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Comparison of theoretical and experimental values of the decay rate of SEP events

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Abstract content

The majority solar energetic particle events exhibit exponential-law decays for few-MeV protons. Profiles of mid-relativistic electrons, however, are of predominantly power-law shape. The comparison of experimental values of decay times, $\tau(\text{obs})$, with those obtained in theoretical models considering convection transport and adiabatic deceleration shows that the expected values $\tau(\text{theor})=3r/4V(1+g)$ (V the solar speed, g spectral exponent, r radial distance), are within about 25 % to fitted slopes in about half of all cases where the solar wind speed stays approximately constant. The events where $\tau(\text{obs})$ is significantly different from theoretical values might be explained by the variation of magnetic connection between the observer and the source through the decay due to the solar rotation the flare site approaches to (Eastern flares) or diverges from (Western flares) the observer's footpoint and consequently $\tau(\text{obs})$ increases or decreases as compared to $\tau(\text{theor})$. In a couple of cases, however, this correlation between $\tau(\text{theor})$ and $\tau(\text{obs})$ fails, which can be due to that the flare site and the place of particle escape from the Sun are different, or might indicate incorrect association between particle event and parent flare. Using SOHO COSTEP data, simultaneously measured proton and electron decays are analyzed and the parameters compared.

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'Olive, 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 139-142

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