Magmatic Evolution of the Area, South Wadi Abu Ziran, Central Eastern Desert, Egypt: A Geochemical Modeling

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A group of intrusive and extrusive igneous rocks are located south of Wadi Abu Ziran, Central Eastern Desert. The rocks have varied petrographic compositions ranging from gabbros to granites together with their volcanic equivalents. They belong to four distinct Neoproterozoic units of the Eastern Desert, namely; "metagabbros (MG), older granites (OG), metavolcanics (MV) and younger granites (YG)". Both major and trace elements are compiled to deduce their genetic relationships. 1/Sr vs. Rb/Sr and Rb/Ba vs. Rb plots suggest comparative magmatic relationships. The trace elements data are used for modeling according to the general equation of partial melting (Shaw, 1970) and Rayleigh equation of fractional crystallization. Various rock types favor complex petrogenetic descend during their generation. The magmatic model is based on "in-sequence" genesis between partial melting and fractional crystallization. A magma mixing processes is suggested in the later stage. It is evident that these rocks are evaluated throughout five essential magmatic stages; 1) the gabbroic rocks (MG) were derived by partial melting (42.5-45.93 %) of oceanic crust followed by fractional crystallization (30-50 %) of the resulted ultramafic magma; 2) rocks of granodiorite (OG) were derived throughout partial melting (30-39.47 %) of gabbroic parent followed by (55-80 %) fractional crystallization of gabbroic magma; 3) the metandesite (MV) was the product of partial melting (0.4 %) of granodiorite (OG) followed by fractional crystallization (25-50 %); 4) the monzogranite (YG) was derived throughout (3-6.02 %) partial melting of granodiorite (OG) followed by (40-65 %) fractional crystallization of granitic magma, finally; 5) the recorded hybrid granodiorite rocks (YG) were generated by partial melting of both gabbroic rocks (MG) (29.58 %) and granodiorite (OG) (6.02 %) followed by magma mixing and (35-60 %) fractional crystallization.