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Towards modelling the evolution of intra plate stress: the Eurasian plate 20 Ma.

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In this study, we investige the evolution of the intra plate stress field. We use the classical characterisation of forces acting regionally on a plate such as 'slab pull/suction', 'ridge push' and 'mantle drag' as used by Forsyth & Uyeda (1975), Chapple & Tullis (1977) and later by Wortel et al. (1991) and Govers & Meijer (2001). So far, the interaction between the lithosphere and the underlying mantle flow was oversimplified and implemented via a coupling cœfficient in the direction of the plate motion and we propose improving this specific interaction. As the shear stress field at the base of the plates is unknown in the past, we propose using a mantle flow simulation induced by the imposition of past plate motions on top of a 3D spherical mantle convective code. To that purpose, we employ the new plate motion reconstruction developed by Stampfli et al. (2008) and a 3D convective code where plates are dynamically coupled to the mantle (Quéré & Forte, 2006). The first plate on which we apply this method is the Eurasian plate as Eurasia is a large plate with a small velocity (not attached to its own subduction zone) and the debate on the main driving forces acting on Eurasia is still going on. The stress field 20 Ma resulting from all plate tectonic forces is calculated by assuming mechanical equilibrium in an homogeneous elastic shell using the plane stress approximation. As direct stress indicators for the past are rare, the predicted paleo-stress field is compared to pertinent data from orogens and extensional basins which will provide new clues to oil exploration teams.