Precambrian crustal lineaments in Africa: Using precise U-Pb geochronology to test correlations across shear zones

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The use of relative structural timing and isotope geochronology as means of correlating Precambrian orogenic belts and testing the role of continental drift in crustal assembly was first proposed by Holmes (1951), using the network of Proterozoic orogenic belts and Archaean cratons of south-central Africa as an example. Subsequent work in the region emphasized a limited role for relative lateral movements, based principally on a distinctive outcrop pattern in which older belts occur on both sides of younger cross-cutting belts with no apparent offset. This spatial relationship is more consistent with ensialic rejuvenation than with continental collision (Kröner 1977), and perhaps the best known of these cross-cutting relationships is that between the Irumide and Zambezi belts.

The Zambezi Belt is part of an east-west trending zone of Neoproterozoic tectonism that passes westwards into the Damara Orogen. It is associated with eclogite relics and reworking of older basement blocks including possible island arc and ophiolite terranes, and Coward & Daly (1984) noted that high-strain structures within the belt are consistent with significant sinistral transcurrent movement and oblique collision along a probable plate margin. This evidence for continental assembly of previously disparate blocks has long been countered by geochronological and structural evidence for a correlation between the northeast-trending Irumide Belt and Choma-Kalomo Block. These terranes lie along strike of one another but on opposing margins of the cross-cutting Zambezi Belt (Shackleton 1973), and preliminary age data indicate that they both developed during a 1400-1100 Ma time frame (Hanson *et al.* 1988) suggesting that they are parts of a single mid to late Mesoproterozoic orogen that crops out on both sides of the Zambezi Belt without any offset.

Isotopic correlation of the Irumide Belt and Choma-Kalomo Block is based on conventional U-Pb zircon ages for the latter terrane and Rb-Sr whole-rocks ages for the former. In order to make more meaningful correlations, we constrained the timing of magmatism, deformation and metamorphism in the Irumide Belt through SHRIMP U-Pb zircon analysis. We identified *c.* 2730, 2000, and 1650 Ma granitic protoliths reworked during 1050-970 Ma tectonism bracketed by age data from syn-tectonic granite plutons and migmatites. It follows that Irumide tectonism is younger than previous estimates of 1400-1100 Ma based on Rb-Sr techniques and that previous Late Mesoproterozoic correlations across the Zambezi Belt are invalid. A review of Mesoproterozoic U–Pb age data from south-central Africa reveals a number of distinct terranes with resolvable ages differences that appear to be juxtaposed along major Neoproterozoic shear zones, which we interpret as collisional sutures.

References

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