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Dynamics of slab detachment

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Our study investigates the dynamics of slab detachment and evaluates the amount of time necessary for slabs to detach. We combine both the results of two-dimensional numerical modeling with the prediction of a one-dimensional analytical solution for viscous necking under gravity. This tidy suggest that the dominant deformation mechanisms leading to slab detachment is viscous necking, independently of the depth of slab detachment. Localised simple shear may also occur when the slab dip is moderate, especially in the colder parts of the slab. Brittle fracturing, or breaking, plays a minor role during the slab detachment process. 2D thermo-mechanical simulations indicate that the duration of slab detachment is short ($<$ 4 Ma) and can occur in less than 0.5 Ma. No simple correlation between the slab detachment depth and duration was found. Our results suggest that deep slab detachments ($>$ 250 km) can also occur within a short time ($<$ 1 Ma). On the other hand, slab detachments taking place between 35 and 250 km depth may last less than 2 Ma. This aspect has implications for geodynamic interpretations using slab detachment as explanation for processes such as melting, exhumation or surface uplift.