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# Transpressional regime in southern Arabian Shield: insights from Wadi Yiba area, Saudi Arabia

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Detailed field-structural mapping of the Pan-African basement rocks exposed at Wadi Yiba area, Southern Arabian Shield, Saudi Arabia, revealed the presence of four main units; metavolcanics, Ablah Group (meta-clastic and marble units) and syn- and post-tectonic granitoids. The exposed rocks are tectonically evolved during the Neoproterozoic throughout, at least, three phases of deformation ($D_1$, $D_2$ and $D_3$). $D_1$ formed tight to isoclinal and intrafolial folds $F_1$, penetrative foliation $S_1$, and mineral lineation $L_1$, which resulted from an early E-W (to ENE-WSW) shortening phase accompanied with the early convergence between East and West Gondwana. $D_2$ deformation phase progressively overprinted $D_1$ structures and was dominated by mostly a transpressional regime and top-to-the-W (WSW) thrusting under a compressive environment. Stretching lineation trajectories, S-C foliations, asymmetric shear fabrics and related mylonitic foliation, and flat-ramp and duplex geometries are main evidence supporting the proposed Pan-African transport direction. The N- to NNW-orientation of both "in-sequence piggy-back thrusts" and axial planes of minor and major $F_2$ thrust-related overturned folds is rather solid evidence indicating the same stress trajectories of compressional regime during the $D_2$ phase.

Wadi Yiba Shear Zone (WYSZ) is a conspicuous structural fabric related to $D_2$ phase, and could be traced easily on landsat images. WYSZ is affiliated to the N-S trending brittle-ductile Late Neoproterozoic Shear Zones in the ANS. Shear sense indicators reveal that shearing during the $D_2$ regional-scale transpression was dextral (right-handed). Dextral sense of shear is consistent with the mega-scale sigmoidal pattern clearly recognizable on the landsat image; i.e. this structural pattern is penetrative all over the mapped area and environs. The shearing led to the formation of the main shear zone and consequent $F_2$ shear zone-related folds, as well as other unmappable shear zones in the deformed rocks. Moreover, emplacement of the syn-tectonic granitoids is likely to have occurred during the $D_2$ transpressional phase rather than in an extensional tectonic environment. This conclusion is evidenced by: 1) absence of $F_1$ folds and at the same time presence of $F_3$ crenulation lineations and kink bands in syn-tectonic granitoids, 2) off-shooting of these granitoids into the enveloping rocks, and 3) intensive degree of shearing and mylonitization. Emplacement of syn-tectonic granitoid took place to accommodate space resulted from thrust propagation.

$D_1$ and $D_2$ structures are locally overprinted by mesoscopic to macroscopic- scale $D_3$ structures ($F_3$ folds, and $L_3$ crenulation lineations and kink bands). $F_3$ folds are frequently open and have steep to subvertical axial planes and axes moderately to steeply plunging towards the E, ENE and ESE directions. The deformational history of Wadi Yiba area is in agreement with the general evolutionary model proposed for the ANS which represents the northern extension of the East African Orogen or East African-Antarctic Orogen.