

RADIOACTIVITY OF RAIN (SAMARKAND , 2007 – 2008)

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The radioactivity of atmospheric precipitations in initial period mainly is caused by short-lived daughter radionuclides (RNs) - ^{214}Pb (26,8 min) and ^{214}Bi (19,7 min) and also by exhalation of ^{222}Rn (3,83 d) from Earth surface.

In current work concentrations of ^{214}Pb and ^{214}Bi in rain were determined using scintillation γ -spectrometer (NaI(Tl), $\varnothing 63 \times 63$ mm, $\Delta E_{\gamma} \sim 10\%$ for $E_{\gamma} = 1332$ keV) and standard source of ^{226}Ra from OMACH set. The technique (Fig.1) consists of followings:

- rain was sampled from the building's drain into one liter Marinelli beaker, selection time $\theta = 0,8 - 6$ mins

- in consecutive order several measurements ($i=1,2,\dots$, duration- $\tau=30$ min) of γ -spectra $S_i = P_i + B_i + L$ of samples were done

- comparing spectra, $V_1 = S_1 - S_{10} = P_1 + B_1$ и $V_2 = S_2 - S_{10} = P_2 + B_2$, the spectrum $x B_1 = (V_2 \exp \lambda_p \tau - V_1)$ was determined, where λ_p is a decay constant of ^{214}Pb and then empirically picking up the value of f , $P_1 = V_1 - f x B_1$ and $B_1 = V_1 - P_1$ were determined;

- comparing P_1 and B_1 with spectrum of standard source of ^{226}Ra $R = P_0 + B_0 + r$, where P_0 and B_0 are correspondingly balanced components of ^{214}Pb and ^{214}Bi and then picking up coefficients p_1 and b_1 the component of γ -radiation 186 keV ^{226}Ra - $r = R - b_1 B_1 - p_1 P_1$ was determined;

- values p_1 и b_1 allowed to determine the number of decay in $i=1$ measurements of ^{214}Pb - $\Delta A_1^P = A^* \tau^* / p_1$ and ^{214}Bi - $\Delta A_1^B = A^* \tau^* / b_1$, where A^* and τ^* - are activity and duration of measurement of standard source of ^{226}Ra ;

- Comparing $\Delta A_1^B / \Delta A_1^P$ with calculated data the time interval from $t_0 = 0$ (averaged start radioactive balance breakdown between ^{214}Pb and ^{214}Bi in probe) to t_1 (start of $i=1$ measurements) and then equilibrium activity $A_0^P = A_0^B$ (Fig 2).

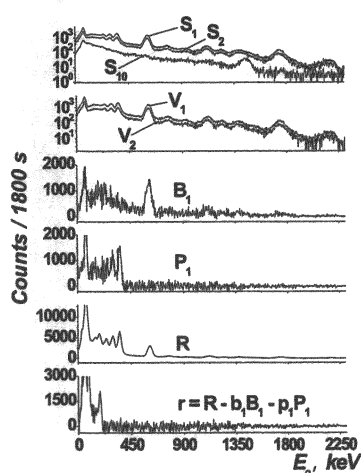


Fig. 1. γ - spectra of rain samples S_1 (28-58 min), S_2 (58-88 min) and S_{10} (298-328 min), components V_1 , V_2 , P_1 , B_1 and γ - are spectra of standard source of ^{226}Ra .

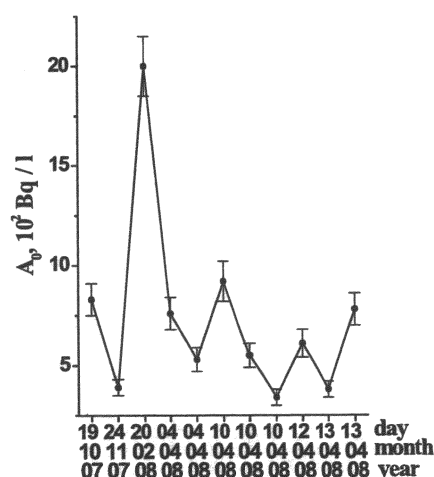


Fig. 2. Values of equilibrium activities of ^{214}Pb and ^{214}Bi .