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[Abstract]

Exploration of AIR profile by meteorological balloons

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Abstract: Scientists have performed different kind of measurements with various experimental setups for more than 100 years in order to explore in detail the atmospheric ionizing radiation (AIR) profile. The common feature of all previous AIR measurements is the presence of continuous intensity increase of ionizing components along the atmospheric vertical profiles up to the well-known Regener-Pfotzer (RP) maximum appearing between 16-25 km altitudes.

In this study, peaking in ionizing radiation intensity in the atmosphere was registered below 10 km altitude, exceeding for more than 20 times the values at these heights from previous measurements by meteorological balloons (or in any other way lifted detectors into the atmosphere), as well as from simulations. We confirmed these findings by three independent measurements performed by detectors equipped with ultra-thin mica windows. The registered anomaly was

observed at altitude ranging from 5-8 km, in a very narrow altitude region (around 300 m).

Monte-Carlo simulations of propagation of cosmic rays through the atmosphere were performed, searching for possible increase in number of detected events at certain altitudes (10 km, 8 km, and 5 km) due to air-shower developments. Unlike our experimental results, the simulation results did not show an enhance in the number of cosmic ray produced secondary particles at certain altitudes (5 km or 8 km) relative to the 10 km altitude.

Results presented in this study will have broad impact on better understanding of the ionizing radiation production mechanism in the atmosphere, as well as on its dose consequences.

Keywords: atmospheric effects, atmospheric ionizing radiation, meteorological balloons, ultra-thin window GM tube, vertical ionization profile