Japan Geoscience Union Meeting 2012
(May 20-25 2012 at Makuhari, Chiba, Japan)

SSS39-P22 Room:Convention Hall Time:May 25 13:45-15:15

Rupture process of the 2011 Tohoku-Oki earthquake inverted from teleseismic body waves and geodetic data

KUBO, Hisahiko[1*], KAKEHI, Yasumaro[1], HOSHIBA, Mitsuyuki[2]

[1]Kobe University, [2]Meteorological Research Institute

Rupture process of the 2011 off the Pacific coast of Tohoku earthquake is estimated from the inversion of teleseismic body waves and geodetic data. In order to obtain a reliable source model, the following are done in this study: (1)The assumed values of the maximum slip duration at each subfault (T_{sd}) and the propagation velocity of the first time window (V_{ftw}) , which have a significant influence on the source model estimated by the multiple time window analysis, are selected as objectively as possible; (2)The joint inversion of teleseismic body waves and geodetic data is done; (3) Considering the 3D shape of the plate boundary, a realistic fault model is assumed; (4)In the calculation of the teleseismic Green's functions, different 1D structure models are used for subfaults with different locations along dip direction, considering the horizontal (along dip direction) heterogeneous structure of the continental plate; (5)Not only terrestrial crustal deformation data but also seafloor crustal deformation data is used as the geodetic data; (6)A spatial and temporal smoothing constraint considering that the fault rupture reached the trench axis is used; (7)Relative weights among different kinds of data-set are determined by theoretical tests.

The estimated seismic moment and the maximum slip are $3.4 * 10^{22}$ Nm (M_w=9.0) and 43 m. The total rupture duration is about 150 s. The derived slip model has one large slip area, which is located on the shallower side of the rupture starting point and extends to the north and south along the trench axis. This model is consistent with the slip distribution estimated from the tsunami records and the results of the bathymetric survey. The estimated rupture propagation velocity is about 2 km/s when the rupture propagates from the rupture starting point towards the shallower part of the fault plane.

Keywords: the 2011 off the Pacific coast of Tohoku earthquake, rupture process, joint inversion, teleseismic body waves, geodetic data