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Modulation of the galactic proton energy spectrum in the inner heliosphere

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Abstract content

The energy spectra of protons in the 1-100 MeV range are studied under quiet solar activity periods during the 21st - 23rd cycles using data sets from near- Earth spacecraft. A series of low-flux spectra is approximated by the form J(E) =AE(ˆ-g)+CEˆn, the two terms describing solar/heliospheric and galactic components, respectively. By determining the best fitting parameters to the energy spectra, we obtain that n has a mean value of 1.3 +- 0.15, significantly steeper than the linear spectrum predicted by the force-field approximation. In modulation theories n > 1 corresponds to a negative Compton-Getting factor posing a challenge. Such inversion may occur if the radial diffusion coefficient kappa(rr) < rV (r is radial distance and V solar wind speed), then, most of the lower energy particles reaching 1 AU have been cooled down within 1 AU and are subsequently convected outward by the solar wind. The probability distributions of n values exhibit two-peak structure and depend on the heliomagnetic cycle phase, being different for odd and even cycles. Correlations made with solar activity indicate that the spectral slope slightly decreases with increasing solar activity whereas n seems to reflect drift processes in the heliosphere. Possible interpretations are discussed.

If this papers is presented for a collaboration, please specify the collaboration

Summary

Reference

Proceedings of the 30th International Cosmic Ray Conference; Rogelio Caballero, Juan Carlos D'Olivo, Gustavo Medina-Tanco, Lukas Nellen, Federico A. Sánchez, José F. Valdés-Galicia (eds.); Universidad Nacional Autónoma de México, Mexico City, Mexico, 2008; Vol. 1 (SH), pages 651-654

Primary author(s) : Dr. KECSKEMETY, Karoly (KFKI RMKI)

Co-author(s) : Prof. LOGACHEV, Yu.I. (Moscow State University); Dr. ZELDOVICH, M.A. (Moscow State University); Dr. KOTA, J. (University of Arizona, Tucson)

Presenter(s) : Dr. KECSKEMETY, Karoly (KFKI RMKI)

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