

Directivity of a moderate earthquake in Odaesan, Korea

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A moderate earthquake with local magnitude of 4.8 occurred in northeastern part of Korean Peninsula (Odaesan region) in January 20, 2007. This event was a largest inland earthquake since 1999 when the Korea Meteorological Administration (KMA) operated digital seismographs. This event was felt in whole region of the Peninsula and the largest intensity was reported as Modified Mercalli Intensity (MMI) V. The focal mechanism solution, estimated from P polarity, showed that this event was nearly pure strike-slip event with northeasterly striking and northwesterly (or southeasterly) striking failure planes.

We investigated the waveforms in relatively close stations to the epicenter and carried out deconvolution using empirical Green function method to estimate the source time function. We used a small earthquake with local magnitude of 2.0 occurred one day before the Odaesan event as an empirical Green function event. The obtained source time functions at six stations with epicentral distance less than about 70 km showed the clear difference in duration depending on azimuth. In a western station the duration was about 0.1 sec, and it was about 0.2 - 0.3 sec at stations in east - south direction from the epicenter. This indicates that this event has directivity to the northwest and the northwesterly (or southeasterly) striking failure plane may be the fault plane. This result is inconsistent with neighboring tectonic lines which align generally in NE-SW direction. However several studies reported some evidence supporting NW-SE striking plane from relocation of seismicity before and after the Odaesan event (W.-Y. Kim, 2008) and from peak ground acceleration (PGA) analysis (K.-H. Yun, 2008). We also estimated fault radius using rise times obtained by the deconvolution and it was about 0.4 km in average. Our results show an observational evidence of directivity during small size rupture.