A REVIEW OF GEOCHRONOLOGICAL DATA ON THE IRUMIDE OROGENY, ZAMBIA

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Zambian Geology is characterised by a number of structurally different terrains due to a series of orogenic and plate boundary events between cratonic blocks such as the Congo, Kalahari and Tanzania cratons. As a result, a series of orogenic belts, which have been attributed to Palaeoproterozoic, Mesoproterozoic and Neoproterozoic events criss-cross Zambia.

The history of Mesoproterozoic orogenic events is preserved in the Irumide belt, which stretches from the Southeast of Zambia, where it is referred to as the Choma-Kalomo Block, to the extreme Northeast, where it is truncated by Neoproterozoic shear zones in the Ubendian belt. According to the dates available, the Irumide belt is the result of an orogenic event which had its peak around 1355 Ma, this being a well constrained Rb-Sr W.R. age marking the phyllonitisation of the Ubendian Nyika Granite (Cahen et al., 1984). Other ages reflecting peak Irumide orogenesis are a K-Ar Hornblende date of 1338±60Ma on an amphibolite of the Misuku Gneiss (Tembo, unpublished) in the Mafingi Hills area (NE Zambia) and the Mivula syenite which intrudes the Mafingi Group dated at 1341±16Ma (Rb-Sr W.R.)(Fitches, 1971; Cahen et al., 1984). This peak deformation was accompanied by large-scale intrusion of granites throughout the Irumide belt. The Mutangoshi Gneissic Granite in the Mutangoshi area (dated Rb-Sr W.R. 1407±71) (Daly, 1986) and the Siasikabole Granite in the Choma-Kalomo Block (dated U-Pb Zircon 1352±14Ma) (Hanson et al., 1988) are examples of this igneous activity.

A late-orogenic event, found throughout the Irumide belt took place around 1180-1100Ma, and is evidenced by resetting of Rb-Sr and K-Ar systems, as well as late- to post-orogenic intrusion of granite bodies. This late tectonic event has been constrained to 1140±54Ma through a four point Rb-Sr W.R. isochron for the Lwakwa, Mwengo and Wililo granite gneisses in north-west Malawi. Good examples of cooling ages of late-Irumide intrusions are the K-Ar biotite age of the Nthonga Granite (1129±30Ma)(Fitches, 1971), a K-Ar age of a lamprophyre (1154±61Ma)(Fitches, 1971) and a K-Ar age of a metadolerite intruding the Mambo Gneiss (1135±40Ma)(Ray & Crow, 1975) in the Mafingi Hills area. The resetting of the Rb-Sr isotopic systems, as a result to this late-Irumide or post-Irumide event, is dated in the Mwambwa Gneiss (Chinsali area) at 1100±252Ma (Daly, 1986). Two more dates on the Phoenix Mine pegmatites in Southern Province yielded 1080±31Ma (Rb-Sr Muscovite) and 1060±40 Ma (K-Ar Muscovite)(Cahen et al., 1984) and are thought to reflect the emplacement of the pegmatites during the same event. The emplacement of the Mpande Gneiss in the Kafue area, dated at 1106±19Ma (U-Pb Zircon)(Hanson et al.,1988) also belongs there.

The Irumide orogeny was followed by a period of uplift and erosion, resulting in the formation of the sediments of the lower arenaceous portions of the Katangan Supergroup. Emplacement of granites such as the Kaunga Granite (Chinsali area, 970±5Ma, U-Pb Zircon), the Lufila Granite (Chinsali area, 947±89Ma, Rb-Sr W.R.)(Daly, 1986), the Lusaka Granite (dated 843Ma)(Cahen et al., 1984) and the Ngoma Gneiss (dated 820±7Ma; U-Pb Zircon)(Hanson et al. 1993) reflect a later igneous phase possibly heralding the Pan African event. These predominantly alkaline intrusives possibly reflect the breakup of the failed Rhodinian super-continent. The extrusion of the Kafue rhyolites, dated at 879±19Ma (Wardlaw, unpublished) also took place during the same period as is the emplacement of the granites intruding the Mpanshya Group near Rufunsa, which were dated at 959±?Ma (granite) and 973±?Ma (porphyry)(Barr et al., 1977).

The Pan African orogeny affected rocks throughout the Irumide belt and produced North-South oriented overprint, and retrograde metamorphic patterns, especially in the south-eastern extents of the belt.

In conclusion, the geochronological data currently available in the Irumide Belt and the Choma-Kalomo Block, seems incomplete to enable a detailed construction of the tectonothermal evolution of the belt. Although the peak deformation during the Irumide orogeny has been constrained in Malawi, no unambiguous dates have been obtained from the Southern and Western parts of the belt. In addition, Pan African overprinting, with resulting resetting of Rb-Sr, K-Ar and Ar-Ar isotopic systems, renders the bulk of the available data difficult to interpret. The availability of new dating and sampling techniques, such as the Sensitive High-mass Resolution Ion MicroProbe (SHRIMP) dating method, have however opened new opportunities to undertake geochronological studies on selected poorly dated portions of the Irumide Belt in order to gain a better understanding of its role and influence on regional dynamics in Southern-Central Africa.

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