Investigating acoustic noise propagation across various continental margin settings

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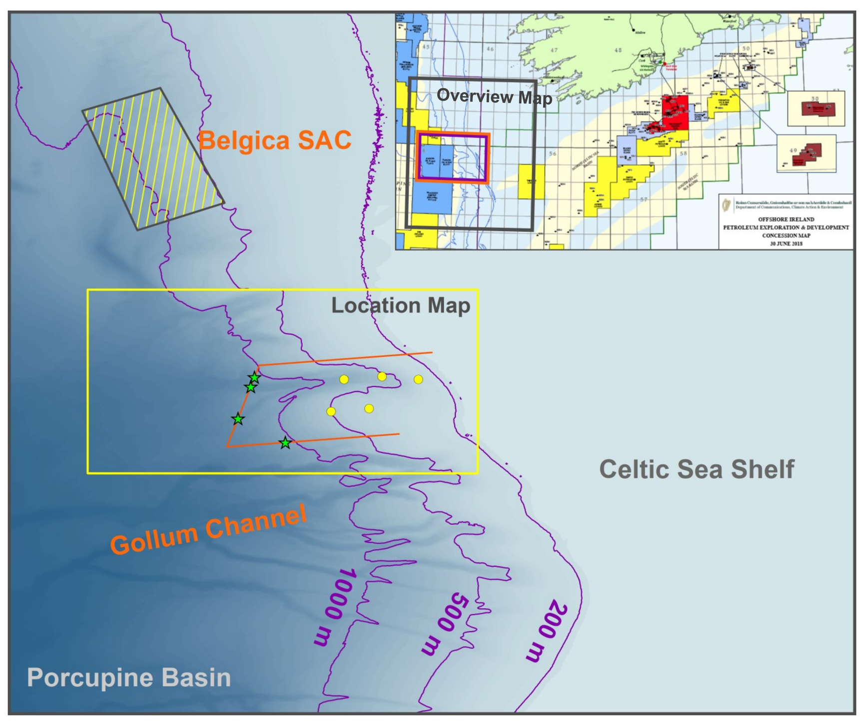
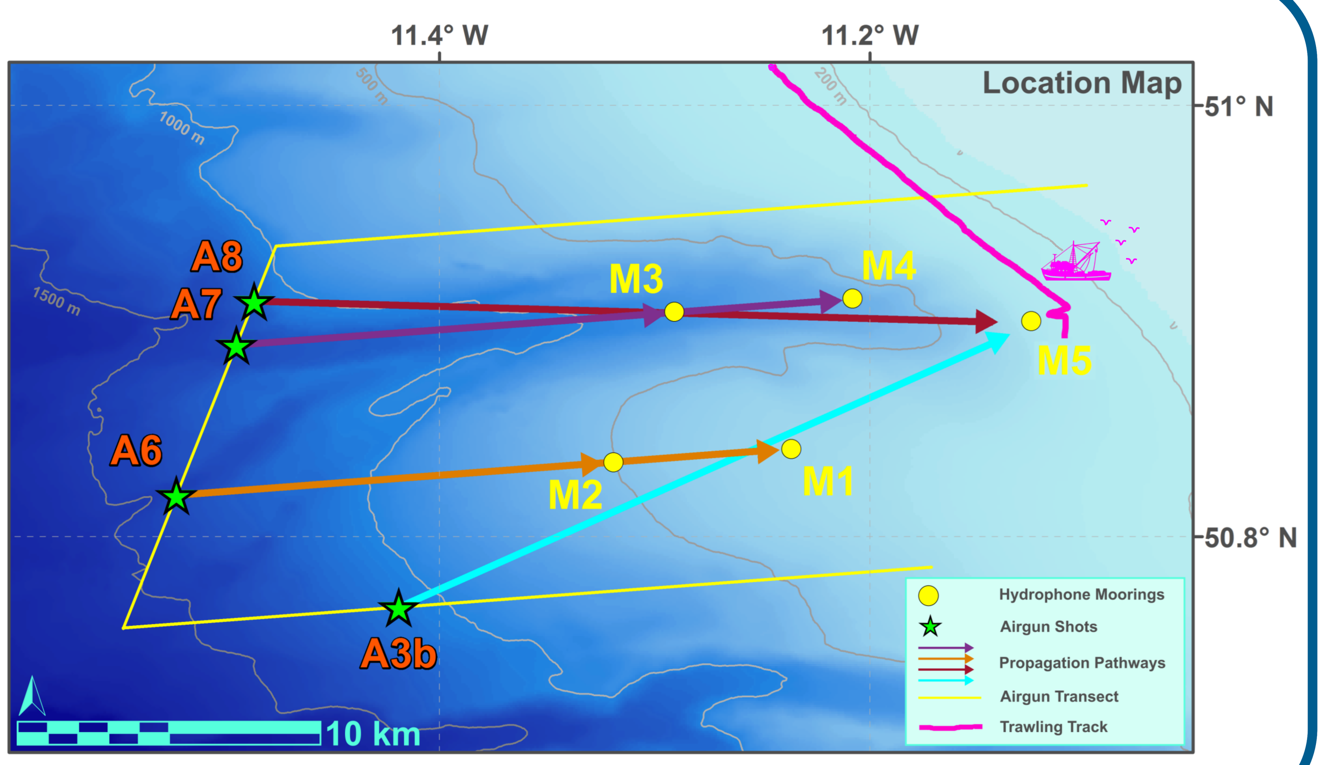
Background and Rationale

