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The late Neoproterozoic Pan-African low-grade metamorphic ophiolitic and island-arc assemblages at Gebel Zabara area, Central Eastern Desert, Egypt: petrogenesis and remote sensing - based geologic mapping

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Abstract

The late Neoproterozoic Pan-African basement rocks of the Gebel Zabara area, Central Eastern Desert of Egypt is of particular interest where the medium-grade Hafafit gneisses juxtapose the low-grade ophiolitic and island-arc assemblages along major structural contacts. The area comprises important mineral deposits including gold, base metal vein-type deposits as well as emerald and talc. In the current work, various image processing algorithms including Principal Component Analyses (PCA), Minimum Noise Fraction (MNF) and Decorrelation Stretch (DS) were proposed and applied on Landsat-8, ASTER and Sentinel-2 data to delineate and discriminate the different rock units. Several ASTER mineral indices are successfully used in the mapping process to detect the alteration zones, which are mainly confined to the NNW-SSE and N-S trending structures. The petrogenesis studies for the different rock units in the study area indicate that the ophiolitic assemblage include serpentinite-talc carbonate, metagabbros complex and metabasalts. Serpentinite rocks represent the hydrated low temperature form of a harzburgite precursor, while the talcose serpentinites evolved via SiO₂aqueous metasomatic alteration. Geochemically, the ophiolitic rocks exhibit N-MORB tholeiitic affinity and imply a back-arc setting. The island-arc rock assemblages encompass calc-alkaline meta-andesite,

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