THE AGE AND DETRITAL FINGERPRINT OF THE MUVA SUPERGROUP OF ZAMBIA: MOLASSIC DEPOSITION TO THE SOUTHWEST OF THE UBENDIAN BELT. B. DE WAELE and I.C.W. FITZSIMONS, Tectonics Special Research Centre, Department of Applied Geology, Curtin University of Technology, GPO Box U1987, Perth, WA 6845, Australia. bdewaele@tsrc.uwa.edu.au

The Muva Supergroup of Zambia comprises four thick (meta)sedimentary sequences, on and around the Palaeoproterozoic Bangweulu block (Fig. 1)[1]. The Mporokoso Group is a largely undeformed sequence, consisting of two quartzite and two pelite formations, which occurs to the west and north of the Bangweulu block. The Manshya River and Kanona Groups are a strongly deformed metasedimentary packages within the Mesoproterozoic Irumide belt to the southeast of the Bangweulu block, in which three quartzite and three pelite formations have been distinguished. The Kasama Formation is a series of supermature quartzites and pelites, and occurs in several small basins on top of the Bangweulu block.

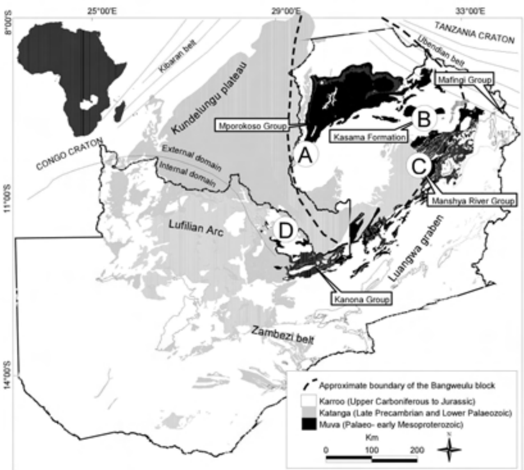

Fig. 1. Overview of the three main sedimentary sequences in Zambia showing the location of the different units of the Muva Supergroup, and the locations of samples discussed in the text.

A U-Pb SHRIMP detrital zircon provenance study on one sample each from the Mporokoso, Manshya River and Kanona Groups (location A, C and D respectively in Fig. 1), indicates that all three are dominated by Palaeoproterozoic detritus and were eroded from similar sources at or after around 1800 Ma (probability density and histogram diagrams in Figs. 2, 3 and 4). Detrital signatures of the three groups indicate a change from west to east, from a strongly polymodal distribution for the Kanona Group in the southwestern Irumide belt, to a bi-modal population for the Mporokoso Group on the Bangweulu block (1.97 and 1.85 Ga) and a nearly uni-modal population dominated by ~2.04 Ga for the Manshya River Group in the northeastern part of the Irumide belt. The youngest concordant detrital zircons for the Mporokoso and Manshya River / Kanona Groups are consistent with a broadly coeval deposition, giving a maximum age of deposition for the base of the Mporokoso Group at 1824 ± 19 Ma and a maximum age of deposition for the Manshya River Group at 1882 ± 30 Ma.

The basement underlying the Manshya River and Kanona Group in the Irumide belt has been dated at 1.94-1.93 Ga in the northeast, and 2.05-1.95 Ga in the southwest [2-4]. An emplacement age on a granite gneiss near Kapiri Mposhi attests to the occurrence of a previously unrecognised Neoarchean basement at 2.73 Ga [3, 6], below the Kanona Group in the southwest. This date represents the oldest emplacement age so far reported in Zambia. Published ages for the Palaeoproterozoic Ubendian belt to the northwest [5-8] indicate granite magmatism and peak metamorphism at between 2.10 and 1.96 Ga, while an extensive plutonovolcanic suite dated at between 1.88 and 1.82 Ga underlies the Bangweulu block [9, 10].

Our detrital age data for the Mporokoso and Manshya River Groups, showing two prominent peaks at ~2.0 Ga and ~1.85 Ga, match these basement ages, and are consistent with deriviation from the Ubendian and Bangweulu block basement. The westward increase in the number of modes, changing from nearly unimodal for the Manshya River Group, over bimodal for the Mporokoso Group to polymodal for the Kanona Group is interpreted to reflect the increasing influx of detritus from the Archean Congo craton to the northwest.

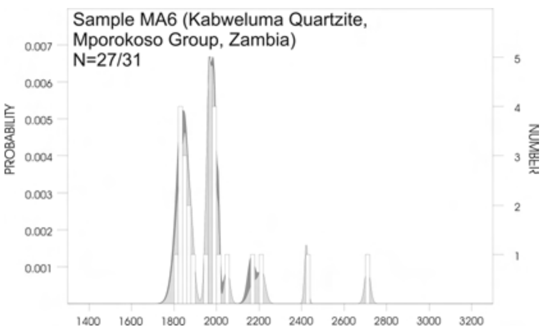

Fig. 2. Probability density plot of detrital zircon from a quartzite near the base of the Kabweluma Formation (location A, Fig. 1.; Mporokoso Group, northern Zambia).

