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# Dependence of lithospheric slab buoyancy on composition and convergence rate: insights from a thermally-coupled kinematic model

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The buoyancy of the lithospheric mantle relative to the asthenospheric mantle is the driving force of plate subduction and mantle delamination (the peeling off of the lithospheric mantle from the crust and its detachment and sinking into the asthenospheric mantle). Both mechanisms are often invoked for the evolution of collision zones, yet there are still open questions about the conditions under which they take place. The higher density of the lithosphere relative to the asthenosphere is thought to lead to subduction or delamination as it sinks. However, it is true only when the densities are temperature dependent. We adopt a mineral physics viewpoint where the density depends on temperature, pressure, and composition such that lithospheric mantle can be less dense than that of the underlying asthenosphere, posing a severe problem for the initiation of delamination. The density and its pressure-temperature dependence, in the lithosphere and asthenosphere, are calculated from stable mineral assemblages computed using major oxides composition based on mantle xenoliths/garnet peridotites in the (CFMAS) framework. We present a parametric study on the relationship between slab buoyancy and convergence rate using a simple 2D kinematic numerical model, incorporating thermal advection and diffusion. We consider different types of the lithospheric mantle (e.g. Archon, Tecton, Proton, and Oceanic), subducting with different convergence rate and constant angle, into the asthenosphere. Our results suggest that Oceanic, Tecton and Proton lithospheres are always negatively buoyant and maximum negative buoyancy increases with the convergence velocity whereas Archons are always positively buoyant. In case of oceanic lithosphere maximum negative buoyancy also increases with its age for a given velocity. This is a SUBITOP (674899-SUBITOP-H2020-MSCA-ITN-2015) and MITE (CGL2014-59516) contribution.