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Modeling extension-related regional vertical movements, on the example of the Rwenzori Mountains

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The Rwenzori Mountains, which form a promontory on the rift shoulder in the East African Albertine Rift, are the most extreme expression of rift-flank uplift on earth. The general aim of this project is to examine possible mechanisms for such pronounced uplift of a block within extended crust, thus determining whether or not this is related to thermo-kinetic processes in the upper mantle or a result of 'simple' tectonic processes due to the interplay of different branches of the graben-system.

For this purpose we apply a 2D thermo-plasto-elastic model to calculate several profiles through a section of the mantle and the crust beneath the EAR.

The model itself is derived from a central and angular force spring model. Viscosity is introduced by a constant adaption of the local spacing of the grid, according to the current local stress-field and a given time step. This process is based on the background viscous deformation of initially circular discrete elements. The general setting within the model involves a simple top-to-bottom temperature-gradient as well as new constraints about the structure of the upper mantle beneath Africa (Ritsema and van Heijst (2000), Behn et al. (2004)). The actual vertical movement is expected to be controlled by the interplay between the local elastic stress-field and the local viscosity.

In the current contribution we present first results of the distribution of geo-materials under extensional conditions in space and time.

References: Ritsema and van Heijst, New seismic model of the upper mantle beneath Africa. Geology, 28, 2000. Behn, M., Clinton, P. Silver, P. Detection of upper mantle flow associated with the African Superplume. EPSE 224, 2004.