

## Recognition and late Quaternary activity of active faults in the northeastern part of Kumamoto Plain.

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At the time of 2016 Kumamoto Earthquake that occurred in April 2016 from the part of the Futagawa-Hinagu fault zone, the SAR interference analysis using ALOS-2 data clarified numerous linear displacements. Those were confirmed not only in the main fault zone but also in the surrounding wide area. These linear displacements include main earthquake faults and their branch faults, but most of them occur far away from the surface earthquake fault and are thought to be passive displacements derived from earthquake-induced stress changes or earthquake motions, so-called "associate faults". Such passive small displacements along the ground fault traces are consistent with known active faults and topographical cliffs, suggesting the possibility of repeated fault movements in the past. And more, although previous studies pointed out the possibility that there are topographically and geologically more active faults in the Kumamoto plain, those assertions are not considered sufficiently until recently. As mentioned above, there are possibly unknown active faults in Kumamoto plain and we need to reconsider the active fault distribution. Therefore, in this study, we aimed at elucidation of the distribution and activities of the active faults in the Northeast Kumamoto plain, the area in particular has been a lack of discussion and geological data even in the plain. Focusing on the place where the 2016 coseismic linear displacement was recognized, we created a topographical map using aerial photographs and aerial laser survey data, and carried out geological survey, measurement of displacement amount, and tephra analysis for age-determination of layers. As a result, we revealed that some active faults displacing the Aso-4 pyroclastic flow sediment layer, about 90,000 years ago, which coincide with previously described active faults. In particular, the newly named Sugimizu fault and the Koshi fault located in the northeastern part of the plain vertically displaced Aso-4 pyroclastic flow sediment layer about 22 m and 27 m respectively. Each their average vertical slip rate is 0.25 mm / yr and 0.30 mm / yr. The Sugimizu fault shows passive displacement as small as 4 cm at 2016 Kumamoto Earthquake. Assuming that the activity interval of the Futagawa fault zone is about 2000 years from recent studies, the passive vertical displacement of the Sugimizu fault after the Aso-4 pyroclastic flow is about 1.7 m, so the residual of about 20 m is thought to be active vertical displacement. Therefore, the Sugimizu fault is recognized as an active fault repeatedly moved in the past 90000 years. The length of the Sugimizu fault is 5.5 – 12 km, and this fault probably empirically causes the earthquake of  $M 6 \sim 6.3$  with vertical displacement of 0.4 ~ 1.0 m at a single event. Detailed seismic profiling of subsurface structures and trench survey are required to verify the activity, paleoseismology of unknown active faults. Those works is urgent for disaster prevention to earthquakes directly above their foci.

Keywords: 2016 Kumamoto Earthquake, Kumamoto Plain, Aso-4 pyroclastic flow, active faults