

## **The Precise Location of the Fifth Nuclear Test in North Korea**

The accuracy of earthquake location is controlled by several factors, including the network geometry, available phases, arrival-time reading accuracy, and knowledge of the crustal structure. At 00:30 (UTC) on 09 September 2016, the North Korea conducted its fifth nuclear test. Because lack of near station and poor network geometry, it's difficult to determine the location of the fifth nuclear test in DPRK with routine earthquake location method. In this study, we developed a relative location method to locate the position of the fifth nuclear test. We extract the travel time differences of Pg/Pn between the new event and reference event at the same station using waveform cross correlation method. We then find the minimum of travel time residual by searching potential location near the reference event with grid search method. Synthetic tests indicate that the method has little effect on velocity model and the location error is less than 100 m. We determined the location of the fifth nuclear test with the new method. The fifth nuclear test is located to the northeastern of the fourth test. The distance between the two tests is about 500 m.

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