

## Large scale crustal deformation and magma ascent process at Ogasawara Iwo-jima caldera

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The large scale crustal deformation at the Ogasawara Iwo-jima caldera reflects a magma ascent process during the post caldera period. National Research Institute for Earth Science and Disaster Prevention has conducted geodetic survey every two years for 30 years since 1976, and has detected vertical and horizontal displacements for the purpose of monitoring the crustal deformation. Since 1996, we have added micro-gravity measurements during the geodetic survey and we started continuous GPS measurements at three sites in the island in 2003. These observations have indicated that the crustal deformation at Iwo-jima is characterized by two deformation modes, one is a continuous deformation mode including a contraction area and uplift areas and the other is an episodic deformation mode of short term large uplift. The continuous deformation mode consists of contraction at Motoyama area, which locates at the center of Iwo-jima caldera, and uplift at the surrounding areas. The displacement rates of the continuous deformation are about 10 to 20 cm/a. During geodetic survey intervals including the episodic uplift, vertical displacements exceeding 1 m were observed.

The crustal deformation source for the contraction at Motoyama area has been estimated to be a horizontal sill-like shaped contracting source at about 1 km deep by assuming a half space elastic material. On the other hand, the source responsible for uplift deformation has not been modeled at present. In the present study, we focus on the following characteristics of the temporal change of horizontal displacements including base-line length changes. (1) Base-line lengths in the Motoyama area have been continuously contracting with constant rates during both contraction periods and uplift periods, indicating that horizontal displacements were far smaller than vertical displacements during the episodic large uplifting. (2) In the Chidorigahara area, a continuously uplifting area located between the caldera rim and the Motoyama area, the extension rates of the base-line lengths increase during the episodic large uplifting, probably suggesting fault movements in this area. It is noteworthy that a ratio of horizontal displacement to vertical displacement of the benchmark in this area during the episodic uplifting is smaller than that during the continuous uplifting.

Gravity change during the 2001-2002 large uplift indicates significant contribution of magmatic materials. Taking account of these characteristics of crustal deformation, we conclude that the source responsible for the episodic large uplift is magma supply, and that the source locates deeper than the sources for the continuous deformation modes of the contraction at Motoyama and the uplift in the surrounding areas. The mechanism of the contraction may be independent process of the deep magma supply for the episodic uplift. The smaller horizontal deformation during the episodic large uplift may be attributed partly to significant contribution of faults locating between the caldera rim and the Motoyama area. We propose a magma ascent process model including the above characteristics.