

Temporal change of interplate coupling in the NE Japan subduction zone

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1. Introduction

We have improved the accuracy in the vertical component of displacement obtained by GPS observation, and estimated the spatial distribution of interplate coupling during 1997-2001 from the 3D velocity field including this vertical component. Estimated strong coupling areas are around off Tokachi, Miyagi, and Fukushima. On the other hand, relatively weak coupling has been estimated for the area off Sanriku probably due to the post-seismic forward slip [Heki et al. (1997), Nishimura et al. (2000)] after the 1989, 1992, and 1994 Sanriku-oki earthquakes. These results have been obtained under the assumption that the velocity during 1997-2001 is constant. However, a closely looking at the time series of site coordinates shows noticeable changes at some GPS stations in the beginning of 1999. In this study, we investigate the temporal change of the interplate coupling based on velocity field data in NE Japan.

2. Temporal change of GPS velocity field

We applied the Precise Point Positioning (PPP) technique of GIPSY/OASIS-II to the data of continuous GPS stations operated by GSI and Tohoku University from 1997 to 2001. Since the distinctive change in site velocities occurred in the beginning of 1999 as noted above, we divided the 5-year period into two periods, that is, from January 1997 to December 1998 and from January 1999 to December 2001. Then we estimated the velocity fields for each period. Systematic increase in westward velocity in the area around Iwate and Aomori prefectures can be seen by comparing the horizontal velocities in the two periods.

3. Temporal change of interplate coupling

We estimated the spatial distribution of interplate coupling intensity in each period by using a geodetic inversion method, GDBYS, devised by Yabuki and Matsu'ura(1992). The overall pattern for each period is identical with the case using 5-year data. However, the coupling in the area off Aomori and Iwate in the latter period is 2~3 cm/yr larger than the first period. This suggests that the interplate coupling in this area is recovering since the beginning of 1999.

A slight decrease in the back-slip rate of 1~2 cm/yr was obtained off Fukushima in the latter period. Suwa et al. (2001) suggested that a post-seismic slow slip event with Mw6.7 occurred in this area, after the M5.8 earthquake on February 25, 2001. Thus the coupling may have been affected by this event.

References

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