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Observations and Quasi-linear Fokker-Planck Simulations of the Quiet Decay of Radiation Belts Electrons in March 2013

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We present dynamic Fokker-Planck simulations of the electron radiation belts and slot formation during the quiet days that can follow a storm. Simulations are made for all energies and L-shells between 2 and 6 in the view of recovering the Van Allen Probes observations of particular events. Pitch angle diffusion is essential to energy structure of the belts and slot region. Pitch angle diffusion is computed from data-driven spatially and temporally-resolved whistler mode hiss wave and ambient plasma observations from the Van Allen Probes satellites [1]. The simulations are performed either with a 3D formulation (Verb-3D based) that uses event-driven pitch angle diffusion coefficients [1] or with a simpler 1D reduced Fokker-Planck equation based on losses computed from event-driven lifetimes [2]. Validation is carried out globally at a 8h rate during 12 days with the use of Magnetic Electron and Ion Spectrometer (MagEIS) Level 2 and Level 3 electron flux measurements. Numerical results are complemented with a sensitivity study involving different radial diffusion coefficients, electron lifetimes, and pitch angle diffusion coefficients. We discuss which models allow us to recover the observed "S-shaped" energy-dependent inner boundary to the outer zone that results from the competition between diffusive radial transport and losses from wave-particle interactions [1, 2]. Periods when the plasmasphere extends beyond L ~ 5 favor long-lasting hiss losses from the outer belt. Through this study, we explain the full structure in energy and L-shell of the radiation belts and the slot formation by hiss scattering during quiet storm recovery.

1. J.-F. Ripoll, O. Santolík, G. D. Reeves, W. S. Kurth, M. H. Denton, V. Loridan, S. A. Thaller, C. A. Kletzing, and D. L. Turner, “Effects of whistler mode hiss waves in March 2013”, *J. Geophys. Res. Space Physics*, **122**, 2017, doi:10.1002/2017JA024139.

2. J.-F. Ripoll et al., “Reproducing the observed energy-dependent structure of Earth’s electron radiation belts during storm recovery with an event-specific diffusion model”, *Geophys. Res. Lett.*, **43**, 5616–5625, 2016, doi:10.1002/2016GL068869.