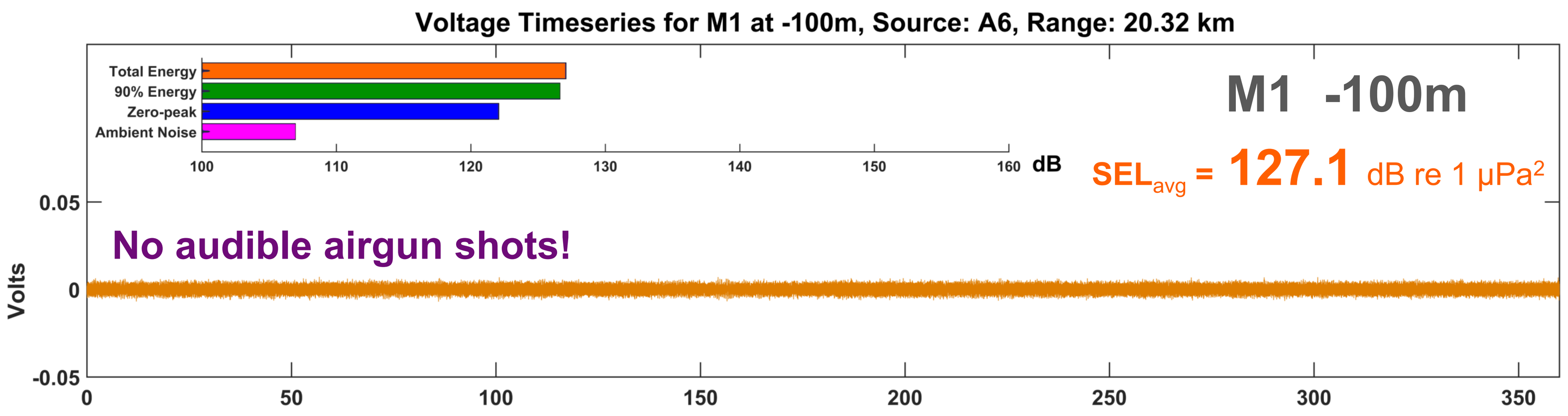


- Offshore Seismic exploration involves pulsed airgun signals, creating noise in the water column, which is classed as pollution by the MSFD [1]
- Propagation of Acoustic Noise in Canyons *'PANiC'*, Summer 2018; research survey to create, record and analyse airgun noise across the continental margin and collect hydrographic data (see Law et al. poster)
- High resolution acoustic mooring array using iMARL hydrophones to record controlled source airgun noise and analyse across varying topographical settings, i.e. typical slope vs submarine canyon
- Understand the controls (e.g. topography and hydrography) on pulsed anthropogenic noise propagation across margin and help inform NGOs, industry and regulators with evidence based research on same



