Characterized source model for estimating strong ground motions during 2016 Kumamoto earthquake

*Susumu Kurahashi[1], Kojiro Irikura[1]

1.Aichi Institute of Technology

1. Introduction
Strong ground motions from the 2016 Kumamoto earthquake (Mw7.3) strikeed in and around Kumamoto city, Kyushu, Japan, on April 16, 2016. The maximum seismic intensity 7 was observed at Mashiki and Nishihara near earthquake fault. PGA and PGV of 825 gal and 171 cm/s, respectively, were observed at the Mashikisite. Coseismic surface rupture is also identified along the Futagawa fault. We estimated the characterized source model, which explain broad-band strong motions, during this earthquake using the results of the waveform inversion using the strong motion data and the empirical Green's function method.
2. Source model inferred from the wavefrom inversion results
We analyzed the slip distribution during this earthquake using the multi-time window linear waveform inversion method (Sekiguchi et al., 2000). The data sets used for an analysis were velocity waveforms of S-waves parts in the frequency range 0.05-0.5Hz at 16 stations (KiK-net, K-NET, JMA and Seismic intensity network). The Green's functions were calculated using the one-dimensional velocity structure model by the discrete wavenumber method (Bouchon, 1981) with the reflection and transmission matrix method (Kennett and Kerry, 1979) at each station. A fault plane was assumed referring to the aftershock distribution and moment tensor solution determined by F-net. The fault plane is decided into 184 subfaults of 2km x2km. The temporal moment release history from each subfault is modeled by a series of 6 smoothed ramp function with a rise time of 1 second each separated by 0.5 second. The characterized source model is constructed based on slip and slip-velocity distributions from the waveform inversion.

3. Conclusion
Large slip areas were constructed about 15km eastward from the hypocenter. Especially, very large fault-slip was obtained at two places on the assumed fault plane, one at about 2 km depth and 8 km eastward away from the hypocenter and the other at about 2 km beneath Mashiki and Nishihara eastward from hypocenter. Seismic moment of the estimated model is 4.6×10^19Nm. The calculated waveform from the estimated model agrees rather well with the observed one at KMMH16 (KiK-net:Mashiki). However, the synthesized waveform of EW component at Mashiki-site of the seismic-intensity-network was clearly underestimated, although that of NS component agrees well with the observed one. The distance between two stations is about 200m away from each other.
One of the reasons why the EW component of ground motions at the site might be that fling step are not correctly simulated in our calculation. We will improve the source model to be able to explain the ground motions observed extremely near the earthquake fault.

Keywords: 2016 Kumamoto earthquake, strong ground motion, characterized source model

