# Supplementary Material

1 PLOTS

1.1 MLT vs time plots with MagEIS data

This section presents comprehensive visualizations for 15 more dates, in addition to the 3 included in the Case Studies section of the paper.

In each triple plot, the top subplot gives the MLT vs time plot for a given date. The path of Athabasca is color-coded based on the camera event classifications, the paths of both satellites are represented by red and blue lines, injections are represented with colored dots, and the trace-forward drift motion of particles originating from detected injections with an energy between 30 and 100 keV is represented by a gray cone.

The middle subplot gives MagEIS data from RBSPA during the same time frame as the top. The dots show where injections were identified and correspond to the injections observed by satellite A plotted in the top plot. The bottom subplot gives the MagEIS data from RBSPB.
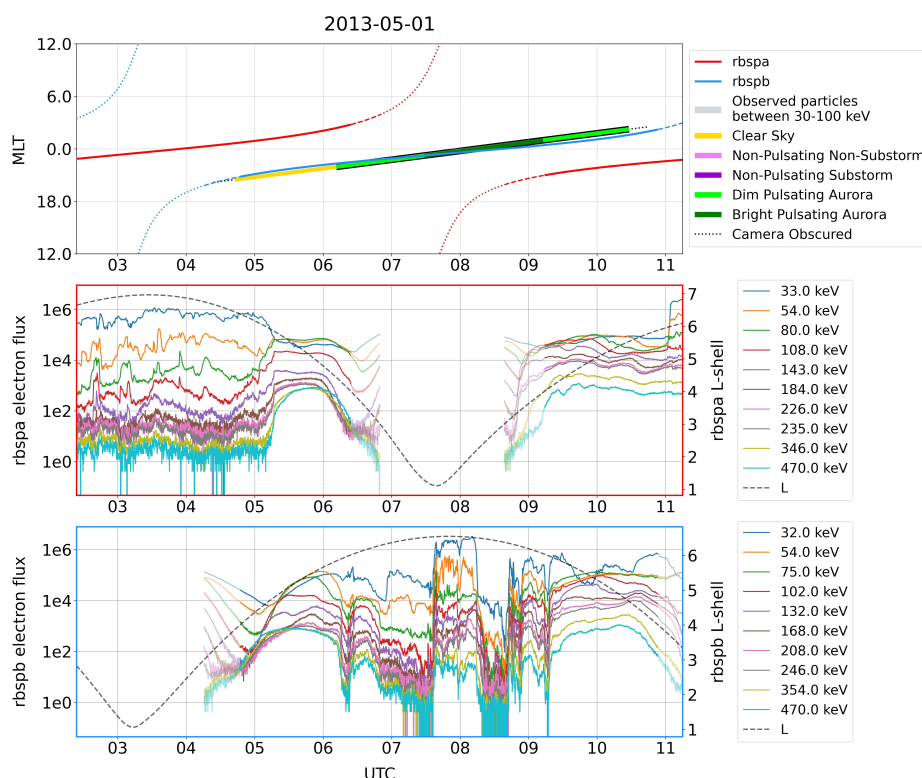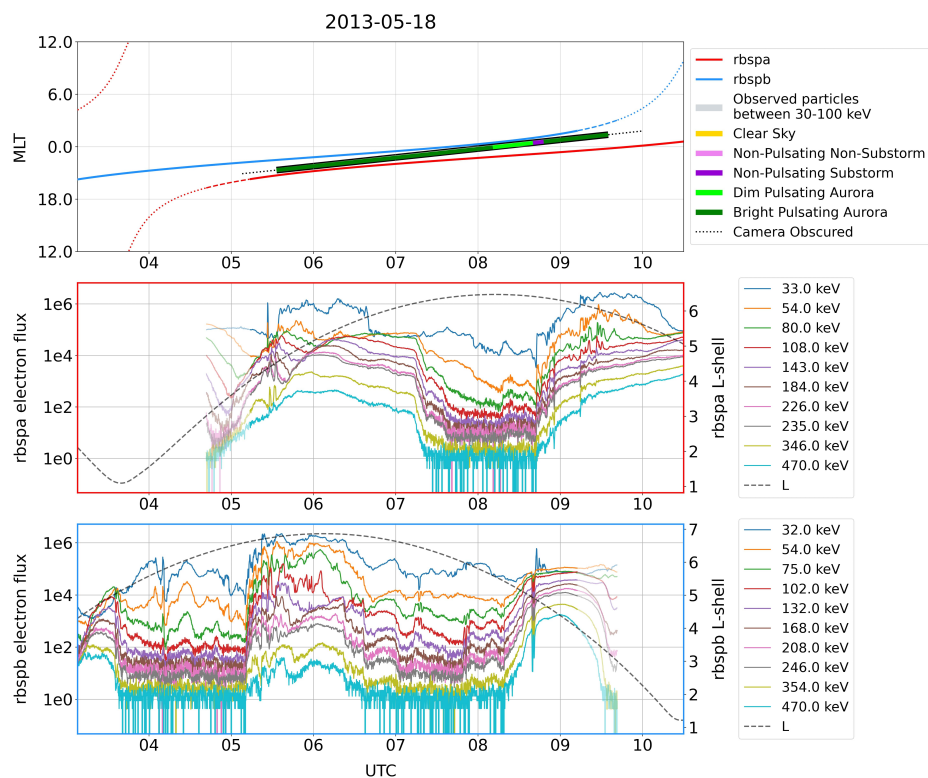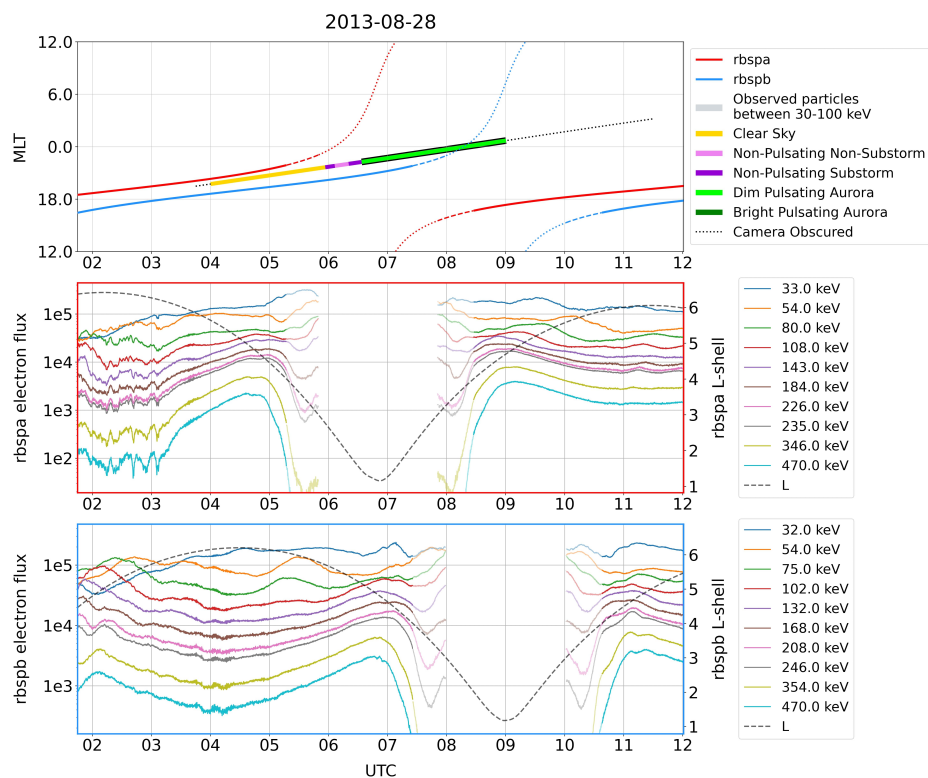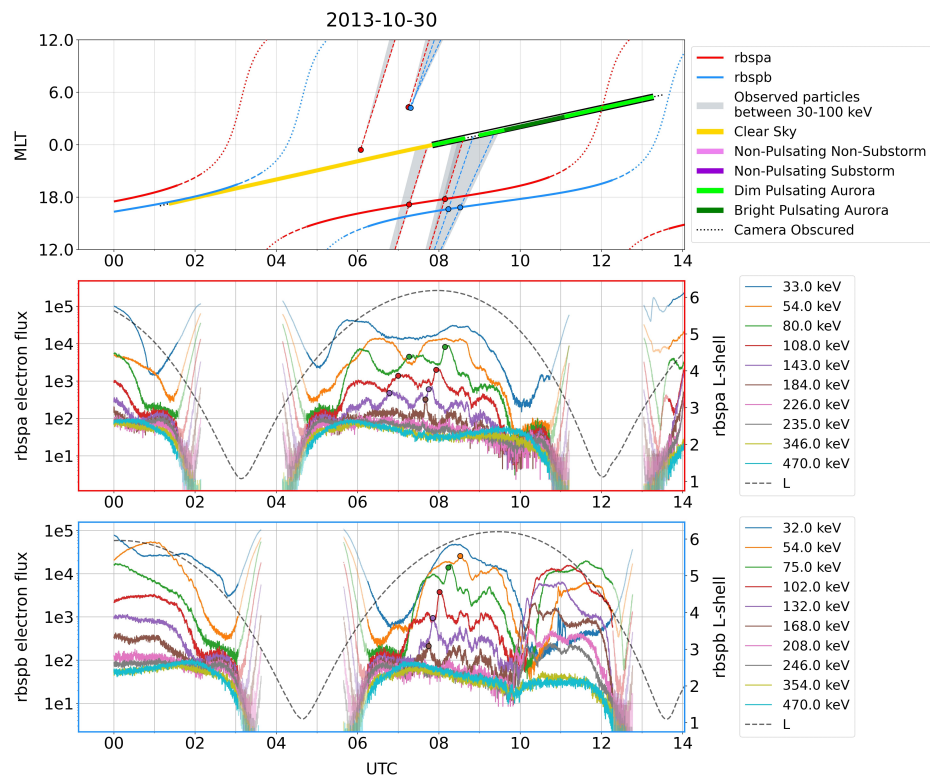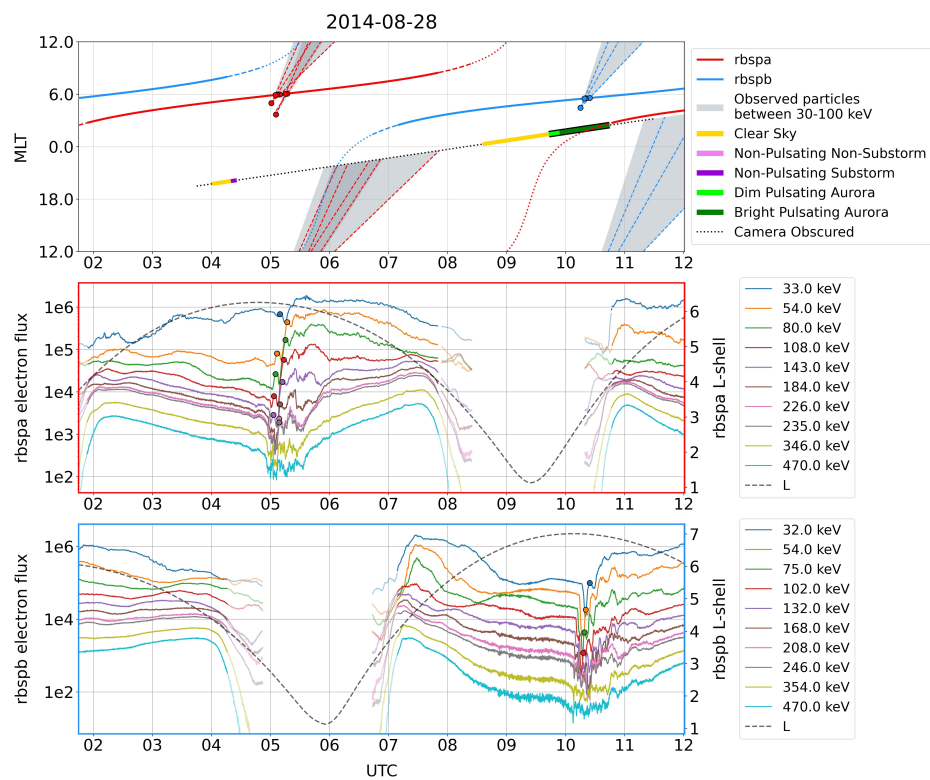