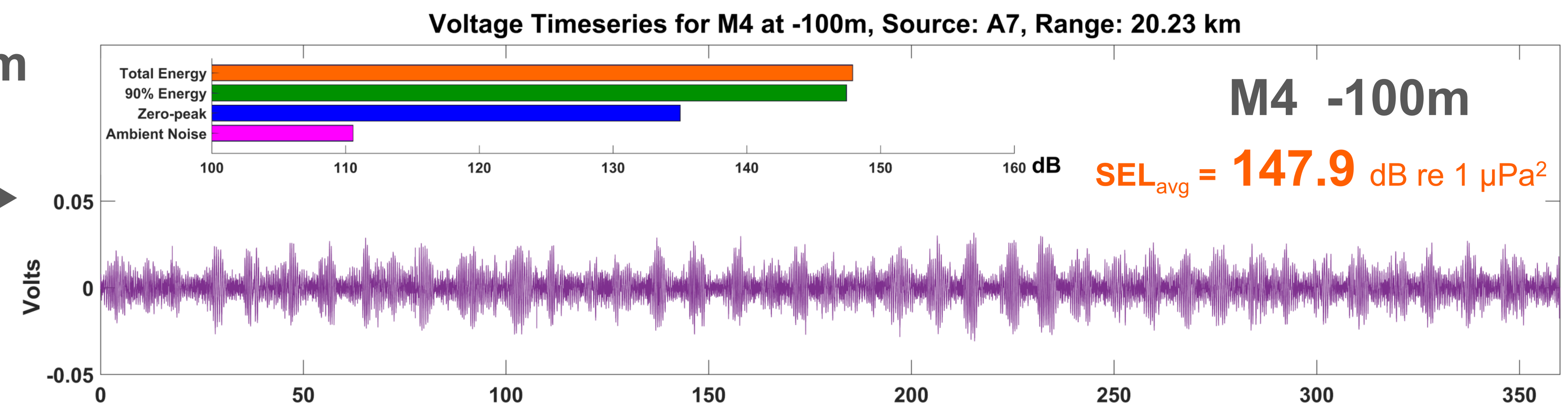
Typical Slope

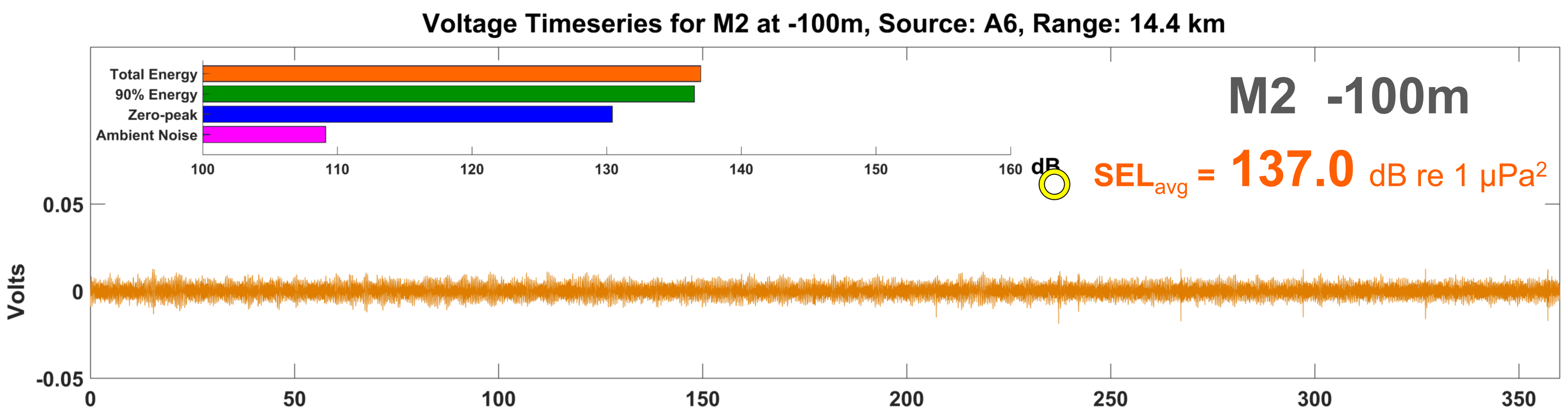
Submarine Canyon



