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Deformation and topography above the lateral transition from continental to oceanic subduction in three-dimensional laboratory models: what can we learn on the Hellenic subduction?

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We use three-dimensional dynamically self-consistent laboratory models to analyze relationships between surface evolution and deep dynamics at convergent margins. Our models are setup with a viscous plate of silicone (lithosphere) subducting under negative buoyancy in a viscous layer of glucose syrup (upper mantle). We focus on the subduction of a laterally heterogeneous lithosphere characterized by an abrupt transition of density using negatively and positively buoyant silicone to reproduce oceanic and continental subduction, respectively. We quantify and establish relationships between the subduction dynamics and resulting slab geometry, trench kinematics and pattern of horizontal/vertical deformation for both the overriding plate and the upper mantle. Assuming that our modeling results can be representative of the natural behavior of subduction zones, we compare them to the Neogene to Quaternary evolution of the Hellenic subduction zone. We more particularly focus on the deformation and topography of the Hellenic upper plate, which may have been influenced by the difference in subduction dynamics north and south of the Kephalonia Transform Zone, with a slowly subducting Adriatic continental lithosphere in the north and a rapidly subducting Ionian oceanic lithosphere in the south.