Synthetic seismograms of explosive sources calculated by the Earth Simulator

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We have calculated broadband synthetic seismograms using the spectral-element method (Komatitsch et al., 2005) for realistic Earth model. Recent progress in supercomputers makes it possible to compute the synthetic seismograms with the accuracy of 1.2 second and longer (Tsuboi et al., 2016a) . Here we have used one chunk of spectral element method to compute synthetics with 1.5 second accuracy using the Earth Simulator. We calculate synthetics for Sep. 3, 2017 (MB(USGS) 6.3). 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 5 minutes of wave propagation accurate at periods of 1.5 seconds and longer requires about 9 hours of CPU time (Tsuboi et al., 2016b) . We use CMT solution of Dreger (2017) as a source model for this event. This source model has 24% CLVD component, 34% double couple component and 42% isotropic component. The hypocenter depth of this solution is 1.4 km but we put the hypocenter at the surface for this computation. Comparisons of the synthetic waveforms with the observation at station MDJ(Mudanjiang) in China show that the arrival time of Pn and Pg waves matches well with the observation, which demonstrates that the crustal structure we have used for this computation models the actual structure well. The surface waves observed at this station 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. However, the amplitudes of Pn and Pg waves in the synthetics are smaller than the observations, which indicates that the amplitude of short period components is not enough in this computation. The result also shows that crustal structure around source region should be improved to get better agreement between the synthetics and observation.

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