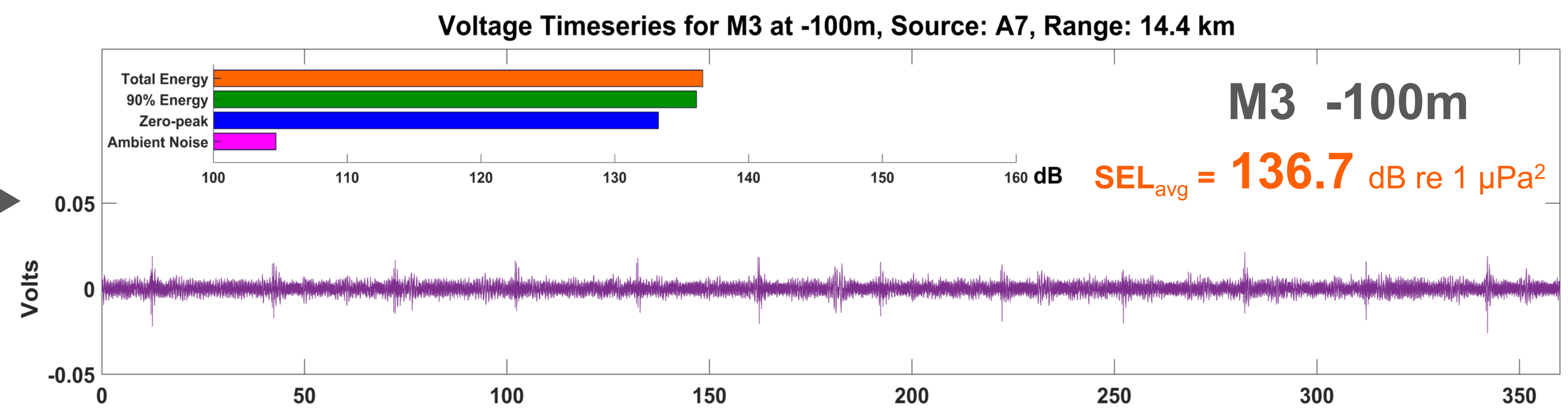
Range from source

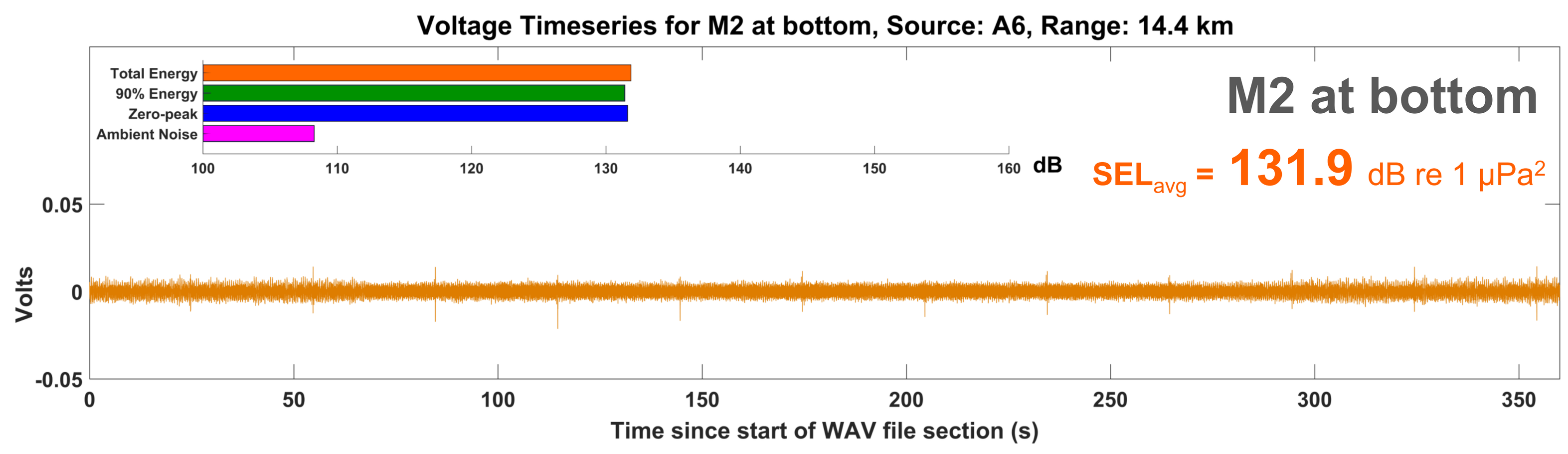
20 km





