IQOE Workshop on Low-Cost, Self-contained Underwater Acoustic Recording Systems

13-14 December 2021

Background

Ocean scientists measure sound in the ocean for a variety of reasons—ranging from measuring wind, waves and rain to tracking animals and observing their behaviour to measuring anthropogenic additions of sound to the natural environment and assessing their effects on marine life. Measurements of sound in the ocean (both the natural and anthropogenic components) are increasingly necessary in the context of regulating industrial activities that add sound to the ocean, which is increasingly being considered as a form of pollution.

Developed under the auspices of the Scientific Committee on Oceanic Research (SCOR) and the Partnership for Observation of the Global Ocean (POGO), the International Quiet Ocean Experiment (IQOE) is an international program of research, observation and modelling, to better characterize ocean sound fields and to promote understanding of the effects of sound on marine life.

An IQOE-POGO Working group developed the specifications for the Ocean Sound Essential Ocean Variable, which was accepted by the Global Ocean Observing System (GOOS) in 2018 as one of its cross-cutting EOVs. IQOE has established a committee to develop an Implementation Plan for the Ocean Sound EOV, which is due to be launched in early 2022.

As with all observing systems, acoustic ocean observations are unevenly distributed around the world's ocean, and concentrated mostly in the Northern Hemisphere (as shown on the IQOE global map of civilian hydrophones). Most acoustic measurements are made from moored hydrophones and cabled arrays located in coastal areas, although new technological developments offer the possibility of fitting hydrophones to mobile, autonomous systems, such as gliders, floats and drifters. POGO and SCOR both have capacity development at the core of their missions, and POGO has in recent years been focussing on increasing the global coverage of ocean observations by providing low-cost technological solutions to developing countries, as well as through the establishment of citizen science projects.

Workshop

In this context, IQOE and its sponsors, SCOR and POGO, are convening a virtual workshop to share information on current solutions and new developments in self-contained underwater acoustic recording systems, and discuss possible ways forward to make these systems available, to be deployed at a global scale in a variety of different environments and ecosystems (from the open ocean to shallow coastal areas and from low to high latitudes), making consistent and calibrated measurements at higher temporal and spatial resolutions, making data freely available on-line for use by scientists and policy makers.

For this workshop, we invite scientists and engineers involved in passive acoustic measurements and technological development to present their work and discuss the challenges and opportunities offered by existing and novel self-contained underwater acoustic recording systems.

We are particularly interested in new systems that fit the following criteria:

- Manufacturing cost of around $50-$200
- Can be calibrated by user and/or calibrated by the manufacturer at a reasonable cost

- Data processing can be achieved without specialist knowledge, supported by manuals, tutorials and/or training courses.

The workshop will discuss optimal combinations of precision and accuracy, target frequency ranges (e.g., for ambient sound vs bioacoustics), and issues regarding time-stamping, in order to meet the needs of user communities as well as the cost goals and other parameters described above.

The workshop welcomes the participation of potential developers and users of low-cost systems, operators of observing systems or platforms with an interest in adding acoustic capabilities to these, students and early-career scientists.

The workshop will run for 2 hours and will be held twice (at different times) to maximise participation from different parts of the world. The format will be a series of short contributions followed by discussion of the following topics:

- How close are we to having a low-cost self-contained underwater acoustic recording systems for measurement of ambient sound that is easy to use and calibrate, can be adapted to a variety of fixed or autonomous platforms, and produces FAIR data (https://www.nature.com/articles/sdata201618)?
- What are the next steps required to make this a reality?
- Can we develop a global project to deploy such technologies worldwide, as a contribution to the implementation of the Ocean Sound EOV? What training programmes and resources would be required to support students, early-career and developing country scientists?
- What role can citizen science play in democratising and globalising acoustic measurements?

Call for contributions

We invite abstracts for short oral presentations, most of which will be allocated 3-5 min slots. Depending on the number of abstracts received some of the presentations may need to be pre-recorded and made available to the participants in advance.

Abstracts should be no more than 2,000 characters including spaces.

Please register and, if applicable, submit your abstract, by **24 November 2021 at 23:59 UTC**, at https://www.surveymonkey.com/r/ZWNP23C. The book of abstracts will be published on the IQOE website (https://www.iqoe.org/workshops), and the workshop discussions may also be synthesised into a joint publication as an outcome.

Follow-up

The outcomes of the workshop will be reported on and discussed at the 23rd POGO Annual Meeting in late January 2022, at the next SCOR Annual Meeting later in 2022, and at the next IQOE Science Committee meeting, with the aim of developing a plan to support further work on this topic.

Organising Committee
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