ON THE INTERNAL BOUNDARY CONDITION'S PROBLEM FOR THE PARKER'S TRANSPORT EQUATION OF GALACTIC COSMIC RAYS

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Parker's 2-dimentional non-stationary transport equation has been numerically solved to investigate the influence of two different radial internal boundary conditions on the anisotropy and the 11-year variations of galactic cosmic rays. The first radial internal boundary condition, a) $\left.\frac{df}{dr}\right|_{r=0} = 0$ (where f is relative density of galactic cosmic rays and r - radial distance from the Sun) was obtained from the widely accepted assumption of the axially symmetric distribution of the density of galactic cosmic rays, while the second one, b) $\left.\frac{df}{dr}\right|_{r=0} \neq 0$, has been obtained from the differential equation with the singular point (the singular zero point is correspond to the Sun's location). Transport equation with drift has been numerically solved using the Crank-Nicholson's grid method for both radial internal boundary conditions and for the various ratios of the perpendicular and parallel diffusion coefficients of galactic cosmic rays depending on the spatial coordinates and time. It was shown that for the variations of galactic cosmic rays with the small amplitudes (less than ~0.2 %), e.g., for the diurnal and semidiurnal variations, the selection of the internal boundary condition is certainly considerable, while for the cosmic ray variations with the amplitudes greater than 0.5% the distinction between the theoretical results obtained for the different radial internal boundary conditions is negligible. Thus, the Parker's transport equation of galactic cosmic ray propagation must be solved with the second radial internal boundary condition, $\left.\frac{df}{dr}\right|_{r=0} \neq 0$, obtained without any additional physical assumption from the differential equation with the internal singular point.