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Discrimination of DPRK M5.1 February 12th, 2013 Earthquake as Nuclear Test Using Analysis of Magnitude, Rupture Duration and Ratio of Seismic Energy and Moment

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On February 12th, 2013 morning at 02:57 UTC, there had been an earthquake with its epicenter in the region of North Korea precisely around Sungjibaegam Mountains. Monitoring stations of the Preparatory Commission for the Comprehensive Nuclear Test-Ban Treaty Organization (CTBTO) and some other seismic network detected this shallow seismic event. Analyzing seismograms recorded after this event can discriminate between a natural earthquake or an explosion. Zhao et. al. (2014) have been successfully discriminate this seismic event of North Korea nuclear test 2013 from ordinary earthquakes based on network P/S spectral ratios using broadband regional seismic data recorded in China, South Korea and Japan. The P/S-type spectral ratios were powerful discriminants to separate explosions from earthquake (Zhao et. al., 2014).
Pribadi et. al. (2014) have characterized 27 earthquake-generated tsunamis (tsunamigenic earthquake or tsunami earthquake) from 1991 to 2012 in Indonesia using W-phase inversion analysis, the ratio between the seismic energy (E) and the seismic moment (Mo), the moment magnitude (Mw), the rupture duration (To) and the distance of the hypocenter to the trench. Some of this method was also used by us to characterize the nuclear test earthquake.
We discriminate this DPRK M5.1 February 12th, 2013 earthquake from a natural earthquake using analysis magnitude mb, ms and mw, ratio of seismic energy and moment and rupture duration. We used the waveform data of the seismicity on the scope region in radius 5 degrees from the DPRK M5.1 February 12th, 2013 epicenter 41.29, 129.07 (Zhang and Wen, 2013) from 2006 to 2014 with magnitude $M \geq 4.0$. We conclude that this earthquake was a shallow seismic event with explosion characteristics and can be discriminate from a natural or tectonic earthquake.
Keywords: North Korean nuclear test, magnitude mb, ms, mw, ratio between seismic energy and moment, ruptures duration