



Deciphering post-Deccan weathering and erosion history of South Indian Archean rocks from cryptomelane ^{40}Ar - ^{39}Ar dating

Nicolas Bonnet (1), Nicolas Arnaud (2), Anicet Beauvais (1), and Dominique Chardon (3)

(1) Aix-Marseille University, CEREGE (CNRS, IRD), Aix en Provence, France, (2) Montpellier 2 University, Montpellier Geosciences (OREME, CNRS, IRD), Montpellier, France, (3) Toulouse University, GET (CNRS, IRD) Toulouse, France

Since the extrusion of Deccan traps ~ 63 Ma ago, weathering and erosion processes have shaped the landscapes of this Peninsula India. This resulted in pervasive bauxitic weathering on traps and deep lateritic weathering of their basement on either side of the Western Ghats Escarpment, which separates a coastal lowland from an East-dipping highland plateau. Mn-rich lateritic profiles formed by supergene weathering of Late Archean manganiferous protose in the different greenstone belts are exposed on relict paleosurfaces, which are preserved at different elevations on the highland plateau and in the coastal lowland, allowing for direct comparison of paleosurfaces and geomorphological processes across one of the most prominent relief in the Indian peninsula.

Detailed petrological and geochemical investigations of samples collected in the different Mn-rich lateritic profiles allowed for precise characterization of cryptomelane [$\text{K}_x\text{Mn}_{8-x}^{\text{IV}}\text{Mn}_x^{\text{III}}\text{O}_{16}, n\text{H}_2\text{O}$], a Mn-oxide suitable for ^{40}Ar - ^{39}Ar dating. The ages obtained document major weathering periods at ~ 53 -50 Ma, ~ 40 -32 Ma, and ~ 30 -23 Ma in the highland profiles, and ~ 47 -45 Ma, ~ 24 -19 Ma and a younger age at ~ 9 Ma in the coastal lowland profiles. The age clusters are in good agreement with major regional and global Cenozoic paleoclimatic events, e.g., the Eocene climatic optimum and the early beginnings of Asian monsoons at ~ 40 Ma. The old ages obtained both in the coastal lowland and high plateau indicate synchronous lateritic (mostly bauxitic) weathering on both sides of the escarpment. The ages also indicate that most of the incision and dissection of plateau landsurfaces must have taken place during successive periods after 45, 32 and 23 Ma, while the coastal lowland surface was only weakly incised after 19 Ma. Our results thus document post-Eocene divergent erosion and weathering histories across the escarpment since it was formed at least 47 Ma ago, suggesting installation of a dual climatic regime on either sides of this escarpment after the Eocene greenhouse peak.