Geophysical Research Abstracts
Vol. 16, EGU2014-12545, 2014
EGU General Assembly 2014

New constraints on the Pan-African tectonics and the role of the Mwembeshi Zone in Central Zambia: Deformation style and timing of two orthogonal shortening events

Kalin Naydenov (1), Jeremie Lehmann (1), Kerstin Saalmann (1,2), Lorenzo Milani (1), Judith Kinnaird (1), Guy Charlesworth (1), William Rankin (1), and Dirk Frei (3)

(1) University of the Witwatersrand, Scool of Geosciences, South Africa (k.naidenov@gmail.com), (2) Norges Geologiske Undersøkelse (NGU), Trondheim, Norway, (3) Department of Earth Sciences, Stellenbosch University, South Africa

In Central Zambia the Mwembeshi Zone (MwZ) separates two branches of the Late Neoproterozoic – Cambrian Pan-African Orogen: the NE-convex Lufilian Arc and the E-W trending Zambezi Belt whose distinct features emphasize the role of the zone as a regional structural and metamorphic boundary.
North of the MwZ, the Hook Batholith was emplaced within the low metamorphic grade Neoproterozoic metasedimentary rocks, and represents the largest Pan-African intrusion in Southern Africa. The granitoids and their host-rocks were affected by two deformation events.
During the D1 deformation of E-W shortening, two high-strained zones developed in the batholith. To the NE, the Nalusanga Zone (NZ) is a $\sim$3 km wide NW-striking subvertical sinistral strike-slip shear zone. To the SW, a $\sim$2.5 km wide N-S trending subvertical pure-shear Itezhi-Tezhi Zone (ITZ) formed. In both structures, the granitoids show a smooth transition from weakly deformed rocks to porphyroclastic mylonites. Microstructural analysis defined them as medium metamorphic grade zones, deforming the granitoids at temperatures between 500 and 550°C. The lower greenschist facies metamorphism in the country rocks indicates that the deformation occurred during the cooling of the granitoids.
D1 in the metasedimentary rocks east of the Hook batholith formed tight, upright folds with subvertical axial-planar cleavage and NNW–SSE trending axis consistent with the E-W shortening. U-Pb zircon geochronology and cross-cutting relationships between granites bracket D1 deformation between 549 $\pm$ 2 Ma and 541 $\pm$ 3 Ma in the NZ and in the SE part of the batholith. In the ITZ, the 533 $\pm$ 3 Ma age on a deformed granite indicates prolonged E-W shortening during granite emplacement and cooling history.
D2 represents a stage of N-S shortening. Airborne geophysical data revealed bending of the N-S trending ITZ and rotation to the east. The D1 structures in the granitoids are cut by D2 north-vergent thrusts and subvertical NW trending dextral strike-slip zones. East of the granite, D2 resulted in E-W trending open folds that refolded the D1 structures. This folding becomes more intense and the folds are tighter when approaching the MwZ to the south. Along the MwZ, the molasse rocks, deposited after D1 (post $\sim$528 Ma, based on new detrital-zircon ages), recorded high-strain greenschist facies coaxial deformation and the formation of E-W trending isoclinal folds with a steep south-dipping axial planar cleavage.
This study shows that the area north of the MwZ is characterised by two orthogonal contraction events. The newly described D1 event of E-W shortening in the Hook area cannot be correlated with any of the published Pan-African tectonic models for the Lufilian Arc and Zambezi Belt. The D2 event of N-S shortening affected the region in response to the final docking between the Lufilian Arc and the Zambezi Belt. The strongest effect of this event was observed along the MwZ, which, during this stage, was a zone of intense coaxial deformation.