

Inflation of ground around Aira Caldera measured by GPS

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GPS measurements has repeated around Aira caldera to grasp horizontal ground deformation around Aira Caldera. Baselines beyond Aira Caldera began to extend after January 1998. Especially, the baselines were extended by 1-2ppm from January to December 1999. Horizontal displacement vectors referred to a station 40km SSE from Sakurajima volcano show radial pattern outward from the center of the caldera by 0.5-2 cm. Assuming Mogi's model, location of the pressure source was estimated to be located at a depth of 11km beneath the center of Aira Caldera. The pressure increase was caused by increase in volume of 18 million cubic meters.

Sakurajima is an andesitic strato-volcano at the southern part of Aira caldera. The main magma reservoir is located at a depth of 10km beneath Aira Caldera. The magma is supplied to the reservoir at a rate of 10 million cubic meters per year (Kamo, 1988). The location of the magma reservoir was estimated from vertical deformation data obtained by precise leveling around Aira caldera. On the other hand, horizontal movement pattern around Aira caldera has not been measured except Electro-Distance Measurement for single baseline beyond Aira Caldera (Eto et al., 1998).

Sakurajima Volcano Research Center has conducted continuous GPS observation at 7 stations around Sakurajima volcano since 1994. In order to grasp horizontal ground deformation around Aira Caldera, 8 bench marks was installed around the caldera in 1996, and 7 GPS measurements were repeated in December 1996, May 1997, January and June 1998, and January, June and December 1999. Leica SR399 GPS receivers were used and the data were sampled every 15 seconds for 12 hours from 18 h to 6 h next morning. The GPS data were processed by SKI 2.X.

According to the continuous GPS observation around Sakurajima volcano, the ground around Sakurajima was inflated during the period from August 1995 to April 1996 and inflation was suspended until November 1997. The inflation of Sakurajima Volcano resumed in November 1997 and has continued until now. The time change in horizontal deformation around Aira Caldera has similar pattern to that of Sakurajima volcano. Although no significant changes were detected from December 1996 to January 1998, baselines beyond Aira Caldera began to extend after January 1998. Especially, the baselines were extended by 1-2ppm from January to December 1999. Horizontal displacement vectors were obtained referred to a station at Osumi Peninsula, 40km SSE from Sakurajima volcano. The vectors show radial pattern outward from the center of the caldera by 0.5-2 cm. The horizontal displacements around Aira caldera were larger than that near the center of the caldera. This fact suggests the ground around Aira caldera was extended by pressure increase of source beneath the Aira caldera. Assuming Mogi's model, location of the pressure source was obtained by grid search method. The pressure source is located at a depth of 11km beneath the center of Aira Caldera. The pressure increase was caused by increase in volume of 18 million cubic meters.