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Temporal variation of radon emanation and its relationship with natural external factors

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Monitoring radon concentration in the ground layers of the atmosphere of the human habitat is one of the urgent tasks in the field of radioecology and health care. Within the framework of the Sustainable Development Goals, healthy lifestyles, and promotion of well-being for all at any age, the UN declares the need for radon monitoring to assess the impact of this radioactive gas on public health [1]. As is known [2-4], the concentration of radon in the ground layers of the atmosphere is periodic and influenced by seasonal factors, as well as other factors depending on the Earth's position in space, the Sun, and the Moon. In addition to periodic components, radon activity contains elements that do not obey this pattern. In particular, such non-cyclic time variations in radon activity can also be formed due to earthquakes [5].

In this paper, the authors present data on the equivalent equilibrium volumetric activity (EEVA) of time variations of Rn-222 in the atmospheric surface layer, measured continuously in automatic mode over a period of 2.5 years with a measurement interval of 35 minutes. The measurements were carried out at the Faculty of Physics and Technology (al-Farabi Kazakh National University, Almaty), the building of which, according to the Institute of Seismology (Almaty), is located near a tectonic fault.

Autocorrelation was performed based on the obtained data, and correlation dependencies with solar activity data, cosmic rays, and earthquakes during the same period were calculated. The most probable temporary external factors influencing the activity of radon EEVA in the ground layer of the atmosphere of the human habitat eco-environment were identified. This, in turn, allowed for the estimation of the contribution to the annual effective dose of the population due to natural radiation from radon and its daughter decay products.

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