



Time constraints on post-rift evolution of the Southwest Indian passive margin from ^{40}Ar - ^{39}Ar dating of supergene K-Mn oxides

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The high-elevation passive margin of Southwest India is marked by the Western Ghats escarpment, which separates the coastal domain from the low-relief East-dipping Mysore plateau. The escarpment has evolved from the Seychelles rifting at ~ 63 Ma following the Deccan traps volcanic event at ~ 65 -63 Ma. This escarpment results from differential erosion processes across the passive margin, the rate and timing of which depend upon whether the margin has evolved according to a model of downwarped or rising flank topography.

We explore the post-rift evolution of the South Indian passive margin through the characterisation of stepped relicts of lateritic paleosurfaces across that margin, and notably by ^{40}Ar - ^{39}Ar dating of in-situ formed K-Mn oxides in supergene Mn-ore deposits carried by these paleosurfaces. The genesis and maturation of Mn-ore deposits are generally linked to progressive weathering processes of the paleosurfaces, which expose them. Dating of K-Mn oxides thus document the timing of these processes [1], and potentially the ages of the altered paleosurface. Moreover, the elevation differences between successive lateritic paleosurfaces of different ages may provide denudation rates for the considered time spans.

Previous work (e.g., [2]) and our own field investigations, allow identifying three main lateritic paleosurfaces on the plateau at altitude ranges of 1000-900 m (S2), 900-800 m (S3) and 800-700 m (S3d), and a lower paleosurface in the coastal domain at 150-50 m (S4).

K-Mn oxides (cryptomelane) were sampled in Mn ore deposits from different paleosurfaces, particularly in the coastal area around Goa on S4 and in Sandur and Shimoga Mn-ore deposits exposed on S2 and S3. The ^{40}Ar - ^{39}Ar ages obtained from carefully characterised mineralogical assemblages range from ~ 26 to ~ 36 Ma in the Sandur Mn-ore deposit indicating intense lateritic weathering processes at the Eocene-Oligocene transition underneath paleosurface S2. Similar ages of ~ 24 and ~ 32 Ma are obtained in two Shimoga Mn ore deposits carried by S3 and S2, respectively. A younger age (~ 21 Ma) is also obtained in a Goa deposit carried by S4. These first results suggest that the Western Ghats passive margin escarpment was established at the latest by early Miocene and that at least part of the inland Mysore plateau morphogenesis was achieved at that time.

[1] Beauvais A. et al., Journal of Geophysical Research 113, F04007, 2008.

[2] Gunnell, Y., Basin Research 10, 281-310, 1998.