Preliminary results of rupture processes of the 2016 Kumamoto Earthquake inferred from strong motion waveform

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INTRODUCTION

In the 2016 Kumamoto Earthquake sequence, high acceleration records were observed and those are important to considering the relations between the source process and ground motions. I performed the inversion analyses to reveal the source processes of the main shock (4/16 1:25) and foreshock (4/14 21:26) using the strong motion records. The information of these events is limited and is updated daily, however, the results of this study are tentative. I will continue the analysis necessary to reveal detail source processes.

OUTLINE of ANALYSES

The hypocenters of these events, including the maximum foreshock, the main shock, were relocated using double-difference method (Waldhauser and Ellsworth, 2000). These parameters were used to configure the fault planes.
The strong motion records observed KiK-net stations (about 15 stations) were used for the inversion analyses. The horizontally stratified velocity models, used in calculating Green's functions, were tuned using the waveform inversion method (Hikima and Koketsu, 2005).
The source processes were inverted by the multi time window analysis (Yoshida et al., 1996, Hikima, 2012). The velocity waveforms obtained by KiK-net, filtered between 0.03 and 0.8 Hz (for the main shock), between 0.03 and 0.5 Hz (for the foreshock) were used.

RESULT of the main shock

The fault plane were configured as 227 degree for strike angle and 75 degree for dip angle, considering preliminary results and aftershock distribution. The rupture propagated toward north-east direction almost uni-laterally. The dimension of fault plane is about 40 km for strike and 16 km for dip direction. The large slip areas (asperity) are located deep northern of the hypocenter and shallow part between Mashiki and Aso. Right lateral strike slip component is dominant, but significant amount of normal fault component is contained in the shallow slip. The total seismic moment of this result was about 4.6×10^{19} Nm (Mw 7.0).

RESULT of the foreshock

Because two wave packets, those interval is about 5 seconds, are recognized on the waveforms at several stations, it seems that the foreshock is multiple shock event. The preliminary analysis was performed using the fault plane referring the F-net mechanism solution. A dominant slip was determined near the hypocenter and another large slip was recovered slightly shallow from those part after a few seconds. The result is unstable, however, I will continue source process analysis furthermore.

Keywords: 2016 Kumamoto earthquake, Source process, Strong motion, Near fault

