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Modelling the east-west asymmetry of energetic particle fluence in large solar energetic particle events using the iPATH model

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Simultaneous observations of large Solar Energetic Particle (SEP) events by multiple spacecraft located near 1 AU during solar cycle 24 have shown an east-west asymmetry of the peak intensities of SEPs with respect to the source flare locations. Using the 2D improved Particle Acceleration and Transport in the Heliosphere (iPATH) model, we consider multiple cases with different solar wind speeds and eruption speeds of the Coronal Mass Ejections (CMEs) and fit the longitudinal distributions of time-averaged fluence by Gaussian functions in 8-, 24- and 48-hour respectively. The simulation results are compared with a statistical study of 28 3-spacecraft (SC) events. The east-west asymmetry shows a clear time-dependent and energy-dependent evolution. We suggest that the east-west asymmetry of SEP fluence (and peak intensity) is a consequence of the combined effect of an extended shock acceleration process and the evolution of magnetic field connection to the shock front. Our simulations show that the solar wind speed and the eruption speed of CMEs are essential factors for the east-west fluence asymmetry.