Field survey and interpretation of the surface linear ruptures in northwest of the outer rim of the Aso caldera emerged on SAR interferogram

*Hiroshi Une[1], Takayuki Nakano[1], Satoshi Fujiwara[1], Tomokazu Kobayashi[1], Yu Morishita[1], Kazumi Iwata[1], Hiroshi, P. Sato[2], Hiroshi YAGI[3]

1. Geospatial Information Authority of Japan, 2. Nihon Univ., 3. Yamagata Univ.

Among many linear discontinuities identified using satellite radar interferometry images of the ALOS-2 showing small surface displacement associated with the 2016 Kumamoto Earthquake, vertical displacement pattern of east-west linear discontinuities with the lengths of a few kilometers in northwest area of the outer rim of the Aso caldera shows south-side-down in northern part and north-side-down in southern part by three dimensional deformation analysis (Morishita et. al., 2016), suggesting half-graben-like normal faulting triggered by north-south tensional stress field derived secondary from the stress changes associated with the main source faulting (Fujiwara et. al. 2016).
We carried out field surveys of the sites on these discontinuities and identified characteristic surface ruptures at many places. Strikes are approximately east-west and both width and throw are 30 cm at maximum. Such ruptures continue straightly at least a few tens meters. All of positions, strikes and direction of surface ruptures are consistent with the assumption by SAR interferometry. Some of those have characteristics in shape that can be misread as surface earthquake faults.
From the geomorphologic point of view, raptures are found on “Kuratake Faults” identified by preceding literatures (Kyushu Active Fault Research Group 1989, Nakata and Imaizumi 2002) with the displacement direction in accordance with geomorphological assumption. Besides, many ruptures were found where geomorphologically active faults are not recognized. This area is thickly covered by the pyroclastic flow deposits and volcanic products from Aso Volcano, consequently it is inferred that activities of buried tectonic structure were triggered.
Recently passive, or “accompanied” deformation of existing structure triggered by the change of stress field or seismic motion associated with earthquakes have been often reported since SAR interferometry has enabled the seamless and detailed understanding of surface deformation. These passive deformation might have occurred universally in nature and not special for the reported events. Such passive deformation may be possibly included in the list of past surface earthquake faults and events recognized by trench surveys. We should start the discussion on the issue of reexamination of identification of characteristic earthquake events of active faults.

Keywords: SAR interferometry, surface ruptures, triggered displacement, accompanied displacement

©2017. Japan Geoscience Union. All Right Reserved.