



Extremely early recurrence of an M6 intraplate earthquake observed after the 2011 Tohoku-oki earthquake

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After the 2011 Mw 9.0 Tohoku-oki earthquake, a swarm of shallow normal-faulting earthquakes was triggered in a localized region beneath northern Kanto, Japan. One of such events was an M6 earthquake on 19 March 2011, eight days after the Tohoku-oki earthquake. The displacements associated with the event were well captured by InSAR using the data of ALOS satellite. Five years and nine months later in December 2016, another M6 earthquake occurred in the region. The InSAR data for the 2016 event, processed from ALOS-2 images, showed a displacement pattern similar to the one for the 2011 event. Field surveys also found surface ruptures associated with the two events very close to each other. We used the displacements observed by InSAR as well as those from GNSS measurements to estimate the slip models of the two events. We carefully performed a series of inversions to determine both the geometry of the fault and the slip distribution on it for the two earthquakes, and finally concluded that the two earthquakes resulted from rupture of an identical fault. Strain analysis using the data of GNSS indicated that the amount of strain accumulated during the inter-event time of 5.8 years was comparable to the amount of strain released by the second event and was much larger than expected from other intraplate earthquakes in Japan. The result suggests that the rapid and large postseismic deformation of the 2011 Tohoku-oki earthquake enhanced the post-seismic deformation of the intraplate earthquake and, as a result, enabled the occurrence of the second event in 2016.