ヒクランギ沈み込み帯における長期・短期的スロースリップと大地震との相互作用モデル
Modeling long- and short-term slow-slip events and their interaction with large earthquakes along the Hikurangi subduction zone

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Recent geodetic observations revealed the occurrence of various slow slip events (SSEs) along the Hikurangi subduction plate interfaces (Wallace and Beavan, 2010). Long-term SSEs with a duration of 1.5 years (e.g., Manawatu SSEs) occur at the deeper portion of the Hikurangi subduction zone, and shallow short-term SSEs with a duration of 1-3 weeks occur along the northern and central parts of the subduction zone. One of the fundamental questions is how SSEs interact with large earthquakes. In the present study, we performed quasi-dynamic modeling on short-term and long-term SSEs and their interaction with large earthquakes along the Hikurangi subduction zone. We used a rate- and state-dependent friction law with a cut-off velocity to the evolution effect (Shibazaki and Shimamoto, 2007). We investigated a realistic configuration of the plate interface. On the basis of the study on interseismic coupling by Wallace and Beavan (2010), we set the seismogenic zone where a-b is negative. The long term average relative slip velocity of each element was fixed at 4.5 cm/year for simplicity.
We set both the Manawatu and Kapiti SSE regions at the deeper extension of the seismogenic zone. The activity of Kapiti SSEs changes significantly during a cycle of large earthquakes. When large earthquakes approach, slip velocities increase at the deeper extension of the seismogenic zone. Consequently, slip velocities of the Kapiti SSEs at the deeper extension of the seismogenic zone increase. During a large earthquake, coseismic slips occur at the Kapiti SSE zone, but the occurrence of SSEs is subsequently restrained for some time. We also developed a model which investigated subducting seamounts in the northern segment of the Hikurangi subduction zone. The effective stress is assumed to be very high in the region of seamounts. The seamounts act as barriers of slow slip but between seamounts slips propagate to the shallow fault zones. Comparison between our results and observations will be necessary to develop a more realistic model of SSEs in this region.

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