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Source Modeling of the 2011 Tohoku-Chiho Taiheiyo-Oki Earthquake (Mw9.0)

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The Tohoku-Chiho Taiheiyo-Oki Earthquake (Mw9.0) on March 11, 2011, which occurred near the east coast of Tohoku district, Japan, resulted from thrust faulting on the subduction zone plate boundary between the Pacific plate and North America plate. The observed acceleration waveforms in Miyagi and Iwate prefectures display two remarkable phases of ground motion. The waveforms in Fukushima prefecture display many phases, and the waveforms in Ibaraki prefecture display one remarkable phase. These observed records suggest a very complex source process. It is very important for the strong ground motion prediction of the future subduction zone earthquakes, such as the Tonankai and Nankai earthquake, to estimate the source process of this earthquake.

We tried to construct the source model by the forward modeling approach using the empirical Green's function method. We use the observed records of two earthquakes, which are Mj6.3 earthquake on October 19, 2005 and Mj6.4 earthquake on March 10, 2011, as the empirical Green's functions. In this study, our target frequency band of the observed records is from 0.1 to 10.0Hz. Finally, we proposed the source model composed of five asperities on the subduction zone plate boundary. The synthetic waveforms using this source model well explain the observed waveforms.

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Keywords: 2011 Tohoku-Chiho Taiheiyo-Oki Earthquake, strong ground motion, source model, asperity, empirical Green's function