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Multiscale mantle convection along the Tethyan collisional margin

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We perform global mantle circulation to reconstruct the style and geometry of mantle convection beneath the Tethyan region, from the Mediterranean to the Hiamalayan belt. To quantify the contribution of mantle heterogeneity and subduction zones to mantle circulation and plate motions, we compute the instantaneous mantle flow that can be inferred from seismic tomography when velocity anomalies are converted into temperature. Model results are compared with geodesy, residual topography, and shear wave splitting observations. We evaluate different boundary conditions to test the role of slab pull and mantle convection as driving forces for the kinematics of the Tethyan system. Our results show that mantle drag exerted on the base of the lithosphere by a large-scale, convective "conveyor belt" with an active upwelling component is likely the main cause for the ongoing indentation of the Indian and Arabian plates into Eurasia. This large scale convection cell superimposed to small scale convection that could be resolved in region such as the Mediterranean, where high resolution seismic tomography is available. More in general, our model emphasizes that large scale mantle convection dragging continental block against Eurasia produce the necessary kinematic conditions to sustaine thick collisional orogen, whereas small scale convection confined in the upper mantle produces ephemeral, slab-pull dominated, orogenic belt.