

Distribution of surface rupture associated the 2016 Kumamoto earthquake and its significance

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A Mj 6.5 earthquake hit Kumamoto prefecture, central Kyushu, southwest Japan at 21:26 JST on April 14th. 28 hours after, another Mj 7.3 at 01:25 JST on April 16 generated severe shaking in the same region (JMA, 2016). It is well known previously mapped the ~100-km-long active fault called Futagawa-Hinagu fault zone (FHFZ) (Watanabe et al., 1979; RGATK, 1989; Ikeda et al., 2001; Nakata and Imaizumi ed, 2002) runs in the epicentral area, we considered the northeastern portion of the FHFZ could be responsible to two earthquakes and started to do a field reconnaissance along the fault zone after the Mj 6.5 event. According to 3 weeks field survey by our team, we found the 31-km-length successive surface rupture close to the traces of the northeastern portion of the FHFZ and another the 5-km-length rupture on a part of Denokuchi fault and some possible surface ruptures in the epicentral area. The rupture along the FHFZ shows right-lateral strike-slip mainly (~ 2 m in maximum between Dozon in Mashiki city and Nishihara village) with down-thrown to northwest. The rupture on the Denokuchi fault, far from 1 to 2km east of the FHFZ, is normal component with down to northwest. These coseismic ruptures of the Mj 7.3 earthquake represented a characteristic movement of the northeastern portion of the FHFZ. A series of the open cracks with NW-SE-trending were traceable for a distance of 5.4 km from Kengun to Shirakawa River in Kumamoto city. Those features followed on tectonic landform by possible active fault and on the line of the fringe abnormal in InSAR image, and may represent minor surface rupture. The local eyewitness and our observation revealed that the coseismic minor rupture of the Mj 6.5 earthquake prior to the Mj 7.3 earthquake were emerged on the same trace of the rupture of the Mj 7.3 earthquake in Mifune town and South of Mashiki town. Seismic inversion theory by DPRI, Kyoto Univ (2016) showed that the coseismic rupture propagated toward ENE along the strike of the FHFZ, and asperity on surface was recognized 10 km far from the epicenter, where we surveyed the maximum displacement of right lateral strike slip close to Nishihara village. JMA (2016):

<http://www.jma.go.jp/jma/press/1604/16a/201604160330.html> The Research Group for Active Tectonics in Kyushu ed. (1989): Active tectonics in Kyushu, Tokyo University Press. Ikeda et. al., (2001): Active fault map in urban area [Kumamoto]. GSINakata and Imaizumi ed. (2002): Digital active fault map of Japan. Tokyo University Press. DPRI, Kyoto Univ. (2016): This work was supported by JSPS KAKENHI Grant Number 16H06298.

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