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Role of the Aswa Shear Zone, Uganda, in the Neoproterozoic East African Orogen

Saalmann, K.[1] and Mänttäri, I.[2]

[1]Geological Survey of Norway, Leiv Eirikssons vei 39, 7491 Trondheim, Norway; kerstin.saalmann@ngu.no
[2]Geological Survey of Finland, P.O. Box 96, Espoo, Finland

The >1000 km long Aswa Shear Zone (ASZ) is a major NW–SE trending structure in East Africa. In Uganda, the ASZ is a steeply NE-dipping, up to 11 km wide mylonitic shear zone that shows multiple stage brittle reactivation. On outcrop-scale, the fabric in the ASZ is characterized by a well-developed NW–SE striking and subvertical or steeply NE- or SW-dipping mylonitic foliation and a subhorizontal to moderately NW- or SE-plunging stretching lineation. Sinistral kinematics and fabric are very consistent along strike. The strain is heterogeneously distributed and partitioned into lens-shaped lower strain zones dominated by pure shear, which are surrounded by high strain zones with intense simple shear combined with flattening. A number of (sub-) parallel shear zones with similar fabrics and kinematics occur to the NE and SW of the main zone at a distance of up to 20–45 km from the ASZ and reflect strain partitioning into simple shear and pure shear domains on a regional scale. Ductile shearing occurred during bulk E–W shortening, commenced at amphibolite facies conditions and continued with similar kinematics at greenschist and even lower grade conditions.

Similar Neoarchaean granitoids and gneisses occurring on both sides of the ASZ and the absence of ophiolitic or Neoproterozoic magmatic arc rocks argue against interpretation of the ASZ as a suture zone between the Sahara metacraton and Congo craton. The inferred suture zone is located farther east in the eastern Karamoja Belt. Zircon U-Pb LA-MC-ICPMS data from shear zone samples as well as fabric and structural relationship of c. 660 Ma granites exposed in the northern segment of ASZ suggest ductile shearing between 685 and 655 Ma, and thus during early stages of the Neoproterozic orogenic evolution. This age demonstrates that the shear zone is not a late-tectonic structure but formed prior to inferred late-orogenic escape tectonics.

The ASZ is interpreted as an intra-cratonic, crustal-scale structure close to the northeastern margin of the Congo Craton, possibly inherited from previous continental extension. Early ASZ activation is linked to underthrusting of the Congo Craton and coeval high-grade metamorphism and intense deformation in the orogen interior. In response to E–W convergence between c. 690 and 650 Ma, the NE-dipping ASZ was activated as an oblique ramp leading to deflection of the transport direction and concentration of non-coaxial strain and sinistral shear along the shear zone system. During progressive convergence, between c. 645 and 620 Ma, sinistral shearing along ASZ changed to ductile–brittle deformation mechanisms, while thrusting took place in Pan-African belts in eastern and western Uganda. Late-orogenic brittle sinistral reactivation of the ASZ can be regarded as the result of continent collision and closure of the Mozambique ocean further to the east, that potentially caused lateral escape manifested in NW–SE striking sinistral shear zones in Kenya [1,2,3] and the southern Arabian–Nubian Shield [4] between 620 and 570 Ma.

References:

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