

## Possibility of a huge caldera eruption of the Aso caldera inferred from its vertical deformations in the last hundred years

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One of the first-order leveling route is passing through the central part of the Aso caldera in the WSW-ENE direction. About 10 points of the first-order benchmarks are in the caldera. There are leveling data since 1893. It is the only one caldera in Japan where the precise vertical deformation of the caldera floor including their central part have been observed directly with leveling survey for more than a hundred years. And in April 1997, three GNSS continuous measurement stations (Geonet stations) were set up by GSI in the caldera. GSI made the most fortunate situation at the Aso caldera for observing caldera vertical deformations continuously in Japan.

We examined about 100 years of vertical deformations of the caldera using the data of the first-order leveling survey conducted five times since 1893 (the other four were made in 1941, 1964, 1988 and 2003). As the results of them, it is noticed that the benchmarks within the caldera subsided relatively to the benchmarks outside the caldera since 1941. In the 20th century after 1941, there is a continuous subsidence in the caldera. It means that there is no phenomenon, appearing before the huge caldera eruption, such as a large amount of the magma supply from the deeper part beneath the caldera. Using the published daily coordinates (F3 value) at the Geonet stations in the central Kyushu, we investigated the temporal variation of the vertical deformations observed at the Geonet stations in the Aso caldera before the 2016 Kumamoto earthquake. Because there are conspicuous co-seismic steps and large after deformations with the 2016 Kumamoto earthquake at Geonet stations in the central part of Kyushu, we excluded the deformation after April 2016 in this study.

As a result, it is clarified that the Geonet stations in the Aso caldera and near the Kuju volcano have large subsiding tendency before the 2016 Kumamoto earthquake since 1998, compared to the other Geonet stations in the central Kyushu. In other words, the Aso caldera continuously subsided after the end of the 20th century.

From the both results of the first-order leveling surveys and of GNSS continuous observations by GSI in and around the Aso caldera, there is continuous subsidence in the caldera since the 20th century. Therefore, there has been no magma supply from the deeper part and no growth of magma chamber beneath the Aso caldera in the last hundred years. It means that there are almost no possibility of the huge caldera eruption in the long run.

Keywords: caldera, Aso, vertical deformation, levelling survey, GNSS