Understanding the longitudinal distributions of quasi-trapped energetic electrons at L=1.7

Zheng Xiang[1], Xizi Liuyang[1], Binbin Ni[1], Xinlin Li[2,3]
[1] Department of Space Physics, Wuhan University
[2] Laboratory for Atmospheric and Space Physics, University of Colorado Boulder
[3] Department of Aerospace Engineering Sciences, University of Colorado Boulder
e-mail (speaker): xiangzheng@whu.edu.cn

At L=1.7, the dynamics of quasi-trapped energetic electrons around 150-250 keV can be influenced by various physical mechanisms including pitch angle diffusions induced by the NWC transmitter signals, atmospheric collisions, and a source from cosmic ray albedo neutron decay (CRAND).
To investigate the relative contributions of these different mechanisms, the variations of ~200 keV quasi-trapped electron fluxes during 2009 are simulated based on a drift-diffusion-source model that includes azimuthal drift, pitch angle diffusions from elastic collisions and wave-particle interactions, energy losses from inelastic collisions, and a CRAND source. The Full Diffusion Code is implemented to calculate the quasi-linear bounce-averaged diffusion coefficients by the NWC transmitter signals. The pitch angle diffusion and energy loss of electrons due to atmospheric collisions are evaluated based on NRLMSISE-00 model and IRI 2012 ionospheric model. The electron source rate due to CRAND with pitch angle distribution is from Lenchek et al. (1961) and has been adjusted to be consistent with the DEMETER observations using a drift-source model. Compared with the DEMETER measurements, the dominant sources of quasi-trapped energetic electrons at L=1.7 when NWC transmitter station is on/off and at nightside/dayside will be given.

References

[1] Xiang, Z., Li, X., Ni, B., Temerin, M. A., Zhao, H., Zhang, K., & Khoo, L. Y. (2020). Dynamics of energetic electrons in the slot region during geomagnetically quiet times: Losses due to wave-particle interactions versus a source from cosmic ray albedo neutron decay (CRAND). *Journal of Geophysical Research: Space Physics*, 125, e2020JA028042. https://doi.org/10.1029/2020JA028042

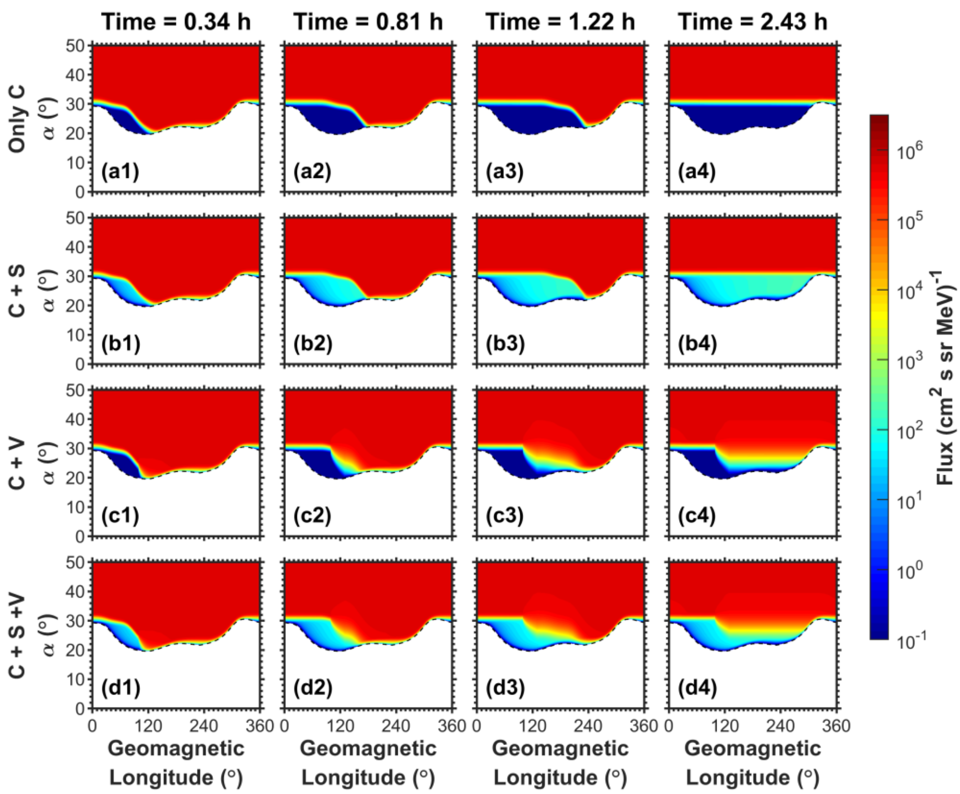

Figure 1. Simulated 200 keV electron fluxes (color-coded) at L=1.7 as a function of equatorial pitch angle and geomagnetic longitude after different simulation periods. From top to bottom, different physical mechanisms are included in the simulations indicated by the uppercase letters: C-atmospheric collision; S- electron source from CRAND; V-waves.