

Vertical deformation due to slow slips off the Boso Peninsula from leveling data using smoothed data fitting with ABIC

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1. Introduction

Slow slip events (SSEs) and swarm earthquakes off the Boso Peninsula have occurred at intervals of about six years. SSEs are slips that occur slowly over 10days on the plate boundary between North American plate and Philippine Sea plate. The maximum amount of the slip is about 10cm, and the magnitude is about Mw6.5. Displacements due to the events have been monitored 4 times after 1996 when GPS continuous observation began. Before 1996, the SSEs are supposed to be in 1990, 1983, and 1977 from record of tiltmeter or swarm earthquakes. But in order to know what kind of crustal deformation occurred, it needs to analyze the geodetic survey data first. Leveling of Chiba Prefecture has been conducted each year since the 1970s, so it is useful for investigating the crustal deformation due to SSEs. However, the leveling data released by Chiba Prefecture is calculated with fixing two or more level points. Therefore, small up-down change caused by SSEs may disappear. Then, we analyze leveling data before setting up fixed points, and get annual displacements of the Boso Peninsula.

2. Data and Analysis

We obtain leveling data about 864 level points that are located in Chiba Prefecture during the period from 1977 to 1979, 1994 to 2009. In analysis, we use two-dimensional spline function for space, set a constraint on vertical deformation being smooth in space. To determine the best degree of this constraint, we use ABIC.

3. Result

We get vertical deformation by SSEs off the Boso Peninsula. As a result, the years SSEs occurred have a characteristic pattern that the Kujukuri region subsides compared with average year. It is consistent with estimation from GPS data. Furthermore, we estimate the slip distributions which cause the obtained deformations with a forward modeling. From the results, we may estimate slip distributions of SSEs before GPS observation using leveling data.

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