Dynamic Simulation of Radiation Belt Electrons Transport in High-Speed-Stream Storms in the Declining Phase of the Solar Cycle

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In this paper we study the variation of relativistic electron phase-space density (PSD) using a radiation belt transport model, for high-speed-stream (HSS) declining-phase magnetic storms. These storms are especially important because they produce some of the largest sustained enhancements of radiation belt electrons. We use a radial diffusion model with a time-dependent radial diffusion coefficient parameterized by *Kp* from *Brautigam and Albert*, a time-dependent geosynchronous orbit boundary condition, and a *Kp*-dependent loss term. The Hilmer-Voigt magnetic field model is used to obtain PSD on the equatorial plane. The results show that radial diffusion can propagate outer boundary variations into the heart of the outer radiation belt, resulting in PSD increases during the recovery phase. The results are qualitatively consistent with satellite observations, but the growth rates of the model PSD at R= 4.2 R$_E$ are slightly larger than observed values. If we artificially divide the Brautigam-Albert radial diffusion coefficient by a factor of 2, the simulation results are in better agreement with the observations. Finally, we explore the sensitivity of the simulation results to the underlying magnetic field model by repeating the calculations using the Tsyganenko 2001 magnetic field model and a dipolar magnetic field. The main differences in the simulation results for different magnetic field models occur during the main phase and early recovery phase of the model storm. The results suggest that the Brautigam-Albert formula for D_{LL} may slightly overestimate the radial diffusion rate for these HSS storms, partly because it was based on a magnetic field model which did not include the ring current field.