# Palaeoproterozoic to Mesoproterozoic deposition, magmatism and metamorphism at the southeastern margin of the Congo craton: the geological history of the Irumide belt

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The southeastern margin of the Congo Craton in Tanzania, Malawi and Zambia records the effects of Palaeoproterozoic (Ubendian), late Mesoproterozoic (Irumide) and late Neoproterozoic (Pan-African) tectonic cycles. The two older events are best preserved in northern Zambia, where the Bangweulu block and Irumide belt largely escaped the Pan-African overprint that dominates elsewhere. The Bangweulu block is the northwestern foreland to the Irumide belt and comprises granite, metavolcanic rock and undeformed quartzite-pelite units. The Irumide belt is a NE-SW trending zone of deformed and interleaved granitoid basement and quartzite-pelite cover sequence, intruded by syn- to late-tectonic granite plutons. A pervasive Pan-African overprint in the Zambezi and Mozambique belts conceals the southern and southeastern margins of the Irumide belt.

Granitoids and metavolcanics of the Bangweulu block have 1870-1860 Ma SHRIMP U-Pb zircon ages and TDM crustal residence ages of 2.3-2.2 Ga. SHRIMP analysis of deformed granitic basement within the Irumide belt has identified widespread 2000 Ma protoliths with TDM ages of 2.5 Ga. These data confirm that basement in the Irumide belt and adjacent Bangweulu block are dominated by c. 2000 and 1850 Ma protoliths that also characterize the Ubendian and Usagaran belts fringing the Congo craton in Tanzania. We also identified 2730 Ma and 1670-1640 Ma granitic basement terranes within the Irumide belt. The former is the oldest protolith yet identified in Zambia and is interpreted as a Neoarchaean segment of the cratonic foreland, whilst the younger protoliths have TDM ages of 3.1-2.4 Ga and probably reflect late Palaeo-proterozoic magmatism in the foreland prior to Irumide tectonism.

SHRIMP analysis of detrital zircon from undeformed sedimentary rocks overlying the Bangweulu block (Mporokoso Group) and deformed sequences within the Irumide belt (Manshya River Group) identified similar age distributions dominated by 2100-1800 Ma grains, consistent with previous suggestions that they are part of a single sequence (the Muva Supergroup). Rhyolitic tuff from the Manshya River Group yielded SHRIMP U-Pb zircon ages of 1880–1860 Ma and TDM ages of 3.1-2.5 Ga, indicating that sedimentation occurred during the closing stages of magmatism in the Bangweulu basement. The Kasama Formation crops out as isolated exposures between the Mporokoso and Manshya River groups, and is dominated by detritus of a similar age to these other units, but a single zircon grain aged c. 1440 Ma implies a younger depositional age and confirms previous sedimentological interpretations that the Kasama Formation was derived by reworking of the Mporokoso Group. Our data imply that all units were derived by erosion of local Bangweulu/ Ubendian/Usagaran protoliths, and rare detrital grains as old as 2800 Ma provide further evidence of Neoarchaean basement.

1050-970 Ma SHRIMP U–Pb zircon ages for syn- to late-tectonic granite plutons in the Irumide belt, and 1020-1015 Ma metamorphic overgrowths on zircon grains from migmatites, indicate that Irumide tectonism was significantly younger than previous estimates of 1400-1100 Ma based on Rb-Sr techniques. Abundant 2700 and 2000 Ma xenocrysts in these plutons and TDM ages of 2.9-2.8 Ga confirm that Neoarchaean and Palaeoproterozoic basement underlies much of the belt.

The Irumide belt comprises reworked Neoarchaean and Ubendian-age basement and a 1900-1800 Ma passive margin sequence, developed at the edge of the Congo craton. Basement within the Irumide belt includes older components than those exposed in the Bangweulu foreland. Our new age data have important implications for regional geology, since they invalidate previous correlations across the Zambezi belt between the Irumide belt and the 1350 Ma Choma-Kalomo block. These correlations have been used to argue that the Pan-African Zambezi belt was intracratonic, but our data imply that the Zambezi belt is a Neoproterozoic plate margin that juxtaposes unrelated crustal blocks.

***Keywords***: Bangweulu block, Irumide belt, Muva Supergroup, SHRIMP U-Pb geochronology, Zambia.