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The whole picture of temporal development of the plate coupling in the Tokai region, 1996–2010

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In the Tokai area, central Japan, the continuous crustal deformation due to the interaction between subducting Philippine Sea Plate and overlying continental plate have been observed by many methods such as GPS and leveling. We developed these data in order to know full picture of the plate coupling process macroscopically.

We developed the GPS data from 1996 to 2010 as following: we cut the time series of daily GPS coordinates into two-year-length time series and removed annual and semi-annual components to obtain mean annual velocity. Using this value, we estimated plate coupling on the plate interface using the geodetic inversion method. The results showed that the plate coupling had three phases: 1) strong slip deficit in the offshore region before 2000, 2) forward slip beneath the inland region in addition to the stronger slip deficit in the same region as 1 between 2000-2004, and 3) the same distribution as 2 but the smaller size than 2 since about 2006. Phase 2 might indicate the slow slip event.

We also developed the leveling data from 1996 to 2008. We picked it up to make five-year-length time series and estimated mean annual velocity in the interval, because unlike the daily GPS coordinates, the leveling observations were taken place usually only once a year. Although the interval of the analysis was slightly different, the overall trend resembled the results using GPS data mentioned above. The estimated coupling distribution by GPS data could make the leveling data, and vice versa.

These results showed that GPS and leveling data were consistent each other and suggested that the result of geodetic inversion became more accurate if the geodetic inversion using both GPS and leveling data was made.