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Modeling the source process of the 2011 off the Pacific coast of Tohoku earthquake using the 1-Hz GPS data

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High-rate GPS data can record ground displacement as a seismometer. Previous studies demonstrated that high-rate GPS data show good agreement with strong motion waveforms for M8 class large earthquakes, e.g., the 2002 Denali Fault earthquake (Larson et al. 2003), and the 2003 Tokachi-oki earthquake (Miyazaki et al. 2004), as well as the medium-sized earthquakes, e.g., the 2008 Iwate-Miyagi Nairiku earthquake (Yokota et al. 2009). Strong motion records must be integrated twice to obtain static displacement, resulting in amplifying noise. On the other hand, the high-rate GPS waveforms contain not only dynamic process but static displacement of the ground surface. Using this advantage of high-rate GPS data, GPS waveforms recorded during an earthquake were inverted to infer slip distribution (e.g., Miyazaki et al. (2004) and Yokota et al. (2009)). For example, Miyazaki et al. (2004) estimated the spatio-temporal evolution of fault slip during the rupture of the 2003 Tokachi-oki earthquake and demonstrated the ability to infer source process of earthquakes solely from high-rate GPS data. In this study, we first analyze 1-Hz GPS data in Tohoku and northern Kanto area for the 2011 off the Pacific coast of Tohoku earthquake. Then we perform a waveform inversion for the rupture process of the earthquake and finally compare theoretical GPS waveforms with observed strong motion waveforms.