Source process of The 2004 Mid Niigata prefecture Earthquake obtained by joint inversion of near-field and teleseismic

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On October 23, 2004, a destructive earthquake (Mjma 6.8) struck mid Niigata prefecture. In this study, we estimated source rupture process of this earthquake using strong ground motion and teleseismic body wave (P-wave). In general, the teleseismic body waves contain the information on the overall moment release rate and the depth range of the rupture area, while the near-source waveforms contain most of the information on the detailed slip process in the source area. Therefore, to estimate the detailed and stable source process, it is important to use both the teleseismic body wave and near-source data.

12 teleseismic body wave (P-wave) data recorded at IRIS-DMC stations were band-passed between 0.001 and 2Hz and then converted into ground velocity with a sampling time of 0.1 sec. 12 acceleration data recorded at 4 JMA stations were band-passed between 0.05 and 0.5 Hz and numerically integrated to ground displacement with a sampling time of 0.1 sec.

We adopted the fault plane of (strike, dip) = (210, 54), which is inferred from moment tensor determined by National Research Institute for Earth Science and Disaster Prevention (NIED). I found that observed waveform at near source region can not be explained by JMA epicenter. To estimate suitable hypocenter, I varied the location of hypocenter in the inversion procedure, and found its minimum variance at (37.30N, 138.84E, 10.5 km). This location is well consistent with result by Tohoku Univ. (Okada et al., submitted to EPS). The source parameters are as follows: (average slip) = (100), seismic moment Mo = 8.1e18 Nm; source duration = 11 sec. We found that the rupture process can be divided into two stages: the rupture nucleated and broke the first asperity near the hypocenter (Stage I), and then the rupture propagated to the east and second asperity was broken (Stage II). The obtained source model can well explain observed waveform.