Figure S1.

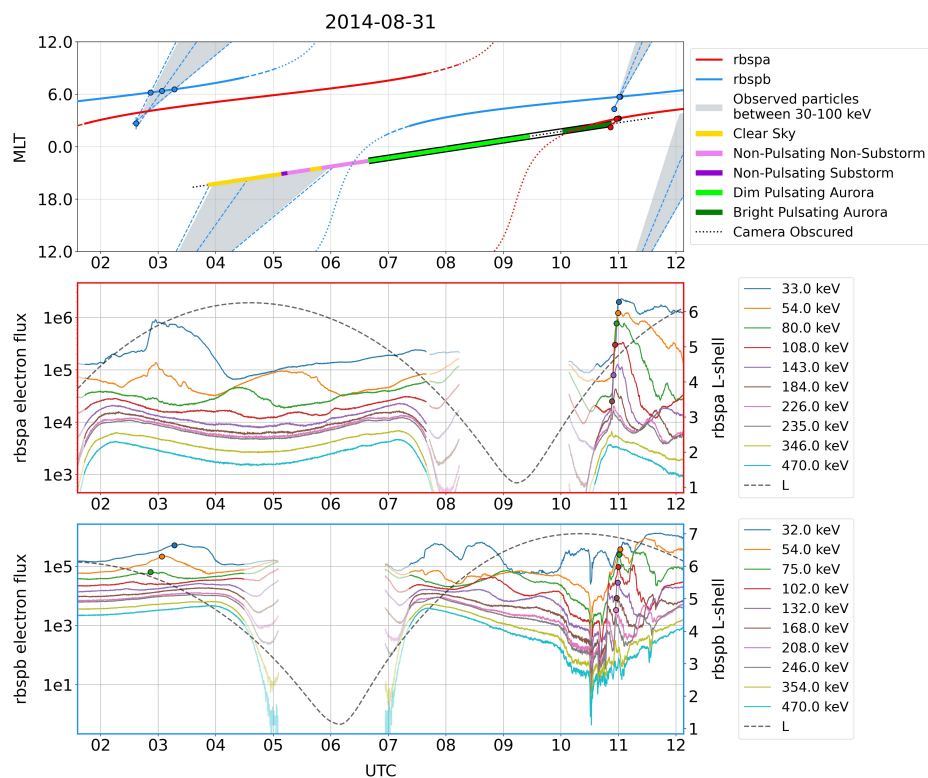**Figure S2.**

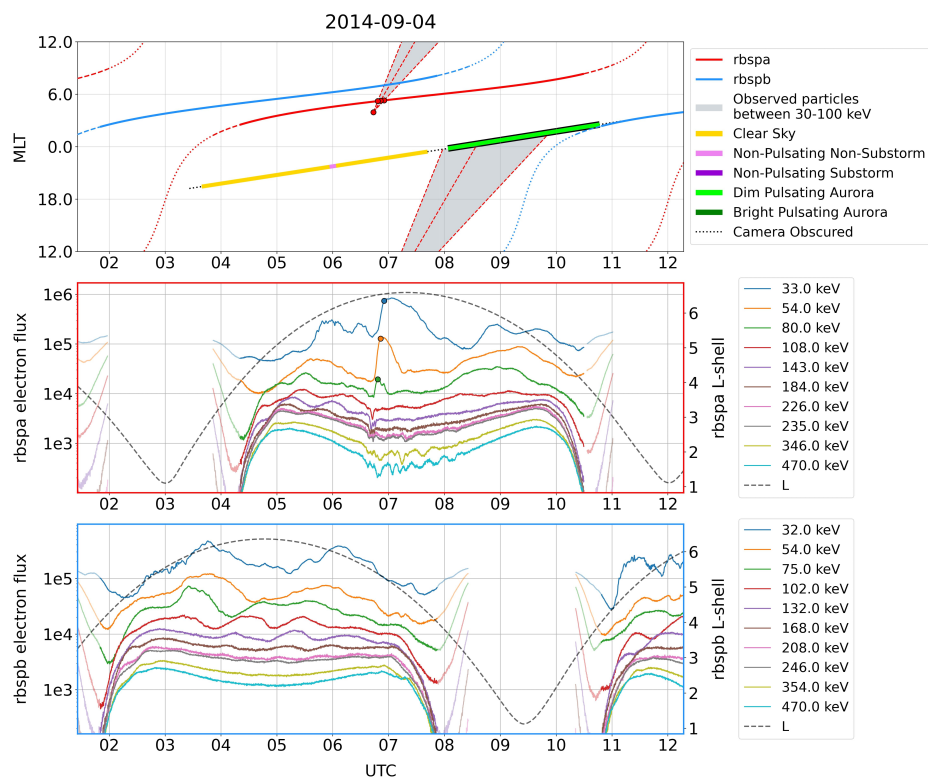