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Seismological Investigations of the 2017 North Korean Nuclear Test

On September 3rd 2017 official channels of the Democratic People's Republic of Korea announced the successful test of a nuclear device. Only minutes after the alleged nuclear explosion at the Punggye-ri nuclear test site at 03:30:02 (UTC), hundreds of stations distributed all around the globe picked up strong and distinct seismic signals associated with an explosion. Our investigations locate the event within the test site at a depth of 0.6 km. The radiation and generation of P- and S-wave energy in the source region are significantly influenced by the topography of Mt. Mantap. Inversions for the full moment tensor of the main event reveal a dominant isotropic component accompanied by significant amounts of DC and CLVD terms, confirming the explosive character of the event. The analysis of the source mechanism of an aftershock around 8 min after the test in the direct vicinity suggests a cavity collapse. Measurements at seismic stations of the IMS result in a body wave magnitude of 6.2, which translates to a yield estimate of around 400 kT TNT equivalent. The explosive yield is possibly overestimated, since topography and source mechanism both tend to enhance the peak amplitudes of teleseismic P-waves.

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