



Quaternary stress field and deformation at a rift triple junction / accommodation zone: synthesis from the Tanganyika – Rukwa - Nyasa Rift (SW Tanzania)

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The intersection between the eastern and the western branches of the East African rift system in the Mbeya region forms a particular node of the Cainozoic rift system in Mbeya. It is connecting two NW-SE trending rift segments (southern extremity of Rukwa rift and northern extremity of the Nyasa - Malawi rift) with an orthogonal segment, the NE-SW trending Usangu basin. At the center of the Junction, the Rungwe Volcanic Province started its activity at about 8-9 Ma ago. This area is also part of the accommodation zone between the Tanganyika, Rukwa and Nyasa rift basins and is particularly important for understanding the kinematics of rift opening.

In order to illustrate the tectonic stress pattern associated with this structure and its evolution with time, we compiled a variety of geological and seismological stress indicators. We revised the existing database of fault-kinematic data and reprocessed them for stress tensor inversion using a more modern software and re-evaluated their stratigraphic position. We used also recently available focal mechanism data from teleseismic earthquakes as from a local seismic network. We completed this database by new fault-kinematic and structural data collected in Quaternary sediments.

The compilation suggests that during the Miocene-Pliocene, deformation occurred by orthogonal opening of all the rift basins involved, despite their different orientation. All together, they display a radial extensional stress regime centred on the Rungwe volcano, as could be expected from a rift triple junction. Since about 1 Ma and after a period of tectonic quiescence, the rift kinematics changed. A markedly different stress field is recorded afterwards, with a good correspondence between and geological fault-slip data focal mechanism data. Deformation in the triple junction area changed into a dominantly strike-slip regime. New high-angle fault systems developed in the centre

of the rift basins rather than along their margins, as it was the case during the preceding stage. The Usangu basin became inactive and the triple junction evolved into a transform fault zone, transferring extensional deformation from the Nyasa-Malawi rift to the Tanganyika rift. Outside the accommodation zone, the Late Quaternary stress field remains in a pure normal faulting regime with orthogonal basin opening in a NE-SW direction. The transfer zone, itself is characterised by a combination of strike-slip and normal faulting under N-S to NNW-SSE direction of horizontal principal extension. This looks similar to the stress perturbations at mid-oceanic ridges in transform faults between two spreading segments.