

Geological and tectonic evolution of the Mesoproterozoic Karagwe-Ankole belt around the Kivu rift region in Central Africa: Data integration from the DRC

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The Mesoproterozoic Karagwe-Ankole belt (northeastern portion of the former Kibara belt) forms the substratum in part of the Great Lakes region of Central Africa. The Kivu rift segment which occupies the central part of this belt, also forms the central part of the western branch of the East African Rift system. The geological basement of the Kivu rift region is relatively well known on its eastern side (SW Uganda, Rwanda, Burundi, NW Tanzania), but its western side in the DRC (N and S Kivu) remained insufficiently studied due to the scarcity of available data and poor access to the field. Recent work on the northeastern portion of the former Kibara belt, which led to the definition of the Karagwe-Ankole belt, has been based largely on data from only its eastern half. Because of this, the knowledge of the tectonic evolution of the entire belt remains incomplete.

We compiled the available geological maps for the DRC side of the Karagwe-Ankole belt, as well as numerous maps from local studies, some based on detailed field work and others based on air photo or satellite imagery interpretation controlled by field data and samples from the old mineral exploration works. These data have been geo-referenced using the river network derived from the SRTM-90 DTM. Using the SRTM DEM as a background, we also controlled the structural interpretation and re-mapped basement and rift-related faults.

The resulting geological map is presented as time-series that illustrate the first-order tectonic evolution of the region. We suspect the presence of a major discontinuity (Matale discontinuity) that runs from the SW to the NNE, below the western border fault of the Kivu basin and through the Virunga volcanic area, between the Nyamuragira and the Nyaragongo volcano. It could connect further to the north to the Nagasongola discontinuity evidenced in western Uganda on the newly published magnetic map of that country. Dextral transpressional movement is proposed along the Matale discontinuity and this occurred before the intrusion of ~ 750 Ma alkaline complexes (Kahuzi Biega, Lueshe, Bingo, etc.) and the deposition of the Late Neoproterozoic (Cryogenian-Ediacaran) Itombwe sediments. Those have been deformed during the terminal Pan-African event under a presumed E-W compression, which caused top to the west thrusting in the N-S Itombwe syncline and generated the left-lateral Bunyakiri – Walikale NW-SE fault zone. After the deposition of Late Carboniferous-Permian sediments in old glacial valleys, some reactivation of this fault system is described near Walikale. The Late Cenozoic rifting created in a first stage (late Miocene-Pliocene) a NNE-SSW rift valley running from Lake Edwards to Lake Kivu and continuing southwestwards to Mwenga and Kamituga. In the Quaternary, the Mwenga-Kamituga branch was progressively abandoned due to the establishment of a connection between the northern end of Lake Tanganyika and Lake Kivu through the Ruzizi valley.