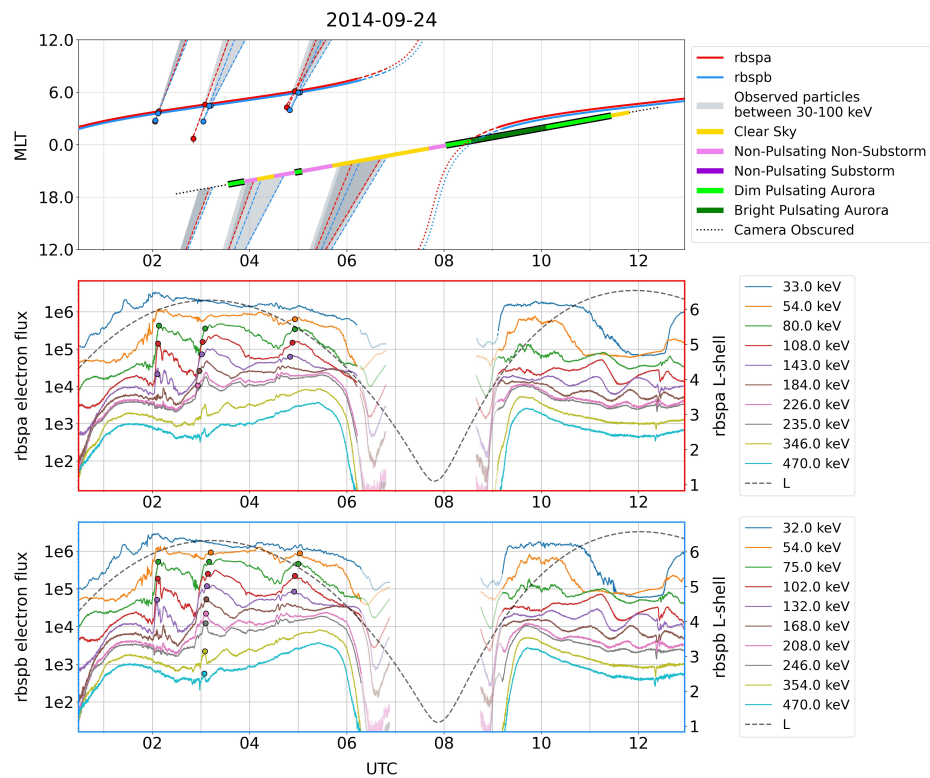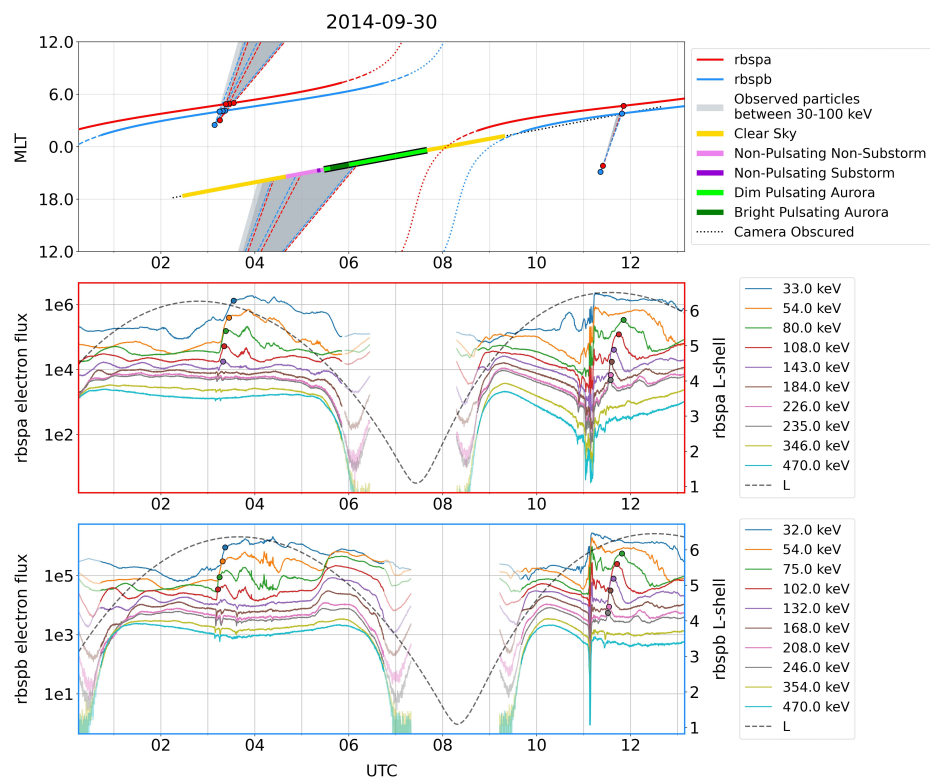**Figure S3.**

