



Structural and petrological re-assessed for the Najd-related shear zones along the Egyptian Eastern Desert

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Abstract

The Nugrus-Hafafit and El Shalul areas are regarded as key regions for many enigmatic problems and debatable issues concerning the tectonic setting of the Najd-related shear zones in the Eastern Desert of Egypt. The Neoproterozoic basement succession in the studied areas is well-developed and represented by four rock groups arranged from older to younger as infrastructure unite (amphibolites, migmatized hornblende-biotite gneiss, psammitic gneiss and chlorite-biotite schist), suprastructure units including ophiolitic mélange (metaultramafics and related derivatives) and island arc assemblages (metagabbros and metavolcanic-metasedimentary association), syn-tectonic granitoids (gneissic to undeformed granodiorite-tonalite), late-tectonic to post-tectonic/post-collision granites (mylonitized muscovite granite, biotite granite and perthitic alkali granite), and post-granitic dykes (pegmatites and quartz veins). The tectonic structures in the studied regions indicate at least three successive phases of deformation (D_1 , D_2 , and D_3). D_1 represents NE-SW (to ENE-WSW) shortening associated with major thrusting of the supracrustal rocks over the infracrustal rocks in Nugrus-Hafafit area and NW-SE shortening accompanied the orogen-parallel extension/extrusion in El Shalul area. D_2 is characterized by NW-SE (to NNW-SSE) transpression along the Najd-related shear zones. During D_3 , the NW-SE (to NNW-SSE) shortening produced dextral shearing along the NE-SW Mubarak-Barramiya Shear Belt (MBSB). Field relations and observations indicate that the NW Najd-related Nugrus and El Shalul shear zones and the NE-oriented shears are not a conjugate pairs. Furthermore, the tectonic-magmatic-metamorphic evolution of the Pan-African belt in the Eastern Desert of Egypt has been progressively changed and/or developed from south to north, in terms of tectonic transportation/thrust direction and deformational style.

Keywords Najd Fault System · Nugrus-Hafafit · Gabal El Shalul · Core complexes · Najd-related shear zones · Conjugate shearing

Introduction

The Najd Fault System (NFS) in the Arabian-Nubian Shield (ANS) is considered as the largest shear zone system on the Earth formed in the Proterozoic. It was active during the later stages of the Pan-African evolution and is suspected to be responsible for the exhumation of the juvenile Proterozoic continental crust in the form of a series of basement domes across the shield areas in Egypt and Saudi Arabia (Johnson and Woldehaimanot 2003). As originally defined (Brown and Jackson 1960; Delfour 1970), the NFS consists of NW-SE trending brittle-ductile shears in a broad zone of width as much as 300 km over 1100 km long belt extended across the northern part of the Arabian Shield. The Najd-related shears off-set/reactivate the Middle to Late Cryogenian suture zones, offset the Cryogenian volcanic-sedimentary and plutonic arc terranes, displace the Late Cryogenian-Ediacaran

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