# Construction of a dense dual-frequency GPS network to observe continuous crustal deformation in Izu-Oshima volcano

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To understand the physical processes of volcanic eruption, we need to observe deformation and the seismic activity not only during the eruption but also before and after the eruption continuously. In Izu-Oshima island, many kinds of geophysical observation, such as seismometers, tiltmeters, GPS, Leveling and so on, have been carried out since the 1986 Izu-Oshima eruption. However, there are a few dual-frequency GPS sites in Izu-oshima, so we can not observe the detailed spatial distribution of crustal deformation. In April 2003, a dense dual-frequency GPS receiver network was constructed to observed the crustal deformation continuously. In this paper, an outline of this network, analysis system and the initial result are reported.

Three dual-frequency GPS sites have been operated by ERI and four (GEONET) have been operated by Geographical Survey Institute (GSI). They are located near the coastline in the Izu-oshima island. Two additional GPS sites are installed at the caldera operated by GSI. We added ten dual-frequency GPS sites in April 2003. Antennas with a radome are set on the top of a pier ( 2 meter height) or top of buildings. We used Legacy-H (TOPCON) and LegAnt antenna with a radome, whose power consumption is very small (about 1.8W). AC power is available at 7 sites, but at other 3 sites DC power supply system are used, which is consisted by two DC batteries and four solar panels. The sampling time is 30 seconds and a minimum elevation angle is 5 degree.

The public telephone lines and mobile phone system are use in nine sites for GPS raw data collection once a day with TR commands software provided by TOPCON from Tokyo. At one site GPS raw data are collected by small Linux computer Lamb-RT-01 (Wildlab) because neither the public telephone line nor a mobile phone system is available. A wireless local area network system will be constructed at this site in March 2004. So, GPS raw data at all ten sites are available once a day.

The average baseline length of the dual-frequency GPS network including GSI's sites is about 3 km in the northern part of Izu-Oshima Island. However, in the southern part that is a little bit larger (about 4 km). Another new GPS site will be occupied in March 2004.

BERNESE GPS software Ver. 4.2 (Hugentobler et al., 2001) is used for automatic daily analysis with IGS rapid ephemeris. We used two networks in daily analysis. A small network consists of newly installed nine GPS sites (Fix site: Gojinka-chaya). The other one consist of the GPS sites in the Izu-Oshima Island (GSI and ERI sites) and 18 GEONET sites in the Honshu (Fix site: Tsukuba). Zenith delay is estimated every two hours but no gradient of the tropospheric effect is estimated.

The repeatabilities of the large network from 10 to 16 August, 2003 are 4.6-6.0 mm in NS component, 1.8-3.7 mm in EW and 16.9-23.2 mm in upward, respectively.

Horizontal displacement vectors from April to December, 2003 at each site in northern part of Izu-Oshima Island point to north-west, whose displacements are about 3 cm. At GPS site at the top of Mt. Mihara amount of horizontal displacement is smaller than that of other sites, say less than 1cm. At another site (EYKW) in south-east area of Izu-Oshima Island point to south-west. At this moment the cause of different direction of displacement does not become clear.

We have constructed the dense dual-frequency GPS network in Izu-Oshima Island since April 2003, whose average baseline length is about 3 km. In the initial analysis it became clear that small displacement (say, several cm) is able to be detected because the repeatabilities are very small. The amount of horizontal displacement in northern part of the island is larger than that in southern part of the island.

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