

Crustal deformation associated with increase in VLP events activity in Aso Volcano

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Aso Volcano, one of the most active volcanoes in Japan, is located in the central part of Kyushu and consists of an elliptical caldera with a diameter of 18km in E-W and 25km in N-S, and of central cones with more than 10 volcanoes aligned in E-W direction. Among central cones, Nakadake volcano is the only active cone and its recent activity is characterized by ash and strombolian eruptions and phreatic or phreatomagmatic explosions. The last strombolian eruptions ended in the beginning of the 1990s and after that, surface activities have been restricted to the fumarolic gas and ash emission from the northernmost crater of the volcano accompanying activity of long period tremors(LPT) or very long period (VLP) events.

Since 1990s, observations using broadband seismometers have revealed that the source of LPT is a crack-like conduit located at depths of 1-1.5 km beneath Nakadake, with a length of 1km and width of 2.5km. It is also revealed that at this depth a pressure was located and caused long-period displacements a few minutes before phreatic eruption which occurred in 1993 and 1994.

The Japan Meteorological Agency (JMA) raised the Volcanic Alert Level from 1 (Normal) to 2 (Do not approach the crater) based on rapid increase in numbers volcanic earthquakes and volcanic gas emission in September 2013, and based on increase in amplitude of volcanic tremors in December 2013, respectively.

Remarkable ground deformation was detected by water-tube tilt meters and super invar-rod extensometers which were installed in a 30m observation tunnel, 1km southwest from the active crater, in September 2013 and January 2014 associated with increase in VLP events activity.

By comparing the calculated deformation assuming a Mogi source and a dyke, it is found that observed deformation can be attributed to the expansion of the crack-like conduit. At the beginning of the deformation, the radial component of the extensometer showed dilatation and converted to contraction, which indicates initiation of expansion at the deeper portion of the crack and propagation to the shallower part.

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