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Data Processing Technique for T-phase and Tsunami Signals Recorded by IMS Hydrophone Triplets

The IMS hydroacoustic (HA) hydrophone network monitors the world's oceans for signs of nuclear explosions since the early 2000's. The wealth of data acquired by the IMS hydroacoustic stations is also used in civil and scientific applications. The present study focuses: i) on hydrophone data recorded during the tsunamigenic 2011 Tohoku earthquake with the purpose of estimating the directivity of T-phase signals, and ii) on identifying tsunami-induced low frequency recordings from the 2015 Chile earthquake. In the first part of the study, data not including contributions from the tsunami stages are analyzed with the objective of detecting the T-phase and determining its direction of arrival. For this purpose, a new three-step process is examined to obtain a signal envelope associated with the T-phase, which makes it possible to apply F-K analysis without spatial aliasing. It is shown that using the three-step envelope processing technique, the direction of the T-phase signals acquired at the IMS hydrophone triplets can be accurately estimated. The second part of the study addresses the detectability of pressure variations associated with the tsunami itself. For the analysis of tsunami detectability, it is shown that short-period dispersive tsunami signals can be identified by the IMS hydrophone triplets.

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