

## and Relative Location of the February 12, 2013, DPRK Announced Nuclear Test

Signals from the announced nuclear test in North Korea on February 12, 2013, were routinely detected and rapidly identified by the Norwegian National Data Center using both a site-specific alert algorithm and using multi-channel correlation detectors on several IMS seismic arrays with signals from both the 2006 and 2009 DPRK events as waveform templates. Using data from IMS seismic stations only, and measuring accurate waveform-correlation-based relative delay times, we estimate the location of the 2013 event to be approximately 450 m SW of the 2009 event with a horizontal uncertainty of approximately 100 m. Using the same techniques, the site of the 2006 event is estimated to be approximately 2 km ESE of the 2009 event. Due to the greater waveform similarity between the signals from the 2009 and 2013 events, together with the greater number of stations recording both events with a higher signal-to-noise ratio, the horizontal uncertainty in the location estimates of the two larger events relative to each other is smaller than for the location of the 2006 explosion relative to the more recent events. All relative location estimates made are consistent with independent estimates made using non-IMS seismic data recorded at regional distances.

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