THE ASYMMETRIC HELIOSPHERE'S ROLE IN THE 27-DAY VARIATIONS OF GALACTIC COSMIC RAYS

M.V. Alania (1, 2), D.G. Baranov (3), A. Gil (1), M.I.Tyasto (4), E.S.Vernova (4)

1. Institute of Mathematics and Physics of University of Podlasie, Siedlce, Poland
2. Institute of Geophysics, Georgian Academy of Sciences, Tbilisi, Georgia
3. Ioffe Physico-Techn. Institute, Russian Academy of Sciences, St. Petersburg, Russia
4. IZMIRAN, Russian Acad. of Sciences, St. Petersburg Branch, St. Petersburg, Russia

alania@ap.siedlce.pl

27-day variations of galactic cosmic rays were studied on the base of neutron monitor data for different epochs of solar activity. It is shown that in maximum epochs of solar activity the inversion of the Sun's global magnetic field is accompanied by drastic changes both in the solar activity distribution and in the galactic cosmic rays variation. Comparison of the 27-day galactic cosmic rays variation with the North- South asymmetry of the sunspot distribution was carried out for different periods of the solar cycle. The amplitude of the 27-day variation of galactic cosmic rays is greater in qA>0 magnetic cycle than in the qA<0 cycle. In order to study an influence of the heliolatitudinal asymmetry of the heliosphere on the 27-day galactic cosmic rays variation 3-dimentional Parkers transport equation with drift has been numerically solved for different solar magnetic cycles, qA>0 and qA<0. The heliolatitudinal asymmetry of the heliosphere has been taken into account by changing of the location of the flat heliospheric current sheet with respect to the helioequator. A solution of the 3-dimentional Parker's transport equation was conducted for the locations of the heliospheric current sheet at the helioequator and at different latitudes of the southern hemisphere, - 5°S, - 10°S and – 15°S and for the various ratios of the perpendicular and parallel diffusion coefficients of galactic cosmic rays depending on the spatial coordinates. It is shown that the expected amplitudes of the 27-day galactic cosmic rays variations at the Earth's orbit (for the energy of 10 GeV) decrease when the heliospheric current sheet is shifting to the southern hemisphere. There were obtained very complicated features of the 27-day galactic cosmic rays variation when the heliolongitudinal asymmetry of the solar wind velocity has maximum at the helioequator, but heliolongitudinal asymmetry of the magnetic field - at the heliospheric current sheet.