

Rupture processes of the 2016 Kumamoto earthquakes derived from joint inversion of strong-motion, teleseismic, and geodetic data

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Two earthquakes respectively occurred on April 14, 2016 at 21:26 (JST) and on April 16, 2016 at 1:25 (JST). These earthquake and aftershocks caused heavy damage to the Kumamoto Prefecture and surrounding region. Especially for the earthquake on April 16, at a strong-motion station in the Nishihara village, Kumamoto Prefecture, the observed maximum velocity of EW component was over 250 cm/s. It is essential to perform source inversion to understand the cause of such waveform observed near to source fault. Therefore, we perform joint source inversion of the earthquake on April 16 using strong-motion, teleseismic, and geodetic data. We obtained strong-motion data from K-NET, KiK-net and JMA stations, teleseismic data from IRIS-DMC, and geodetic data from GEONET. We construct a fault model with three segments because observed surface fault traces, aftershock distributions, and SAR analyses by GSI cannot be represented by single plane fault model. We bend the fault model at the junction of the Hinagu and Futagawa fault zones, and the entrance of the Aso caldera. The results show that rupture propagated to northeast shallow part from the hypocenter and total rupture duration was about 20 s. Maximum slip was obtained at the northeast shallow part near to the Nishihara village. The data fitting was largely well, but some data fitting were not enough, suggesting that further adjustments of the assumed fault model and the velocity structure model are needed. For future study, we will perform the joint source inversion of the earthquake on April 14 or others.

Keywords: 2016 Kumamoto earthquake, rupture process, joint inversion