

# Seismo-Acoustic Analyses of the DPRK Underground Nuclear Tests for the Estimation of Source Depth

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The nuclear tests by the Democratic People's Republic of Korea (DPRK) have generated both seismic and infrasonic signals. This presentation will address seismo-acoustic analyses of these tests. Special focus will be given to the 2013 and January 2016 tests, that were estimated to have a similar yield. Clear detections were made in the Russian Federation (I45RU) and Japan (I30JP) in 2013 at stations from the International Monitoring System. Both tropospheric and stratospheric refractions arrived at the stations. In 2016, only a weak return was potentially observed at I45RU. Data analysis and propagation modeling show that the noise level at the stations and the stratospheric circumpolar vortex were different in 2016 compared to 2013. A relative analysis of the 2013 and 2016 DPRK tests, in combination with atmospheric infrasound propagation modeling, motivates the hypothesis that the 2016 test was at a greater depth than the 2013 test. In such a case, less seismic energy would couple through the lithosphere-atmosphere interface, leading to less observable infrasound. A preliminary analysis suggests that the 2016 test occurred at least 1.5 times deeper. Since explosion depth is difficult to estimate from seismic data alone, this motivates a synergy between seismics and infrasonics.

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