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Modeling the seismo-acoustic events of DPRK's underground nuclear tests

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In this work, seismo-acoustic modeling of DPRK's underground nuclear tests will be presented. The Fast Field Program (FFP) is used to model seismo-acoustic coupling between the solid Earth and the atmosphere under the variation of source depth and atmospheric conditions. There will be a focus on the February 2013 and January 2016 DPRK events. The results show the important role of evanescent coupling between the Earth and the atmosphere and the ability of such emitted energy to get trapped in the atmospheric waveguides. The energy emitted to the atmosphere as a function of vertical propagation angle depends on the source's frequency and depth. As the source depth increases, less energy will be trapped in the tropospheric waveguide compared to the stratospheric waveguide.

Although ECMWF atmospheric conditions suggest that the tropospheric duct towards the CTBTO infrasound array I45RU (Russian Federation) was stronger in January 2016, the shallower source in 2013 lead to enhanced tropospheric propagation. Moreover, the stratospheric duct was more efficient compared to January 2016. This allowed for more energy to arrive at I45RU. The simulated transmission loss values at I45RU and estimated source depths are in agreement with independent observations.