

PALEOMAGNETISM OF THE 765 MA LUAKELA VOLCANICS IN NW ZAMBIA AND IMPLICATIONS FOR NEOPROTEROZOIC POSITIONS OF THE CONGO CRATON

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ABSTRACT

Owing to the scarcity of reliable paleopoles, the Neoproterozoic position of the Congo craton (incorporating the São Francisco, Tanzania, and Bangweulu blocks) is very poorly known. We report new paleomagnetic data for the 765 ± 5 Ma Luakela volcanics, a NE-trending belt of basaltic to andesitic flows in NW Zambia (Key et al., 2001). The volcanics are up to 0.8 km thick and occur within a 2 km thick succession of siliciclastic rocks that unconformably overlies Neoproterozoic and Paleoproterozoic rocks of the Congo craton margin, and is correlated with the Roan and Mwashia Groups of the Katanga Supergroup (Key et al., 2001). The strata are essentially undeformed, and either subhorizontal or dip shallowly to the SE. Although no metamorphic mineral growth is observed in fine-grained sedimentary rocks, alteration has strongly affected plagioclase and pyroxene in the volcanic rocks, and magnetite has been partially altered to hematite (Key et al., 2001). AF and thermal analysis of 65 samples from nine sites isolated three magnetisation components. Component A, carried mainly by SD magnetite, is directed very shallowly to the SE. Component B, carried mainly by hematite, is oriented shallowly SW-up. A low stability component C is directed very steeply downward. Some samples contain only component A, others only component B, and some contain both A and B. Component A is likely to be primary, because it is carried by SD magnetite (which petrography indicates is primary), does not resemble younger magnetisations from the Congo craton, and because the rocks have not been thermally metamorphosed. Component B, carried by hematite, we consider to be an overprint, possibly acquired during Pan-African deformation in the Lufilian Arc. Component C is similar to Permo-Carboniferous paleodirections from the region, and may have been acquired at that time. Paleopoles for components A and B (LVA and LVB) are about 90° apart, and similar to those from the Tanzania block. LVA coincides with a reliable pole for the Mbozi complex (Meert et al., 1995), for which several K-Ar results are within uncertainty of a U-Pb age of 748 ± 6 Ma (Mbede et al., 2004). The LVA and Mbozi poles place Congo at the equator at 765-750 Ma. LVB falls within uncertainty of a pole for the Gagwe lavas (Meert et al., 1995), which have an Ar-Ar cooling age of 795 ± 7 Ma (Deblond et al., 2001). LVB cannot be older than 765 Ma, however. If the Tanzania block has not moved significantly relative to the Congo craton since at least 800 Ma, either the 795 Ma age is incorrect, or the Gagwe pole represents a younger overprint. The latter possibly implies that models which invoke a 90° CCW rotation of Congo between 800 and 750 Ma are no longer supported. Instead, the Congo craton rotated in the opposite direction between 750 Ma and the time of component B acquisition. The Luakela volcanics are overlain by 200 m of siltstones, followed by an unknown thickness of poorly-exposed diamictite, correlated with the 'Grand Conglomerat', a widespread glaciogenic unit of Sturtian age at the base of the Kundelungu Group. The diamictite is younger than the 765 Ma volcanics, and older than volcanic pods, dated at 735 Ma, in contact with the diamictite (Key et al., 2001). The Congo craton occupied equatorial latitudes at 765-750 Ma, suggesting that the diamictite, the 'Grand Conglomerat', and other Sturtian glaciogenic rocks in the Congo craton, represent a low-latitude glaciation.

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