

Abstract

HELEJ, MARKUS. Continuous methods of measuring radon isotopes in the atmosphere and their application [dissertation thesis]. Comenius University Bratislava. Faculty of mathematics, physics and informatics; Department of nuclear physics and biophysics. Supervisor: prof. RNDr. Jozef Masarik, DrSc., doc. RNDr. Karol Holý, CSc. Defence committee: Nuclear and subnuclear physics, Head of the committee: prof. RNDr. Jozef Masarik, DrSc. Graduate degree: Phd in nuclear and subnuclear physics. Bratislava : FMPI CU, 2024. 127 s.

The presented work deals with the measurement and study of the behavior of radon and its transformation products. It also supports and expands our knowledge about the behavior of dust particles contained in atmospheric aerosols. The work analyzes in detail the results from continuously recorded data on the volume activity of radon and equivalent volume activity from the years 2019 to 2022, spanning 36 consecutive months. By monitoring the behavior of the equilibrium factor F , it was found that the process of removing dust particles by wet and dry deposition exceeds the removal of radon by vertical transport into the atmosphere, but there are cases when this effect is suppressed under conditions of increased vertical mixing in the atmosphere. The residence time of atmospheric aerosol particles is a function of their removal from the atmosphere due to dry processes (diffusion, sedimentation, and resuspension) and wet deposition (precipitation). In this work, the estimation of the residence time of aerosols in the atmosphere was based on measurements of the activities of ^{210}Pb , radon, and radon transformation products (^{214}Pb and ^{214}Bi). When analyzing the daily fluctuations in the concentration of PM dust particles, it was found that they are higher on weekdays than on weekends. The temporal changes in the concentration of dust particles in the atmosphere of Bratislava for individual days of the week were described using a simple model, which was employed to estimate the daily anthropogenic contribution to the concentration of $\text{PM}_{2,5}$ in the atmosphere of Bratislava.

Keywords: ^{222}Rn , ^{218}Po , ^{214}Bi a ^{214}Pb , radon measurement methods, outdoor atmosphere, aerosole, $\text{PM}_{2,5}$, PM_{10} residence time, emission, dust particles