Modeling of the recurrent Forbush effect of the galactic cosmic ray intensity and comparison with the experimental data

A.Wawrzynczak (1), M.V. Alania (2,3)

(1) Institute of Computer Science of University of Podlasie, Siedlce, Poland, (2) Institute of Math. And Physics of University of Podlasie , Siedlce, Poland, (3) Institute of Geophysics, Georgian Academy of Sciences, Tbilisi, Georgia,

We developed a new three dimensional (3-D) steady-state model of the recurrent Forbush effect of the galactic cosmic ray (GCR) intensity using Parker's transport equation. New code for the solution of the transport equation is realized by C++ and needs less time for computations than the FORTRAN variant. Convection, diffusion, drift and energy change of the GCR particles in the diverged solar wind are taken into account in the modeling. Changes of the strength of the interplanetary magnetic field (IMF) and the power spectral density (PSD) of the IMF's turbulence in the range of frequencies $\sim 10^{-6}$ – 10^{-5}Hz versus the radial distance, heliolatitudes and heliolongitudes are the sources of the recurrent Forbush effect of the GCR intensity. The state of this range of the frequencies $\sim 10^{-6}$ – 10^{-5}Hz of the IMF's turbulence is responsible for the intensive diffusion of the GCR particles of the energy 5-50 GeV (responding by neutron monitors) and for a peculiarities of the rigidity spectrum of the Forbush effect. Results of the modeling calculations (time profile, amplitude, rigidity spectrum) are compatible with the experimental data of the Forbush effects of the GCR intensity observed by neutron monitors in the positive (A$>$0) and in the negative (A$<$0) periods of solar magnetic cycle.