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2-D thermo-mechanical numerical modelling of the South American subduction zone

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Here we will present a parametric study of the South American subduction zone to investigate what combination of parameters best reproduces the present-day geometry of the slab observed in tomography studies. Tomography models indicate that the slab in the center of the subduction zone dips eastward in the whole mantle, but the dip angle changes with depth and a thick high density anomaly is observed in the lower mantle, suggesting some folding of the slab. Replicating this disctinct slab geometry using geodynamic modelling may help us better constrain variables that are commonly used in the literature. Using the code Underworld 2, we ran 2-D buoyancy-driven thermo-mechanical subduction models extending down to the core mantle boundary and with a large horizontal dimension of 11600 km to extend up to the Atlantic mid-oceanic ridge. We studied the effect of varying lower mantle viscosity and density, upper mantle rheology (linear or non-linear viscous), cohesion at the subduction interface, as well as the temperature dependence of the slab viscosity. Preliminary results show that using a non-linear rheology for the upper mantle is more efficient to produce slab folding in the lower mantle, while other parameters including lower mantle viscosity and density control the dip angle in the lower mantle.