Japan Geoscience Union Meeting 2015
(May 24th - 28th at Makuhari, Chiba, Japan)

SSS02-10 会場:国際会議室 時間:5 月 25 日 11:45-12:00

Characteristics and waveform simulation for dynamic rupture model of the 2011 Tohoku earthquake with deep SMGAs
Characteristics and waveform simulation for dynamic rupture model of the 2011 Tohoku earthquake with deep SMGAs

GALVEZ Percy[1] ; Petukhin Anatoly[2*] ; 入倉 孝次郎 [3] ; SOMERVILLE Paul[1]
GALVEZ, Percy[1] ; PETUKHIN, Anatoly[2*] ; IRIKURA, Kojiro[3] ; SOMERVILLE, Paul[1]

[1]AECOM, USA, [2]Geo-Research Institute, Japan, [3]Aichi Institute of Technology, Japan
[1]AECOM, USA, [2]Geo-Research Institute, Japan, [3]Aichi Institute of Technology, Japan

The rupture process of the 2011 Tohoku earthquake is simulated using the spectral element program SPECFEM3D with the recent dynamic rupture module implemented by Galvez et al. (2014). The state-of-the-art unstructured mesh software CUBIT provides a powerful tool to deal with geometrical complexities. We use this capabilities to perform dynamic rupture simulation for the Tohoku earthquake including the non-planar slab interface and tiny angles (<5) found in the trench wedge. Based on this geometry we allocate asperities and SMGAs inspiring by the source inversion results and gradually modify the asperity distribution. To create more slip in the shallow regions, the main asperity has been moved close to the trench. In the deep region we place asperities on the strong-motion generation areas (SMGAs) detected by Kurahashi & Irikura (2013). By a systematic adjustment of stress drops, slip critical distance (Dc), the rupture reproduces final slip recorded by kinematic models (e.g. Suzuki et al.(2011); Lee et al. (2011)).

Moreover, this model also reproduces qualitatively the multi-seismic wave front observed from the strong ground motion and GPS data along the Japanese coast. We take the seismic station (FKS011) and compare the recorded velocity waveform and our 1D synthetic between 20 to 100 seconds period (see Figure). The fitting is remarkable but there are other stations less accurate. For a set of coastal hard rock sites we perform 3D FDM simulations for the JIVSM velocity model and periods 5 to 20sec, and confirm that developed dynamic model reproduce observed wave-packets as amplitude, spectral content and arrival time. Overall, we could resemble the rupture process of the Tohoku earthquake and reproduce qualitatively the recorded multi-seismic wave front detected by the KNET and Kik-net networks.

Acknowledgements. Seismic waveform data of the KiK-net and KNET were used. We are indebt to J.-P. Ampuero and K. Miyakoshi for fruitful discussions. This study was based on the 2014 research project 'Improvement for uncertainty of strong ground motion prediction' by NRA (Nuclear Regulation Authority).

キーワード: 2011 Tohoku earthquake, dynamic simulation, slip reactivation
Keywords: 2011 Tohoku earthquake, dynamic simulation, slip reactivation