7-th International Symposium on

IN SItu NUclear METrology as a tool for radioecology – INSINUME 2017

BOOK OF ABSTRACTS

24–28 April 2017
Ohrid, Macedonia

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An overview of time integrated measurements of indoor radon and thoron concentrations in Republic of Macedonia

Paper S4
O-25
Invited Talk

Stojanovska Z

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Radon, thoron and their decay products are the main sources of public exposure to ionizing radiation in indoor environment in most countries worldwide. Taking into account the health effects and their large scale variability, the investigation of radon and thoron concentrations in living and working environments still affords scientific attention. During last several years, a number of studies related to indoor radon and thoron concentrations in different indoor environments of Republic of Macedonia appeared as well in international literature. This presentation summarized published data and discussed radon and thoron temporal and spatial variability. The analysis of the factors which influence the concentrations variation is also reported. Apart from discussing this results, this presentation give an overview on the radon and thoron concentrations measured in the neighboring countries, ongoing and plans for further activities.

Keywords: indoor radon, indoor thoron, gas, spatial variability, temporal variability.

Spatial and temporal variability of soil gas radon concentration and permeability: study performed in Eastern part of Macedonia

Paper S4
O-26

Stojanovska Z[1], Boev B[2], Dimov G[2], Ajka S[3]

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The preliminary results of soil gas radon concentrations and permeability in situ measurements carried out in 39 primary schoolyards infour neighbouring municipalities of Eastern Macedonia are presented in this paper. At each location, the radon was sampled at 80 cm depth and measured by ionization chamber. Using the RADON-JOK equipment the measurement of permeability was performed in the same point. The infield campaigns wre conducted in January and June 2016. Radon concentrations and permeability ranged: from 7 to 84 kBq/m^3 and from $1.7 \cdot 10^{-13}$ to $7.8 \cdot 10^{-12}$ m^2 in January; and from 8 to 60 kBq/m^3 and from $2.5 \cdot 10^{-14}$ to $1.9 \cdot 10^{-11}$ m^2 in June. Spatial variations within investigated area expressed by the coefficient of variation were lower for radon concentrations than for permeability in both sets of measurements. The variations of radon were: 61% in January and 56% in June whereas 102% in January and 149% for permeability were obtained. The resulting radon potential of the measuring sites varied from 3 to 49 in January and from 2 to 38 in June. The correlation between observed values and its relation with lithostratigraphy was confirmed.

Keywords: Radon, soil gas, permeability, radon potential, lithostratigraphy.

Variation of ^{40}K, ^{238}U and ^{232}Th specific activities in soil within geological units of Republic of Macedonia

Poster
P-08

Stojanovska Z[1], Boev B[2], Ristova M[3], Dimov G[2]

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Territory of Republic of Macedonia (situated on 25.713 km^2) is roughly divisible in four geotectonic units: Western Macedonian Zone (WMZ), Pelagonian Massif (PM), Vardar Zone (VZ) and Serbo-Macedonian Massif (SMM) and one separate volcanic area: Kratovsko-Zletovska Area (KZA). In order to establish relation between terrestrial radioactivity in populated areas and the aforementioned geologically determined regions of the country, a total number of 200 soil samples from 20 cm depth were collected from regions around the major settlements and cities evenly from all the geotectonic units. After their standard preparation, the samples were subjected to high-resolution gamma spectrometry. The results of the analysis of the variance showed statistically significant differences among the specific activities (A) of ^{40}K, ^{238}U and ^{232}Th measured from soils of different geotectonic units. The following geometric mean (GM) values and geometric standard deviations (GSD) of (^{40}K), A(^{238}U) and A(^{232}Th) were obtained: 627 Bq/kg (1.38), 41 Bq/kg (1.44) and 40 Bq/kg (1.37) for WMZ; 620 Bq/kg (1.33), 52 Bq/kg (1.41) and 55 Bq/kg (1.42) for PM; 464 Bq/kg (1.51), 30 Bq/kg (1.48) and 30 Bq/kg (1.52) for VZ; 635 Bq/kg (1.36), 44 Bq/kg (1.44) and 41 Bq/kg (1.44) for SMM; 621 Bq/kg (1.25), 56 Bq/kg (1.22) and 51 Bq/kg (1.15) for KZA. Further analysis confirmed that these differences are related to the type of the rocks from which soils originate, and hence to the geological composition of each lithological area. Pairwise Comparison activity analysis of the three radionuclides, resulted in grouping of the soils into two major groups: the first one to be soils of volcanic origin, and the second one to be soils of metamorphic and sedimentary origin. It appeared that the GM values of $A(^{40}\mathrm{K})$ = 702 Bq/kg (1.27), $A(^{238}\mathrm{U})$ = 59 Bq/kg (1.32) and $A(^{232}\mathrm{Th})$ = 59 Bq/kg (1.42) in soil with volcanic origin were higher than activities in soils originating from metamorphic: $A(^{40}\mathrm{K})$ = 567 Bq/kg (1.56), $A(^{238}\mathrm{U})$ = 39 Bq/kg (1.47) and $A(^{232}\mathrm{Th})$ = 41 Bq/kg (1.46) and sedimentary $A(^{40}\mathrm{K})$ = 530 Bq/kg (1.45), $A(^{238}\mathrm{U})$ = 36 Bq/kg (1.52) and $A(^{232}\mathrm{Th})$ = 35 Bq/kg (1.52) rocks. Furthermore, the soils results were classified by lithostratigraphic units (23 samples for this study). It also appeared that they show a grouping tendency. According to the differences among $A(^{40}\mathrm{K})$, $A(^{238}\mathrm{U})$ and $A(^{232}\mathrm{Th})$ in the different lithostratigraphic units, the results were grouped into four groups.

Keywords: radionuclides, gamma spectrometry, soil, geology, lithostratigraphic units.