ICRC2015

ICRC
The Astroparticle Physics Conference
34th International Cosmic Ray Conference
July 30 - August 6, 2015
The Hague, The Netherlands

Contribution ID: **477** Type: **Oral contribution**

Influence of region behind the shock front on acceleration of solar energetic particles

Saturday 1 August 2015 11:00 (15 minutes)

Acceleration of solar energetic particles by the shock accompanying a coronal mass ejection is considered. Influence of the region behind the shock front on particle acceleration process is investigated. The external boundary of coronal mass ejection and the shock front are specified as the segments of spherical surfaces with the different radii moving in coordination. Nonstationarity of process, spherical symmetry and adiabatic losses of particle energy in the extending environment are considered in the calculation. The propagation velocity of solar wind is determined by the conservation of matter stream taking into account the known distribution of matter density. Scatterings of solar energetic particles are carried out by Alfven waves moving radially from and to the Sun. The parameters determining the coefficient of particle diffusion are chosen taking into account the available results of theoretical calculations and indirect measurements. Influence of the accelerated particles on dynamics of the system and the turbulence level of the magnetic field isn't considered. The performed numerical calculations show that the influence extent of the region behind the shock front on acceleration process is determined by a ratio between coefficients of particle diffusion in regions behind and before the front. In that case when these coefficients are comparable: 1) rate of acceleration significantly decreases; 2) the considerable part of the accelerated particles is behind the shock front; 3) at the same time few of the accelerated particles with the maximum energies reaches the ejection surface.

Collaboration

– not specified –

Registration number following "ICRC2015-I/"

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Session Classification: Parallel SH 03 SEP II

Track Classification: SH-TH