

Mantle micro-block beneath the Indian Ocean and its implications on the plate reconstruction of Gondwana

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A series of ancient Tethys ocean basins have been consumed beneath the Indian Ocean and are hard to observe due to their subduction below the southern Eurasian margin. The presence of the delaminated Gondwana fragments beneath the Indian Ocean also has long been suspected. These microplate tectonics lead to a fairly complex shallow crust and deep mantle configuration, which makes it difficult to reconstruct East Gondwana and discuss the geodynamics of continental rift-drift-collision in the Tethyan Realm. Lithospheric or crustal thinning due to the dehydration of the underlying stagnant slab is a good tracer of the subducted plate. Using the gravity-derived oceanic crust and Euler rotation method, we obtained an asymmetric crustal thickness across the Indian Ocean ridges. Areas of anomalous intra-plate crustal thinning were revealed and applied to track the possible subducted slabs. Then, combined with other geophysical data, two Meso-Tethyan slabs, one Neo-Tethyan slab, and two Indian slabs were delimited. From north to south, the slabs beneath India and the Northeast Indian Ocean constitute a south-dipping and step-shaped architecture, which are significant to the reconstruction of East Gondwana. It requires a double subduction zone or a two-stage India-Eurasia collision model to be driven by the slab pull, which is still open for debate.