THE WANNI-HIGHLAND BOUNDARY SHEAR ZONE OF SRI LANKA: FIELD AND STRUCTURAL EVIDENCE

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Previous petrological, structural, geochronological, geochemical and isotopic data have led to the identification of three lithotectonic units in the Precambrian of Sri Lanka, namely, the Wanni Complex (WC), the Highland Complex (HC) and the Vijayan Complex (VC). The HC is a Palaeoproterozoic belt of rocks flanked on either side by the Mesoproterozoic WC to the West-North West and the Mesoproterozoic VC to the East-South East. These lithotectonic units have been juxtaposed during two tectonic events which led to the high-grade metamorphism and polydeformation of those as a consequence of the assembly of Gondwana supercontinent during the Pan-African.

The WC-HC and the HC-VC boundaries resulting from the two collisional orogenies had been a subject of debate. The geology and the geographical position of the HC-VC boundary are fairly well understood and believed to be a tectonic boundary. Whereas the geology of the WC-HC boundary and its geographical position are poorly understood despite the magmatic, sedimentation, isotopic, geochemical and structural differences between the two lithological units have been identified.

The present study deals with unraveling the geology of the WC-HC boundary and its geographical position. Detailed geological and structural analyses were carried out along a part of the boundary which runs over a stretch of 150 km length and 0.1-1 km width between Habarana and Ginigathena within the studied area. In the northern part the boundary follows nearly a NS, and then a SSE direction before it turns into a SSW direction in the central part and continues in the same direction further South.

The boundary zone consists mainly of charnockitic rocks and metasediments formed under granulite-facies. Among them, pelitic gneisses, marble and hornblende-bearing metagranitoids are the predominant rock types. Pelitic gneisses and calcitic to dolomitic marbles occur almost along the entire length of the boundary North of Kandy. South of Kandy, dolomitic to calcitic marble is absent along the boundary and hornblende-bearing metagranitoids are present. However, pelitic gneisses continue to occur and sometimes make conformable layers. The lithological contact between the WC and the HC lies between the pelitic (Grt-Bt) gneiss and the underlain marble (N of Kandy) and Khondalite (S of Kandy).

Most of the rocks along the boundary zone are highly sheared and consists of mylonites and striped gneisses. Mylonites are khondalitic while striped gneisses are mainly hornblende-bearing metagranitoids. Striped gneisses of graphic granite also occur. These rocks contain shear sense indicators such as mesoscopic and microscopic S-C and S-C′ fabrics, asymmetric folds, asymmetric feldspar porphyroclasts, rotated garnet porphyroclasts and "book-shelf" model grains and mineral fishes.

The regional distribution of mylonites and striped gneisses and shear sense-indicators demonstrate that this is a tectonic boundary and a crustal-scale ductile shear zone which formed in a convergent type tectonic regime. The plate convergence took place leading to the assembly of Gondwana supercontinent during the Pan-African was the tectonic regime where the boundary was formed. It was formed at the juxtaposition of the magmatic arc containing the WC and the HC microplate at ~610-550 Ma. The sense of shear deduced from some of the above shear sense indicators demonstrates that the WC has moved over the HC from top-to- the SSE, indicating that the latter subducted under the former. The orogeny of this subduction which led the juxtaposition caused the high-grade metamorphism and polydeformation of the boundary zone as in the WC and the HC. The boundary has subjected to six episodes of deformation (D_1-D_6) and folded by D_4-D_6 events. The D_5-D_6 deformation was a consequence of the collision between the already juxtaposed WC-HC unit with the VC. The D_1 deformation during the prograde path followed by D_2 and D_3 deformations during the peak-metamorphism and D_4-D_6 deformation during the retrograde path characterizes the P-T-t evolution of the boundary zone.

The WC-HC Boundary Shear Zone (WHBSZ) is comparable with the Robertson Lake Shear Zone of Ontario, Canada. The two shear zones are comparable in length, metamorphic characteristics of flanking terranes and the tectonic environment. The WHBSZ is a minor shear zone when compared to the large-scale shear zones of Madagascar or India.

A proper terminology for shear zones and a systematic nomenclature for the rocks formed in shear zones should also be introduced.

Detailed geological and structural mapping along the boundary is essential to understand the structural evolution of the WC-HC boundary and its detailed relationship to the P-T-t evolution of the Sri Lankan Precambrian. Further studies are needed to elaborate the exact nature of the collision between the WC and the HC and to correlate it with those in the other Gondwana fragments around Sri Lanka.