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Implications for the tectonic development of the Sistan Suture Zone, South East of Iran by using REE and HFS elements

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Zargoli Granites extending in a NE-SW direction, intrude into Eocene-Oligocene regional metamorphic flysch-type sediments outcrop in the Southeast Iran. These rocks, based on modal and normative mineralogical classification, compose of metaluminous biotite granite and biotite granodiorite which was contaminated by the country rocks during their emplacement and has slightly changed to peraluminous. Their SiO2 content varies from 62.4-66 wt % with a alumina saturation index of Shand [molar Al2O3/(CaO+Na2O+K2O)]∼1.1 and most of their chemical variations can be explained by biotite fractionation. The features of the rocks are typical of post-collisional granitoids Chondrite-normalized LREE patterns of the rocks fractionated at represent (La/Lu)N= 2.25-11.82 with pronounced negative Eu anomalies (Eu/Eu* = 3.25-5.26). However, they are the medium Mg# 100Mg/(Mg+Fe) values (44-55), Fe+ Mg+ Ti (based on Millication)= 130-175 and Al- (Na+K+2Ca) (based on Millication)= 5-50 may suggest that they have derived from the dehydration partial melting of metaigneous lower crust. The combination of petrological and geochemical data with tectonic constraints has enabled us to propose a model for magma genesis of the Zargoli granite. The main aspects of this model, and their justifications, are briefly summarized below:

1) A Late Cretaceous ocean basin developed as a result of early late Cretaceous rifting between the once-connected Lut block (in the west) and Afghan cratonic block (in the east). The basin, which was relatively short-lived, eventually closing as the two blocks converged again in a NE-SW direction. This convergence was continuous from the middle Eocene until Miocene.

2) Collision of the Lut block with the subduction complex in the middle Eocene until Miocene produced widespread deformation and was followed by the emplacement of Oligocene- Miocene calc-alkaline Zargoli granite during the convergent movement between the Lut and Afghan cratonic blocks.

3) The Zargoli granite generated in post environments with significant partial melting of metaigneous rocks and mantle component and this is well-matched with field study and geochemical data.

4) The temperatures obtained for the representative samples by using Zircon saturation thermometer range from 767.4 to 789.3°C.

5) Most of samples in the Al-(K+ Na+ 2Ca) vs. Fe+ Mg+ Ti diagram are plotted in moderately peraluminous granitoids filed and show the Zargoli granite was generated from dehydration melting of metaigneous from the lower crustal source during the collision and subduction of Sistan oceanic lithosphere beneath the Afghan block.