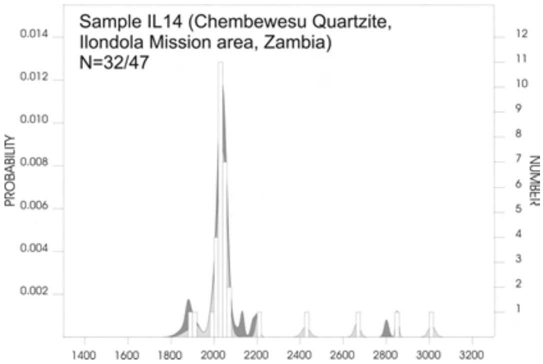

Fig. 3. Probability density plot of detrital zircon from a quartzite of the Manshya River Group (location C, Fig. 1.; Irumide belt, northern Zambia).

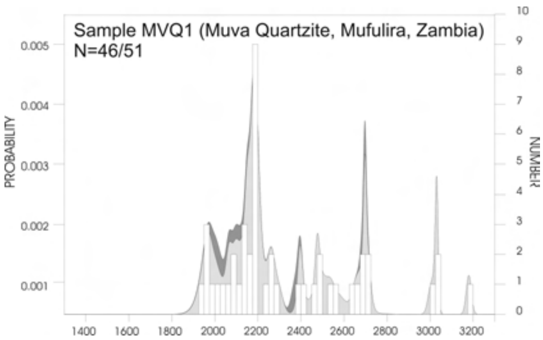

Fig. 4. Probability density plot of detrital zircon from a quartzite near Mufulira (location D, Fig. 1.; Kanona Group, Copperbelt, Zambia) (data after [11]).

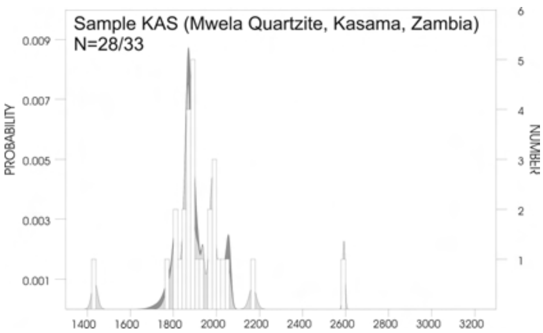

Fig. 5. Probability density plot of detrital zircon from the Mwela quartzite east of Kasama (location B, Fig. 1.; Kasama Formation, northern Zambia).

Direct SHRIMP U-Pb zircon age constraints for the depositional age of the Manshya River Group in the northeastern part of the Irumide belt are obtained from two interlayered rhyolitic tuff beds and a thick series of volcanics, constraining the time of deposition at 1879 ± 13 Ma, 1856 ± 4 Ma and 1871 ± 24 Ma [3, 12]. The extrusion age of acid volcanics in the Mporokoso Group of northern Zambia, which occur interlayered within the base of the sequence, places the age of deposition of that group at 1862 ± 19 and 1868 ± 7 Ma [2, 4, 12, 13].

Our detrital data indicate that the Kasama Formation to the east is a younger sedimentary sequence, derived from reworking of the Mporokoso Group to the west [1]. The youngest concordant zircon places the maximum age of deposition of the Kasama Formation at 1434 ± 14 Ma (Fig. 5).

Conclusion: The metasedimentary sequences of northern Zambia, which comprise the Muva Supergroup, consist of three near identical sedimentary sequences of Palaeoproterozoic age. Our age data support deriviation from the Ubendian Orogen during, or immediately after Ubendian tectonism, consistent with the Muva Supergroup representing a mollasse-like sequence. The youngest concordant grains yield maximum ages of 1824 ± 19 Ma for the Mporokoso Group and 1882 ± 30 Ma for the Manshya River Group. Sedimentation in both the Mporokoso and Manshya River / Kanona Groups appears to have started before 1.86 Ga, as indicated by lavas dated at 1860 Ma near the base of the Mporokoso Group and rhyolites and basalts occurring within the Manshya River Group dated at 1879-1856 Ma. The notion that the Kasama Formation is a second cycle sediment, derived from reworking the Mporokoso Group, is supported by our detrital age data, which places a maximum age for the Kasama Formation at 1434 ± 14 Ma.

References: [1] Andersen, L.S. and Unrug, R. (1984) *Prec.Res.* 25, 187-212. [2] De Waele, B. et al. (2003). *IGCP 440 South China w/shop*, Abstract, 3p. [3] De Waele, B. and Mapani, B. (2002) *Journ. Afr. Earth Sc.* 35(3), 385-397. [4] De Waele, B. et al. (2003) *IGCP 440 South China w/shop*, Abstract, 3p. [5] Ring, U. et al. (1997) *Prec. Res.* 85, 27-51. [6] Vrána, S. et al. (2004) *Journ. Afr. Earth Sc.* 38, 1-21. [7] H.N.A. Priem et al. (1979) *Prec. Res.* 9(3-4), 227-239. [8] Gabert, G. and Wendt, I. (1974) *Geol. Jahrbuch* B11, 3-55. [9] Brewer et al. *Rep. Inst. Geol. Sc.* [10] Schandelmeier, H. *PhD Berlin* [11] Rainaud, D. et al. (2003) *Journ Geol. Soc. London* 160, 11-14. [12] De Waele, B. and Fitzsimons, I.C.W. (submitted). *Prec. Res.* [13] De Waele, B. et al. (submitted) *Journ. Afr. Earth Sc.*