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Ancient and young landforms coexist in a high relief landscape in the Brazilian continental interior

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A range of empirical constraints in many post-orogenic landscapes suggests topographic rejuvenation long after tectonics ceased tens to hundreds of millions of years ago. Such evidence is at odds with what one would expect in the case of steady boundary conditions over geologic timescales. At the same time, there is compelling geochronological and geomorphic data showing that slowly eroding humid tropical areas in Australia, Africa, India, and South America are of considerable antiquity. These ancient areas commonly refer to low-relief uplands capped by chemically and physically resistant duricrusts, with an age range from the Paleocene onwards. Here we investigate the morphology of a tropical, ancient landscape in the Brazilian continental interior that last experienced active tectonics ~80 Ma and is characterized by lithological heterogeneity to test whether its topography has been rejuvenated long after the cessation of crustal thickening and later rifting. In particular, we explore how bedrock erodibility and duricrusts are related to topographic relief in this setting. We show topographic data suggesting that the study area is experiencing a transient topographic disequilibrium due to a relative base level fall, with a relict landscape adjusted to pre-existing boundary conditions preserved in low-relief uplands capped with ferruginous duricrusts. Transient waves of accelerated river incision and adjacent hillslopes' feedback actively dissect these relict uplands. Our study demonstrates that relief is growing instead of decreasing over time in this ancient landscape. Moreover, instead of supporting the two end-members for post-orogenic relief development (i.e., ancient vs. young landforms), we demonstrate that older and younger landforms coexist in a post-orogenic landscape in the Brazilian continental interior.

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