14 km





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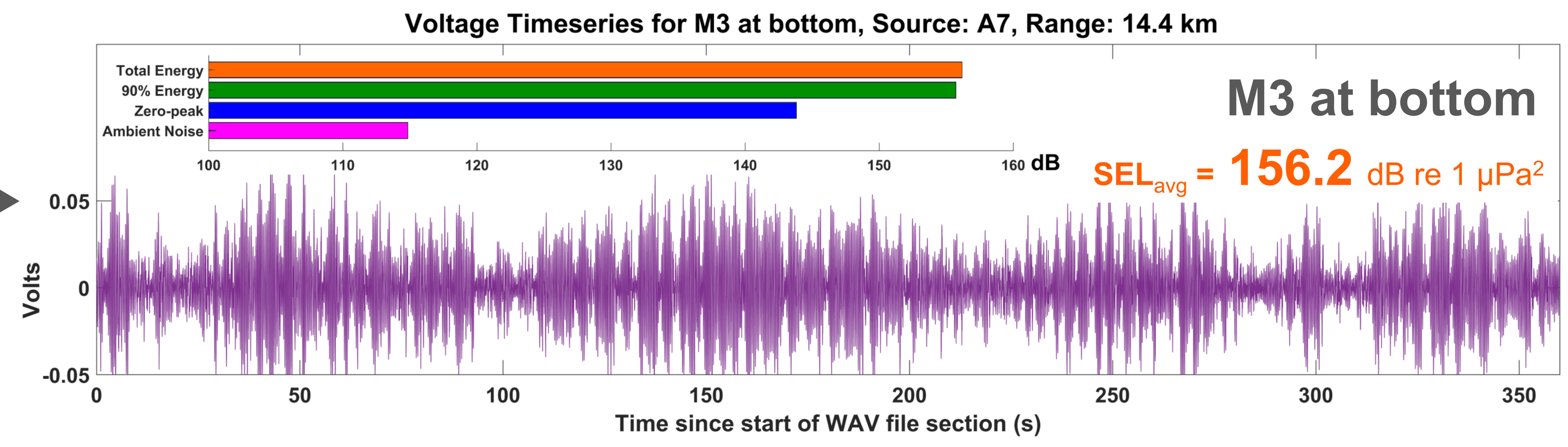
