Geochronology of the Zambezi Supracrustal Sequence, Southern Zambia: A Record of Neoproterozoic Divergent Processes along the Southern Margin of the Congo Craton

S. P. Johnson,[1] *B. De Waele,*[2] *D. Evans,*[3] *W. Banda,*[3] *F. Tembo,*[4] *J. A. Milton,*[5] *and K. Tani*

Institute for Research on Earth Evolution, Japan Agency for Marine-Earth Science and Technology, 2-15 Natsushima-cho, Yokosuka, Kanagawa-ken 237-0061, Japan
(e-mail: simon.johnson2@doir.wa.gov.au)

ABSTRACT

The Zambezi supracrustal sequence (ZSC) of southern Zambia comprises a metasedimentary package of clastics and carbonates, with a thick sequence of basal volcanics and lavas. The sequence has traditionally been interpreted as a Neoproterozoic continental rift succession, but the lack of reliable age constraints hinders any tectonic interpretation. In this article, we date magmatic and detrital zircons using the U-Pb SHRIMP method in order to better constrain the timing of rifting, volcanism, and basin deposition. The basal volcanoclastic Kafue Rhyolite and Nazingwe formations were erupted at ca. 880 Ma, and the sequence was intruded by the Lusaka Granite at ca. 820 Ma, providing lower and upper limits on the age of sedimentation. Whole-rock Nd isotopic signatures of these volcanics indicate that they formed as a result of assimilation and recycling of basement gneisses, probably during crustal thinning and extension. We uphold the correlation between the ZSC and the Roan Group in the Zambian Copperbelt and suggest that both successions formed in discrete rift basins along the southern margin of the Congo-Tanzania-Bangweulu (CTB) Craton; however, extension at this time probably did not result in complete continental separation. If the CTB Craton were an integral part of Rodinia, then rifting at ca. 880 Ma would represent one of the first known records of attempted breakup of the supercontinent.

Online enhancements: appendix, color figures.

Introduction

In the past decade there has been a considerable volume of publications and debate on the makeup, configuration, and existence of the Mesoproterozoic supercontinent of Rodinia (e.g., Hoffman 1991; Dalziel 1997; Weil et al. 1998; Pisarevsky et al. 2003; De Waele et al., forthcoming). The majority of data pertaining to these reconstructions come from only a limited number of cratons for which palaeomagnetic and geochronological data are better constrained (updated database of available global palaeomagnetic data in Pisarevsky 2005). Pertinent geological information may be obtained not only from the bounding orogenic belts, i.e., those that may have formed during the assembly of the supercontinent, but also from rift-related sedimentary and volcanoclastic deposits and igneous intrusions that formed during supercontinent breakup (e.g., Moores and Twiss 1995; Li et al. 2003).

Recent geochronological, geochemical, isotopic, and metamorphic studies from the Mesoproterozoic central southern African belts (De Waele 2005;

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[1] Author for correspondence; present address: Geological Survey of Western Australia, 100 Plain Street, Mineral House, East Perth, Western Australia 6004, Australia.

[2] Tectonics Special Research Centre, School of Earth and Geographical Sciences, University of Western Australia, 35 Stirling Highway, Crawley 6009, Australia. Present address: British Geological Survey, Keyworth, Nottingham NG12 5GG, United Kingdom.

[3] Albidon Mining, 141 Broadway, Nedlands 6009, Australia.

[4] School of Mines, Geology Department, University of Zambia, P.O. Box 32379, Lusaka, Zambia.

[5] School of Ocean and Earth Science, University of Southampton, European Way, Southampton SO14 32H, United Kingdom.

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