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# Tear geometry at active STEPs: an analogue model approach

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At the lateral end of a subduction zone, tearing of lithosphere is the result of subduction of oceanic lithosphere while adjacent buoyant continental lithosphere stays at the surface. The location of lithospheric tearing is called a Subduction-Transform-Edge-Propagator (STEP), which continuously extends the plate boundary between overriding plate and continental lithosphere. One of our areas of interest is the southern Caribbean where Atlantic lithosphere subducts below the Caribbean plate. Mantle tomography suggests a clear southern edge of the Lesser Antilles slab, which makes the boundary between the Caribbean and South America a clear STEP candidate. At the surface, the San Sebastián/El Pilar fault zone forms the plate boundary between the Caribbean and South America and the active STEP is located near Trinidad. For the deeper part of the damage/shear zone, some information is available from a recent 3D gravity study: significant lateral variability in densities of the lithospheric mantle to the south of the STEP fault zone. The low-density zone may result from higher sub-crustal temperatures, such as would arise from an asthenospheric window resulting from detachment. Interpreted in this way, the mantle part of the damage zone may be 200-250 km wide. So, while the location of the plate boundary at the surface is relatively well resolved, little is known about the deeper continuation of the active STEP in the mantle lithosphere.

We study the evolution of the tearing process at a STEP using analogue models. In our models we use silicone putty (lithosphere) and glucose (asthenosphere). Solely gravitational forces resulting from density differences between oceanic lithosphere and asthenosphere drive our model. Lithospheric tearing commences after subduction has initiated. The geometry of the tear varies with the rheology of the lithosphere and asthenosphere, particularly Newtonian versus power-law. We investigate the dependence on model parameters of the width of the tearing zone and the depth at which tearing occurs.