

Estimation of motion of Pacific plate byGPS technique

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Previously, it was difficult to estimate plate motion of Pacific plate precisely by space geodetic methods since it has little lands compared to other plate like Eurasia. Geographical Survey Institute (GSI) has installed six GPS sites on Pacific islands to obtain more precise estimate of Pacific plate, and then reveal intra-plate deformation. Harada et al., 2001 analyzed the data between 1997 and 1999, and found that the estimated Euler pole of Pacific plate is very close to that of NNR-NUVEL1A (DeMets et al., 1994), unlike the result obtained by Larson et al., 1997, and that Pacific plate is considered to be rigid to good extent and upper limit of intra-plate deformation is 5mm/yr. In this research, we analyzed the data up to 2001 in addition to the data used in Harada et al., 2001, and try to obtain more precise estimate of Pacific plate motion and to detect minute internal deformations under 5mm/yr.

Procedure of analysis is as follows. We used the data from IGS stations, Hawaii University's stations, Otago University's stations, and stations of WING project (Kato et al., 1998) in addition to the data from our GPS stations. 24 stations are used at maximum. We used GAMIT/GLOBK(e.g. Dong, et al., 1989) and analyzed the data at every 5 days to estimate velocity vectors in ITRF 2000. We could obtain high precision velocity vectors with formal error under 1mm/yr at almost all stations. Then we selected sites which are not affected by plate boundaries, and estimate the Euler pole of Pacific plate by the least square method. Next, we calculated the velocities due to the rigid plate motion with the estimated Euler pole and subtracted them from the observed velocities to obtain the residual velocity vectors. These residual velocity vectors represent intra-plate deformation of Pacific plate.

There are several characteristics of the obtained residual velocity vectors. The prominent feature is the relatively large (10mm/yr) magnitude of the residual velocity vectors at the western coast of US and at the east of New Zealand, affected by the adjacent plates. Besides, though magnitude is very small (several mm/yr), two interesting characteristics are found. First, we found a clockwise rotation in the western Pacific. One possibility is that this is an indication of a micro-plate in this region, though no trace of earthquakes is found. Second is the extension between Tahiti and Gambier, which is 1700km southeast of Tahiti. These islands are within the proposed South Pacific Superwell (e.g. McNutt et al, 1990), and this extension might be related to the activity of this Superwell. Since these deformations are very minute, we will check the reliability of them while seeking the appropriate mechanism.