

Overriding plate deformation during subduction evolution (Invited)

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Subduction dynamics has been widely studied in free subduction models, which document the important control of the downgoing plate. However, various models have shown how the overriding plate can influence subduction dynamics through its thermal structure, thickness and coupling.

Using the code Fluidity we investigate overriding plate deformation in a 2-D thermo-mechanical model of the two-plate subduction system. We use Fluidity's adaptive mesh and free-surface formulation. The model includes a composite temperature- and stress-dependent rheology, and plates are decoupled by a weak layer, which allows for free trench motion.

We focus on the evolution of the topography and state of stress in the overriding plate during the different phases of the subduction process: early stages of subduction, free-fall sinking in the upper mantle and interaction of the slab with the high-viscosity lower mantle.