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Sr, Nd isotopes and geochemistry of the western Nuba Mountains low-grade metavolcanics (Sudan): New evidence for Neoproterozoic arc magmatism on the eastern Saharan Metacraton

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Pillowed metabasalt in the Nuba Mountains of Sudan has a geochemical signature of HFSE-depleted tholeiitic basalt. Associated meta-andesite has calc-alkaline LILE-enriched, HFSE depleted patterns characteristic of arc-derived magma, a well-developed negative Nb-Ta trough and a negative Zr-Hf trough, all of which are features of subduction-related arc magmas. This arc magmatism occurred at 751 ± 47 Ma (the age of eight points Sm – Nd isochron), well within the age of arc magmatism in the ANS.

The pillowed basalt has a geochemical signature of HFSE-depleted tholeiitic basalt, and the meta-andesite has calc-alkaline large ion lithophile element (LILE)-enriched, high field strength element (HFSE) depleted patterns characteristic of arc-derived magma, a well-developed negative Nb-Ta trough and a negative Zr-Hf trough, all of which are features of subduction-related arc magmas. This arc magmatism occurred at 751 ± 47 Ma (the age of eight points Sm – Nd isochron), well within the age of arc magmatism in the ANS.

All of the metavolcanics have a homogenous Sr – Nd isotope composition: initial $^{87}\text{Sr}/^{86}\text{Sr}$ (0.703872 ± 0.00040) and ϵ_{Nd} (5.4 ± 1.2) at 751 Ma. Metamorphic, isotopic, geochronological and geographical distribution characteristics of these metavolcanics identify them as a low-grade juvenile Neoproterozoic terrane to the west of medium-grade gneisses of presumably the pre-Neoproterozoic SmC of south central Sudan. This terrane, named the Abutulu terrane, is proposed to have formed as a result of opening and closing of a marginal basin that developed on the medium grade gneisses of the SmC. Whether or not this terrane represents a new location for the eastern boundary of the SmC in central Sudan is dependent on the age and nature of the medium to high-grade gneisses between the Kabus suture and the Abutulu terrane and hence more geological and geochronological investigations are needed in that region.

