

Spatial distributions of radon isotopes in the Tien Shan (Almaty region) foothill regions and in the Neva lowland (St Petersburg region)

Friday, 24 September 2021 17:00 (5 minutes)

The territory of the Republic of Kazakhstan is characterized by a complicated radiation situation due to the active development of extractable natural resources (coal, non-ferrous metals and uranium), the geological features of the certain areas of ground surface, seismically activity and the highlands in the southern regions. In this context, radioactive gases and their decay products formed in uranium and thorium (natural radioactivity) decay chains have a big influence on the common radiation background. These radioactive elements, from the depths of the lithosphere, come into the surface atmospheric layer. Then, such radionuclides entered to the human body by the breathing processes and it is a main case for the human internal exposure. The exposure level is determined by the radionuclide mixture of the inhaled air which depends on a number of factors. The key role in this mixture is played by the radon isotopes and their decay products. There were discovered more than 30 radon isotopes, but only four of them are formed in nature: ^{222}Rn , ^{220}Rn , ^{219}Rn , ^{218}Rn , and only two isotopes: ^{222}Rn , ^{220}Rn are responsible for approximately 50% of the average annual effective dose of internal human exposure [1].

The natural radiation background in the regions of the Republic of Kazakhstan has average value approximately 3.1 mSv / year [2], and the total dose from natural and industry radioactive sources in average per person is about 4 mSv / year. This is in 1.5 times higher than the average dose accepted in the world for the human society [2]. In this case it has to be interesting to study of the radon isotopes spatial distribution in the foothill regions of the Tien Shan, located in the Almaty region. Because the tectonic faults and the mountain rocks are the additional sources of the radon emanations. On the other hand, there is an additional interest to compare the experimental data obtained in mountainous areas with the data of the radon distribution obtained in the Neva lowland at zero height above mean sea level (St. Petersburg region). An additional interest for the study of the radon formation processes is connected with the development of new buildings (in big and rapid growth cities) with the increased energy efficiency [3].

In present work the new data on spatial distribution of radon isotopes were obtained for the foothills of the Tien Shan (Almaty region) at different heights above mean sea level: from 600 to 2500 meters. Finally, the radon isotopes distribution map with the corresponding values of its concentration has been plotted. Similar experimental investigations were carried out in the Neva lowland area (St. Petersburg region). All the measurements were done at the altitude above the sea level which did not exceed 50 m. Based on the obtained values of radon concentration it was made the conclusion about spatial distribution of the radon isotopes in this region.

The reported study was supported by the Science Committee of the Ministry of Education and Science of the Republic of Kazakhstan (Grant No. AP09258978).

1. V.I. Zhrebchevsky, N.A. Maltsev, «Measurement of the content of radon and thoron in samples», SPB.: VVM Publishing House, ISBN 978-5-9651-1299-9, 2020.
2. Bersimbaev R.I., Bulgakova O. The health effects of radon and uranium on the population of Kazakhstan // Genes and Environment. –2015. –Vol.37. –Article number: 18.
3. Yarmoshenko, I.V., Onishchenko, A.D., Malinovsky, G.P. et al. Radon concentration in conventional and new energy efficient multi-storey apartment houses: results of survey in four Russian cities, Nature, Sci. Rep. 10, 18136 (2020). <https://doi.org/10.1038/s41598-020-75274-4>

Primary author: DYACHKOV, Vyacheslav (al-Farabi Kazakh National University, Almaty, Republic of Kazakhstan)

Co-authors: ZHEREBCHESKY, Vladimir (St. Petersburg State University); ZARIPOVA, Yuliya (al-Farabi Kazakh National University); MALTSEV, Nicolai (Saint-Petersburg State University); NESTEROV, Dmitrii (St Petersburg State University (RU)); PICHUGINA, Daria; PROKOFIEV, N.A.; MISHENEVA, V.M.; RAKHMATULLINA, Alina (St Petersburg State University (RU)); BIGELDIYEVA, Mirgul (al-Farabi Kazakh National University, Almaty, Republic of Kazakhstan); YUSHKOV, Alexander (al-Farabi Kazakh National University)

Presenter: DYACHKOV, Vyacheslav (al-Farabi Kazakh National University, Almaty, Republic of Kazakhstan)

Session Classification: Poster session

Track Classification: Section 8. Nuclear medicine.