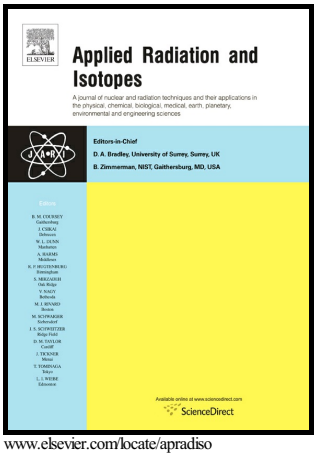

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Atef El-Taher, Hesham MH. Zakaly, Reda Elsaman

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Environmental implications and spatial distribution of natural radionuclides and heavy metals in sediments from four harbors in the Egyptian Red Sea coast

Atef El-Taher[1]*, Hesham MH. Zakaly[1,2], Reda Elsaman [1]

[1]Physics Department, Faculty of Science, Al-Azhar University, Assuit Branch, 71524 Assuit, Egypt.

[2]Department of experimental physics, Institute of physics and technology, Ural Federal University, Yekaterinburg 620002, Russia

Abstract

Measurements of natural radionuclides concentrations (^{226}Ra, ^{232}Th and ^{40}K) in sediments collected from sea, rivers or ocean is significant to protect the sea water ecosystem and to human health from radiation. Thirty-three sample of sediment have been collected from four ports in the Red Sea coast, Egypt for investigation by gamma-ray spectrometer using NaI(Tl) detector. The average and range activity concentrations of ^{226}Ra, ^{232}Th and ^{40}K were 26(5– 58), 19 (4–33) and 458 (16-2665) Bq.Kg^{-1} in Quseir Harbor, 30(14– 53), 20(14–34) and 430(378-511) Bq.Kg^{-1} in Abu-Tartour Harbour,. However, the average and range activity concentrations were 23(14– 35), 21(15–32), and 602(327-821) Bq.Kg^{-1} in Touristic Harbor and 14(5– 26), 13(2–23) and 489(36-950) Bq.Kg^{-1} in Hurghada harbor. These results were compared with reported ranges in the literature from other location in the world. The radiation hazard parameters; radium equivalent activity annual dose, external hazard were also calculated and compared with the recommended levels by UNSCEAR reports. Eight heavy metals (Fe, Mn, Ni, Co, Zn, Cu, Pb and Cd) have been measured and analyzed by atomic absorption spectrometer. The concentration for the investigated heavy metals overtakes the allowable limits recommended by the Canadian Environmental Quality Guidelines. Because there are no existing databases for the natural radioactivity in the sediment samples from Egyptian Red Sea ports, our results are a start to establishing a database for Red Sea harbours environment.

Keywords: Red Sea harbours – Natural radionuclides - Heavy metals - Marine Sediments- Egypt

Introduction

The Red Sea possesses a unique geography, as it is almost entirely locked by land, and its ecosystems are diverse, including mangrove, macro-algae and coral reefs (Alkershi and Menon., 2011). The Red Sea encompasses two gulfs, the Gulf of Suez and the Gulf of Aqaba, in addition to the Red Sea proper. The