

## **The importance of geometric inhomogeneity of faults alias How models can catch up with observations**

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Rate and state friction laws are the proverbial power horse driving models of earthquake cycles. Since their discovery in the 70's, they have led to a tremendous progress in physics based earthquake cycle models but also to a lot of mis-interpretation. The discovery of slow slip events (SSEs) and the large shallow slip during the 2011 Tohoku-Oki earthquake have put a spotlight on the latter aspect. In this talk we'll show how fault networks (geometrical complexities) and symmetry breaking geometrical effects can easily explain these new observational complexities without making any ad hoc assumptions about complexities in the initial and boundary conditions vis à vis the patch models for subduction zones. Specifically, we'll show that a simple non planar fault system can reproduce the observed scaling laws of earthquakes and SSEs. We'll also show the re-discovery (hypothesized by James Brune) of a torquing mechanism of thrust faults that can naturally allow for large shallow slip in subduction zone faults.