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Volume change of a magma chamber beneath Izu-Ohsima island

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Abstract
GPS network on Izu-Ohsima island detected position time series from 1996 to 2009. The latest eruption of the Izu-Ohsima volcano ocurred in 1986. It is assumed that crustal deformation on Izu-Ohsima island is caused by magma chamber deflation and inflation beneath the island. In this research, we assumed one Mogi-source at a depth of 6 km beneath the center of Izu-Ohsima island and estimated a volume change of a magma chamber on daily basis. The result shows that the magma chamber beneath Izu-Ohsima island inflated and deflated alternately and a net volume increase amounted to 11 million cubic meter for a period between 2004 and 2009.

Introduction
Since the eruption in 1912-1914, the Izu-Ohsima volcano erupted at a time interval of about 40 years. The latest eruption occurred in 1986. Continuous GPS network was set up since 1996 and detected crustal deformation on Izu-Ohsima on daily basis. The detected crustal deformation was caused by the Philippine Sea plate motion and a magma chamber inflation and deflation since 199 6. Though it is pointed out that a inflation magma chamber and a deflation magma chamber exist in different locations, in this research, we assumed one magma chamber and estimated volume change in a magma chamber for a period between 2004 and 2009. In fact, this one Mogi-source model well reproduces the observations.

Analytical Procedure
We can estimate a volume change in a magma chamber on daily basis, since the GPS network detects crustal deformation every day. We adopted the time dependent inversion method proposed by the Stanford University group, though there are several other methods. We used position time series from 2004 to 2009. Annual changes were estimated from original time series and removed from the original data. We used 9 GPS sites which include GPS sites of the Meteorological Agency of Japan. 93051 site in Izu-Ohsima was used as a reference point. Mogi source is set beneath the center of Izu-Ohsima island at a depth of 6 km. We estimated time evolution of volume of the assumed Mogi source, while other parameter were assumed constant over time.

Results and discussion
A volume change in a magma chamber was estimated from the analysis of the time dependent inversion for a period between 2004 and 2009. Assumed magma chamber inflated and deflated alternately and the net volume increase was estimated to be 11 million cubic meter. Our model well reproduces the observed crustal deformation. Since it is pointed out that inflation source and deflation source are located differently, we will estimate time evolution of magma chambers using a two different magma chamber model at the meeting.

Keywords: Izu-Ohsima, magma chamber, time dependent inversion