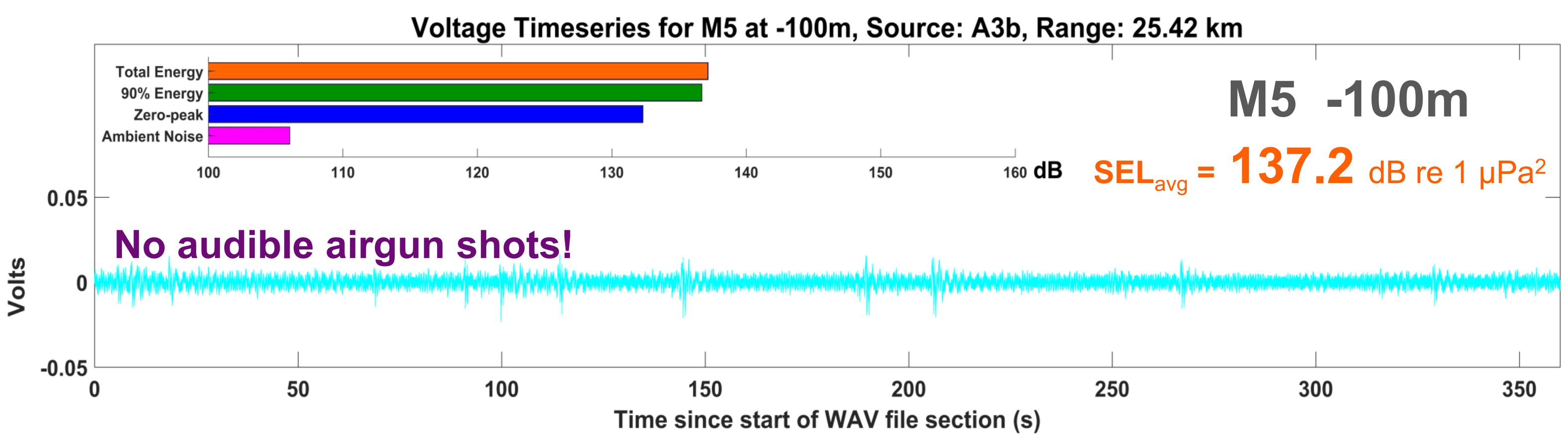
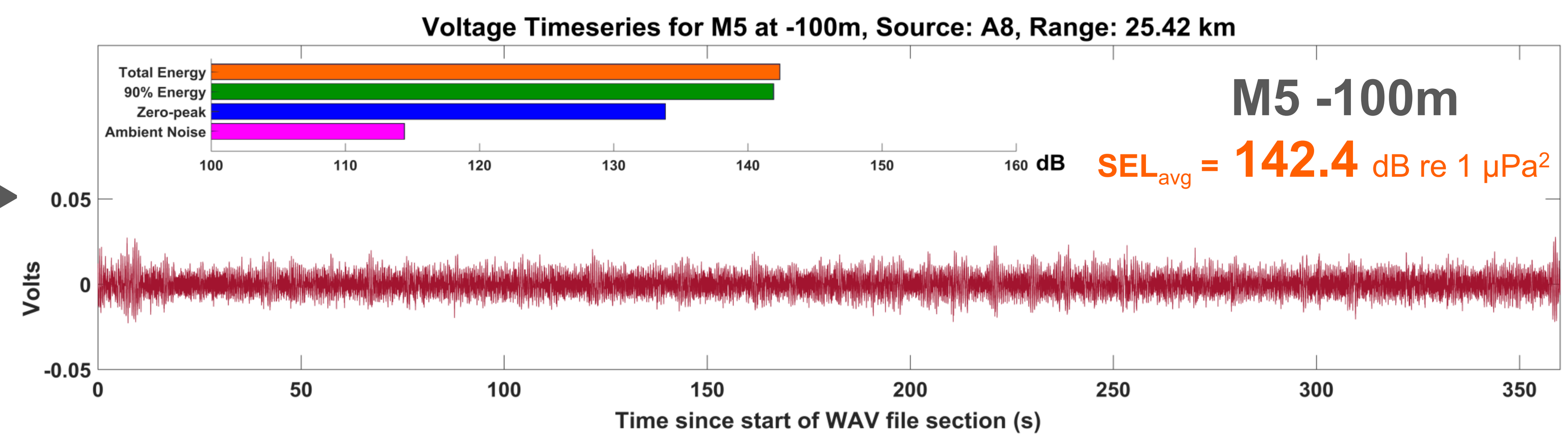
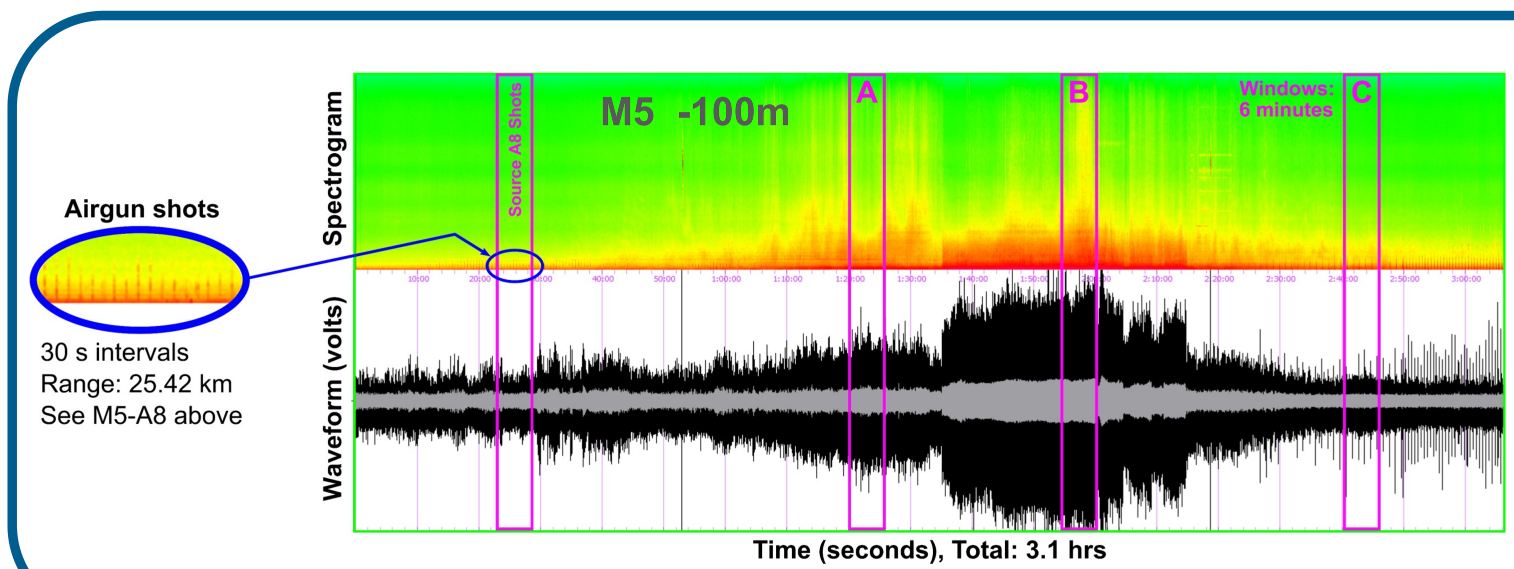


