



Constraints of subducted slabs under the Indian Ocean on the northward motion of India from Gondwanaland towards Eurasia

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We find an extensive swath of slabs in the lower mantle under the Indian Ocean at depths of 1000-2200km, with shallower slabs to the north under India and Eurasia at ~200-1500km. These slabs closely correspond to the well-known track that India has travelled northward from Gondwanaland toward its collision with Eurasia, viewed in the Indo-Atlantic moving hotspot reference frame, and account for a significant proportion of the predicted loss of the Ceno- and Neo-Tethyan Oceans since ~140Ma.

Our work is based on our methodology of [1] mapping subducted slabs in global tomography (MITP08, Li et al. 2008) as 3D mid-slab surfaces in the Gocad environment, [2] quantitatively unfolding these surfaces to the surface of the earth in a spherical Earth model, minimizing changes in area and distortion, and [3] incorporating them into Gplates global plate tectonic reconstructions (<http://www.earthbyte.org>).

These unfolded subducted slabs provide substantial quantitative constraints for the original location and extent of India and Greater India and for the nature and history of Ceno- and Neo-Tethys. We observe a distinct discontinuity in amplitude of p- and s-wave velocity anomalies between the higher-amplitude Neo-Tethyan slabs to the north under India and the Middle East and the lower-amplitude Ceno-Tethyan slabs under the central Indian Ocean, which is in agreement with a predicted large ~100Ma discontinuity in age-at-subduction between Neo- and Ceno-Tethys in existing plate-tectonic models (e.g. Müller et al., 2008; Seton et al., 2012). We present a plate tectonic reconstruction that incorporates these mapped slab constraints, with the implication that a substantial fraction of the Tethyan Ocean (~3000km) subducted southward under India at an early stage in the northward motion of India from Gondwanaland.