



## **Analysis of hydro-acoustic and seismic signals originating from a source in the vicinity of the last known location of the Argentinian submarine ARA San Juan**

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The CTBT International Monitoring System (IMS) is a world-wide network of seismic, infrasound, hydroacoustic and radionuclide stations designed and deployed to verify Treaty compliance by detecting all nuclear tests underground, in the ocean and in the air. In addition to treaty verification, the signals recorded by the IMS network are also used for a broad range of civil and scientific applications. This analysis deals mainly with signals obtained by two hydroacoustic IMS stations, namely, HA10 (Ascension Island in the Atlantic Ocean) and HA04 (Crozet Islands in the southern Indian Ocean). These signals originated in the vicinity of the last known location of the ARA San Juan submarine on 15th November 2017. A variety of techniques were employed, including assessment of received spectral energy levels, cepstral analysis, azimuth and arrival time estimation using Progressive Multi-channel Correlation (PMCC), analysis of direct and reflected signals. These techniques were also used for the study of subsequent signals originating from a controlled calibration charge deployed on the 1st December 2017 by the Argentinian Navy in the surroundings of the last known location of ARA San Juan. Consideration of signals from geophysical surveys provided indication of which signal characteristics are expected to be preserved over different propagation distances. Herein we present and interpret similarities and differences between the signals originating from the calibration charge and the ones originating from the 15th November event, whose origin is still unknown at the time of this writing. In addition to event solutions based on data from the two IMS hydrophone stations, we consider open source data from non-IMS seismic stations.