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Coseismic topography deformation at Sumatra

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Subduction zones produce the largest earthquakes. However, our understanding of earthquakes' spatial-temporal occurrence and tectonic deformation at convergent margin is limited. Traditional view for subduction earthquake cycle contain three stages: Interseismic - superposition of steady elastic strain accumulation and occasional short-duration aseismic strain release, Coseismic – rapid opposite-direction release of accumulated elastic strain, and Postseismic – superposition of afterslips and viscoelastic flow in mantle wedge and lower crust. However, the way strain accumulated interseismically which is related to the generation of long-term deformation and uplift in the forearc region is still a matter of debate. Moreover, when integrated over time, coseismic uplift poorly matches the longer-term vertical deformation. To better understand these relationships, we investigate numerically how coseismic slip and long-term deformation (vertical uplift) accumulate and interact at subduction zones by using a robust, adaptive, multi-dimensional, finite element method solver, Dynearthsol3D, on a 2D continuum viscoelastoplastic model. We set the conditions in this model to a realistic convergent margin setting that resembles Sumatra region. By introducing bathymetric features, this research also explore mechanisms that could explain how strain accumulation in space and time is modified by the presence of large asperities at the subduction interface.