non- fault slip source components of long-term SSE and the relation to interseismic process preparing for large earthquake generation

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Various types of slow events including slow slip events (SSEs) are detected, and they are explained as fault slip at the plate boundary. However, the mechanism of how to generate a slow event is still open.

From the point of view of the fault strength, source area of slow slip events occurring at the deeper part of the seismogenic zone locate at the brittle-ductile transition zone. The transition from brittle fracture to ductile fracture (or ductile flow) accompany the increase of plastic deformation of rock at the plate interface, and the plastic deformation is not a fault slip at the fault plane but a bulk deformation. If this bulk deformation has an only simple shear component along the plate interface, it is assumed the same as fault slip. On the other hand, if the bulk deformation has the additional mode to the simple shear, the mode is expected to appear as the normal component to the fault plane. Therefore, non-fault slip deformation at the plate boundary, especially normal component, will help to understand the SSE generation mechanism.

Thus our purpose is to detect the non-fault slip deformation at SSE source from observation data, and we select the Tokai long slow slip event (LSSE) because the cumulative Mw is 7.1 and large detectable geodetic signals are expected at GNSS observation points. We examined deformation other than fault slip as Tokai LSSE source by using a finite rectangular fault model with GEONET F3 solution relative displacement in 2001-2003 to 1998-2000 as the reference one. Optimized Tokai LSSE source model of 2yr in 2001-2003 is the finite rectangular fault beneath eastern Aichi Prefecture with 1.6cm tensile dislocation & 9.7cm fault slip, that is, (tensile deformation) : (fault slip) =1:6. This result is better than the case which model has only fault slip component based on AIC (Akaike, 1974).

This result of tensile deformation with fault slip is similar to geological result (e.g., Ujiie et al., 2018). It will help to understand the SSE generation mechanism (e.g., comparing the ratio of tensile dislocation to fault slip). This results depend on the fault geometry; thus source model needs to be reexamined by using realistic plate boundary model along Nankai Trough.

Keywords: slow event, Tokai SSE, generation mechanism, tensile deformation

