



## **Structural underprint, tectonic overprint and drainage integration — do escarpments at passive margins persist or reform?**

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A popular idea considers that receding escarpments are self-similar through time and indefinitely sustain both the topographic asymmetry and the persistence of local relief initially imparted by continental breakup. Examination of a range of passive margin escarpments in the United States, India and Madagascar suggests instead that long after continental breakup, steep escarpments develop either because they are underpinned by resistant bedrock or because they were recently reformed by active tectonics. Because continental breakup often follows the strike of Precambrian or Paleozoic fold belts, escarpment growth commonly appears to be pre-ordained by pre-rift geological fabrics exposed by the topographic energy of rifting. Where geological structure is nonuniform, the erosional pattern follows lithological heterogeneities as the landscape erodes. The persistence of such structurally controlled escarpments depends on the capacity of geomorphic agents in successive climatic environments to reshape topography in response to drainage integration across the hinterland. As drainage systems cut into the belted outcrop systems, new escarpment-forming conditions arise intermittently. We analyze important aspects of drainage integration as mobile drainage basin boundaries shift across but also along the strike of inherited geological structures and through continental-scale bioclimatic zones, and suggest how lithological contrast and drainage capture interact to reenergize degrading escarpments and cause scarp jumps. The studied examples provide little positive evidence that changes in escarpment morphology are either steady over time or spatially uniform, or that present-day escarpments at mature passive margins are a direct consequence of, and therefore

preserve information about, the initial process of continental breakup.