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Tectonic inheritance in the development of the Kivu - north Tanganyika rift segment of the East African Rift System: role of pre-existing structures of Precambrian to early Palaeozoic origin.

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The present architecture of the junction between the Kivu rift basin and the north Tanganyika rift basin is that of a typical accommodation zone trough the Ruzizi depression. However, this structure appeared only late in the development of the Western branch of the East African Rift System and is the result of a strong control by pre-existing structures of Precambrian to early Palaeozoic origin. In the frame of a seismic hazard assessment of the Kivu rift region, we (Delvaux et al., 2016) constructed homogeneous geological, structural and neotectonic maps cross the five countries of this region, mapped the pre-rift, early rift and Late Quaternary faults and compiled the existing knowledge on thermal springs (assumed to be diagnostic of current tectonic activity along faults). We also produced also a new catalogue of historical and instrumental seismicity and defined the seismotectonic characteristics (stress field, depth of faulting) using published focal mechanism data.

Rifting in this region started at about 11 Ma by initial doming and extensive fissural basaltic volcanism along normal faults sub-parallel to the axis of the future rift valley, as a consequence of the divergence between the Nubia and the Victoria plate. In a later stage, starting around 8-7 Ma, extension localized along a series of major border faults individualizing the subsiding tectonic basins from the uplifting rift shoulders, while lava evolved towards alkali basaltic composition until 2.6 Ma. During this stage, initial Kivu rift valley was extending linearly in a SSW direction, much further than its the actual termination at Bukavu, into the Mwenga-Kamituga graben, up to Namoya. The SW extremity of this graben was linked via a long oblique transfer zone to the central part of Lake Tanganyika, itself reactivating an older ductile-brittle shear zone. In the late Quaternary-early Holocene, volcanism migrated towards the center of the basin, with the development of the Virunga volcanic massif, and the Kivu-Ruzizi accommodation zone connected the northern half of the former Kivu rift basin to the northern extremity of the Tanganyika basin. This process was influenced by the highly heterogeneous basement, formed during a long geological history with a dominantly brittle structuration during the Pan-African. The local stress field revealed by earthquake focal mechanisms appears strongly influenced by this heterogeneous structure but also by the transition towards the Congo basin on the western side of the rift and towards the Tanzanian carton on its eastern side.

Delvaux, D. et al., 2016. Journal of African Earth Sciences. doi: 10.1016/j.jafrearsci.2016.10.004