The Dependence of Characteristic Times of Gradual SEP Events on Their Associated CME Properties

Z. H. Pan, C. B. Wang, X. H. Xue, and Yuming Wang

School of Earth and Space Sciences, University of Science and Technology of China, Anhui, China (Zhpan3@mail.ustc.edu.cn, cbwang@ustc.edu.cn)

It is generally believed that coronal mass ejections (CMEs) are the drivers of shocks that accelerate gradual solar energetic particles (SEPs). One might expect that the characteristics of the SEP intensity time profiles observed at 1 AU are determined by properties of the associated CMEs such as the radial speed and the angular width. Recently, Kahler statistically investigated the characteristic times of gradual SEP events observed from 1998-2002 and their associated coronal mass ejection properties (Astrophys. J., 628: 1014–1022, 2005). Three characteristic times of gradual SEP events are determined as functions of solar source longitude: (1)T_0, the time from associated CME launch to SEP onset at 1 AU, (2)T_R, the rise time from SEP onset to the time when the SEP intensity is a factor of 2 below peak intensity, and (3)T_D, the duration over which the SEP intensity is within a factor of 2 of the peak intensity. However, in his study the CME speeds and angular widths are directly taken from the LASCO CME catalog. In this study, we analyze the radial speeds and the angular widths of CMEs by an ice-cream cone model, and re-investigate their correlationships with the characteristic times of the corresponding SEP events. We find T_R and T_D are significantly correlated with radial speed for SEP events in the best-connected longitude range, and there is no correlation between T_0 and CME radial speed and angular width, which is consistent with Kahler's results. On the other hand, it's found that T_R and T_D are also have significantly positive correlation with angular width in the best-connected longitude range.