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First paleostress tensors from the Kivu – North Tanganyika rift region, Central Africa (D.R.Congo, Burundi): Insight its Phanerozoic brittle tectonic evolution.

Gloire Ganza[1], Damien. Delvaux[2].

[2] Université Officielle de Bukavu, Democratic Republic of the Congo, gloireganza@yahoo.fr

[2] Royal Museum for Central Africa (RMCA), Tervuren, BELGIUM; damien.delvaux@africamusem.be

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Abstract

The Kivu rift region lies in the central part of the western branch of the East African rift system, over Rwanda, Burundi, Eastern D.R.Congo, SW Uganda and NW Tanzania. It developed in the Mesoproterozoic Karagwe-Ankolean belt and the Paleoproterozoic Rusizian belt between the Congo and Tanzanian cratons. Rifting in this region started at about 10 Ma as a consequence of the divergence between the Nubian and the Victorian plate, but it entered in the brittle deformation regime at the end of the Pan-African amalgamation of Gondwana, in Early Cambrian. From this event to the onset of rifting, little is known although this ~500 Ma-long period is essentially characterized by brittle tectonics which can be investigated by fault kinematic analysis and tectonic stress reconstruction using now well established methods.

We performed preliminary fault-kinematic analysis of a few but good quality sites in different tectonic settings, along the western shore of Lake Kivu (Katana, Bukavu), along the northern extremity of Lake Tanganyika (Bujumbura, Uvira) and along the Twangiza-Namoya gold belt, in the southwestern continuation of the Kivu rift basin. The studied outcrops expose well expressed slickensided faults, tension fractures and conjugated fractures, sometimes corresponding to two successive brittle deformation events. The fault-kinematic data have been inverted using the Win-Tensor programme to compute the 4 parameters of the reduced stress tensor (3 stress axes and stress ratio). These are further used to determine the horizontal stress directions and stress regimes.

The results allow to identify brittle tectonic elements that formed under markedly different stress conditions. We have identified at several locations, expressions of a deep brittle E-W compression, with low-angle thrust faulting and a transport direction generally top-to-the-West. This event is tentatively related to the late Pan-African deformation. It was followed by pure normal faulting in E-W extension and transpressional faulting with N-S horizontal compression in relatively deep conditions, with no particular expression in the topography. Cross-cutting relations show that they are younger than the E-W compression, but the relation between these two could not be observed. We propose that the E-W extension could mark a local expression of the post-orogenic extension after the cessation of the pan-African convergence, while the N-S transpressional faulting could be related to an early Mesozoic event known elsewhere in Tanzania and in Katanga. The last brittle deformation is normal faulting which occurred under more superficial conditions and is related to the neotectonic rift faults.