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Landsat-TM-Based discrimination and tectonic evolution of the Neoproterozoic lithologies of Shwas Shear Zone, Central Asir terrane, Arabian Shield

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Sutures and mega shears played a significant role in the structural shaping of the deformation belts in the Arabian-Nubian Shield (ANS); the northern continuation of the East African Orogen (EAO). Sutures comprise the E- to NE- and N- to NE- oriented arc-arc sutures which delineate the terrane accretion (~800-700 Ma) in the ANS, and the arc-continental sutures which represent the subsequent emplacement (~750-650 Ma) of the entire ANS between East and West Gondwana Continental Blocks and at the same time define the eastern and western borders of the ANS. Continued convergence and assembly between East and West Gondwanas resulted in younger deformations that are manifested by post-accretionary structures (~650-550 Ma) overprinted the older ones. These structures are typified by the N- to NNE-oriented shear zones and the NW- trending Najd Fault System (~1200 km long and ~300 km wide); the latter extended from western Arabia into the Eastern Desert tectonic terrane (Egypt) forming what is called "Najd Shear Corridor". Shwas Shear Zone (SSZ) is one of the most pronounced N-oriented early Cryogenian (?) post-accretionary structures in southern Arabian Shield. It extends over 200 km across the highly complicated Asir terrane, from Rafaah pluton in the north to Al-Majardah in the south. It contains volcanosedimentary and plutonic lithologies along with lensoidal serpentinite blocks and fragments. The present work is an attempt to shed much light on the Neoproterozoic tectonic history of the SSZ, employing integrated Landsat-TM-Based discrimination of the highly strained rocks and ground-based investigations of various lithologic units and shear fabrics. Spectral signatures collected from Landsat8 Operational Land Imager (OLI) data are very helpful in differentiating exposed units. Panchromatic spectral band 8 with spatial resolution 15m is used to highlight the preliminary structural lineaments in the area. Both band ratioing and principal component analysis (PCA) techniques are used to refine the discrimination between the granitoides, metaultramafics, mafic and intermediate metavolcanics and gabbros. Field observations and overprinting relations indicates that the SSZ is a polydeformed high strain zone experienced a prolonged history of deformation involving three successive Neoproterozoic deformations. Such deformations are the subject matter of detailed description and discussion in this study with emphasis on the overall transpressional shearing sense.