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# Influence of the geometry of continental to oceanic lithospheric transition on slab break-off

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Slab break-off is generally proposed to explain different features recognized at the Earth's surface such as uplift of the upper plate (due to isostatic rebound after break-off and unloading of the subducted plate), extension in the inner higher portion of the rising orogenic belt, or magmatism and metamorphism related to the inflow of sub-slab mantle material. In addition, slab break-off is generally identified on tomographic images as a gap, or anomalously slow region, within the subduction slab. However, these tomographic images only give information on the present-day state of a subduction zone. Analogue and numerical models have proven useful to understand the time evolution of the slab break-off process. They have shown that slab break-off occurs after a less positively-buoyant material enters in the sub-lithospheric mantle, increasing the overall buoyancy of the subducting lithosphere and leading to internal slab deformation under stretching. If localization of deformation is important enough, slab stretching can lead to slab break-off within a few m.y, which can eventually propagate laterally. However, most of the models done so far are either 2D or 2.5D, the transition between the negatively and positively buoyant domains being linear and parallel to the trench, while in Nature more complex geometries may have existed.

We present here the first results of laboratory models that simulate the arrival at trench of a continental lithosphere following oceanic subduction into the upper mantle by using a two-layer system made of silicone (PDMS) and glucose syrup. The transition between oceanic and continental lithospheres (COT) is represented as a thin layer of PDMS silicone homogenously seeded with high viscous glass beads. This combination allows the oceanic part to detach from the continental one because of the high local strain obtained around the seeds that makes the mixture to behave as a non-Newtonian medium. We obtain with our initial 2.5D set-up depths of break-off (120-300km depth) and time periods for break-off after continental subduction (20-35 m.y) in agreement with previous models. We then studied the influence of the angle between the trench and the COT on the evolution of trench velocity, timing of necking and break-off, velocity of lateral propagation and surface topography changes obtained by using photogrammetric analysis. For instance, we show that increasing the angle between the COT and the trench from 0 to 40° increases the timing for slab break-off initiation by 5-10 m.y. We finally tested the influence of different geometries (from linear to sinusoidal shapes) for the COT.