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Ground deformation measurements in Izu-Oshima volcano

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In Izu-Oshima volcano, inflation continues over 20 years since the end of the last eruption in 1986-87, suggesting magma accumulation for future eruptions. Meteorological Research Institute has been conducting electro-optical distance measurements (EDM) and GPS observations since 1997 and 1998, respectively, in order to delineate a magma plumbing system of the volcano.

To enhance temporal resolution of data and source parameter estimations, we have been reinforcing the GPS observations. Campaign GPS sites in flank areas have been replaced by continuous observation sites since 2001. Further, a dense continuous GPS network was installed in the caldera area in February 2009. Currently, 22 GPS sites (including three JMA sites) are operating as continuous stations.

The EDM is preferable for real-time monitoring because of simpler post data processing compared to the GPS. Thus, automated distance measurement systems (APS) were further installed in the caldera region. Currently, 23 baseline lengths are measured every thirty minutes from two base stations.

The continuous GPS data clearly show repetition of deflation and inflation events. Deformation sources of both the deflation and inflation phases in 2006-2007 were located beneath the northern part of the caldera, when we applied the Yamakawa-Mogi model. On the other hand, about 3 km of a shallower source depth was obtained by a preliminary analysis using APS data during the 2007 inflation phase. In order to use different types of data effectively, we have to evaluate the effects of data type and station distributions on the source parameter estimations.

During the one-year observation in 2009 when the dense caldera GPS network was operating, prominent ground deformation did not occur. However, we expect the dense GPS and APS network will contribute to deformation source estimations in future deflation and inflation events.

Keywords: Izu-Oshima volcano, ground deformation, GPS, APS