Geochemistry of volcanic and plutonic rocks from the southern Musoma-Mara greenstone belt: Implication for the evolution of the Tanzania craton

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Abstract

The Neoarchean Tanzania craton contains patches of greenstone belts set in granitoid masses that occupy a large percent of the craton. Because of limited geological, geochronological and geochemical information, very little is known about this craton and its constituent terrains. We report new U-Pb chronological, Nd-Hf isotopic and major and trace element data for volcanic and granitoid rocks from the southern Musoma-Mara greenstone belts of the Northeast Tanzania craton. The volcanic rocks are mainly basaltic with minor felsic volcanic rocks. The intrusive rocks are mostly granodiorites and granites with few trondhjemitic samples. Geochemically, the basalts are tholeiitic and MORB-like but with minor depletions of Nb and Ti relative to N-MORB. The felsic volcanic and granitoid rocks are calc-alkaline with normal arc to adakitic signature. The basalts yielded a Sm - Nd isochron age of 2842 ± 65 Ma (εNd = +2.1, MSWD = 1.6) and εHf2840 = +1.7 - +3.2. One granitoid yielded U-Pb zircon age of 2689 ± 12 Ma which is similar to those reported for the oldest rocks in the North Musoma-Mara greenstone belt [1], and is interpreted to represent the age of granitoids and felsic metavolcanic rocks. The felsic volcanic rocks have εNd2689 ~ +1.6 - +2.5 and εHf2689 ~ +0.1 - +1.6 that are within error of those for granitods and meta-basalts. Collectively, these data show that the basaltic rocks may not be related to the felsic volcanic and intrusive rocks by fractionation but were likely formed from equally depleted sources, possibly in arc-back arc environment. The spatial association of MORB-like tholeiites and arc-like volcanic and granitoid rocks is not uncommon in the Tanzania craton [2], as well as other late-Archean cratons worldwide [3, 4], and may imply that the tectono-magmatic processes that produced this association were widespread during this period.