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Lithospheric Block Model as Test Bench for Plate Reconstructions and Plate-Mantle Coupling

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Existing global plate reconstructions are based purely on surface observations, i.e. primarily seafloor magnetization. For plates where only little or contradicting information is preserved, assumptions must be made by extrapolating the existing evidence.
In general, plate motion is a consequence of viscous coupling between the plates and the underlying mantle and friction between the plates themselves. Thus, an unambiguous reconstruction of plate motion requires the knowledge of this whole force balance. However, this is inherently problematic because the mantle velocity field is generally unknown; it can only be inferred from surface motion, and usually the reconstructed plate motion is used directly as a velocity boundary condition for mantle models.
As a consequence, the motion of some oceanic plates that have largely been subducted is only poorly known. However, it is possible to improve our knowledge of plate motion by including physical constraints. We use a numerical lithospheric block model to determine the plate boundary forces; by testing different rheological assumptions, we can infer implications on the plate motion and also on the mantle velocity field, due to its smooth nature.