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Simulating CRN derived erosion rates in a transient Andean catchment using the TTLEM model

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Assessing the impact of mountain building and erosion on the earth surface is key to reconstruct and predict terrestrial landscape evolution. Landscape evolution models (LEMs) are an essential tool in this research effort as they allow to integrate our growing understanding of physical processes governing erosion and transport of mass across the surface. The recent development of several LEMs opens up new areas of research in landscape evolution. Here, we want to seize this opportunity by answering a fundamental research question: does a model designed to simulate landscape evolution over geological timescales allows to simulate spatially varying erosion rates at a millennial timescale? We selected the highly transient Paute catchment in the Southeastern Ecuadorian Andes as a study area. We found that our model (TTLEM) is capable to better explain the spatial patterns of ca. 30 Cosmogenic Radio Nuclide (CRN) derived catchment wide erosion rates in comparison to a classical, statistical approach. Thus, the use of process-based landscape evolution models may not only be of great help to understand long-term landscape evolution but also in understanding spatial and temporal variations in sediment fluxes at the millennial time scale.