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Seismicity and magmatic processes in the Rwenzori region of the Albertine Rift.

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In this presentation we summarize results from two extensive seismic field studies with temporary station networks in the Rwenzori region of the Albertine rift, located at the border between Uganda and the Democratic Republic of Congo. The first network was running from February 2006 to September 2007. It consisted of 27 seismic stations which were deployed in the Ugandan part of the area. A second network of 33 stations was operated between October 2009 and October 2011. It traversed the whole rift segment from the eastern rift shoulder in Uganda to the western shoulder in the D.R. Congo, covering the whole Rwenzori region.
The data analysis revealed a pronounced local earthquake activity in this area with an average rate of more than 800 events per month and proves that this segment of the Albertine Rift belongs to the seismically most active regions of the whole East African Rift System. The earthquake distribution is highly heterogeneous. The highest activity is observed in the northeastern part of the Rwenzori area. Here, the mountains are connected to the eastern rift shoulder whereas they are surrounded by rift segments elsewhere. We were able to locate seismicity bursts with more than 300 events per day.
The depth extent of seismicity ranges from 20 to 39 km and correlates well with Moho depths that were derived from teleseismic receiver functions. The majority of the derived fault plane solutions exhibit normal faulting with WNW-ESE oriented T-axes, which is perpendicular to the rift axis and in good agreement with kinematic rift models.
The area of highest seismic activity is also characterized by the existence of several vertical elongated earthquake clusters in the crust. From petrological considerations we presume that these events are triggered by fluids and gases which originate from a magmatic source below the crust. The existence of a magmatic source within the lithosphere is supported by the detection of mantle earthquakes at about 40 - 60 km depth below the cluster area. We interpret these observations as an indication of deep magmatic infiltration processes that play a significant role in rift formation and that may eventually lead to the complete detachment of the Rwenzori block from the surrounding rift flanks.