

Crustal deformation of the 2016 October 21th M 6.6 earthquake in central Tottori prefecture.

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Introduction

There is a zone of active microseismicity along the Japan Sea coast in the San'in region. Some large earthquakes including the 1943 M7.2 Tottori and the 2000 M7.3 western Tottori earthquakes also occurred in this seismic zone. Nishimura et al.(2014) showed a zone of high strain rate observed by GNSS almost overlapped the seismic zone and proposed to call it "the San'in shear zone".

We constructed 13 continuous GNSS stations in Tottori and Okayama prefectures in late 2014 so as to clarify a detailed distribution of the San'in shear zone. These stations constitute three linear arrays across the shear zone. An M_{JMA} 6.6 earthquake hit central Tottori prefecture on October 21, 2016. Our GNSS network, as well as GEONET revealed a detailed pattern of crustal deformation before, during, and after the earthquake. We report the deformation observed by GNSS and InSAR.

Preseismic deformation

Deformation in the San'in shear zone is characterized by right-lateral shear movements. GNSS stations along the Japan Sea coast moves eastward relative to those in Okayama prefecture. The 20-km-wide shear zone extends in an east-west direction and accommodates 5 mm/yr of shear movements. The M6.6 earthquake occurred in the shear zone.

Coseismic deformation

Coseismic displacement was observed at GNSS stations in Tottori and Okayama prefectures (Figure). The largest displacement was observed at KRNS and shows horizontal displacement of 9 cm toward east-southeast and subsidence of 4 cm. We estimate parameters of a rectangular fault model using the observed displacement. The estimated parameters suggest a vertical fault oriented NWN-SES with left-lateral strike slip, which is concordant with aftershock distribution. The estimated moment magnitude is ~6.2. SAR interferograms of ALOS-2 show a clear quadratic pattern of surface coseismic displacement.

Postseismic deformation

Postseismic displacement at GNSS stations reached 2 cm as of end of December, 2016. Although a spatial pattern of postseismic displacement is similar to that of the coseismic displacement, observed postseismic displacement is concentrated near the source fault. It suggests shallow afterslip along the coseismic fault.

Keywords: Crustal deformation, GNSS, InSAR, San'in shear zone

