

Tectonic evolution of kid metamorphic complex and the recognition of Najd fault system in South East Sinai, Egypt

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Abstract A low-to medium-grade metamorphic belt of a volcano-sedimentary succession occurs in the eastern side of South Sinai as a part of the northernmost extension of the Arabian–Nubian Shield in Egypt. The belt is known as the Kid metamorphic complex. It is considered as one of the major belt among the other exposed metamorphic belts in South Sinai. Here, we detect and investigate the signature of the Najd Fault system in South Sinai based on detailed structural analysis in field and digital image processing. The enhanced satellite image and the geo-spatial distributions confirm that the Kid belt is essentially composed of nine Precambrian units. Field relations and geometrical analysis of the measured structural data revealed that the study area underwent four successive deformational phases (D_1 – D_4). D_1 is an upright tight to isoclinal large-scale folds that caused few F_1 small-scale folds and a steeply dipping S_1 axial plane foliation. The second deformational event D_2 produced dominant of sub-horizontal S_2 foliation planes accompanied with recumbent isoclinal folds and NW–SE trending L_2 lineations. The main sense during D_2 was top-to-the-NW with local reversals to the SE. The third folding generations F_3 is recorded as axial plane S_3 -surfaces and is characterized by open concentric folding that overprinting both F_1 and F_2 folds and has a flexural-slip mechanism. F_3 fold hinges plunge to the west–northwest or east–south-east indicate north–northeast–south–southwest shortening during D_3 . The fourth deformational event D_4 is characterized by NE plunging open concentric folding overprint the pre-existing fold generations and formed under flexural slip mechanism reflecting coaxial deformation and indicating change in the stress regime as a result of the change in shortening from NE–SW to NW–SE. This phase is probably accompanied with the final assembly of east and west Gondwana. The dextral NW–SE shear zone that bounded the southwestern portion of the metamorphic belt is probably related to reactivation of the Najd fault system during Oligo-Miocene in South Sinai.

Keywords Kid metamorphic complex · Image processing · Shear zone · Structure analysis · Najd fault system