

Early rupture process of the 14 March 2014 Iyo-Nada intermediate-depth earthquake

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An intermediate-depth earthquake (M_{JMA} 6.2) occurred in Iyo-Nada on March 14, 2014. The focal depth is 78 km, and this event occurred in the Philippine Sea slab. In this study, we investigate the early rupture process of this earthquake for about 5 seconds after the initial break. Three characteristic P-wave phases, P1, P2 and P3 are identified on the observed waveform records. Later phases has larger amplitude among the three phases. We estimate the generated position and time using the relative arrival time from the initial P phase for each of the three phases. We use vertical component of velocity waveform records at 52 seismic stations from the networks of JMA, NIED, AIST and Kyushu University, which are located at less than 105 km of epicentral distance, and read the arrival times and the polarities of the three phases and the first P arrival. Comparing the polarities of each arrival phase to the focal mechanism solution and the CMT solution from JMA, P1 phase corresponds to the focal mechanism, while P2 and P3 phases correspond to the CMT solution. Therefore, P1 phase is an initial rupture phase, while P2 and P3 phases are main rupture phases. The rupture position and time for each phase are estimated by the method of Takenaka *et al.* (2006, EPS) and its extension. As results, we found that initial P and P1 phases occurred on the east-dipping fault plane of the focal mechanism solution, while P2 and P3 occurred on north-dipping fault plane of the CMT solution. The two fault planes are crossover. The rupture moved from the initial rupture fault plane to the main rupture one. Focusing on the rupture times of the three phases, P1 phase was emitted by an event on the initial rupture fault plane at 0.49 seconds after the origin time of this earthquake. P2 phase then was generated by an event on the main rupture fault plane at 1.82 seconds after the origin time. P3 phase was emitted by a larger event at 3.3 seconds after the origin time.

Keywords: Rupture process, Initial rupture, Main rupture, Iyo-Nada