Title:

Modeling Relativistic Electron Dropout in the Outer Radiation Belt During the 31 December 2016 Storm

Abstract:

Magnetopause shadowing (MPS), electromagnetic ion cyclotron (EMIC) wave scattering, and field line curvature (FLC) scattering could contribute to the dropout of radiation belt electrons. However, systematic coupling of these loss mechanisms during the relativistic electron dropout events has not been incorporated in previous radiation belt modeling. In this study, we model the dropout of outer belt electrons observed by the Van Allen Probes on 31 December 2016, considering various loss mechanisms. The model captures the electron dropout features when both MPS and EMIC wave scattering are included. MPS dominates the electron loss at high equatorial pitch angles at radial distances farther away from Earth, while EMIC wave scattering primarily contributes to the loss at low equatorial pitch angles over a wide *L*-shell region in the outer radiation belt. In contrast, the FLC effect is found to play a negligible role in the dropout. Our model results show that physical parameters quantifying MPS, along with more realistic EMIC wave properties, are required for accurate reproduction of the observed dropout.