Title: Radiological, environmental, and structural investigations of Wadi El Markh granitic rocks, southeastern desert, Egypt

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Abstract: The radiological and environmental hazards of Wadi El Markh granitic rocks were investigated, and magnetic data were used to delineate the structural framework and determine the bedrock depth in the area. The result displayed that geological structures influence the occurrence of uranium mineralization in this area and are mainly associated with altered granitic formations. The activity concentrations of radioisotopes in the regions studied showed a range of values: ^{238}U varied between 345 and 1729 $Bq.kg^{-1}$, averaging 980 $Bq.kg^{-1}$; ^{232}Th ranged from 73 to 162 $Bq.kg^{-1}$, with an average of 120 $Bq.kg^{-1}$; and ^{40}K varied from 829 to 1790 $Bq.kg^{-1}$, average 1245 $Bq.kg^{-1}$. The measured concentrations of ^{238}U, ^{232}Th, and ^{40}K in the analyzed granitic rocks samples exceeded the worldwide average of 35, 45, and 412 $Bq.kg^{-1}$, respectively. The primary radiological risks related to these granitic rocks were associated with the gamma radiation emitted by the radioactive elements. The statistical assessment confirmed that the main contributors to the radiological risks were uranium, potassium, and associated minerals in the granitic rocks. The entire investigation region has been determined to exceed the permissible safe radiation dose rate limit of 1 mSv/year. As a result, the study determined that the granitic rocks in the surveyed area were deemed unsuitable for construction because of their elevated levels of radioactivity. The effects of pollution on the ecological system were evaluated using several ecological indices, including the Geoaccumulation index (Igeo), Contamination factor (CF), Degree of Contamination (Cd), Pollution Load Index (PLI), Potential ecological risk factor (Eri), and Potential Ecological Risk Index (RI). Based on Cd and PLI, 100 % of the samples were found to be very highly polluted to the ecological system and suggest deterioration if used. Regarding RI, the metals were arranged as Cd > As > Co > Cu > Pb > Cr > V > Zn, with considerable risk in all samples.

Key words: Wadi El Markh Granitic rocks Radiological hazards Environmental pollution Uranium mineralization

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