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Long-term VERB code simulations of ultra-relativistic electrons and comparison with Van Allen Probes measurements

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In this study, we compare long-term simulations performed by the Versatile Electron Radiation Belt (VERB) code with the Van Allen Probes observations. The model takes into account radial, energy, pitch-angle and mixed diffusion, losses into the atmosphere, and magnetopause shadowing. We include scattering by hiss and chorus based on a recently developed statistical models of VLF/ELF waves obtained from EMFISIS instrument. We consider the energetic (>100 KeV), relativistic (∼0.5-1 MeV) and ultra-relativistic (>2 MeV) electrons. One year of relativistic electron measurements are well reproduced by the simulation during a period of the various geomagnetic activity. However, for ultra-relativistic energies, the VERB code simulation significantly overestimates electron phase space density. Since the additional loss is required only at very high energies we conclude that EMIC waves is the most likely additional source of scattering that could explain observed decay rates.