ENERGETIC ELECTRON SPECTRA IN SOLAR ENERGETIC PARTICLE EVENTS ASSOCI

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We considered energetic electron intensities and spectra in solar energetic particle (SEP) events after flare/coronal mass ejection (CME) associations and after flares only using measurements onboard various spacecraft (s/c) at radial distances of 0.3-1.5 AU during the 21st and 22nd solar activity cycles. Statistics included about a hundred events of both types. More than 50 events of each type were observed simultaneously at different points of the inner heliosphere. So it was possible to compare electron spectra at different radial distances and azimuthal angles relative to the proposed source. Energy spectra in the range 0.3 to 3.0 MeV were generated from maximum flux at each energy taking into account the electron response function of the instruments, especially in the case of the Helios s/c. We consider the relationship between the spectral shapes of events and CME speeds and angular widths and obtained that electron spectra become harder with CME speed, V and correlate with V stronger than with flare duration and intensity. The best correlation between the exponent of integral electron spectrum, k and V was obtained in the case when the observer`s magnetic footpoint was in the limits of CME angular width and the best fit approximation of k(V) looks as k~V**-0.5 with k and V in the range of 4.5-1.5 and 500-2000 km/s, correspondingly. Dependencies obtained were tested using the results of the SOHO energetic particle measurements. We may conclude that CMEs and CME-driven shocks are essential factors for electron acceleration and injection in SEP events.