URSI GASS 2021, Rome, Italy, 28 August - 4 September 2021

Examination of Radiation Belt Dynamics during Substorm Clusters: Activity Drivers and Magnetic Local Time Variation of Precipitating Fluxes

Craig J. Rodger*(1), Mark A. Clilverd(2), and Colin Forsyth(3)
(1) Department of Physics, University of Otago, Dunedin, New Zealand; e-mail: craig.rodger@otago.ac.nz
(2) British Antarctic Survey (UKRI-NERC), Cambridge, United Kingdom, e-mail: macl@bas.ac.uk
(3) UCL Mullard Space Science Laboratory, Dorking, United Kingdom, email: colin.forsyth@ucl.ac.uk

There is already significant evidence that clusters of substorms linked to time intervals with high-speed solar wind streams lead to large changes in the trapped electron fluxes of the radiation belts [e.g., 1, 2]. One suggestion is that multiple substorms provide electron populations available to be accelerated [3], and also trigger the waves driving the acceleration [2]. Recently, we used the Polar Orbiting Environmental Satellites (POES) constellation of spacecraft to undertake an MLT-resolved examination of the trapped radiation belt electron fluxes, showing evidence of multiple MLT-dependent processes (i.e., injection, magnetopause losses, and acceleration), which quickly interact due to the short drift times of radiation belt electrons [4].

In the current presentation we will move on to focus on precipitation during clusters of substorms. We make use of the bounce loss cone observations made by the telescopes carried onboard POES in the MEPED/SEM-2 instrument. While there are multiple issues with the precipitation measurements made by POES, they are unique in being very long lasting, and combine to give high cadence MLT coverage. This leads to a dataset which is well suited for statistical analysis to determine the "typical" response of radiation belt losses to substorm clusters (themselves linked to high speed solar wind streams). We make use of the results from the SOPHIE algorithm [5] which produces a large set of well defined substorm events.

We wish to answer the following questions:
- what is the magnitude of energetic electron precipitation (EEP) during clusters of substorms?
- how does this vary with *L*- and Magnetic Local Time?
- how consistent are the EEP patterns, examined in a statistical sense?
- is there a good geomagnetic proxy for representing the EEP magnitude? It is known that, on average, whistler mode chorus power is strongly linked to AE. Is the same true for EEP in these events?

References

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