

Title: Geochemical evaluation and hazard indices due to radioactive minerals associated with granitic areas

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Abstract: The present study employed statistical methods to evaluate the possible radiological hazards linked to granitic rocks-bearing mineralization in the ELgarra region of Egypt. The geological structures influence the occurrence of uranium mineralization in this area and are primarily associated with altered granites. Gamma-ray spectrometry was utilized to examine the quantities of ^{238}U , ^{232}Th , and ^{40}K in granitic rock samples. The recorded levels of radioisotope activity concentrations in the analyzed regions ranged from 374 to 1740 Bq.kg⁻¹ ^{238}U , with an average of 1018 Bq.kg⁻¹. For ^{232}Th , the range was between 71 and 163 Bq.kg⁻¹, with an average of 119 Bq.kg⁻¹. Lastly, for ^{40}K , the range was 756–1789 Bq.kg⁻¹, with an average of 1212 Bq.kg⁻¹. The detected levels of ^{238}U , ^{232}Th , and ^{40}K in the examined rock samples were observed to exceed the permissible limits of 35, 45, and 412 Bq.kg⁻¹, respectively. The primary radiological risks linked to these granitic rocks were attributed to the gamma rays released by the radioactive elements. Estimations of the radiological hazards in the granitic rocks were made, and statistical approaches were utilized to demonstrate the associations among radionuclides and radiological factors. The assessment confirmed that uranium, potassium, and their respective minerals in the granitic rocks were the key factors contributing to the radiological risks. As a result, the study determined that the granite rocks found in the study area needed precautions to be taken due to their high levels of radioactivity.

Keywords: Mineralogical analysis, Cancer risk, Uranophane, Radiological parameters

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