Slip models of the 2016 Mw7.0 Kumamoto, Japan mainshock and its two foreshocks constrained by multi-mode InSAR data

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Interferometric Synthetic Aperture Radar (InSAR) data is of high spatial resolution and has been widely used in measuring surface deformation generated by earthquakes. However, the temporal resolution of InSAR data is relatively poor from an individual mode SAR sensor. A series of earthquakes hit Kumamoto, Japan in April 2016. These earthquakes were considered to be a sequence that started from two foreshocks (TFS) larger than Mw 6.0 and reached its climax for the largest earthquake of Mw7.0 only after 28 hours. To better reveal the source model characteristics of the TFS and the main shock, we firstly determined the geometrical parameters using the aftershock re-location data and the surface fault rupture data of field survey, and then applied multi-mode InSAR data only covering the TFS and the whole sequence, respectively, to carry out the joint inversion of respective source models based on the time correlation between the TFS and the main shock. The results show that both the source models determined here are well consistent with previous results constrained by seismological data. The strategy of inversion used in this study suggests that we may separate multiple seismic sources sequence from geodetic observations using the joint inversion based on the time correlation.