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Uptake of Radioactivity by Marine Surface Sediments Collected in Ghazaouet, West Coast of Algeria

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Samples of surface marine sediments of different grain sizes collected in Ghazaouet, a small bay on the western coast of Algeria, have been examined to measure concentrations of natural and artificial gamma-emitting radionuclides. The aim of this study is to determine the level of radioactivity and its repartition in the sedimentary area. The samples analyzed by direct counting gamma spectrometry, showed relatively high activities for natural radioactivity and revealed measurable quantities of ^{137}Cs, ranging from 0.66–8.47 Bq kg^{-1} dry weight. In addition, some of the samples of different nature were sieved in different grain-sizes, to study the uptake of radioactivity. It is found that the sediments of less than 100 μm grain-size have the highest level of uptake of radioactivity. © 1998 Elsevier Science Ltd. All rights reserved

Introduction

Natural and man-made radionuclides in marine environment have different origins. The major source of natural radionuclides results from the weathering and recycling of terrestrial minerals and rocks that give rise to ^{40}K, ^{87}Rb, ^{232}Th, ^{235}U and ^{238}U. The latter three decay naturally to produce other important radioactive isotopes of elements, including: radium, radon, polonium and lead (IAEA, 1988). Sediments are known to be good receptacles of radioactivity compared with other marine materials. The uptake of radioactivity by marine sediments depends on the physical and chemical properties of radionuclides and on the grain-size of the sediment (NAS, 1971). The radioelements of interest in this study are ^{40}K, ^{238}U and ^{232}Th daughters and ^{137}Cs. Among the sediments collected, some of them were classified in different grain-sizes and then analyzed by direct counting gamma spectrometry.

Experimental Methods

Sampling locations

The Bay of Ghazaouet is located in the west coast of Algeria. An amount of 3 kg of surface sediment samples were collected from 25 seashore stations along the Bay, during March 1993, as shown in Fig. 1. (Azzam and Belkacem, 1994). The samples were brought to the laboratory, air dried and then dried at 100°C in an oven, crushed and homogenized prior to direct counting by gamma spectrometry.

Granulometry

The collected samples of different nature were classified according to they grain-sizes. They were dried in an oven at 75°C during 48 h washed free from salts with fresh water, and then sieved through a pore of less than 100 μm diameter. The remaining samples were again washed, dried in an oven at 75°C during 48 h, and then sieved through different pores ranging from 100 μm to 1000 μm. Three different classes were retained, these are (800–200) μm, (200–100) μm and <100 μm. Finally, radioactivity was determined in each of the collected samples and for some of them also in each class.

Radioactivity measurement

A number of 25 samples from fine to coarse grained sediments and the three classes of the 3 samples, collected at several points as shown in the previous section, were analyzed to determine ^{137}Cs,

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