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Numerical model of slow slip events with plate configuration -A tentative application of the Nankai model to Cascadia-

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Slow slip events (SSEs) and non-volcanic tremor are found in various subduction zones, for example, Nankai, and Cascadia. We have modeled and successfully reproduced SSEs in the Nankai region (e.g., Matsuzawa et al., 2013). However, to validate the model, it is important whether our model can explain SSEs in the other region. In this study, we show a result of a tentative application of our model to SSEs in the Cascadia region.

In our numerical model, a rate- and state- dependent friction law (RS-law) with a cutoff velocity is assumed to model frictional stress on the plate interface, as in the previous studies (e.g., Shibazaki et al., 2012; Matsuzawa et al., 2013). SSE regions are given by the actual distribution of tremor which is located by the monitoring system of Wech (2010). Low effective normal stress and a low cutoff velocity are assumed at the depth where SSEs occur. Negative and positive (a-b) value in the RS-law is assumed within and outside of the SSE region, respectively. Subducting plate interface is modeled by about 200,000 triangular elements, based on the configuration in McCrory et al. (2004).

In our numerical result, SSEs recur at the intervals of about 1 year. In addition, SSEs are relatively active between the south of Vancouver island and the Olympic Peninsula. These characteristics are similar to observations. In this region, minor tremor activities at the down-dip portion occur between the occurrences of major tremor activities both in the up-dip and down-dip portion. Such a feature is also reported in the actual tremor in Cascadia (Wech and Creager, 2011) and Nankai (Obara et al., 2011). The feature is more clearly found in the result of Cascadia SSEs than that in the Shikoku region (Matsuzawa et al., 2013). This may be attributed to wider tremor region with curved plate interface in Cascadia. In this study, it is suggested that our model can explain some features of SSEs.

Keywords: Slow slip event, Cascadia, Numerical simulation, Rate- and state-dependent friction law