

Preliminary report of co-seismic surface rupture produced by the 28 December 2016 Hokubu-Ibaraki earthquake, northern Kanto region, Japan.

*Keitaro Komura¹, Koutaro Aiyama¹, Keiichi Ueta¹, Yasuhira Aoyagi¹, Toshinori Sasaki¹, Takahiro Nagata², Kazuo Kobori²

1. Central Research Institute of Electric Power Industry, 2. Dia consultants

A normal faulting earthquake (Mj: 6.3) occurred at northern Ibaraki, northern Kanto region, Japan, in 28 December 2016 (JMA, 2016). InSAR imaging revealed 2 km length of NW-SE trending crustal offset, maximum ~27 cm of western crustal movement away from satellite and ~6 cm of eastern crustal movement toward satellite (GIAJ, 2016). In the source area, seismicity has abruptly increased since the 2011 off Tohoku earthquake and another moderate (Mj: 6.1) earthquake of normal faulting prior to this event occurred in 19 March 2011. We conducted field survey immediately after the 2016 earthquake to check the surface fault rupture.

We recognized intermittent open cracks along with the InSAR offset. These cracks occurred from northern Mochiyama-area (N36°49'20", E140°36'36") to southern upstream of Koyama-dam (N36°47'54", E140°37'45") and it has ~3.4 km of total length. The distribution of open cracks located at upstream of valley and tip of ridge in right bank (south-west side) of Mochiyama-river between Mochiyama-area and Tomioka-area. In Mochiyama-area, surface rupture of the 2011 earthquake was also suggested by field survey on deformation zone across the asphalt road and leaned trees on its extension (Aoyagi et al., 2015). We observed a clear expansion of the deformation zone (distribution and crack width) after the 2016 earthquake. Additionally, we found fault zone just under small crack at southern tip of trace. The fault zone has ~40 cm width of fault gouge zone consisting of at least two layers of fault gouge. Sharp fault surface (N6°W strike, 67°W dip) recognized along with fault gouge zone may be latest slip surface because colluvium that covers fault surface is deformed. Fault striations (72°NNW rake) recognized inferred latest slip surface are consistent with the 2016 fault-plane mechanism. We concluded these intermittent cracks are tectonic surface rupture by these observations.

Aoyagi Y., T. Onuma, T. Oku, and T. Sasaki (2015): Fault displacement evaluation by InSAR for the recent moderate earthquakes in Japan. Proceedings of the Symposium on Fault Displacement Evaluation, I-5, pp.31-38 (in Japanese).

Geospatial Information Authority of Japan (GIAJ), 2016, Information of earthquake in northern Ibaraki prefecture. <http://www.gsi.go.jp/BOUSAI/H28-ibaraki-earthquake-index.html> (in Japanese).

Japan Meteorological Agency (JMA), 2016, Earthquake report of Northern Ibaraki prefecture, 28 December, 2016. <http://www.jma.go.jp/jma/press/1612/28a/kaisetsu201612282345.pdf> (in Japanese).

Keywords: coseismic surface rupture, InSAR, fault zone