WEATHERING AND DENUDATION OF THE WESTERN CONTINENTAL MARGIN OF PENINSULAR INDIA: THE $^{40}Ar/^{39}Ar$ DATING OF LATERITIC K-RICH MANGANESE OXIDES

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The Cenozoic weathering of peninsular India has been advocated as a major driver of global cooling, however, its timing remains virtually unconstrained such that proposed links between tropical weathering of the Deccan Traps, regional monsoonal intensity and global climate remains speculative. To solve this conundrum we present here a revised weathering chronology based on the identification of lateritic paleosurfaces and their dating using $^{40}Ar/^{39}Ar$ on supergene K-rich manganese oxides. We focus on the Indian western passive margin where the Western Ghats Escarpment (WGE) – a ~1000 m high topographic barrier resulting from the continental break up of Greater India – exposes exceptionally preserved weathering profiles from the western coastal lowlands to the eastern highland plateaus above the WGE. Four main lateritic paleosurfaces have been identified: Three in the highland; a high landsurface (Al-Fe mostly bauxite) at elevation 1200-1000 m asl, an intermediate landsurface covered by a Fe-duricrust at 1000-900 m asl and a lower pediment landsurface at 850-600 m asl; and one in the coastal lowland underneath a pediment landsurface at 150-50 m asl. The $^{40}Ar/^{39}Ar$ ages document three major weathering periods over the Cenozoic. The oldest weathering period (W1) is recorded between 53 Ma to 45 Ma both in the highland and the lowland. This correlates to the Global Eocene climatic Optimum, and allows defining a bauxitic paleolandsurface across the escarpment. Intense bauxitic weathering between ~ 45 and 47 Ma in the lowland indicate that the WGE was stabilized before ~ 47 Ma on its margin and also implies low denudation rate at the foot of the WGE (<5 m Ma^{-1}) since that time. The second weathering period between 37 Ma to 19 Ma (W2) occurred in two distinctive stages (W2a and W2b). From 37 to 26 (W2a), weathering is only recorded in the highland and affect intermediate surfaces. The intensity of chemical weathering decreased sensibly between 32 and 29 Ma – potentially linked to the Early Oligocene cooling – and resulted in the formation of the lower pediment surface. From ~26 Ma to 19 Ma (W2b), only the western coastal lowland weathered while the highland surfaces are mostly dissected. This change and the highland/lowland weathering mitigation after ~26 Ma documents a change in climatic patterns over peninsular India that signs the onset of modern-like monsoon regime. These results are being interpolated to the Deccan Traps basalts to quantify their weathering and ultimately estimate of the contribution to CO_2 fluxes of these three weathering periods and their potential link to Asian Monsoons and global cooling.