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Slow slip events in the Hyuga-nada, southwestern Japan

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Post seismic deformation occurred after the Oct. 1996 and the Dec. 1996 earthquakes (Mw6.8, 6.9)in Hyuga-nada, southwest Japan. Decay time of this postseismic deformation was approximately estimated to be around 1.5 years. Afterslip of the earthquakes which caused post seismic deformation seems to have ended in 2004. However, slow slip event started from approximately 2005 in afterslip area. Hyuga-nada slow slip event seems to have a recurrence time of 2 years and duration of 1 year. Though Hyuga-nada slow slip is clearly observed after January 2005, there is a possibility that slow slip event occurred before January 2004.

Introduction

Post seismic deformation occurs after a large subduction earthquake. Post seismic deformation that is usually caused by afterslip follows logarithmical decay. The post seismic deformation after the 1996 Oct. and Dec. earthquakes decayed logarithmically until 2004. However, a slow slip event suddenly started from January 2005. We estimated the time evolution of afterslip and slow slip events and compared them.

Analytical Procedure

Spatial and temporal evolution of aseismic slip on the plate interface was estimated by the time dependent inversion.We firstly removed annual component and a linear trend from the raw time siries.We used time series without annual and trend components for the period between 1996 and 2013.A linear trend is estimated for the period between October 1 2008 and March 1 2009 during which there was no transient.We used approximately 60 GPS sites and weighed horizontal components and vertical components at a rate of 1:3 in the inversion.

Results and discussion

Our inversion result showed that afterslip occurred immediately after the occurrence of the main shocks. Afterslip gradually decayed and subsided approximately in 2004. However, a slow slip event started from January 2005 and subsided in Janaruy 2006 in the afterslip area. A next slow slip event started in January 2007 and subsided in January 2008 in a similar place. A slow slip event from January 2009 subsided in 2011 and there is no aseismic slip until January 2013. The time evolution of the estimated moment of aseismic slip for the period between January 1997 and January 2011 follows logarithimical decay with fluctuations. We cannot rule out a possibility that there occurred slow slip events before 2004.

Keywords: Hyuga-nada, slow slip event, afterslip