

GPS observation of crustal movements at Aso Volcano

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In Aso volcano, leveling survey has been repeatedly performed since 1937 by Kyoto University. As the result, subsidence centering on a point about 2km west-southwest of Naka-dake crater is observed. And it is revealed that this subsidence was caused by contraction source located at about 3km west of Naka-dake crater (which is called as Kusasenri) with a depth of 4 to 6 km (Sudo et al. submitted to JVSJ). Moreover, campaign observation of GPS which was performed from 1999 to 2001 has detected shortening of 2-3 cm/year centering on Kusasenri. On the other hand, it is shown clearly from the result of seismic tomography that a low velocity zone of a 2 to 3 km diameter exists 6km below Kusasenri (Sudo and Kong, 2001). Almost in accordance with the position of contraction source, the low velocity zone is considered to correspond to magma chamber. However, the accumulation process of the magma into magma chamber is not clear. Therefore, in order to detect crustal movement associated with the accumulation process of magma to magma chamber, GPS continuous observation was started in the circumference of the Aso central cone.

The observation in seven stations was started from December, 2003. And one station was extended in March, 2004, three stations were added in July, 2004. The many of baseline length are 10 km or less. The receiver used for observation are all dual frequency type – Topcon Legacy, Ashtech MicroZ, Topcon GP-R1DY and Leica SR530. Continuous observation with a sampling rate of 30 seconds is performed at all stations.

The data of GPS-based control stations of the Geographical Survey Institute (960701, 960703, 960704 in the Aso caldera) was also used, and analysis by Bernese4.2 was performed. In the analysis, the coordinates of 960701 (Choyo) were fixed to the daily coordinates (F2 analysis result) by the Geographical Survey Institute, baseline analysis with each point was performed, and the daily coordinates were calculated using the IGS precise ephemeris. In that case, the amount of atmosphere delay is calculated every 2 hours at each point.

Although Murakami (2004) has reported the possibility that the dilatation centering on near the Aso volcano had occurred between March, 2003 and October 2003 is high, the deformation which shows such expansion during this research is not detected, but, on the whole, the deformation pattern of shortening nature is obtained. However, the amount of shortenings of a baseline is about 1/3 value of Nakabo et al. (2001).

Moreover, after the observation start, although small eruption occurred in January 2004 and April, 2005, the remarkable crustal deformation corresponding to these eruptions was not detected.

Although the degree level of activity of the Aso volcano by the Japan Meteorological Agency is 1 as of February 2005, continuous GPS observation will be continued to detect the deformation caused by the movement of magma to the crater from magma chamber in the preparation process of an eruption.