Analysis of Seismic, Hydroacoustic and Acoustic Waves Recorded on the Shoreline in the Vicinity of Shallow Underwater Explosions

Éric Beucler, Mickael Bonnin, E. Diego Mercerat, Nathalie Favretto-Cristini, Anne Deschamps, David Ambrois, Thierry Garlan

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The POSA project (Projet de Propagation des Ondes Soniques en Méditerranée, 2015-2019) aimed to study the impact, inland, of the WWII unexploded ordnance (UXO) disposal operations at the French Navy in the French coasts. Several tons of UXO are detonated offshore every year in order to remove the security of ships and divers. We performed two sets of experiments in 2018 and 2019 to determine magnitudes to charge weight (kg TNT-equivalent) for the underwater explosions. We have collected two sets (Favretto-Cristini et al., 2022, see figure on the right) for UXO detonated on the sea bottom (shown in the figure) and an other for UXO detonated in the water column (its floating barrel, blue in the figure).

This paper presents the analysis of the experiment conducted in December 2018 in the bay of Hyères, SE France, and, in particular on the high frequency signals of the gas globe generated by the explosion in the water column. This thus raises the question of the gas globe generation by the explosion in the water column (see the spectrogram, modified from Reid, 1981).

The POSA experiment showed that UXO disposal operations at the French coasts generate hydroacoustic and seismic waves that may be perceived onshore (at least with seismic instruments). Detecting UXO within the water column induces water energy received onshore but dramatically increases energy propagating on land. This then raises the question of the long-term persistence of UXO disposal impacts on the coastline. Moreover UXO are highly protected in the population and not favorable conditions. These investigations should therefore be pursued further.