

## Ground deformation associated with 2018 eruption at Kusatsu-Shirane volcano detected by the GNSS observation

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Kusatsu-Shirane volcano is a stratovolcano consisting of pyroclastic hills such as Shirane, Ainomine, and Motoshirane. The eruption of Kusatsu-Shirane volcano occurred around the Yugama on the Shirane in the historical era. On January 23, 2018, an eruption occurred near the Kagamiike crater on Motoshirane. According to this eruption ground deformation was observed at the GNSS station which installed by Japan Meteorological Agency (JMA). In this study, we examine this ground deformation data.

The eruption at Motoshirane occurred around 10:02 on January 23. Prior to the eruption, volcanic tremor was started on 09:59. New craters were formed on the north side of Motoshirane. The Ainomine South-East GNSS observation station was installed about 500 m north from the new craters by JMA. We examine the ground deformation data of this GNSS station of 30Hz sampling by the kinematic analysis. As a result, it was revealed that the displacements were about 15 cm in the north direction and about 7 cm in the upward direction before the onset of the eruption, respectively. These displacements exponentially mitigated in the opposite direction after the eruption. On the other hand, the obvious displacements were not observed on GNSS data at Aobayama West station which located about 2 km east from the new craters.

For preliminary analysis, we examined the ground deformation by the forward modeling assuming a vertical dyke just below the new craters. As a result, it was revealed that the dyke was located above sea level to explain the upward displacement before the eruption. Then, to explain the ratio of north and upward displacements, the height of the dike was 1700 m above sea level. The volume change of  $3 \times 10^5 \text{ m}^3$  was necessary to explain the horizontal displacement at Ainomine South-East station.

Keywords: Kusatsu-Shirane volcano, ground deformation, GNSS