Figure S4.

Figure S5.

Figure S6.

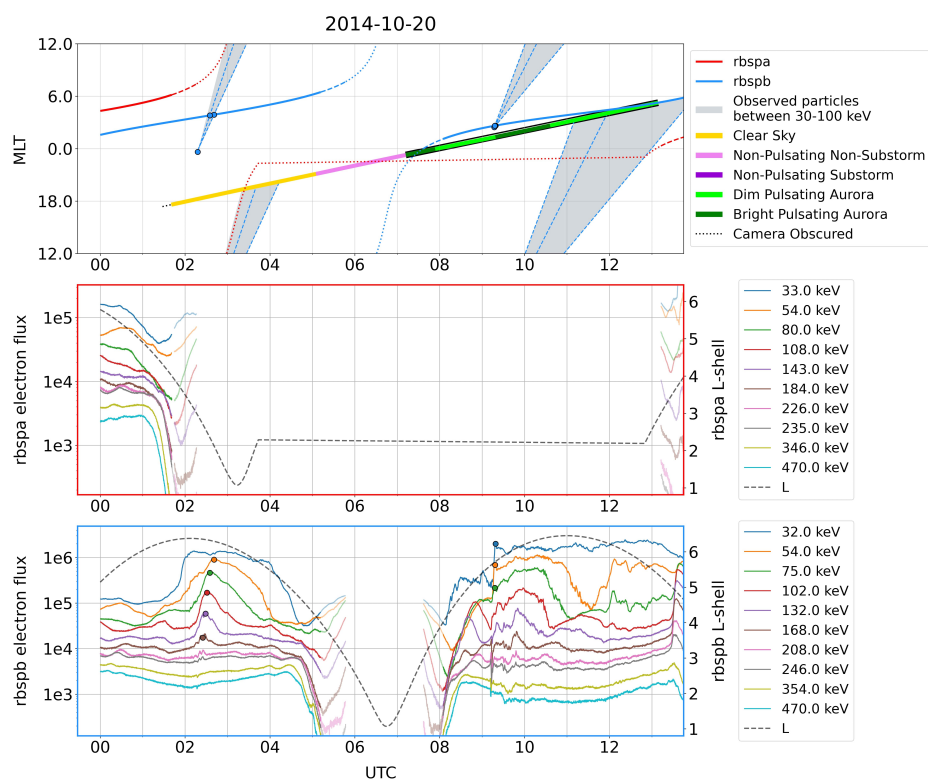
Figure S7.

