

## T-waves from the nuclear test in North Korea

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North Korea conducted 3rd nuclear test on 12 February 2013. P-waves from the explosion were observed widely in the Japanese Island. We examined seismic T-waves observed by the seismometers of Hi-net stations because T-waves have been effectively used to detect explosions in the context of the Comprehensive Nuclear Test Ban Treaty (CTBT). We found that the T-waves were clearly observed in the Japan Sea side of northern Japan, while the waves are obscure along the coast from Yamagata to Fukuoka prefectures. This is probably due to the topography of ocean bottom. Along the paths of T-waves from the source to northern Japan the depth of ocean bottom is almost deeper than 3000 m. Thus there is few topographic high to prevent the propagation of sonic waves in the SOFAR channel. On the other hand, shallower and complex bathymetry causes incoherent arrival of T-wave energy along the paths to the southern Tohoku to Kyushu. We investigated the characteristics of T-waves by seismograms, envelopes, and spectrograms. At some stations in Hokkaido and northern Tohoku the amplitude of T-waves is much larger than P-wave. The peak frequency of T-waves reaches about 4 Hz. The most notable feature is the duration of T-waves; the duration is longer at stations in Hokkaido than at stations in northern Tohoku. Longer duration in Hokkaido is attributed to the contribution of reflected/scattered T-waves from the northern edge of the Yamato Bank situated at the middle part of the Japan Sea. Thus the T-waves from the nuclear test provide unique opportunity to investigate the lateral variation of the SOFAR channel and scattering characteristics of sonic waves in the Japan Sea.

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