Paleo-seismological survey on the Idenokuchi fault, Nishihara village, Kumamoto prefecture

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In the 2016 Kumamoto earthquake, surface ruptures appeared not only on the Futagawa fault, source fault of this event but also on the other active faults. Especially, on the Idenokuchi fault located about 2 km south of and subparallel to the Futagawa fault, normal fault scarps (10 km length and Max. 2 m vertical offset) appeared (Toda et al., 2016). Toda et al. (2016) presented that the slip-partition occurred using the Futagawa (strike-slip fault) and Idenokuchi (normal fault) faults, indicating the structural relationship between both faults. Additionally, in considering the 2016 event, there is one question whether the activity of Idenokuchi fault coincides that of the Futagawa fault or not. Recent paleoseismological survey (Kumahara et al., 2017; Iwasa et al., 2018; Shirahama et al., 2018; Toda et al., 2018; Tsutsumi et al., 2018; Ueta et al., 2018) revealed that 3 or 4 events including the 2016 event were estimated since Kikai-Akahoya (K-Ah) tephra (7.3 ka; Machida and Arai, 2003) fall. Thus, if the Idenokuchi fault ruptures together with the Futagawa fault, we would find multi-events on the Idenokuchi fault during the last seven thousand years.

We excavated a 14-m-long, 6-m-wide, 3-m-deep trench on the antithetic fault of the Idenokuchi fault, where we found 30-60 cm vertical offset associated with the 2016 event. In the laboratory, we conducted tephra analysis and radiocarbon dating. Now, we are measuring radiocarbon dates, and thus will estimate depositional and event ages in our presentation.

On the trench walls, we recognized clear, but complex normal and reverse faults. A main normal fault with a high dip angle bounded basement rocks and soil just below the 2016 surface rupture. On the hanging wall side, we found many antithetic normal faults and reverse faults. In the soil sediments, we identified K-Ah tephra (thickness of 40 cm) based on volcanic glass morphology and refractive index. Soil sequence on the hanging wall side is shown from the surface: surface soil, brown soil, black soil (paleosol1), brown soil, K-Ah, black soil (paleosol2) and yellowish soil.
At present, we identified at least four events including the 2016 event since paleosol2. Especially, after K-Ah deposition, we confidently three events including the 2016 event, corresponding with the frequency of the Futagawa fault activity (Kumahara et al., 2017; Toda et al., 2018; Tsutsumi et al., 2018; Ueta et al., 2018). This preliminary result suggests that the Idenokuchi fault ruptured with the Futagawa fault. Additionally, we also identified a few probable events and will discuss this with radiocarbon dates in the presentation.

Keywords: 2016 Kumamoto earthquake, Idenokuchi fault, Paleo-seismological survey, K-Ah tephra, Normal fault

