Geophysical Research Abstracts
Vol. 18, EGU2016-14933-1, 2016
EGU General Assembly 2016

Analysis of recordings from underwater controlled sources in the Pacific Ocean received by the International Monitoring System (IMS) of the Comprehensive Nuclear-Test-Ban Treaty Organization (CTBTO)

Tomoaki Yamada (1,4), Mario Zampolli (1), Georgios Haralabus (1), Kevin Heaney (2), Mark Prior (1,3), and Takeshi Isse (4)

(1) CTBTO, Vienna, Austria (tomoaki.yamada@ctbto.org; yamada@eri.u-tokyo.ac.jp), (2) OASIS Inc., Lexington, USA, (3) TNO, The Hague, Netherlands, (4) Earthquake Reseach Institute, University of Tokyo, Tokyo, Japan

Controlled impulsive scientific underwater sound sources in the Northwestern Pacific were observed at two IMS hydroacoustic stations in the Pacific Ocean. Although these experiments were conducted with the aim of studying the physical properties of the plate boundaries inside the Earth, they are also suitable for the investigation of long range underwater acoustic detections. In spite of the fact that the energy of these controlled impulsive scientific sources is significantly smaller than that of nuclear explosions, the signals were obtained by IMS hydrophone stations thousands of kilometres away and also by distant ocean bottom instruments operated by various Institutes, such as the Earthquake Research Institute, University of Tokyo. These experiments provide calibrated (yield, time, location) long-range acoustic transmissions, which enable one to examine the physics of long-range acoustic propagation and to verify the capabilities of the CTBTO IMS network to detect even small explosions.The two IMS stations used are H03 (Juan Fernandez Island, Chile) off the coast of Chile in the Southeastern Pacific and H11 (Wake Island, USA) in the Western Pacific. Both stations consist of two triplets of hydrophones in the SOFAR channel, which monitor the oceans for signs of nuclear explosions. H03 detected low-yield explosions above flat terrain at distances of 15,000 km across the Pacific as well as explosions above the landward slope off the coast of Japan at distances above 16,000 km across the Pacific. These records showed that source signatures, such as short duration and bubble pulses, were preserved over the long propagation distances. It was found that the observed maximum amplitudes from each source exhibit order of magnitude variations even when the yield and detonation depth are the same. The experimental data and transmission loss simulations suggest that bathymetric features around the sources and between the sources and the receivers are the main causes for these variations.