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Rift-related uplift of the Rwenzori mountains in Uganda investigated by seismological methods

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The passive source seismological project within the **RiftLink** research group aims to constrain the development and uplift of the Rwenzori mountain range and its relation to the formation of the western branch of the East-African rift system. Local and teleseismic earthquake recordings are used to image structures of the crust and upper mantle within the region.

A temporary network consisting of 23 mobile broadband and short-period seismic sensors has been deployed starting in April 2006 and will remain in the field until the end of 2007. Stations are located mainly along two profiles in the westernmost part of Uganda near the Congo border. One profile is situated within the rift along the eastern flank of the Rwenzori mountains, approximately between 0.2°S and 0.9°N. The second profile is located nearly perpendicular to the rift, spanning the transition from the rift shoulder into the rift valley and further crossing the northern part of the Rwenzori. Additional seismic stations have been placed on the rift shoulder in the South-East and the North-West.

A number of seismological methods are used to study crustal and upper-mantle structure. The localisation of sources and fault-plane solutions provide information on active fault zones and on current tectonic movements. Depth distribution of local events provides further constraints on the transition from brittle to ductile crust. The studies may also improve information on seismic hazards and risk assessment.

Local and teleseismic tomography are applied to determine the 3D velocity structure in the area under investigation and to detect velocity anomalies in the crust and the upper mantle down to approximately 300 km depth. Seismic discontinuities down to the mantle transition zone can be derived from converted phases using receiver functions. Furthermore, shear wave splitting will be analysed to detect regions of anisotropy and their relation to deformation processes and mantle flow.

The first analysis of the data shows high seismic activity all over the Rwenzori region with focal depths concentrated between 10 and 20 km. Few events have been located below 30 km depth. Local P and S-wave tomography using data of the first few months shows significant low velocity anomalies in the northern part of the network, correlating with active volcanic fields and hot springs. From receiver functions, crustal thicknesses of about 23 km have been found beneath the eastern flank, thinning to the West, with Moho depths as shallow as 8 to 15 km. However, no evidence has been found for a deep crustal root underneath the Rwenzori mountains.

As part of the **RiftLink** project the interpretation of our results will provide constraints for the modeling of geodynamic processes responsible for the formation of the Rwenzori mountains. During the second half of this 6-year project we plan to extend the experimental investigation to a larger area along the western branch of the East African Rift System.