Linear Surface Ruptures in NW Aso Caldera by Kumamoto Earthquake and Relationship with Active Faults in Central Kyushu

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Introduction

We constructed and analyzed the ground surface displacement associated with the 2016 Kumamoto earthquake using satellite radar interferometry images of the Advanced Land Observing Satellite 2. The radar interferogram generally shows elastic deformation caused by the main earthquakes but many other linear discontinuities showing displacement are also found. In this presentation, we will show the relationship between groups of linear surface ruptures appeared around NW Aso caldera and active faults in central Kyushu.

Northeast of Aso volcano –Kuradake fault group –

Several dozens of linear surface ruptures are found in the area northwest of the outer rim of Aso caldera (Fig 1 and 2). In this group, the ruptures generally have a WNW- ESE direction and typical dip-slip displacements. The largest up-down displacement gap of more than 30 cm is found in the southern part of this area. This rupture group is also further divided into two groups, whereby the northwest group mainly shows dip slip where the south side moves downward, and the southeast group mainly shows the north side moving downward (Fig 1). The displacement is saw–tooth in shape and, interestingly, the direction of the saw–tooth pattern differs between the two groups (Fig 1). There are about 10 known active faults in this area, known as the Kuradake fault group, that show graben landform, and the positions and directions of the linear surface displacements coincide with those of the known active faults.

Haneyama–Kuenohirayama fault zone

In the central part of Kyushu, there are many parallel faults in the east-west direction from Beppu Bay to Unzen. As an example, Fig 2 shows Haneyama–Kuenohirayama fault zone located in the central part of them. Fig 2 also depicts the normal fault group that appeared around Mt. Kuradake on the same scale and comparing the two fault group, it is clear that the north group mainly shows dip slip where the south side moves downward, and the south group mainly shows the north side moving downward, suggesting that these fault groups were formed in a similar mechanism. Although the density of the fault is much lower in the Haneyama–Kuenohirayama fault zone than in the Kuradake fault group, the number of faults of the Kuradake fault group that had been certified as active faults is small.

What is the cause of the common fault group in central Kyushu?

From the crustal deformation detected by GEONET of the Geospatial Information Authority of Japan for about 20 years, the strong east-west compression and slightly smaller north-south extension are found in the central part of Kyushu, and the shear stress is also large. Based on the similarity of the form of the Kuradake fault group and the Haneyama–Kuenohirayama fault zone, the occurrence of large earthquakes in the ENE–WSW strike of faults such as the Futagawa fault zone as the main earthquake fault released

the main distortion and some of the remaining North-South extension is likely released in the normal fault group. In addition, these normal fault groups are present in the volcanic geology, and together with the characteristics of wide-range strain fields, there is a possibility that it is a unique but general form of central Kyushu.

Keywords: Kumamoto earthquake, Crustal deformation, Central Kyushu, Active fault, ALOS-2

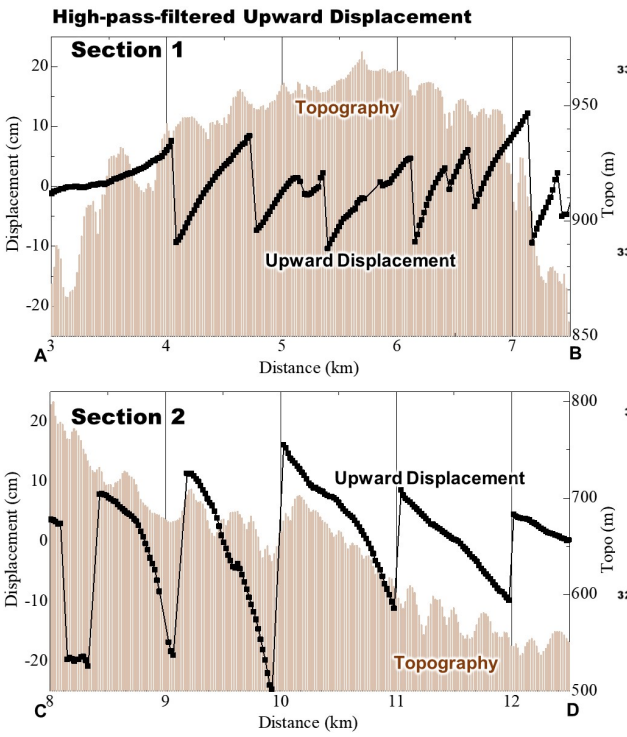

Fig 1. Cross-sections of deformation

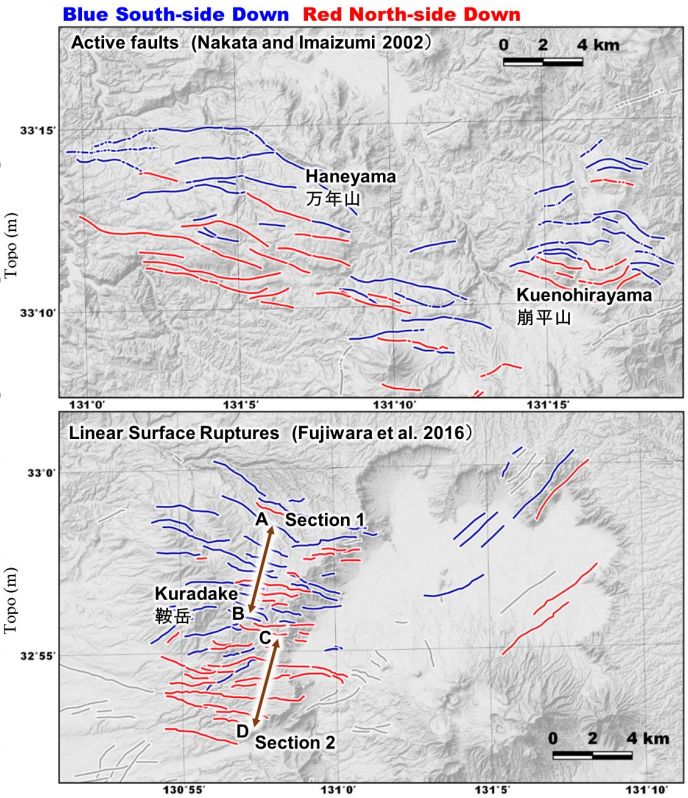

Fig 2. Comparison of two fault groups

