# Spatial distribution of slip deficit in southwest Japan estimated from horizontal and vertical displacement rates of GEONET data

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1. Introduction

Study of interplate coupling is important for understanding strain accumulation processes in source regions of Mw8 class giant earthquakes. The key at the present stage to have high resolution distribution of the slip deficiency should be to put veritical component to good use. In this study, we try to reduce noises and irregular biases of GPS time series, which enables us to include the vertical displacement rate in geodetic inversions.

2. Data processing and analysis

When analyzing GPS data in a regional scale, conventionally one of stations in the region is taken as fixed point. However, biases included in the GPS time series data of the fixed point could be propagated in those of other stations.

In this study, the data we analyze are daily coordinates of continuous GPS network (GEONET) of Geographical Survey Institute for a period from 1996/3/21 to 2000/6/25. Taking one of GPS station as a fixed point, time series of all of stations are recomputed. We modify the noise reduction process in Yagi et al.(2001) and apply it to the GPS time series. We can obtain a zero-order estimate of biases included in the GPS time series of the fixed point. Subtracting the biases from the original time series of the fixed point, we obtain new time series of displacement rate at the fixed point. Repeating this procedure for time series data of 254 GPS sites in the southwest Japan, we have new data set of GPS time series. Variance reduction is around 90 %.

Nationwide average of vertical displacement rate is around 4 mm/yr, which is subtracted from vertical displacement rates of all stations. Thus, nationwide average of vertical displacement rate is zero.

Geodetic inversion of Yabuki and Matsu'ura (1992) is applied to thus obtained horizontal and vertical displacement rates.

3. Result and discussion

Overall direction of slip deficiency vectors is around N50W between the Eurasia and the Philippine Sea plates, consistent with that of relative plate motion model of Seno et al. (1993). The maximum (around 70 mm/y) of the slip deficiency is located in off Muroto and Kumano-nada regions, where Kodaira et al. (2000) suggested subducting seamount.

Difference between spatial distributions of the slip deficiency estimated by only horizontal displacement rate and by both horizontal and vertical displacement rates is not remarkable in this case.

Major asperities of the 1944 Tonankai and the 1946 Nankai earthquakes estimated by leveling and triangulation data (Sagiya and Thatcher, 1999) seem to be located in areas of large slip deficiency.

The large slip deficiency extended to the west of the coseismic slip area of the 1946 Nankai earthquake. This could be attributed to poor resolution in regions off Ashizuri-misaki and of Hyuga-nada, resulting from elimination of GPS stations which are strongly affected by the 1996 Hyuga-nada earthquakes (Yagi et al., 2001) and 1997 Bungo channel silent earthquake (Hirose et al., 1999).

4. Issues remaining to be solved

Statistical features of GPS data are not well-known and thus, validity of our method is not evident. The non-zero assumption of the nation-wide average of vertical displacement rate should be cross-checked with tidal data. Thus, this study should be regarded as one of steps toward good use of GPS vertical displacement rates.