

Cumulativeness of “triggered” surface rupture in north-western area of outer rim of Aso caldera and its impact for active fault evaluation

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The characteristics of the ground surface displacement associated with the 2016 Kumamoto earthquake sequence were clarified in detail using satellite radar interferometry images of the Advanced Land Observing Satellite 2 (GSI, 2016). The result shows not only the surface ruptures and elastic deformation along the Futagawa and Hinagu fault system caused by the main earthquakes but many other linear discontinuities showing small displacement (Fujiwara et al. 2016). Especially, many surface ruptures were emerged in north-western area of the outer rim of the Aso caldera, located apart from the main faulting zones. We carried out field surveys and identified characteristic surface ruptures at many places on the phase discontinuities in the interferogramme. All of positions, strikes and direction of surface ruptures are consistent with the assumption by SAR interferometry (Une et al. 2017). As the aftershock has not been observed below this area, these are regarded as the passive, or "accompanied", surface ruptures triggered by the change in stress field and/or seismic ground motion. We are investigating the cumulativeness of the activities of the Matoishi Bokujo 1 Fault, where tectonic geomorphology is clear, the significant phase discontinuity appears in SAR interferogramme and the surface displacement also appeared at the site, by a trench excavation and the ground penetrating radar (GPR) survey. In this presentation, we report on a result of the trench excavation investigation mainly.

From the geomorphological point of view, the fault shows reverse fault scarp cutting flat surface of alluvial fan, and a low fault scarplet of 1 m - 3 m of relative elevation continues at the bottom of the scarp. By SAR interferometry, there supposed to have about 10 cm of vertical displacement associated with the 2016 Kumamoto Earthquake. From the observation of the trench wall, a clear fault displacement is not found, but a sediment layer with pyroclastic material is deformed vertically at least 70 cm dipping to south with a sharp boundary to upper layer, suggesting that a repetitive faulting activities occurred resulting the layer displaced cumulatively. The result of GPR survey also indicates a consistent structure.

Extension of the Matoishi Bokujo 1 Fault is about 2 km, with the clear displaced topography cutting the low relief surface which seems Aso 4 pyroclastic flow depositional surface. This fault is shown on an active fault map of GSI "Aso" (Suzuki et al. 2017) as an active fault. If such passive, "triggered" or "accompanied" crustal deformation without generating a major seismicity contributes to at least one part of formation of active fault topography, we should reconsider the evaluation method for activities in the active fault where the recurrence of the earthquake is presumed from the history of displacing events from a trench excavation.

Keywords: Kumamoto Earthquake, SAR interferometry, surface rupture, triggered fault, cumulativeness