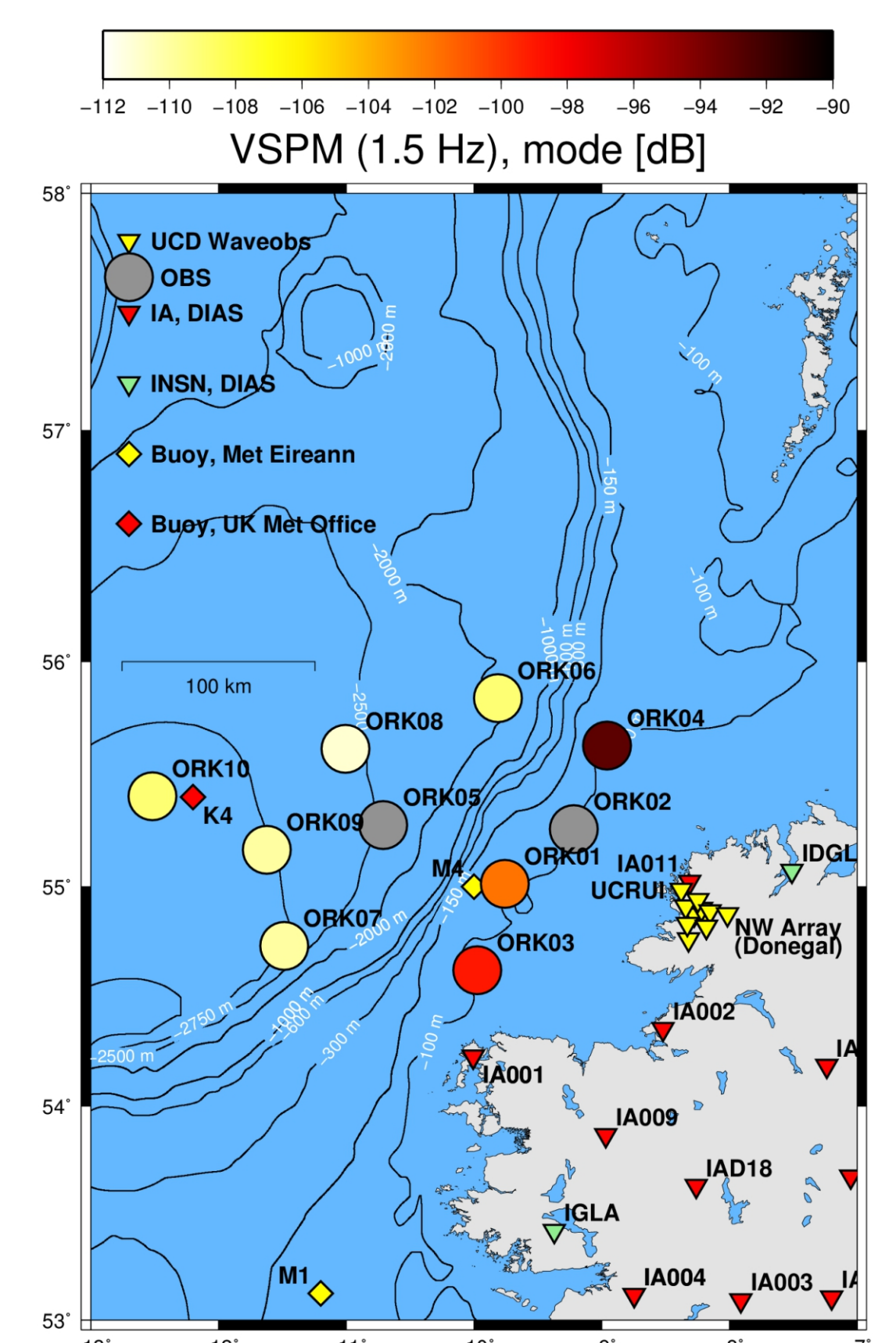


Figure 6: Amplitudes at 'high' frequencies during storm - note they are stronger in the Shelf area

Summary

The first component of the OBS and Acoustic Sensor network will be established by Autumn 2017. It is open as a National Facility to the whole geoscience community. It will be used for:

- (i) Broad scale seismic imagery of the Atlantic basins
- (ii) Offshore earthquake detection and slope stability studies
- (iii) Ocean-land coupling investigations in deep water
- (iv) Cetaceans & other biological activity monitoring
- (v) Noise pollution determination
- (vi) Distal/emergent storm tracking