Neoarchean and Paleoproterozoic crust formation in the Ubendian Belt of Tanzania: Insights from zircon geochronology and geochemistry

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Abstract

LA-ICP-MS U–Pb zircon geochronological and geochemical data of meta-igneous and metasedimentary rock types of the Katuma Block of the Paleoproterozoic Ubendian Belt in Tanzania are used to unravel the crustal evolution of this metalliferous terrain. The protoliths of the metabasites and orthogneisses previously considered to be Paleoproterozoic are in fact mostly Neoarchean in age (2713 ± 11 Ma to 2638 ± 5 Ma), from which the oldest rocks experienced their first metamorphism during the same Neoarchean orogenic cycle at ca. 2650 Ma. A second event of mafic magmatism (2021 ± 11 Ma) was concomitant with the migmatization of the Neoarchean orthogneisses and was succeeded by granitic intrusions at 1990–1940 Ma. All rocks of the Katuma Block experienced their main metamorphic reworking during several Paleoproterozoic orogenic events, which were recognized by dating of various metamorphic zircon growth zones and the age of magmatic events dated at ca. 2050, 1960 and 1880 Ma. The detritus of the high-grade metasedimentary rocks derived from Neoarchean (Katuma Block or Tanzania Craton?) and Paleoproterozoic provenances and the minimum age for the deposition is constrained by its first metamorphism at ca. 1960 Ma. The Neoarchean and Paleoproterozoic metabasites, gabbronorites and orthogneisses are sub-alkaline in composition displaying a REE and trace element geochemistry akin to those of rocks formed in modern-arc settings. On the basis of the geochemical data, the presence of eclogites, deformation and metamorphic ages, we suggest that in Paleoproterozoic time the Katuma Block was again at an active continental margin, below which a Paleoproterozoic oceanic lithosphere was subducting.

Keywords

LA-ICPMS zircon dating;
Mpanda mineral field;
Archean metabasites and orthogneisses;
Continental arc;
Ubendian Belt