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Shaping the Rwenzori Mountains

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The Rwenzori Mountains are a high alpine mountain chain, about 40x80 km in size, just north of the equator in the western branch of the East African Rift System in Africa. The central part of the mountain chain is located in Uganda, and the highest peak, the Margherita Peak with 5119 m, lies on the border to the Democratic Republic of Kongo. Topography is very pronounced, with steeply incised valleys and clear glacial landforms in the upper part of the mountain chain. The Rwenzori Mountains are an unusually high mountain chain located in the extensional setting of the East African Rift System, and the huge elevation poses a challenging problem for geodynamists to explain.

We use the numerical model Ultima Thule to simulate the evolution of the Rwenzori Mountain chain over the period of around 800,000 years with a temperature variation derived from ice-core data. Processes considered are ice-sheet evolution, hillslope diffusion, fluvial incision, glacial abrasion, surface deformation, and tectonic uplift. With a set of numerical experiments, we estimate the temperature drop between the present day and the last glacial maximum needed to glaciate to high parts of the Rwenzori in accordance to field data. We then provide estimates on the morphological processes decreasing the relief, and the amount of tectonic uplift needed to counter-act the decrease in topographic height.