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Three-dimensional modeling of slab detachment during continental collision

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Slab detachment has recently been the focus of numerous geodynamic studies, especially in the framework of continental collision. This process involves the detachment of a segment of oceanic lithosphere during its subduction. It thus has a number of implications ranging from perturbations of geodynamic regimes, topographic development, or exhumation of high pressure rocks. Previous modeling study have been carried out, mostly in two-dimensions, therefore not considering the role of along trench processes.
In this study we present three-dimensional (3D) numerical models of subduction-collision ultimately leading to slab detachment. In order to investigate the role of along trench processes, the model setup involves the subduction of a continental edge. Two different setups allow to investigate the impact of the presence of trench normal transform fault (i.e. along the continental edge) on slab detachment dynamics. Results show that slab detachment may take the form of homogeneous boudinage in the along trench direction if the continental edge is adjacent to a transform fault. However, in the absence of a transform fault, the continental edge subducts together with adjacent oceanic plate and slab detachment takes the form of trench parallel tear further leading to the formation of a slab window.