



Evolution of the Southwest Indian continental divergent margin: Constraints from ^{40}Ar - ^{39}Ar dating of lateritic paleosurfaces

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The western continental passive margin of Peninsular India is marked by the Western Ghats escarpment, which separates a coastal lowland from an East-dipping highland plateau and is carved both into the 63-Ma old Deccan traps and their Archean basement. Previous studies suggested establishment of the escarpment by differential erosion across an elevated rift shoulder, and thermochronologic models predicted escarpment formation from higher denudation in the coastal lowland than on the plateau until ~ 50 Ma.

We provided complementary time constraints on the evolution of the passive margin by ^{40}Ar - ^{39}Ar dating of supergene K-Mn oxides (cryptomelane) sampled in lateritic formations exposed on paleosurfaces, which are preserved as relicts on both sides of the escarpment. Three main lateritic paleosurfaces were identified in the highland at altitude ranges of 1200-1000 m (S1), 1000-900 m (S2) and 850-600 m (S3), and a lower paleosurface in the lowland at 150-50 m (S4).

All the ^{40}Ar - ^{39}Ar ages obtained on either side of the escarpment document major weathering periods for each paleosurface: 53 to 45 Ma (S1-S4) synchronously with the bauxitic weathering, 40 to 32 Ma (S2), 30 to 23 Ma (S3), and 24 to 19 Ma (S4). These ages indicate that most of the incision and dissection of plateau landsurfaces S1, S2, and S3 must therefore have taken place after 45, 32 and 23 Ma respectively, while the coastal lowland surface S4 was incised after 19 Ma.

Preservation of laterites as old as 47 Ma in the coastal lowland implies that the escarpment already existed in the Mid-Eocene while intense bauxitic weathering was taking place on both sides of the escarpment. The ages obtained in the lowland are also indicative of limited erosion ($\sim 4 \text{ m Ma}^{-1}$) at the foot of the escarpment since 45 Ma, and particularly low incipient incision of the lowland ($\sim 5 \text{ m Ma}^{-1}$) since 19 Ma. Ages obtained on the highland plateau indicate further Neogene denudation inland but at less than 15 m Ma^{-1} since 45 Ma, and incision lower than 6 m Ma^{-1} since 23 Ma. Limited erosion in the coastal lowland contrasts with Late Neogene increase in clastic fluxes on the offshore margin, which may therefore be attributed to erosion of the shelf edge or material imported from the Indus fan. Our results attest to the antiquity of the first-order relief and topography of the high-elevation margin of Southwest India and to a divergent erosion pattern on either side of its escarpment since at least 47 Ma.