

Spatio-time evolution of the Bungo channel aseismic interplate slip, southwest Japan

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Introduction

For the 1996-1997 period and the 2002-2004 period, the GPS network of the GSI detected transient crustal deformation in the Bungo channel area which is located between Shikoku Island and Kyushu Island, southwest Japan. The transient motion detected by the GPS array shows southeastward motion, suggesting occurrence of aseismic interplate slip in this area. New time series data of the locations of the GPS sites are generated by using Bernese software ver. 4.2 with newly improved strategy (Hatanaka, 2004). In this research, we estimate spatio-time evolution of slip distribution on the plate boundary in this Bungo channel area for the above two periods, employing Kalman filter to the latest detrended crustal deformation data detected by the GPS network.

Data and analytical procedure

GPS data are analyzed with Bernese GPS software version 4.2. We used East-West, North-South, and Up-down components at 40 GPS sites in the Bungo channel area for the period between 1996 and 2005. Since the raw data include annual and linear trend components, we estimate them for the period between 1999 and 2002 and remove them from the raw data. Akaike's information criteria is used to select a degree of overtone for annual components in the fitting. By using detrended time series without annual components, we applied Kalman filtering following the time dependent inversion technique (Segall and Matthews, 1997) for the 1996-1998 period and the 2002-2004 period to estimate spatio-time evolution of the Bungo channel aseismic interplate slip.

Results and Discussion

The detrended crustal deformation in the Bungo channel area show southeastward motion up to 3cm for the 1996-1998 period and the 2002-2004 period, suggesting occurrence of aseismic interplate slip in this area. Based on the above detrended time series data, our analysis for the 1996-1998 period shows that slip area appeared from around December 1996 beneath the Bungo channel and Southwestern part of Shikoku Island. From the middle of 1997, slip speed increased and subsided over time. Because of the scarcity of data before the 1996-1997 Bungo aseismic slip, we cannot clearly say from which part interplate aseismic slip started. At maximum, slip magnitude reached 30 cm with a magnitude amounting to 7. For the 2002-2004 period, our analysis shows that slip area appeared beneath the Bungo channel until around early 2003. From February 2003 to November 2003, the estimated slip area expanded to the southwestern part of Shikoku Island and subsided over time afterwards. Though it is unclear when the 2002-2004 aseismic slip started, we cannot rule out a possibility that the aseismic slip dates back to 2002. The slip magnitude reached 30 cm with an estimated magnitude of 7 for the 2002-2004 event.