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Journal of Taibah University for Science 10 (2016) 271–280

Journal of Taibah University for Science

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# Effective radiation doses from natural sources at Seila area South Eastern Desert, Egypt

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Received 30 March 2015; received in revised form 10 June 2015; accepted 12 June 2015

Available online 3 September 2015

**Abstract**

Fifty one locations were chosen at Seila area, South Eastern Desert, Egypt to evaluate the public effective doses due to the exposure to the natural sources of radiation at this area. These locations were distributed over these sites called the Passage and the Wadi. The average value of the activity concentration of the terrestrial radionuclides $^{238}$U, $^{232}$Th and $^{40}$K was found to be 41.68, 28.51 and 567.57 Bq kg$^{-1}$ at the Passage and 37.34, 35.2 and 696.43 Bq kg$^{-1}$ at the Wadi, respectively.

The public at Seila area receive an annual effective dose 0.1 mSv due to the exposure to the gamma component of the cosmic rays while they receive an annual effective dose of 0.01 mSv from the gamma rays emitted from the radon and thoron decay products in the air at the studied area.

The public at the studied area receive an average value of the external effective dose of 0.14 mSv y$^{-1}$ and an average value of the internal effective dose due to the inhalation of the radon and thoron gases is 0.088 mSv y$^{-1}$ outdoors. The average value of the total annual effective dose due to the terrestrial radioactivity at Seila area was obtained to be 0.225 mSv which is safe for the activities of El Bisharya tribe at the studied area.



*Keywords:* Radiation-Dose; Effective doses; Stream sediments

## 1. Introduction

The Gabal El Seila area in the South Eastern desert of Egypt is located between latitudes 22°13′48″–22°18′36″ N and longitudes 36°10′12″–36°18′36″ E (Fig. 1) at a distance of approximately 22 km southwest of Abu Ramad City [1].

The younger granite in the Gabal El Seila area is represented by Gabal Qash Amir, Gabal El Seila, and isolated granite stocks. These rocks are affected by the ENE–WSW shear zone and the sub-parallel fault system

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Peer review under responsibility of Taibah University

Production and hosting by Elsevier

http://dx.doi.org/10.1016/j.jtusci.2015.06.010

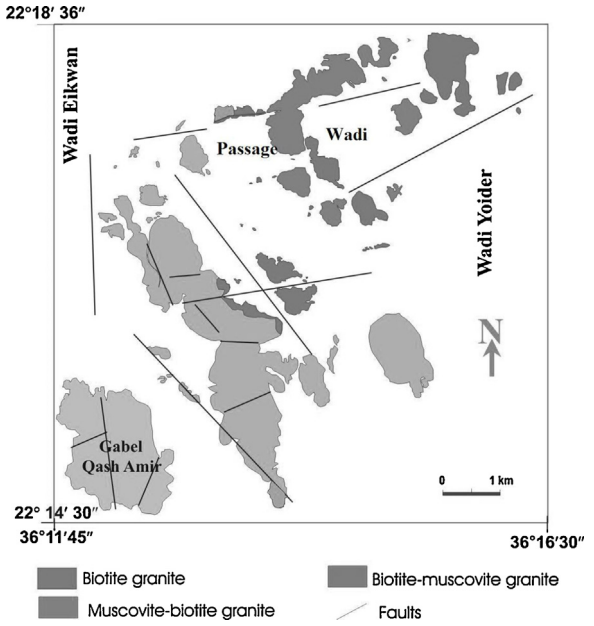


Fig. 1. Geological map of Seilaarea, south Eastern Desert, Egypt showing the studied two sites.

dipping 50°–70° to the south and extending approximately 9 km, with thicknesses from 2 to 40 m. The ENE–WSW trend is intersected by the N–S sinestral strike slip and dip slip fault systems. These shear zones and fault systems are filled with quartz veins, fine granite, and basic dykes. The ENE–WSW shear zone contains a radioactive anomaly along the sheared fine granite and basic dykes. Generally, this rock is pale pink, slightly leucocratic, medium to coarse grained, cavernous and exfoliated monzogranite. The rock contains U-bearing minerals, such as biotite, zircon and muscovite. The Seila area is characterized by green grasses, meaning that there are numbers of shepherds and camels throughout this area. The area is inhabited by the local El Bishariya tribes, who practice their traditional lifestyle in harmony with the environment. These tribes have settled mainly in the Abu Ramad village on the western coast of the Red Sea, in the South Eastern desert of Egypt. They carry out activities during the day in the Seila area. Stream sediments in the Seila area have been determined to have originated from bedrock that has been subjected to airiation, weathering and fracturing in different Wadis and tributaries.

This study aims to evaluate the public exposure as a result of natural sources of radiation, terrestrial radioactivity and cosmic rays in the Seila area and to estimate the effective doses received by members of the El Bishariya Tribes.

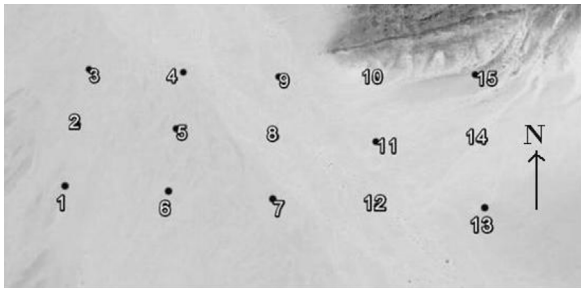


Fig. 2. Fifteen locations distributed in a grid pattern over the Passage.

## 2. Material and methods

### 2.1. Description of the monitoring stations

To evaluate the public exposure in the Seila area from natural sources of radiation, 51 locations were distributed in a grid pattern over two sites in the Seila area. The first site, known as the Passage, includes 15 locations, as shown in Fig. 2. The second site, known as the Wadi, includes 36 locations, as shown in Fig. 3. These locations were chosen to measure the uranium, thorium and potassium contents in the stream sediments and the concentration of radon gas in the sediment.

### 2.2. Uranium, thorium and potassium measurements

A RS-230 BGO (Bismuth Germanate Oxide) spectrometer was used to measure the wide range of potential radiation concentrations during the uranium exploration process. This device provides a readout of the concentration of uranium and thorium in ppm and the percentage of potassium in the medium after a 30 s measurement time (used in this work). This convenient, handheld instrument is more affordable than other more costly, portable units. For example, measurements taken using the RS-230 BGO handheld unit provide comparable quality to

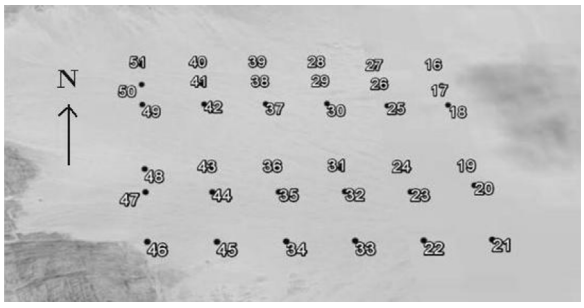


Fig. 3. Thirty six locations distributed in a grid pattern over the Wadi.