

Slip Distribution of the November 2006 and January 2007 Kuril Earthquakes from Inversion of Phase-corrected Tsunami Waveforms

Toshiki Doyama¹, Satoshi Kusumoto¹, Shingo Watada¹, *Kenji Satake¹, Yushiro Fujii²

1.Earthquake Research Institute, The University of Tokyo, 2.Building Research Institute

Along the Kuril-Kamchatka trench, two Mw 8-class earthquakes occurred at a two-month interval: an intraplate underthrust earthquake in November 2006 (Mw 8.3, the Global Centroid-Moment-Tensor (CMT) Project) and an outer-rise normal fault earthquake in January 2007 (Mw 8.1, the Global CMT Project). Tsunamis generated by the two earthquakes were recorded at far-field observation stations in Hawaii (e.g. Hilo) and the west coast of the United States (e.g. Crescent City) as well as in and near Japan and Russia.

We usually forecast and invert tsunami waveforms by assuming the linear long waves. However, we could not use far-field tsunami waveforms for inversion because simulated tsunamis arrive earlier than observed ones, and the initial phases of simulated and observed ones show the reverse polarity at far-field stations. Recently, Watada *et al.* (2014) completely explained the observed tsunami delay and developed a model to correct the initial phases of synthetic waveforms. In this study, we estimated the fault slip distribution of the two earthquakes from tsunami waveform inversion using the tsunami phase correction method (Watada *et al.*, 2014).

The slip distribution of the November 2006 Kuril earthquake estimated by using phase-corrected tsunami waveforms indicates that a main rupture area is located in the shallower side, which is different from the slip distribution estimated by using uncorrected tsunami waveforms (e.g. Fujii and Satake, 2008), where the deeper side has a large slip amount, and agrees well with the inversion results of previous studies estimated from teleseismic body waves (e.g. Lay *et al.*, 2009). For the January 2007 Kuril earthquake, the location of a main rupture area estimated by using phase-corrected tsunami waveforms also approximately coincides with the inversion results of previous studies estimated from teleseismic body waves. At far-field observation stations as well as at near-field observation stations, the phase-corrected synthetic waveforms agree very well with the observed waveforms. Furthermore, by using phase-corrected tsunami waveforms for inversion, the seismic moment and moment magnitude become larger and closer to the Global CMT solution and previous inversion results estimated from teleseismic body waves. Therefore, through the tsunami phase correction method, far-field tsunami waveforms can be used for the inversion for the slip distribution estimation.

Keywords: Kuril earthquakes, Kuril-Kamchatka trench, Fault slip distribution, Tsunami waveform inversion, Tsunami phase correction method, Far-field observation stations