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Thermomechanical modelling of slab eduction

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Our study presents the plate eduction model. This geodynamic process is characterized by the extensional reactivation of a subduction zone which might take place after slab detachment. The detachment of a slab separates the dense oceanic plate from the buoyant orogenic root leading to a rebound. Eduction may therefore be partly responsible for exhumation of high pressure rocks, late orogenic extension, and topographic uplift. We employ two-dimensional thermomechanical modelling to investigate the main features of plate eduction. The results show that eduction can cause a near adiabatic decompression of the subducted crust ($\approx$ 2 GPa) in a timespan of 5 My, large extensional strain in the subduction channel, flattening of the slab, and a surface uplift associated to orogenic extension. In order to further investigate the forces involved in the eduction process and derive specific scaling laws, we ran several parametric studies using a simplified setup. This experiment showed that eduction is a plausible mechanism if the viscosity of the asthenospheric mantle is lower than 10^{22} Pa.s while subduction channel viscosity does not exceed 10^{21} Pa.s. We suggest that eduction can be a viable mechanism and may play an important role in orogenic evolution.