SHRIMP U-Pb geochronology of the Choma-Kalomo block (Zambia) and geological implications

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The Choma-Kalomo block is a Mesoproterozoic terrane exposed in southern Zambia, south of the Pan–African Zambezi belt. It includes a large plutonic complex in the central part, surrounded by supracrustal metasedimentary assemblages. The plutonic complex represents a set of intrusive bodies that yielded TIMS U-Pb zircon dates between c. 1345 and 1200 Ma (Hanson et al., 1988). Two deformation events were recorded in this terrane: D1 is presumably coeval with the emplacement of the c.1345 Ma granitoids (converted into orthogneisses) and D2 coeval with emplacement of c.1200 Ma granitoids.

Because of its location between the Mesoproterozoic Irumide belt of Zambia and the Ngamiland province of Botswana, the Choma-Kalomo block is a critical terrane in the reconstruction of late-Mesoproterozoic (Kibaran) orogenic system central and southern Africa.

Zircons extracted from five granitoid samples were investigated by U-Pb SHRIMP technique and yielded the following results: CK4: medium-grained two mica granite: 1174±27 Ma; CK10: foliated medium to coarse biotite granite: 1188±11Ma; CK12: gneiss containing mica-rich restites: 1177±70 Ma; CK25: foliated, medium to coarse grained biotite granite: 1181±9 Ma; CK13: augen (ortho)gneiss: 1368±10 Ma.

The new SHRIMP ages support the existence of two major magmatic events in the Choma-Kalomo block at c. 1.37 and 1.18 Ga. Neither the 1.37 Ga magmatic event nor the 1.18 event are reported from the Irumide belt (De Waele et al., 2002) or the Ngamiland province (Kampunzu et al., 1999), which is not in support of the correlation of the Choma-Kalomo block to these two provinces as suggested by Hanson et al. (1988) and Singletary et al. (2002). In contrast, 1.38-1.37 Ga granitoids are widespread in the Kibaran belt in SE and eastern Congo (Kokonyangi et al., 2001) and in Rwanda and Burundi (Wingate and De Waele, pers. comm.). A second (<1.25 and >1.0 Ga) and third (ca. 1 Ga tin granite) magmatic events described in the Kibaride belt include granitoids emplaced between <1.25-1.0 Ga (Kampunzu and Kokonyangi, pers. comm.). Therefore, we suggest that the Choma-Kalomo terrane is a block detached from the Kibaran belt of southeastern Congo during the rift-drift stage of the Katangan-Zambezi basin evolution.

If this interpretation is correct, it implies that either the Katangan-Zambezi basin did not evolve into an Antlantic-type Mid-Oceanic Rift (e.g. Kampunzu et al., 1991, 2000) or that the closure of the Neoproterozoic Katangan Ocean fortuitously reunited the dispersed blocks in their original, pre-drift position which is unlikely. The existence of HP metamorphic assemblages (e.g. John et al., 2003) along the Katangan-Zambezi belts demand substantial oceanic subduction and would argue for an extensive Katangan-Zambezi basin but how extensive was this basin is still unconstrained. The absence of Neoproterozoic arc igneous rocks in the Zambezi-Lufilian belts and the geochronological data in this paper indicating that the Choma-Kalomo block on the southern side of these two Neoproterozoic belts is a terrane detached from the Kibaride on the northern side of the same belt do not support the Neoproterozoic closure of an ATL-type oceanic basin in this region. These conflicting data require further studies before a definitive conclusion is reached.

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