

Aftershocks of announced underground explosions carried out at the DPRK test site and detected by the method of cross-correlation of waveforms between 2013 and 2022.

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In this paper, aftershocks are understood as non-explosive activity occurring later in time and not contradicting the hypothesis of proximity to the epicenter of an underground explosion within 1–2 km. The first aftershock of an underground explosion at the DPRK test site was detected by the waveform cross-correlation method (CCWF) on September 11, 2016, two days after the fifth explosion (DPRK-5). Dozens of new DPRK-5 and DPRK-6 aftershocks have been detected through comprehensive data reprocessing since 2009, with the most recent and largest events occurring in February 2022. The DPRK-3 (February 12, 2013) and DPRK-4 (6 January 2016) aftershocks were detected also. In the period from January 2009 to February 2013, neither natural nor man-made seismic events with a waveform similar to that observed for explosion aftershocks in the DPRK were detected. The DPRK-3 and DPRK-4 aftershocks were also confirmed by interactive analysis. At present, more than 100 aftershocks of the DPRK have been detected by the CCWF method, while the relative positions estimated from the data of two stations do not contradict the hypothesis of proximity to the epicenters of the DPRK explosions within 1–2 km. An accurate estimate of the relative location of the DPRK-6 explosion is needed to analyze the mechanical interaction between underground cavities and collapsing chimneys. The mechanics of the process of this interaction, accompanied by the release of seismic energy, is important not only for theoretical consideration, but also for practical applications related to safety and seismic location problems.