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Tempo of lateritic weathering and erosion of Peninsular India over the Cenozoic: Morphoclimatic implications

Bonnet, N.J.¹, Beauvais, A.¹, Chardon, D.², and Arnaud, N.³

¹ Aix Marseille Université, IRD, CNRS, CEREGE UM34, Aix-en-Provence, France (beauvais@cerege.fr)

² GET (CNRS/IRD/UPS), Université de Toulouse, Toulouse, France

³ Université de Montpellier 2, Géosciences Montpellier, Montpellier, France

Most shields of the tropical belt show extended lateritic landform relicts, which result from conjugated chemical weathering and mechanical erosion processes over the Cenozoic. After Deccan Traps extrusion ca. 65 m.y. ago, Peninsular India has been shaped by successive periods of lateritic weathering and erosion on both sides of the Western Ghats escarpment (WGE), which separates a coastal lowland from a highland plateau. The weathering periods are documented from $^{40}\text{Ar}/^{39}\text{Ar}$ dating of K-Mn oxides (cryptomelane, $\text{K}_x \text{Mn}_{8-x}^{\text{IV}} \text{Mn}_x^{\text{III}} \text{O}_{16}, n\text{H}_2\text{O}$) formed in Mn ore deposits and Fe-Mn lateritic weathering profiles, which are developed from Archean supracrustal rocks and exposed on stepped remnants of paleolandsurfaces on either side of the escarpment. The $^{40}\text{Ar}/^{39}\text{Ar}$ ages obtained document three major weathering periods [1], ca. 53-45 Ma both in the highland and the lowland, ca. 37-24 Ma only in the highland [2], and ca. 24-19 Ma only in the lowland [3]. These ages' series document evolving geomorphic and climatic patterns on either side of the WGE over the Cenozoic.

The intense lateritic weathering at 53-45 Ma and 37-24 Ma reflect the Early Eocene optimum and the onset of Asian monsoon regimes, when the peninsula drifted across the equatorial belt. Synchronous early Eocene weathering on both sides of the WGE and the preservation of laterites as old as 47 Ma on its piedmont attests to the stabilization of this marginal escarpment before that time, and further documents a slow denudation of the lowland since then [3]. The ages series also indicate that the highland landsurfaces were mostly dissected after ca. 24 Ma, while little incision affected the lowland after ca. 19 Ma. Finally, the $^{40}\text{Ar}/^{39}\text{Ar}$ ages document a divergent erosion and weathering history on either side of the escarpment suggesting a dual climatic regime across this topographic barrier after the Eocene climatic optimum.

[1] Bonnet NJ et al. (2016) Chem Geol, in press.

[2] Bonnet NJ et al. (2014) Earth Planet Sci Lett 386:126-137, doi:10.1016/j.epsl.2013.11.002

[3] Beauvais A et al. (2016) Geology, in press, doi:10.1130/G37303.1

