



Geochronological and geochemical study of the Pan African intrusive rocks along the Najd Fault system in El Wajh area, Saudi Arabia

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In the active tectonic regions, shear zones play an important role to re-configure the structure of the lithosphere. One of the largest shear zones on the Earth is the Najd Fault system of the Arabian-Nubian Shield. Literature data record the main active phase of this shear zone during the last stages of the Pan-African Orogeny (ca. 650–550 Ma). Compilation of new geochronological and geochemical data in addition to field relation is used to figure the tectonic history of the Najd Fault system. Different relationships between igneous intrusions and the Najd Fault System are observed. Some igneous bodies predate the activity of the shear zone, others intruded during the shearing process and a later phase intruded after the activity of the Najd Fault system ceased. The intrusive rocks in the study area show a geochemical and compositional diversity. Intrusives with dioritic composition were derived from a metaluminous tholeiitic magma around 700 Ma, and granodiorite-tonalite intrusions have calcalkaline characters and display a metaluminous to peraluminous character (ca. 740 and 660 Ma) then the magmatic activity terminated with peraluminous calcalkaline intrusives which formed granitic rocks with intrusion ages of 605–580 Ma. These magmatic events are identical for the Arabian-Nubian Shield but contamination from the crust or different rates of fractionation are recorded in our samples which are responsible for variations in the geochemical signature of the intrusive rocks.

Based on field observations and contact relations, the intrusive rocks within the Ajjaj shear zone were studied in details in order to determine the age and the tectonic history of this shear zone that marks the termination of the Najd System against the eastern margin of the Red Sea. The provided zircon U-Pb dating by LA-ICP-MS and field relationships confine the activation age of the Ajjaj shear zone in limited period between 605 Ma and 580 Ma.