Crustal movements at the Kozu-Niijima area detected by GPS measurements after the 2000 dike intrusion event

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Remarkable volcano activity around Kozushima

The ground deformation of 10-20 cm is detected at Kozu, Shikine and Niijima by the GPS measurements in 2000, and the large magma intrusion stretching for 15 km with depth more than 10 km is estimated between the Miyakejima and Kozushima. Detailed observations after the 2000 event make clear the seismic reflector zone and strong attenuation area of the seismic wave, and geomagnetic reduction under the Kozu and Niijima area. The earthquake swarms are frequently observed and the ground deformation of few cm/yr and reduction of the gravity are observed before the 2000 even.

We discuss the crustal deformation and the mechanism in the area after the 2000 even,

1. Crustal deformation in the Kozushima and Niijima area

Nagoya University occupied the GPS measurements continuously at ten sites in Kozushima, Shikinejima, and Niijima to discuss the crustal deformations. As observation are done by single frequency receivers and the ionosphere disturbance is not corrected, we process the GPS resolution between the GIS sites and Nagoya university sites for one year since of December 2000 to November 2001.

The convergent rates of the Philippine Sea plate at the GPS sites are removed from the detected velocities using the estimation by the plate model (Kotake et al.,1999). Although the distance between GPS sites by GIS and Nagoya University is maximally 5km, GPS solution shows the annual change with the amplitude of +- 5 mm in up-down and north-south components. We extract the station velocities removing the annual changes. The horizontal velocity is 8cm/yr.

The horizontal displacements detected by GPS measurements are including the convergent rate of the Philippine Sea plate. The local movements deduced the observation velocity from the calculation velocity by the plate model (Kotake et al.,1999) shows the displacements toward southwest with a rate of 7 cm/yr in Kozushima. It is clear that the station velocities is increasing than that observed in 1999 (Kimata et al.,2000).

2.Source mechanism of the crustal deformation

It is suggested the large dike intrusion between Miyakejima and Kozushima in 2000, point power pressure in Kozushima and Niijima before 2000, deflation source at Miyakejima after the eruption of August 2000 as, a source mechanism of the deformation.

1) The Dike intrusion model between Miyakejima and Kozushima

The southwestward displacements observed at Kozushima in 2001 do not suggest the deflation at the dike in 2000. We estimate the tensile rate of the dike and the creep rate of the fault with the source model by Nagoya universityy2000). They are the tensile of 0.5 m and the creep of 0.4 m. These rates is corresponded the twenty percent of the activity in 2000.

2) The point pressure model in the Kozushima and Niijima before the 2000 event. The residuals of displacements observed and calculated from the dike intrusion model show the displacements of 4-5 cm. We estimated the point source model in north off of the Kozushima and west coast of the Niijima. The locations and magnitudes of the point sources are almost the same as that estimated before 2000. It means the point pressures are continued after the 2000 event.

3) The deflation model at the Miyakejima

The residuals of the displacements between the observation and estimation by the dike and the point pressure source show 2-3 cm. The deflation model is estimated at the Miyakejima by the GPS measurements. It suggests the displacements caused by the deflation model at the Miyakejima.