A RECORD OF NEOPROTEROZOIC DIVERGENT PROCESSES ALONG THE SOUTHERN CONGO CRATON MARGIN

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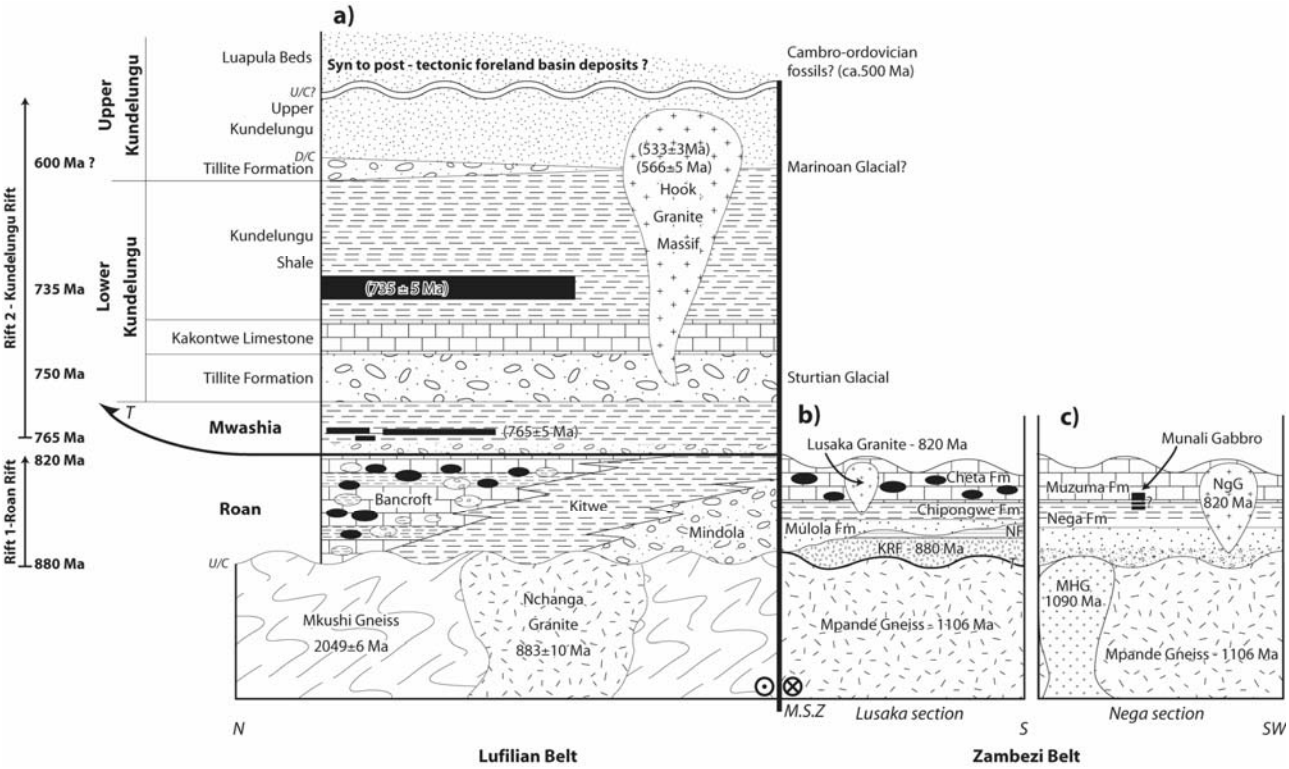
The Zambezi Supracrustal sequence of southern Zambia, comprises a metasedimentary package of clastics and carbonates with minor volcanics and lavas. The sequence lies to the south of the Mwembeshi Shear Zone (a Neoproterozoic megashear), but based on lithological similarities is thought to be a temporal equivalent of the lowermost Katangan sediments of the Copperbelt region, the Roan Group. Both sequences are interpreted to have been deposited in a continental rift to oceanic setting along the present day southern margin of the Congo Craton. Furthermore, based on sparse geochronological evidence, it appears that they were deposited in a similar time frame to that of break-up of the Rodinia supercontinent (i.e. between ca. 880 and 570 Ma) and thus determining their exact age of deposition (i.e., continental rifting) may provide critical data for supercontinent reconstructions.

