SnT 2025
8 SEPTEMBER ONLINE DAY
9 TO 12 SEPTEMBER AT HOFBURG PALACE, VIENNA & ONLINE
CTBT: SCIENCE AND TECHNOLOGY CONFERENCE

P1.3-659

Automatic identification of sources detected by the hydroacoustic stations of the International Monitoring System

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INTRODUCTION AND MAIN RESULTS

In this study, we present an automatic method to identify records from hydroacoustic stations of the International Monitoring System (IMS) by type of source. We show the benefits of this method in an operational context with the southern triplet of Diego Garcia for 2024.

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Introduction

Deployed to detect events of interest as part of the CTBT, IMS hydrophones record coherent underwater waves from a wide range of types of sources. These may be anthropophonics (e.g. airgun, chemical explosion), biophonics (whales) or geophonics (earthquake, volcanic activities, cryospheric activities). As a manual analysis of hydroacoustic data is time-consuming, the implementation of an automatic processing chains is necessary.

Currently, the PMCC algorithm is used to detect several thousand coherent waves from hydroacoustic station data daily (a). However, these detections are not discriminated by type of source. In this presentation, we propose to complete the processing chain by classifying PMCC detections by type of source

Data/Methods

We have implemented a two-stage classification method.

- PMCC detections with a maximum amplitude higher than 1.5 Pa has been extracted by type of source using an expert system (Fauvel et al., 2025, *in prep.*).
- A neural network with two convolution layers has been trained on the spectrograms (1 min 30 s from 1 Hz to 100 Hz) of these extractions.

We have analysed the results with new data.

- We have predicted the type of source of PMCC detections above 1.5 Pa in the year 2024 from the HA08S triplet.
- Figure b shows the PMCC detections assigned to three source types with a probability of at least 75%.

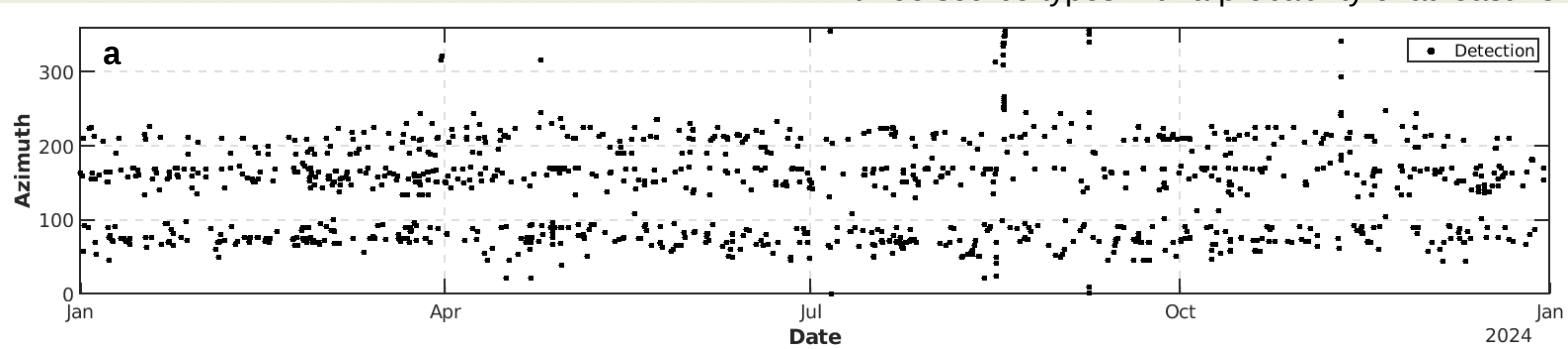

Figure a. PMCC detections above 1.5 Pa for the HA08S hydrophone triplet in 2024.

Results

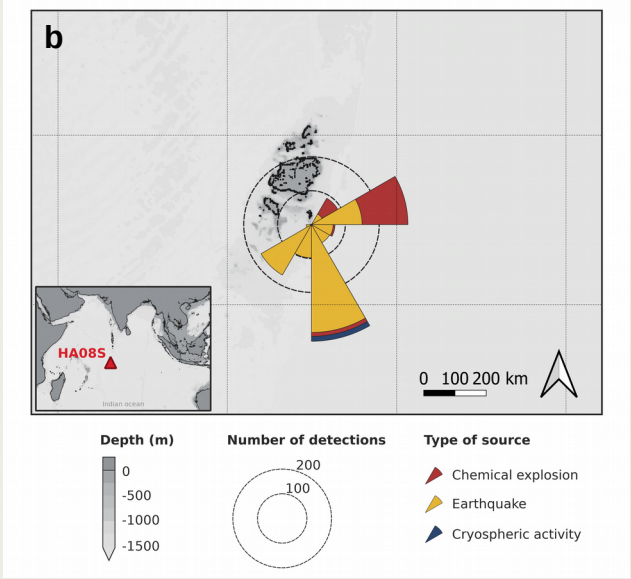

Figure b. Azimuthal distribution of HA08S PMCC detections in 2024 assigned to earthquakes, cryospheric activities or chemical explosions.

Conclusions

We have developed a method for identifying records by type of source. The method has provided useful results for signals whose maximum amplitude is above 1.5 Pa. It provides reliable discrimination, but with some errors due in particular to cryospheric events.

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