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Rift Induced Delamination –
A new mechanism for explaining Rwenzori Mountain's Extreme Elevation?

With heights of 4 to 5 km the topography of Rwenzori Mountains, a large horst of old crustal rocks located inside a young passive rift system, poses question "Why are the Rwenzori Mountains so high ?". The Cenozoic Western Rift branch of the East African Rift System is situated within the Late Proterozoic mobile belts between the Archean Tanzania Craton and Congo Craton. The special geological setting of the sticking out massif at a rift node encirceled by the ends of the northern Western Rift segments of Lake Albert and Lake Edward induces that the mechanism to form the high elevation of the Rwenzoris is related to the rifting process.
Thus our hypothesis is based on the propagation of the rift tips, surrounding the stiff old lithosphere at Rwenzori region, thereby triggering the delamination of the cold and dense mantle lithosphere root by reducing viscosity and strength of the undermost lower crust. As a result, this unloading induces fast isostatic pop-up of the less dense crustal Rwenzori block. We term this RID – "**R**ift **I**nduced **D**elamination of Mantle Lithosphere".
The RID hypothesis is tested on principle by a physical approach solved numerically. Viscous flow of 2d models is approximated by Finite Difference Method in an Eulerian formulation. Equations of conservation of mass, momentum and energy are solved for a multi component and two phase system. Based on laboratory data of appropriate samples a temperature, pressure and stress dependent rheology is assumed.
First results of numerical models will be presented. A simple starting model is in its capability succsessful, RID seems to be a viable mechanism to explain the extreme elevation. Important conditions therefore are a thermal anomaly, a lower crust with reducible strength and lateral density variations. The special situation of a two-sided rifting or offset rift segments to decouple the mantle lithosphere laterally from the surrounding seems to be most decisive. Further support comes from additional crustal thickness and an extensive stress field. Some parameters, here excess temperature and yield stress, are very sensitive, small changes determine whether delamination takes place or not.