

Early rupture process of 14 March 2014 Iyo-Nada intermediate-depth earthquake inferred from 3D and 2D source imagings

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An intermediate-depth earthquake (M_{JMA} 6.2) occurred in Iyo-Nada on March 14, 2014. The focal depth is estimated to be 78 km by JMA, and this event occurred in the Philippine Sea slab. In this study, we investigate the early rupture process of the earthquake for three seconds after the initial break. We use P-wave portion on vertical components of waveform records at 50 seismic stations from the seismic networks of JMA, NIED, and AIST. The result of three-dimensional (3D) imaging, we find three strong slip regions S1, S2, and S3 except the hypocenter (S) corresponding to the initial break: S1 is located close to S, northward and upward from the hypocenter at about 0.7 seconds after the initial break, S2 about 9 km southward and 6 km downward at about 2.2 seconds after the initial break, and S3 about 8 km eastward and 7 km downward at about 2.7 seconds after the initial break. From this result, we suggest a fault model with two planes: initial rupture plane including S and S1 with strike of 22°E and dip angle of 69° from JMA's P-wave first motion focal mechanism and the main rupture plane including S2 and S3 with strike of 244°E and dip angle of 26° from JMA's CMT solution. Then, from the two-dimensional (2D) imaging, we locate the main rupture plane to be 7 km just below the hypocenter. The rupture process is interpreted as follows: a large slip occurred at S1 close to the hypocenter on the initial plane; after the rupture propagated southward and downward on the initial plane and got into the main rupture plane, another large slip occurred at S2; asides, the third large slip then took place at S3.

Acknowledgments: we used the strong motion records of JMA, NIED, and AIST.

Keywords: Initial rupture, Main rupture, Source imaging, 2014 Iyo-Nada intermediate-depth earthquake