The comparative analysis of variations of background radiation components and atmospheric electrical parameters

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Interest to investigation of natural background radiation levels is caused by the need to assess the role of ionizing radiation variations in the dynamics of aerosol atmosphere. The main purpose of the work was a comparative evaluation of the spectral-temporal variations of the ionizing radiation measured at series of heights and depths, and identification of their mutual relations with meteorological and electrical parameters of the surface layer. The monitoring method and equipment are detail described in [1].

3-years experiment in Tomsk revealed that variations of β-background radiation of atmosphere are relatively poorly associated with pressure variations of synoptic-scale and is closely related to daily variations of temperature and moisture. Annual behavior of β-background changes from year to year as opposed to γ-background for which the maximum is observed in November and a minimum in February and March. Synchrony in the dynamics of β- and γ-radiation fields was registered in summer-autumn period.

In soil, the duration of increase of background radiation component levels was from 6 up to 12 hours, the duration of recovery was about some days. Variations of α-, β-and γ-radiation in atmosphere and soil with a one-day period were in opposition. Relationship of variations of atmospheric meteorological parameters and subsurface radiation components has fundamentally different nature in winter and summer conditions. Namely, in winter pressure increase is accompanied by an increase in the subsurface radiation components but in summer there is no such relationship between them. Typical example of the dynamics of atmospheric (height) and subsurface (depth) components of β-background in early winter is represented in Fig. 1. Here are the variations of: β-background levels at a height of 10 m (h=10 m) and at a depth of 50 cm (h=-0.5 m); positive and negative conductivities (light ions) $\lambda_{\pm}$ (data1 – λ_-; data2 – λ_+), pressure ***P*** and temperature ***T***.

If for $\lambda_{\pm}$ the correlation with variations of pressure is negative, then the β-background in the soil it is positive. A situation with variations in the temperature is reversed: the correlation between above mentioned parameters and the temperature changes its sign compared to the pressure. β-background radiation in the air rise sharply with amplitude of up to several hundred percent and duration from a few hours to half a day with changing pressure (temperature). Temporal variations of β-radiation in soil are not some hours but some days.

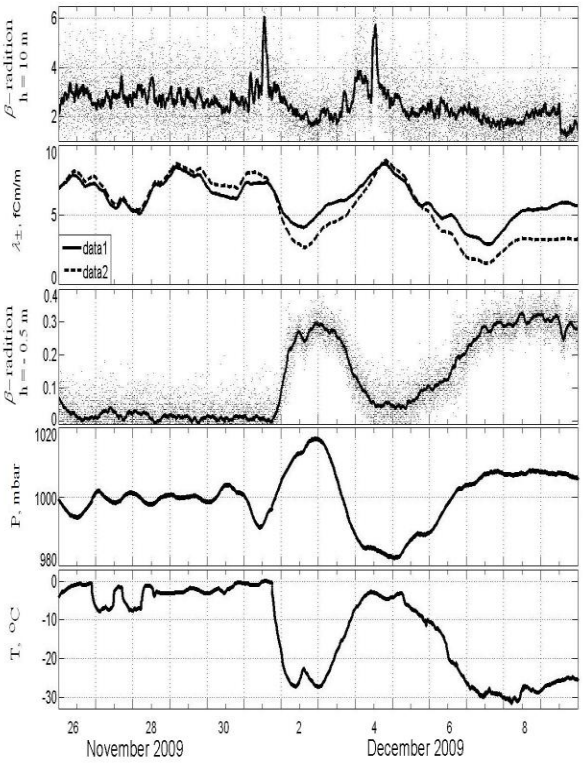

Figure 1. Variations β-background radiation and meteorological parameters in winter season

3-years monitoring revealed some important futures in variations of background ionizing radiation at series of heights and depths during such events as heavy rainfall.

It was also observed that on synoptic and annual scales the variations of atmosphere γ-background and the neutron component of cosmic rays are closely related with atmospheric pressure changes. As a result, cyclonic activity leads to concerted fluctuations in the γ-background levels of terrestrial origin and cosmic rays, and the restructuring of the atmospheric circulation in large areas, which is related with global climate changes, leads to concerted changes in the γ-background level.

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