Features of long-term variations of galactic cosmic ray intensity

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We use data of neutron monitors to calculate the temporal changes of the rigidity spectrum of the galactic cosmic ray (GCR) isotropic intensity variations for the four ascending and four descending phases of solar activity (1960–2002) including different the positive (A$>$0) and the negative (A$<$0) periods of solar magnetic cycle. The soft rigidity spectrum of the GCR isotropic intensity variations for the maximum epoch and the hard rigidity spectrum for the minimum epoch obtained by the world-wide network of neutron monitors data can be ascribed to the existence of the essential rearrangement of the structure of the interplanetary magnetic field (IMF) turbulence in the range of the frequencies (10^{-6} – 10^{-5})Hz in the course of 11–year cycle of solar activity. Two-dimensional (2-D) model with drift on the warped heliospheric neutral sheet including all other general processes of modulation of GCR is developed based on the Parker's transport equation to describe the 11–year and 22 –year variations of GCR intensity. We show that the relationships between the changes of the rigidity spectrum of GCR intensity variations and the time profile of the GCR intensity is almost universal in the A$>$0 and the A$<$0 periods and is caused by the changes of the IMF turbulence from the minima to maxima epochs of solar activity; an exception is the descending period of solar activity (1971–1976) when this relationship was violated due to anomaly recovery of the GCR intensity for the different energy range owing to the Sun's global magnetic field reversal in 1970–1971.