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The 1375 Ma "Kibaran event" in Central Africa: Prominent emplacement of bimodal magmatism under extensional regime

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ABSTRACT

In previous literature, the "Kibara belt" has often been portrayed as a Mesoproterozoic belt trending NE over 1300 km across the Central African Congo craton, from the Angola-Zambia-D.R.Congo border triple-junction in the SW, through Katanga and Kivu-Maniema (DRC), Rwanda and Burundi, up to SW Uganda and NW Tanzania in the NE. However, north of Katanga in the DRC, there is a clear break in continuity of the thus-defined "Kibara belt", cross-cut by Palaeoproterozoic (Rusizian) terranes, in structural continuity with the NW-SE trending Ubende shear belt further south in Tanzania.

In this paper, we redefine the use of the term "Kibara belt" ("KIB"), restricting it henceforward to the belt occurring SW of the Ubende-Rusizian terranes, i.e. in the Kibara Mountains type area of Katanga (DRC). The other belt situated NE of the Ubende-Rusizian terranes and east of the Western Rift, previously referred to as the "Northeastern Kibaran Belt" (NKB), is henceforward and for clarity reasons re-named "Karagwe-Ankole belt" ("KAB"). In our re-definitions, we do not take into account the Kivu-Maniema (DRC), because of its geological complexity apparent from satellite imagery and the lack of recent field data, although "some continuity" of the KAB in Kivu-Maniema is obvious.

For the KAB, we document 10 new SHRIMP U–Pb zircon ages, in addition to new $^{40}Ar/^{39}Ar$ and laser-ablation zircon Hf data, all of them obtained from previously already isotopically "dated" rock specimens. Contrary to previous belief, magmatism in the KAB (and the KIB) is punctuated by the profuse emplacement of bimodal intrusions between 1380 and 1370 Ma. Moreover, the occurrence of Palaeoproterozoic basement within the KAB is confirmed. The prominent c. 1375 Ma bimodal magmatism in the KAB consists of (1) the 350 km long Kabanga-Musongati (KM) alignment of mafic and ultramafic, Bushveld-type, layered complexes, originating from an enriched lithospheric mantle source and (2) voluminous S-type granitoid rocks with accompanying subordinate mafic intrusive rocks. Both coeval magmatic suites are interpreted to have been emplaced under extensional regime in a regional-scale intra-cratonic setting. During ascent the mantle-derived magmas have taken advantage of the regionally occurring crustal-scale zone of weakness in the KAB, i.e. the rheological boundary between the Archaean craton of Tanzania, to the east, and the adjacent Palaeoproterozoic basement (2.1 Ga mobile belt), to the west, both overlain by Mesoproterozoic (meta)sedimentary rocks. The mantle-derived magmas initiated concomittantly and under extension, large-scale crustal melting preferentially of the Palaeoproterozoic basement, and characterised by the absence of a thick lithospheric profile in contrast to the nearby Archaean craton. Such petrogenetic processes have intra-plate characteristics and are thus not associated with normal plate boundary processes nor with their typical magmatism. On the contrary, they may include rift-related packages, characteristically associated with successful or attempted, though unsuccessful, continental break-up as was the case here.

In the KAB, later magmatic events occurred respectively at c. 1205 (A-type granitoids) and c. 986 Ma ("tin-granites"). They represent minor additions to the crust.

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