Figure S8.

Figure S9.

Figure S10.
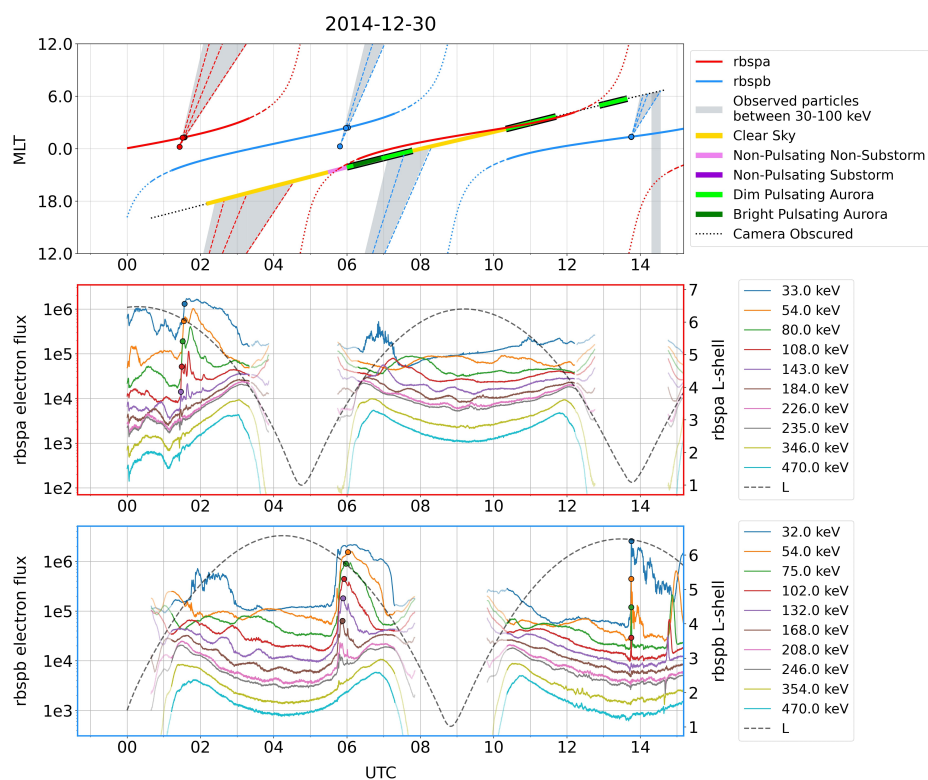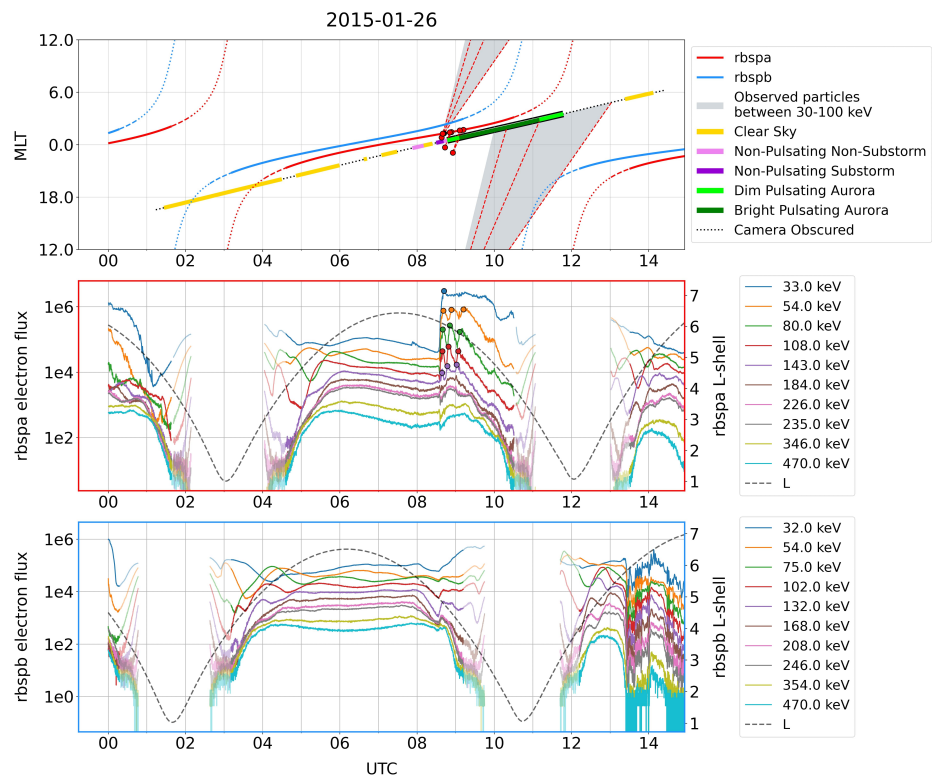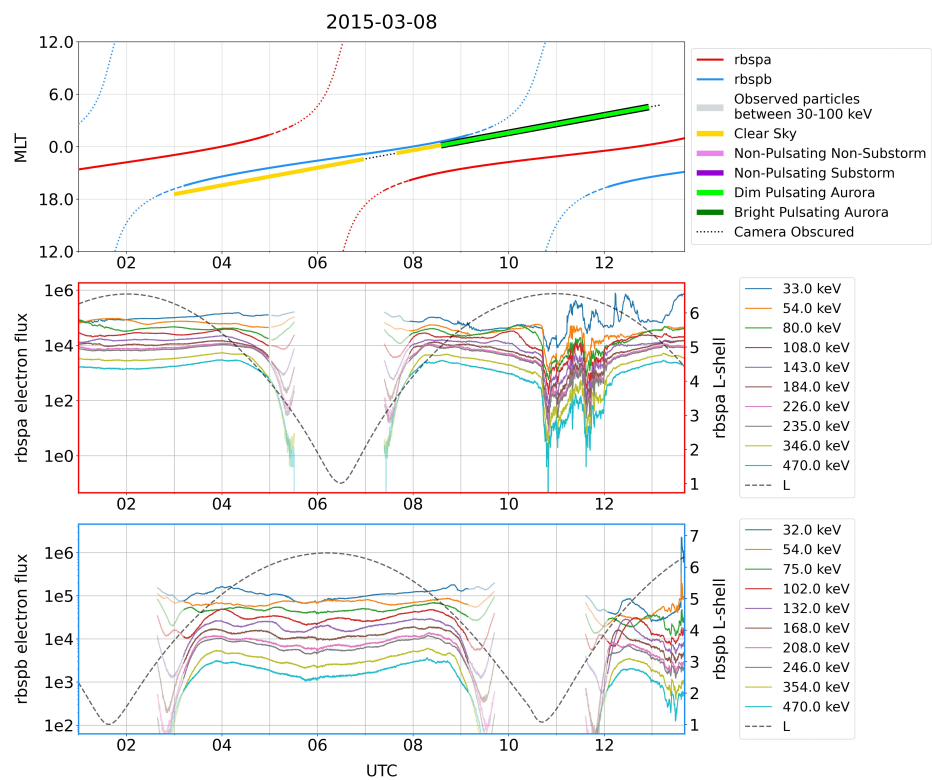

