

The 2018 Hyuga-nada and Bungo channel long-term SSE detected by GEONET

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Abstract

Global Navigation Satellite System (GNSS) network in Japan detected the transient crustal deformation along the Nankai trough, Japan from June 2018. Time dependent inversion analysis shows that the long-term slow slip event in northern Hyuga-nada sea along the Nankai trough, Japan, started from June 2018 and abated in October 2018. From October 2018, slip area appeared in the Bungo channel and expanded to northern Hyuga-nada SEA and southwestern Shikoku. The Bungo channel long-term slow slip continued until around June 2019.

Introduction

Long-term slow slip events repeatedly occurred in the Bungo-channel and northern Hyuga-nada Sea. Just before the 2016 Kumamoto earthquake, long-term SSEs were occurring in northern Hyuga-nada and southwestern Shikoku. Because of the coseismic and postseismic deformation, it remains unknown whether they continued or ceased after the earthquake. Under the circumstances, transient crustal deformation started in northern Kyushu from June 2018. From October, 2018, the areas neighboring the Bungo-channel showed transients. We estimate spatiotemporal evolution of aseismic interplate slip by inverting position time series detected by GNSS.

Analytical Procedure

We estimated annual and semi-annual components for the period between 2012 and 2019 and subtracted them from the position time series. After this, we estimated a linear trend from 2017 and 2018 and subtracted it from the data without annual and semi-annual components. We conducted the time dependent inversion using east-west, north-south, and up-down components at 250 GNSS sites. We adopted the geometry model estimated by Hirose et al. (2008). Grid spacing is around 40 km. We constrained the slip direction eastward and southward.

Results and Discussion

Long-term slow slip occurred in northern Hyuga-nada from June 2018. After that, slow slip started in the Bungo-channel and expanded into northern Hyuga-nada and southwest Shikoku. From June 2019, slow slip in the central part of the Bungo-channel abated and neighboring areas show subsidence in August 2019. The estimate rupture propagation is different from those of the past Bungo-channel SSEs. In particular, the 2018-2019 SSE started in northern Hyuga-nada and propagated to the Bungo-channel area and northern Hyuga-nada restarted slow slipping.

It is seven years from the last Bungo-channel SSE and seems to be delayed considering recurrence interval of 5 to 6 years. Furthermore, northern Hyuga-nada SSE occurred twice in 2018-2019 events. These difference in rupture propagation and recurrence interval may be affected by stress perturbation by the 2016 Kumamoto earthquake.

Keywords: Slow slip event, Hyuga-nada Sea, Bungo channel