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Editorial: Observing ocean sound

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Editorial on the Research Topic
Observing ocean sound

Ocean sound is emerging as a key health indicator of marine ecosystems, increasingly at risk of anthropogenic stressors (Duarte et al., 2021). The full potential of this Essential Ocean Variable (EOV) keeps developing (Tyack, 2018). The science and methods resulting from this EOV address an increasing number of domains, from geophysics to bio- and eco-acoustics. It also offers opportunities to respond to questions as varied as geohazard and marine life occurrence, and provides potentially cost-effective solutions to monitor biodiversity and ecosystems at large.

When "*Observing* Ocean Sound" was accepted as the subject for the first EMSO[1] Time Series Conference (TSC), cursive style highlighted an unusual expression. Maturity level of this EOV is rather low, still at pilot or conceptual stage for several of the Global Ocean Observing System (GOOS) criteria. Despite the fact that *observing* sound as an expression might be counterintuitive to humans, it is less so for those who contribute to GOOS, where all variables are observables. The conference and associated Research Topic offered three tracks: posters, the opportunity to publish an article in this Research Topic and, maybe the most attractive one for early stage researchers: training. Training sessions were organized in different formats and supported by hands-on programming activities. The conference web portal provides a detailed introduction of the keynote speakers, the trainers, and the content of the courses. The conference programme included the following topics: anthropogenic noise and other environmental sounds, impact of anthropogenic noise on cetaceans, acoustics for studying marine geophysics, bioacoustics, new discoveries and applications from ocean sound observing, technologies for underwater sound observing (Figure 1), from acoustic data acquisition to products. While only registered attendees had access to all training material, some of the courses provide related material and documentation for free, e.g. PAM2PY (Rodríguez et al., 2021), MBARI notebooks for blue whale (*Balaenoptera musculus*) calls and shipping noise data processing. A call was open after the conference to submit papers to this Research Topic. Article contributions accepted are introduced in the following paragraphs; of the nine submitted articles, five were accepted for publication as original research articles. Additional output from the conference includes posters, which are available for download from the conference website.

In Skarsoulis et al. and White et al. bioacoustics methods are developed for improvement of our understanding of different odontocete species. These new methods offer opportunities for enhanced understanding of animal behaviour, tracking marine mammals, and even reducing

1 The European Multidisciplinary Seafloor and water column Observatory (EMSO) – www.emso.eu

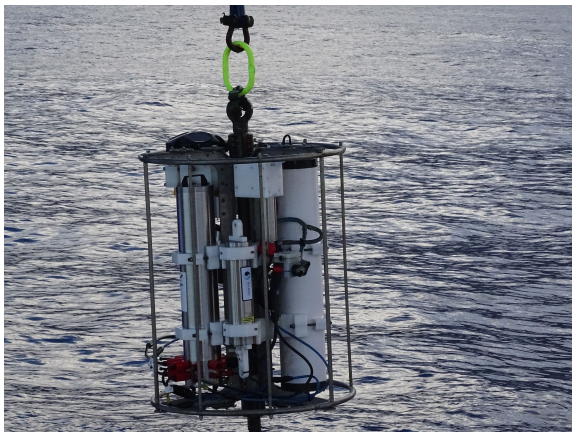

FIGURE 1
Deployment of an EMSO EGIM in stand-alone mode, equipped with ocean sensors including a digital hydrophone (Lantéri et al.). Photo courtesy: PLOCAN.

risks of collisions with ships. These methodological developments can offer keys to a better management and protection of the oceans. The techniques developed in these articles will require ground-truthing across a variety of locations, given the diversity of soundscapes and environmental conditions, for broader application. Making the technology available to the broader community will be key for further validation and adoption.

Han et al. provide a detailed assessment of the acoustic field produced by airguns, a poorly documented topic otherwise. Because these sources are considered notoriously problematic for ecosystems due to their extreme intensities and time frequency characteristics, with potentially high impacts, this study offers new information and further documents how knowledge of the sources and the physical environment are important to improve our capacity to predict the potential impacts of airgun usage, also confirming the power of current modeling methods as useful estimation tools (Ainslie et al., 2019).

Sound propagation models are also assessed in Oliveira et al. at megameter spatial scale for a recent submarine earthquake off New Zealand, revealing the importance of three-dimensional effects. Modelling is also shown to be useful in the design of hydrophone arrays in Shajahan et al. where a noise coherence model analytical solution has been compared to numerical modelling in a simulated real shelf break environment. A simple hydrophone spacing formula was drawn from the simulations for shallow and deep water. The article can be of interest to students who are eager to learn more on the acoustic and noise theoretical framework in a practical use-case. Here modeling based on known oceanographic conditions is shown to be useful in designing and optimizing ocean sound observing technologies, improving cost-benefit and performance.

Short of covering the vastness of ocean sound observing, we hope these article contributions, along with the conference posters and the training material provided at the conference, will help researchers expand their work and serve to define new lines of research and development.

Author contributions

ED, AS, SJ are editors of this Research Topic. ED prepared the manuscript draft, AS and SJ reviewed and contributed to the manuscript. All authors contributed to the article and approved the submitted version.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Publisher's note

References

Ainslie, M. A., Laws, R. M., and Sertlek, H.Ö. (2019). International airgun modeling workshop: validation of source signature and sound propagation models–Dublin (Ireland), July 16, 2016–problem description. *IEEE J. Oceanic Eng.* 44, 565–574. doi: 10.1109/JOE.2019.2916956

Duarte, C. M., Chapuis, L., Collin, S. P., Costa, D. P., Devassy, R. P., Eguiluz, V. M., et al. (2021). The soundscape of the anthropocene ocean. *Science* 371, 583–583-583. doi: 10.1126/science.aba4658

Rodríguez, O., Duarte, R. J., and Jesus, S. M. (2021). PAM2PY: a Python tool for sharing ocean soundscape data. *Proc. Meetings Acoustics* 44, 070011. doi: 10.1121/2.0001471

Tyack, P. (2018). EOV specification sheet: ocean sound. *Global Ocean Observing System*. Available at: https://oceanexpert.org/document/22567.