Figure S11.

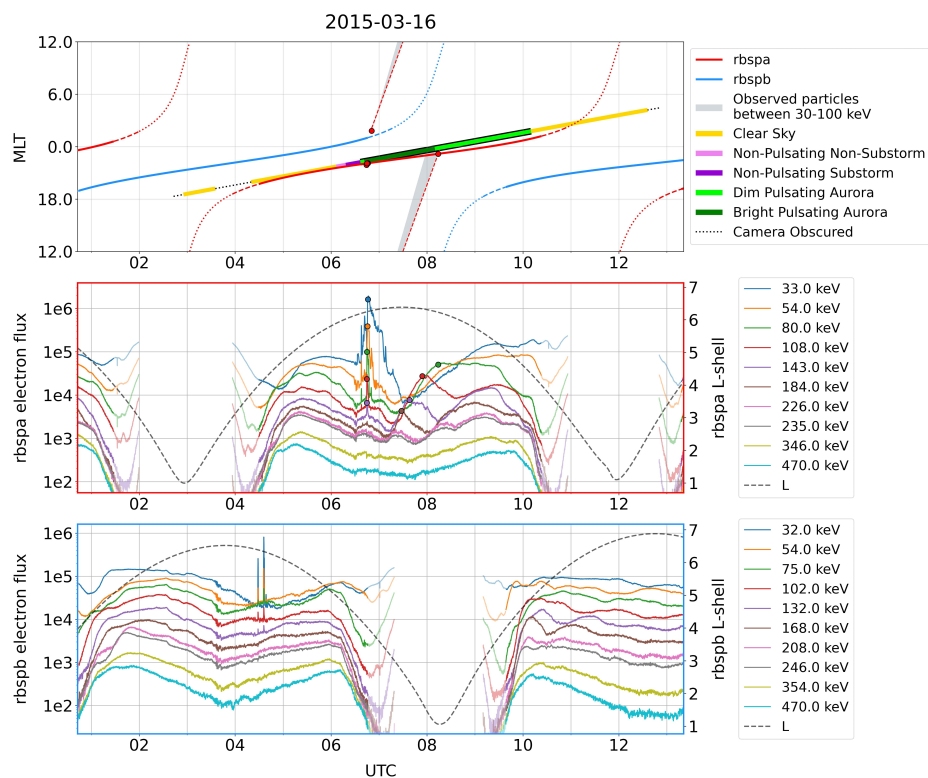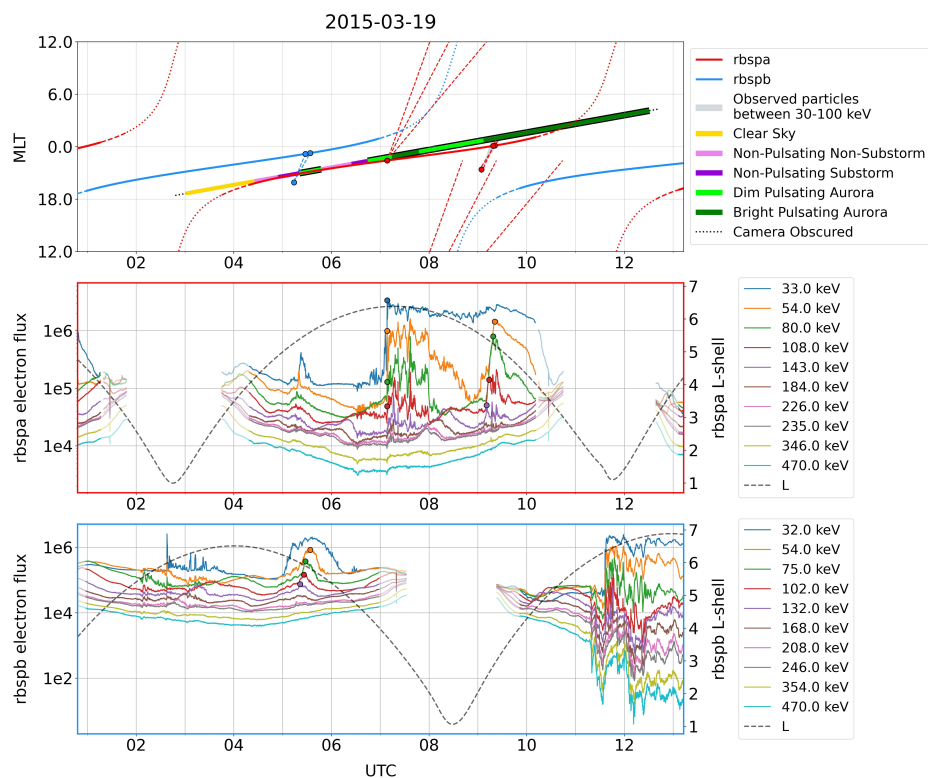**Figure S12.**

Figure S13.

Figure S14.

Figure S15.

2 SPREADSHEETS

2.1 List of All Identified Injections

"injections 10-20-2023.xlsx" provides the list of all injections identified by this study. Each row in columns C through M corresponds to a single injection observed by RBSPA. The column headers give the energy channels while the values in the cells give the UTC time that each injection was identified in a given energy channel. Injections identified by RBSPB are listed in columns O through Y. All injections identified on each date are grouped together and the data for distinct dates is separated with black lines.

3 ANIMATIONS

3.1 Satellite Paths Animation

"2014-09-30_satellite_paths_animation.mp4" is an animation that shows the relative position of the satellites, camera, and injected particles in MLT for one date. The paths of the satellites are given by the red and blue curves and the current position of the satellites are given by the red and blue dots moving along the curves. The path of Athabasca is color-coded with the previously defined colors signifying different all-sky features and it traces out a circular arc as the Earth rotates. The current locations of the satellites and camera also have a colored line connecting their current position to the center of the graph in order to make it easier to tell where they are located in MLT.

As the animation progresses, a gray segment appears and travels counter-clockwise along the outside edge of the plot. This represents the drift motion of injected particles with an energy between 30-100 keV, similar to the gray cone in the MLT vs time plots. As the gray segments pass by the location of the satellites, a colored dot appears at the time and location of the satellite when it observes the injection in each consecutive energy channel. After passing the point they were observed, the injected particles continue drifting around the Earth until they arrive at the MLT of the all-sky imager. During the time that injected particles arrive at the camera, the color code switches to light and dark green, showing that pulsating aurora is being observed.

3.2 THEMIS Animation

"2014-08-29_themis_animation.mp4" shows the video from the Athabasca camera for one date. The border of the camera changes color to represent the different features observed at different times. This animation provides instances of each of the different camera classifications used in this study in order to give examples of what each classification typically looked like in the camera.