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Structural geology and geochronology of Archaean rocks in the Tonota area, NE Botswana

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The basement geology of NE Botswana comprises metamorphic and igneous rocks of Neoproterozoic age subdivided into three main crustal terranes: the south-western part of the Zimbabwe Craton, the western part of the Central Zone to the Limpopo belt and a third terrane referred to as both the Shashe Belt [1] and the Motloutse Complex [2]. The Tonota area forms part of this third terrane and lies adjacent to the Francistown Complex [2] a granitoid-greenstone complex that helps define the south-west margin of the Zimbabwe Craton [3].

Recently published research shows that magmatism and deformation associated with the SW margin of the Francistown Complex can be linked to an Andean type continental arc along the edge of the (proto) Zimbabwe Craton between 2737Ma and 2647Ma [3,4,5]. The structural grain of this arc complex is defined by a NW striking, SW dipping foliation that is developed in both the supracrustal rocks of the Tati Schist Belt and associated granitoid gneisses in the Shashe area. The foliation in these gneisses carries a lineation defined by the preferred orientation of minerals and the elongation of deformed mineral aggregates. The lineation is upright on the foliation and plunges southwest parallel to the axis of minor folds compatible with high strain. This high strain zone has been interpreted as a thrust-sense ductile shear zone with NE vergence [2]. Similar kinematics have been recognised by Majuane [6] in the supracrustal rocks and associated granitoid gneisses that define the Matsitama Belt.

The rocks in the Tonota area are similar in character to those around Shashe and Matsitama but the kinematics of the deformation structures in these rocks are very different. Foliation strikes NNE to NE and dips NW. Folds developed in the supracrustal rocks trend NE-ESE and deform bedding (S_0) and a bedding-parallel foliation (S_1) Map scale fold structures defined by the supracrustal rocks are Type-3 interference patterns compatible with NW-SE compression. The granitoid rocks of the Tonota area are variably deformed and regional foliation in them is co-planar with that in the supracrustal rocks. SHRIMP U-Pb zircon data from the granitoids indicate magmatism occurred between 2724Ma and 2631Ma and field relationships show deformation in the regionally extensive megacrystic gneiss occurred before 2631Ma.

The new data from the Tonotha area will be discussed and an attempt made to elucidate the relationship between the Motloutse Complex and adjacent terranes.

References:

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