

Seismic and Hydroacoustic Observations from Underwater Explosions off the East Coast of Florida

To test the ability of new classes of ship to withstand explosions, the United States Navy periodically detonates underwater 10000lb chemical explosions close to the hull of the vessel undergoing testing. In terms of monitoring compliance with the Comprehensive Nuclear-Test-Ban Treaty, as some ground-truth information exists, these explosions provide an opportunity to assess the capability of the International Monitoring System (IMS) to detect, locate and characterise small yield underwater explosions (body-wave magnitudes around 3.5). In this study, seismic and hydroacoustic signals from a series of test explosions in 2001, 2008 and 2016 near Florida are analysed. As the locations of many of these explosions are known, arrival times of seismic and hydroacoustic signals can be used to assess the reliability of epicentres estimated using the IMS. Seismic and hydroacoustic signals are also used to characterise the underwater explosion sources. Bubble pulses characteristic of underwater explosions are identified at seismic stations in the United States and the estimated explosion depths are shown to be consistent with published ground-truth information. The absence of a clear bubble pulse at the IMS hydrophone station at Ascension Island demonstrates the importance of combining seismic and hydroacoustic observations.

Primary author: HEYBURN, Ross (AWE Blacknest)

Presenter: HEYBURN, Ross (AWE Blacknest)

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