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Magma-plumbing System of Asama Volcano after 2004 Eruption, Estimated from Vertical Deformation above the Presumed Press

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[Introduction]

Asama volcano is one of the active volcanoes in Japan, and it erupted on September 1, 2004. A shallow dike intrusion is estimated in the Takamine, 4 ? 5 km west of the Asama crater from the ground deformation detected by GPS measurements (Murakami, 2005; Aoki et al., 2005). However they discussed pressure sources based on GPS data observed far field as 4 km away from the presumed pressure source.

Ground deformation observation close to the pressure source should clarify the depth and volume change of pressure sources. We establish the precise leveling routes ranging to Mt. Takamine above the presumed pressure source from Oiwake, at the southern foot of Asama volcano in May 2005. The route is consisting of 60 benchmarks in 28 km distance.

[Vertical deformation detected precise leveling]

The precise levelings have practiced seven times for five years since May 2005 to June 2011. We calculated the vertical deformation for six-months to two-years between leveling epochs. Generally, deformations detected by the precise leveling are small of 10 mm. For example, it is measured the subsidence of 9 mm in the mountainside and relative uplift of 7 mm to the mountain path in the period of May 2005 to June 2011.

Vertical deformations detected in the periods of May 2005 ? Nov.2005 ? May 2006 ? May 2009 ? June 2010 ? June 2011, are grouping two patterns. One is definite subsidence, and another is slight uplift. Murakami (2005) discusses the line length changes between two GPS sites of Tsumagoi and Tobu, and he shows that the extension of line length just before the eruption in 2004 and 2009 and contraction between the eruption. Slight uplifts in the periods of May 2005 ? May 2006 are corresponding to the period observed the extension, and subsidence in the periods of May 2006 ? May 2007, May 2009 ? June 2010, and June 2010 ? June 2011.

[Magma-pluming system after the 2004 explosions]

Two pressures sources are estimated from the ground deformation detected by precise levelings. One is a deeper spherical deflation source in the 6 km BSL depth beneath the mountainside, and another is the shallow dike intrusion beneath Mt. Takamine.

A spherical source is previously estimated from the leveling data for last 100 years (Murase et al., 2007), and it is suggestive a dominant source of the Asama volcano. They suggest a slight inflation after 1960, however our results show the deflation of -6.6 km3/6yr in the deeper sources for five years after the 2004 eruption.

A shallow pressure source at 1.3 km BSL depth is corresponded to the presumed dike intrusion in 2004 eruption. It is very difficult to discuss the volume change of the dike, because of insignificant identification of dike length and width. Since May 2009, large deformation of 10 mm uplift and subsidence are detected around Mt. Takamine. It is suggested a drain back in May 2009 ? June 2010 and an intrusion in June 2010 ? June 2011. There is one possibility that the deformation of the dike caused by 2011 Tohoku earthquake (Takada and Fukushima, 2011).

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