**Slow slip events and seismogenic fault strength of the Cascadia subduction zone**

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In this presentation, I will first discuss numerical modeling effort to understand the physical mechanism of episodic slow slip events in the framework of rate-state friction. We implement 3D subduction fault geometry, and use tremor distribution and gravitational anomalies along the Cascadia margin to constrain frictional parameters in the SSE cycle model. The modeled SSEs capture the major characteristics revealed by GPS observations in northern Cascadia. The along-strike segmentation of slow slip is inversely related to the local fault dip and strike angles of the slow slip zone, suggesting strong geometrical control. Segmentation of Mw6.0 SSEs, represented by the average slip released over many SSE cycles, appears spontaneously, mimicking the tremor distributions, while individual SSEs can still propagation across the segmentation boundaries, indicating adjacent SSE interactions as observed in time-dependent GPS inversions. I will also present recent work on stress inversion and implications for a weak subduction plate boundary at seismogenic depths in southern Cascadia near the Mendocino Triple Junction. We use focal mechanism solutions of events derived from the Cascadia Initiative ocean bottom seismometer and Northern California land stations to constrain the stress orientations and solve for the absolute stress tensors in a three-layer model of the upper continental crust, plate boundary fault and the subducting mantle. Our results indicate the shear stress on the plate boundary fault is likely no more than ~ 50 MPa at ~ 20 km depth, a relatively weak megathrust fault with an effective friction coefficient of ~ 0 to 0.2 at seismogenic depths. The low friction coefficient requires a combination of high fluid pressure and/or fault-zone minerals with low inherent friction in the region where a great earthquake is expected in Cascadia.