Numerical Modeling of the Landscape Evolution and Denudation History of the Borborema Province, NE Brazilian Continental Margin

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The landscape evolution of the Borborema Province, northeastern Brazil, is characterized by post-rift uplift, as attested by the presence of Albian shallow marine sediments now at elevations ca. 700-800 m. However, after more than three decades of investigation, neither the timing nor the cause of the topographic uplift and extensive erosion of sedimentary basins are well understood. In the present work, we used numerical models that couple surface processes dynamics, flexural isostasy and thermal effects due to lithospheric stretching to simulate the tectono-sedimentary evolution of the Borborema Province since the onset of continental stretching during the Early Cretaceous. Based on these numerical experiments, we concluded that nearly 70% of the post-rift regional uplift observed in the Borborema Province can be explained by differential denudation of the continent and flexural rebound of the lithosphere. We suggest that the remaining uplift of $\sim$250 m can be related to thermal uplift induced by partial erosion of the base of the continental lithosphere under the Borborema Province due to edge driven convection, in accordance with the anomalously thin continental lithosphere observed under the Borborema Province. Additionally, comparing the observed fission track data with the calculated one in the numerical models, we observed that the regional pattern of the fission track ages can be explained by the combined effect of differential denudation and flexural rebound, taking into account the three-dimensional shape of the margin.