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RADIONUCLIDES IN DRY ATMOSPHERIC DEPOSITS IN 2020 IN THE CITY OF KARSHI

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Abstract: The dependence of the radionuclide composition of dry atmospheric fallout in the city of Karshi on natural and man-made factors was investigated by gamma-spectrometric method.

Keywords: radionuclide, dry precipitation, gamma spectrum, activity.

Introduction

The radioactivity of atmospheric fallouts is mainly due to the primary natural radionuclides (PERN) of the uranium-thorium families and ^{40}K contained in the dust lifted into the air, and the cosmogenic radionuclide (SCR) ^{7}Be (T1 / 2 = 54 days, Eγ = 478 keV, Qγ = 10%), formed in the upper atmosphere in the reactions of nuclear fission of nitrogen, oxygen, etc. the high-energy component of cosmic radiation, from where, as a result of atmospheric exchange processes, they are transferred to the surface layers of the air, are sorbed by aerosols and dust particles, and together with them fall onto the Earth's surface. The ^{7}Be activities in fallout depend on latitude (maximum at the poles, minimum at the equator) and geophysical conditions of the area. In wet precipitation (rain, snow), they are much higher than in dry precipitation (dust) (see, for example, [1] and the references contained in the literature).

In this work, the radioactivity of dry atmospheric fallouts sampled in October 2020 (before the start of the rainy season) in the city of Karshi was investigated by the gamma spectrometric method.

Methodological questions.

The selection of dry fallout (dust) was carried out by wiping with moistened pieces of gauze (2 m^2) sections of the flat surfaces of the roof of detached two-story buildings. In Tashkent, two plots with an area of 50 m^2 were wiped, in Samarkand - one with an area of 55 m^2 and in Karshi - two, with an area of 25 m^2.

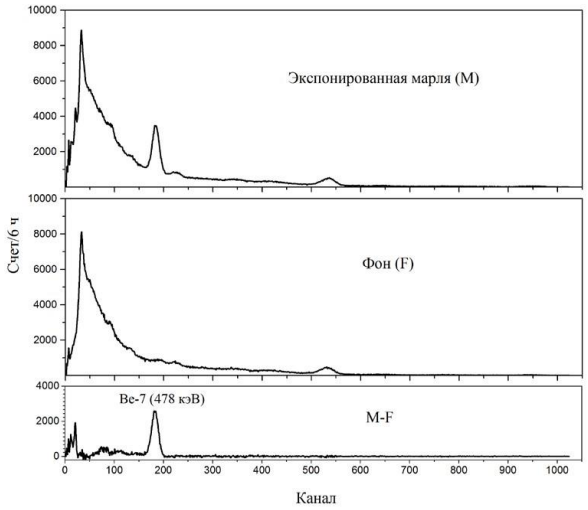

Fig. *Gamma-spectrum of the Karshi dust sample, background and component of SCR and PERN.*

Measurement samples are made from the specified pieces of gauze, packed, after drying, in one-liter Marinelli vessels.

The gamma spectra of the samples were measured on a scintillation γ-spectrometer with a NaI (Tl) crystal with dimensions of Ø63x63 mm, an energy resolution of ~ 10% at the 1332 keV ^{60}Co line. The duration of individual measurements is 6 h (Fig. 1).

The processing of γ-spectra and the establishment of the activities of radionuclides in the samples was carried out according to the method [2]. The relative errors in the established values of radionuclides do not exceed 15%. The values of radionuclide activities in parallel samples of Tashkent and Karshi coincide within the experimental errors.

The discussion of the results. The table shows the values of the specific activities of PERN ^{226}Ra, ^{232}Th, ^{40}K and KRN ^{7}Be in dry fallout, geographical coordinates of sampling

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sites and average values of air dust content in the period June-October 2017 in Tashkent, Samarkand and Karshi [3].

City	N, E, Z	Dust content μg / cm^3	A, Bq / m			
			^{226}Ra	^{232}Th	^{40}K	^{7}Be
Karshi	N38°52' E65°48' 374 м	0,0310	31	22	340	2,2

Consideration of the data given in the table for the city of Karshi shows:

- their northern latitudes decrease in sequence

$$N_t > > N_s \quad N_k \quad (1)$$

- dustiness of the air in sequence

$$C_t > > C_k \quad C_s \quad (2)$$

- activity of CRH ^{7}Be in the sequence

$$B_t > > B_k \quad B_s \quad (3)$$

- activity of PERN of uranium-thorium families in the sequence

$$R\,T_s\,,\,_s \geq R\,T_k\,,\,_k > R\,T_t\,,\,_t \quad (4)$$

- activity PERN ^{40}K

$$K_k > > K_s \quad K_t \quad (5)$$

Sequences (2) and (3) are the same because direct correlation between the activities of SCC ^{7}Be in dry fallout with dustiness of the air is obvious. As for the latitudinal dependence of the ^{7}Be activity (1), it is violated by superimposing the prevailing dependence on the dust content of the air on it.

Sequences (4) and (5) can be associated with the fact that the dustiness of the air is due to two components:

- natural, the radioactivity of which is due to the content of PERN in the earth's dust raised in the surface layers of the air; its intensity depends on the geographical characteristics of the area; Tashkent is located in the center of a large oasis, unlike Karshi and Samarkand, bordering on arid zones, therefore, the intensity of the natural component of dustiness in the air in it should be noticeably lower.

- techno genic, the radioactivity of which is due to radionuclides in the atmospheric emissions of industrial enterprises and vehicles, which are highly depleted in relation to the natural component, PERN of uranotorium families; As for the high activities of PERN ^{40}K in Karshi, they can be associated with the activities of the largest in Central Asia, the Dekhkanabad plant of potash fertilizers (Kashkadarya region).

Obviously, this assumption requires a more detailed study.

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