Around Lusaka, the base of the succession is marked by the Kafue Rhyolite Formation (KRF), a 2500m thick sequence of folded, variably-metamorphosed rhyodacitic flows and tuffs with subordinate rhyolite, tuffaceous sediments, agglomerates and extremely rare, thin mafic horizons (Smith, 1963; Mallick, 1966). The KRF passes up into the Nazingwe Formation (NF), a thin sequence of tuffaceous semi-pelites with intercalated acid volcanic horizons. The nature of the boundary of the KRF with the underlying Mesoproterozoic basement rocks (the Mpande Gneiss – ca. 1106 Ma) is uncertain due to a lack of exposure; however, our observations along the Kafue Gorge Road suggest that it is a re-tectonised unconformity. The KRF and NF are unconformably overlain by the quartzitic Mulola Formation (Mallick, 1966). This formation passes up into kyanite-bearing and biotite-rich schists and semi-pelites of the Chipongwe Formation and subsequently into the monotonous dolomitic marbles of the Cheta Formation. The Cheta Formation contains abundant gabbroic and ultramafic blocks that have N-MORB chemistries (John et al., 2004).

A similar sedimentary succession crops out to the southwest of the Mpande Dome but does not contain any basal volcanic rocks. The lowermost unit, the quartzitic Nega Formation, rests

unconformably upon the Munali Hills Granite (ca. 1090 Ma) and Mpande Gneiss and contains occasional pockets of basal conglomerates. The Nega Formation passes up into extensive pelitic units and eventually into the Muzuma Formation marbles. This sequence also contains a large N-MORB gabbroic body, the Munali Gabbro, which appears to show intrusive-contact relationships with the surrounding meta-sediments and which we interpret to be a disrupted, boudinaged dyke or sill. Both sequences are intruded by various metaluminous, monzogranitic plutons, one of which, the Ngoma Gneiss has been dated by the TIMS method at 820 ± 7 Ma (Hanson et al., 1988).



Stratigraphic columns for the Lufilian Belt in Zambia and the two Zambezi Supracrustal sequences.

In order to constrain the age of deposition of the Zambezi Supracrustals we have dated by the U-Pb zircon SHRIMP method several of the basal volcanic and igneous units that intrude the sequence. Three volcanic-volcanoclastic units from the KRF and NF are all within error of each other at ca. 880 Ma and confirm a previously unpublished TIMS age of ca. 879 Ma (Wardlaw, reported in Wilson et al., 1993). These units have whole rock $\varepsilon_{Nd}(T)$ values between –4 and –2 with T_{DM} model ages between 1.5 and 2.1 Ga consistent with their generation by mixing/assimilation of juvenile mantle material with older continental crust, i.e, in a continental extension setting. The Munali Gabbro has an age of ca. 855 Ma with a juvenile $\varepsilon_{Nd}(T)$ value of +2.5, while two different phases of the Lusaka Granite have identical crystallisation ages of ca. 820 Ma.

Regional Correlations and Tectonic Evolution: Although the Roan Group does not contain any basal volcanics and the Zambezi Supracrustals do not contain any known significant Cu-Co

deposits, we uphold the previous correlations on a number of grounds and suggest that these differences are related to an actively dynamic topography produced during the initial stages of continental rifting (880 Ma). In the Copperbelt region, rift horsts and grabens controlled local oxidising-reducing conditions resulting in the deposition of Cu-Co-bearing minerals and potentially eroding any volcanic deposits, whereas in the Zambezi region a more quiescent topography allowed the preservation of discrete volcanic rift basins and maintained constant oxidising conditions. The Roan Group also contains numerous undated mafic bodies that have been interpreted as dykes or sills (Tembo et al., 1999) but these units have intraplate geochemical signatures. Because there are no age constraints for these blocks, or those in the Cheta Formation we do not want to speculate too much on their origin. However, we suggest that all these mafic units may represent dismembered syn-rifting sills and dykes that intruded during various stages in the rift cycle and represent juvenile mantle material that has variably mixed with a progressively thinning continental crust. The ca. 855 Ma age for the Munali Gabbro indicates that deposition of the Zambezi sequence was complete by this time. The final stages of basin development involved the intrusion of discrete A-type granitoids at ca. 820 Ma but these have yet to be identified in the Roan Group. Currently there is insufficient data to determine if this rift basin developed into a full oceanic basin; however it is clear that renewed rifting at ca. 765 Ma (Key et al., 2001), to form the Kundelungu Basin, did result in the production of a vast oceanic tract that eventually closed during the Zambezi Orogeny at ca. 530 Ma. Continental rifting at 880 Ma is unknown in the context of Rodinia break-up, but this age potentially provides a unique time-marker that may, in the future, allow for positioning of the Congo Craton within this supercontinent.

Keywords: Lusaka Granite, Munali Gabbro**,** Neoproterozoic, SHRIMP, Zambezi Supracrustals

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