

Recent Transient Crustal deformation in the Tokai region

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Abstract

Analysis of Global Positioning System (GPS) data shows clear transient crustal deformation in the Tokai region, central Japan, from the beginning of 2001. The southeastward detrended displacements suggest the occurrence of aseismic slip on the plate boundary between the Philippine Sea plate and the overriding continental plate. We estimate an area of aseismic slip with moment magnitude (M_w) nearing 7.0 by January 2004, adjacent to the assumed source area of the Tokai earthquake. The center of the estimated slip area propagated to northeast over time. The moment release of aseismic slip slowed down from the middle of 2002 till the end of 2002 and increased again from 2003.

1. Introduction

The GPS array of the Geographical Survey Institute of Japan has detected clear transient crustal deformation deviating from the northwestward steady horizontal motion in the Tokai region from the beginning of 2001. Southeastward detrended crustal deformation near Lake Hamana reached about 3 cm horizontally with around 3 cm uplifting. Aseismic interplate slip based on detrended crustal deformation is resolved beneath Lake Hamana from 2001 and the center of slip area moved northeastward over time. In this research, we estimate the recent state of aseismic interplate slip in the Tokai region from the latest GPS data.

2. Data and Analytical procedure

We used east-west, north-south, and up-down components of detrended crustal deformation time series at 99 GPS site in the Tokai, Kanto, and Izu Islands. We estimated trend and annual components from the data for the period between 1997 and 1999 and removed them from the raw time series data. Aseismic interplate slip between the Philippine Sea plate and the overriding continental plate is estimated by employing Kalman filter following the time dependent inversion technique. We weighted east-west, north-south, and up-down components with a ratio of 1:1:3. The geometry of the Philippine Sea plate in the Tokai region is based on the result by Ishida [1992].

3. Results and Discussion

Our analysis shows that aseismic interplate slip gradually started from 2001 and the center of slip area moved northeast by about 40 km over time. We cannot clearly estimate the exact start time of the Tokai aseismic slip from our present study, though. The moment release rate slowed down from the middle of 2002 till the end of 2002 and increased from 2003, which is now comparable to that of 2001. The moment magnitude is nearing 7 in January 2004. We will report spatio-time evolution of the Tokai aseismic interplate slip based on the latest GPS data in the meeting.