

Synthetic Seismograms of Explosive Sources Calculated by the Earth Simulator

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We calculate broadband synthetic seismograms using the spectral-element method (Komatitsch & Tromp, 2001) for September 3, 2017 (Mb(USGS) 6.3) DPRK events. We use Earth Simulator system in JAMSTEC to compute synthetic seismograms using the spectral-element method. The simulations are performed on 8,100 processors, which require 2,025 nodes of the Earth Simulator. We use one chunk with the angular distance 40 degrees to compute synthetic seismograms. On this number of nodes, a simulation of 20 minutes of wave propagation accurate at periods of 1.5 seconds and longer requires about 10 hours of CPU time. We use CMT solution of Dreger (2017) for this event. This source model has 34% double couple component. The hypocenter depth of this solution is 1.4 km. Comparisons of the synthetic waveforms with the observation for this event show that the arrival time of Pn and Pg waves matches well with the observation. Comparison also shows that the agreement of amplitude of other phases is not necessarily well, which demonstrates that the crustal structure should be improved to include in the simulation. The surface waves observed are also modeled well in the synthetics, which shows that the CMT solution we have used for this computation correctly grasps the source characteristics of this event. Synthetics which are calculated only with isotropic component do not match well in the horizontal component, which shows that the double couple component is significant in this event.

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