A new tectonic and temporal framework for the Tanzanian Shield: Implications for gold metallogeny and undiscovered endowment

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Abstract

The lack of new gold discoveries in recent times has prompted suggestions that Tanzania is mature or approaching maturity, in terms of gold exploration. New tectonic–metallogenic subdivisions proposed in this study are used to explain gold-endowment, assess gold exploration maturity, and suggest the potential for new discoveries from the following three regions: 1) the Lake Victoria Region, comprising the gold-endowed East Lake Victoria and Lake Nyanza Superterranes of < 2.85 Ga greenschist–amphibolite facies granitoid-greenstone terranes in > 3.11 Ga continental crust. These superterranes are separated by the gold-poor, Mwanza–Lake Eyasi Superterrane, comprising deeply eroded and/or exhumed terranes of gneissic-granulite belts and widespread granitoid plutons; 2) the Central Tanzania Region, comprising the Moyowosi–Manyoni Superterrane, which is largely composed of granitoid and migmatitic–gneissic terranes, and the Dodoma Basement and Dodoma Schist Superterranes, these are underlain by extensive, > 3.2 Ga migmatitic-gneisses and granitoid belts with interspersed, relatively narrow, < 2.85 Ga greenschist–amphibolite facies greenstone and schist belts. The Central Tanzania Region also includes the East Ubendian–Mtera Superterrane, comprising the East Ubendian Terrane of predominantly Paleoproterozoic belts with cryptic Archean age components, and the ~ 2.85–3.0 Ga Isanga–Mtera Terrane of thrust-transported migmatitic ortho- and para-gneisses; and 3) Proterozoic Tanzania Regions, comprising various Archean terranes which were once sutured to the Tanzania Craton prior to later Proterozoic orogenic and tectonic events that separated them from the craton and thermally reworked them. These include the Archean Nyakahura–Burigi Terrane in the Northwestern Tanzania Proterozoic Orogen and the Kilindi–Handeni Superterrane in the Southern East African Orogen of Tanzania.

The major metallogenic significance of the new tectonic subdivisions is the recognition of under-explored belts: 1) in the gold-endowed East Lake Victoria and Lake Nyanza Superterranes, Lake Victoria Region. Here deeply weathered belts in the Musoma–Kilimafedha, Kahama–Mwadui and Nzega–Sekenke Terranes and belts, situated in tectono-thermally reworked crustal blocks such as the Iaida–Haidon, Singida–Mayamaya and Mara–Mobrama Terranes, are predicted to be prospective; 2) in the Dodoma Basement Superterrane, Central Tanzania Region, where relatively thin, juvenile granitoid-greenstone belts, similar to the ~ 2815–2660 Ma Mazoka Belt in the Undewa–Ilangali Terrane, contain small-scale gold

systems with analogous terrane-scale geologic settings and evolution histories to those of gold-hosting greenstone belts in the Sukumaland Terrane, Lake Victoria Region. The overall geologic–geometric setting of the greenstone belts in the Central Tanzania Region (Mazoka-type) is comparable to those of the gold-hosting juvenile granitoid-greenstone belts in the South West and Youanmi Terranes, Yilgarn Craton, Western Australia, and North Superior and North Caribou Superterrane, northwestern Superior Craton, Canada; and 3) in the Proterozoic Tanzanian Regions, where terranes that lie in close geographic proximity and regional strike extension to the gold-endowed Lake Nyanza Superterrane are likely to be most prospective. They include the Archean Nyakahura–Burigi Terrane in unroofed thrust windows of the Mesoproterozoic Karagwe–Ankolean Belt of northwestern Tanzania, and the Kilindi–Handeni Superterrane where Archean proto-crust has been reworked by Pan-African tectonothermal events in the Southern East African Orogen.

Keywords

- Tanzania Craton;
- Gold endowment;
- Tectonic framework;
- Lake Victoria Region;
- Undiscovered resources;
- Southern East African Orogen;
- Central Tanzania Region