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# Modeling Long-Term Landscape Evolution in Southeastern Brazil: The Retreatment of the Mantiqueira Escarpment

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Landscape evolution models (LEMs) have deeply improved our ability to understand the combined effects played by tectonic and surficial processes in controlling long-term landform development. Although these models can be applied to simulate the evolution of a variety of geomorphological situations, important results have been obtained in reproducing the retreatment of escarpments during the Cenozoic, especially where incision rates were well-constrained by field data.

The Mar and Mantiqueira mountain ranges in southeastern Brazil have been the subject of several studies which have presented different conceptual models for the origin and evolution of these scarped features along rift borders. In this study we applied the GOLEM model to simulate the retreat of a portion of the Mantiqueira escarpment located in the Cenozoic Continental Rift System of southeastern Brazil, close to the Resende's basin fault edge, at the border between Rio de Janeiro and Minas Gerais states. Our main purpose was to use the model results to improve the discussion concerning the main conceptual established ideas describing the origin and evolution of this escarpment. The simulated scenarios were constrained by detailed geological mapping, 200 apatite fission-track analyses, 20 40Ar/39Ar weathering profile dates, as well as by tectonic and sedimentary records from the adjacent Paleocene/Eocene Resende basin.

The results suggest that the main factors that controlled the evolution of the northern edge of the Resende basin were the possible isostatic flexural responses associated with the times of higher crustal stretching, the climatic variations and the lithological differences. Concerning the associated surficial processes, the simulations suggest that fluvial incision over exposed bedrock was a major process. The numerical experiments which simulated scenarios with thick weathered profiles did not generate reasonable results, producing greater denudation and associated retraction rates than the ones observed in the area.

In terms of initial conditions, the best simulated scenario for the escarpment retreat assumed an original plateau at 55 My ago with an elevation of about 1000m, particularly when compared with the present conditions. The results support the idea that the area was exposed to three uplift pulses during the first 35 My, followed by a period of 20 My of denudation without associated uplifts. The escarpment retreat rates estimated by this study, mostly around between 0.13 and 0.25 km/My for the Cenozoic period, are very close to those obtained for other regions like the great escarpments of the southwestern African and southeastern Australian coasts.