PRIMARY COSMIC RAYS AND TRAPPED RADIATION AS THE SOURCES OF THE POSITRON FLUXES IN THE EARTH'S VICINITY

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The production of positron and electron fluxes due to nuclear reactions of cosmic rays and trapped particles in the Earth's magnetosphere is considered. It is supposed that positrons as well as electrons are mainly produced in the decay of charged pions $p^{\pm} \to m^{\pm} \to e^{\pm}$, which are born in nuclear collisions of relativistic protons with the residual atmosphere constituents. These positrons and electrons are captured in the magnetosphere and create positron and electron radiation belts of nuclear reaction origin. We simulated the positron and electron trapped magnetospheric fluxes as due to the radiation belt proton source modeled by AP-8 through reactions and decay schemes and obtained the e^+/e^- flux ratios dependent on positron energy and close to ~ 4. However, this excess is absent when we considered the primary and secondary cosmic ray proton fluxes observed in equatorial region as a positron flux source in our simulations. Interestingly, the Alpha Magnetic Spectrometer (AMS) on board the space shuttle, in the equatorial region at altitudes of ≈ 400 km (The AMS collaboration, 2000), registered quasi-trapped positron fluxes with intensities about 4 times higher than the electron fluxes at energies above 200 MeV and with e+/e- flux ratio dependent on positron energy. This agreement between the e^+/e^- flux ratio and its energy dependence calculated on the basis of AP-8 model and the AMS observations is good.
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