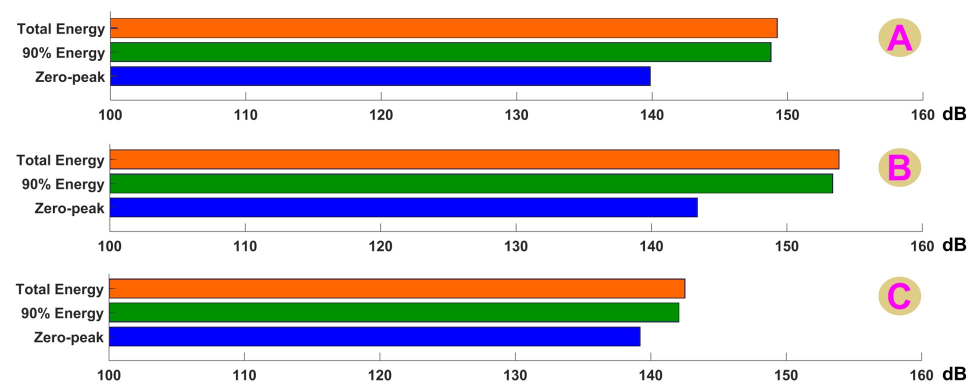
- ***Above:*** Comparison of Sound Exposure Levels (SEL), a pseudo-measurement of acoustic energy [2] between canyon and typical slope. Sound propagation is greater in canyon especially when comparing M1 and M4 hydrophones (shots were not audible on playback at M1). M2 and M3 (-100m depth) have similar values but shots are clear in canyon (M3). M3 bottom mounted hydrophone shows highest and most interesting signal, with shots overlying a background sinusoidal pattern. Possible multiple returns or focusing due to 3D nature of canyon? ***Note:*** dB is a logarithmic scale.
- ***Below:*** Equidistant paths to the shelf edge mooring M5 showed variation in transmission loss, with the canyon path louder (A8) and no audible shots on the typical slope path (A3b).
- These results are preliminary and as yet unvalidated. Full analysis will include frequency domain calculations and a comprehensive treatment of background noise using verified methods [3].
- Data collection was very successful and holds potential to investigate hydrographic controls (e.g. internal waves) and other various noise types, such as ships passage or even trawling noise.



25 km







Left: Spectrogram and waveform displaying possible trawl noise at approx. 1.5 hours into .WAV file. ***Above:*** Values for average Sound Exposure Levels (SEL) over six minute windows A to C for trawl noise

- **Trawling Noise?** During survey a trawler (whilst probably trawling) approached mooring M5 approximately within a kilometre. This coincided with a relatively very loud, low frequency broadband noise, seen in far left figure. SEL values (near left figure) can be compared with the canyon (A8) pathway to M5 as seen above. Evidence for trawl noise is uncorroborated, as exact location and activity of trawler are unknown.

DIAS iMARL DEEP OCEAN LISTENING Ryan Institute GMIT Christian-Albrechts-Universität zu Kiel RS AQUA

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Marine Institute Foras na Mara

PIP Petroleum Infrastructure Programme

References:
[1] MSFD (2008). Directive 2008/56/EC
[2] McCauley, et al., (2000). Appea Journal, 40(692), 08.
[3] Robinson, et al., (2014). NPL Good Practice Guide, (133). ISSN: 1368-6550, 2014.