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and modeling of the infrasound signals from the 2017 DPRK nuclear explosion at IMS station IS45

Strong infrasound signals from the Democratic People's Republic of Korea (DPRK) underground nuclear test on 3 September 2017 were observed at IMS infrasound station IS45 in Russia around 25 minutes after the explosion, consisting of 2 distinct high-amplitude peaks about 1 min apart. From Progressive Multi-Channel Correlation (PMCC) processing and frequency wave-number analysis these arrivals yield distinctly different estimates for back azimuth and apparent (trace) velocity indicating different propagation paths. Furthermore, we were able to identify some weaker precursory arrivals as well as an infrasound arrival about 8 minutes later, thus presumed to be associated with the explosion's aftershock, i.e. collapse event. For the numerical modeling of the identified infrasonic phases we applied two-dimensional (2D) ray-tracing and 1-D parabolic equation methods with atmospheric velocity profiles derived from an ECMWF forecast model augmented by empirically deduced velocity variations. These propagation calculations indicate for epicentral seismic-acoustic wave conversion that both stratospheric and thermospheric ducting has occurred explaining well the major peaks and the aftershock signal. For the precursory signals we applied grid search calculations for backtracking the likely source regions where additional conversions of seismic waves into acoustic energy occurred.

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