Contribution ID: **8** Type: **Original Talk**

Calculation of geomagnetically trapped proton flux from the PAMELA experimental data.

Wednesday, 28 June 2023 15:00 (15 minutes)

The special interest to the estimation of trapped proton intensities in low-altitude region of the near-terrestrial space environment concerns their effects on numerous robotic and manned missions. The main part of radiation exposure comes from the space region where the trajectory of mission orbit pass through the South Atlantic anomaly (SAA).
At present time, the nature of long-term magnetic trapping of protons is well established. The main sources of trapped protons are cosmic ray albedo neutron decay (CRAND) and injected solar protons. The contribution from solar protons prevail at energies <100 MeV and L>1.3, while the influence of CRAND dominates otherwise. Inelastic nuclear scattering, energy transfer to plasma electrons and ionization of the neutral atmosphere, provides the losses.
Recently the measurements of the geomagnetically trapped proton fluxes for the kinetic energy interval ranging from 80 MeV to the highest trapping energies (2 GeV) were fulfilled by the PAMELA mission at low Earth orbits (350 ÷ 610 km). Protons flux properties were investigated in detail, providing a full characterization of the particle radiation in the SAA region, including locations, energy spectra, and pitch angle distributions.
To analyze data the standard approach developed in 1995 by SAMPEX team was introduced. To reconstruct the intensities of trapped particles, the effective areas, averaged over gyro phase angle, are calculated as function of pitch angle for different instrument orientations respective geomagnetic field vector. Therefore, the numerous simulations are fulfilled varying pitch angle and telescope axis orientation angles in steps (energy bins varying is separate point).
In this report, we propose another variant of trapped particles intensity reconstruction. Instead of multiple effective area calculations, the value of effective acceptance is estimated for fixed instrument orientation and pitch angle from one simulation sample (for given energy bin) of data in ordinary way with isotropic flux incidence. In this procedure, the additivity of acceptance for different regions of allowed directions is used.

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Session Classification: Cosmo- and geophysical aspects of cosmic rays at the ground level

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