



## **Constraining central Neo-Tethys Ocean reconstructions with mantle convection models**

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A striking feature of the Indian Ocean is a distinct geoid low south of India, pointing to a regionally anomalous mantle density structure. Equally prominent are rapid plate convergence rate variations between India and SE Asia, particularly in Late Cretaceous/Paleocene times. Both observations are linked to the central Neo-Tethys Ocean subduction history, for which competing scenarios have been proposed. Here we evaluate three alternative reconstructions by assimilating their associated time-dependent velocity fields in global high-resolution geodynamic Earth models, allowing us to predict the resulting seismic mantle heterogeneity and geoid signal. Our analysis reveals that a geoid low similar to the one observed develops naturally when a long-lived back-arc basin south of Eurasia's paleomargin is assumed. A quantitative comparison to seismic tomography further supports this model. In contrast, reconstructions assuming a single northward dipping subduction zone along Eurasia's margin or models incorporating a temporary southward dipping intraoceanic subduction zone cannot sufficiently reproduce geoid and seismic observations.