SAPS Focus Study: Requested Data – Model Comparison Plot Formats

To facilitate intercomparison of data sets and testing of data against model outputs, we have defined standard presentation formats for the SAPS Focus Study. These are based on the primary available observational datasets: DMSP, SuperDARN, AMPERE, GPS/TEC, and Millstone Hill ISR. We understand that various models and observations are typically presented in their own formats, but for efficiency, we ask that the suggestions below be followed as much as possible.

Initially, to collect a survey of results, we ask that results be presented in one (or more) of the following three formats:

1. One-dimensional "satellite-track" plots. We seek plots of the magnetic zonal component of the ExB drift velocity at an appropriate ionospheric F-region altitude as a function of magnetic latitude for one or more values of local time within the 18-03 MLT sector. We call this "DMSP format", although this format is also useful for comparison with 1-D latitude vs. flow plots from Millstone Hill data. As an option, such plots can be made along DMSP trajectories for easier comparison with those observations; however, a simpler plot for a chosen MLT at a fixed UT would be sufficient initially and will allow ISR comparisons particularly in the 15-20 MLT range. The range of latitudes should cover the auroral zone and subauroral region (e.g., 50-70 degrees magnetic latitude). In addition to the ExB drift velocity, other electrodynamic quantities of relevance should be plotted when available for geospace boundary determination – e.g. electron precipitation flux, ionospheric conductivity, electron density, density of field-aligned (Birkeland) currents, total electron content. Figure 1 gives a representative plot example.

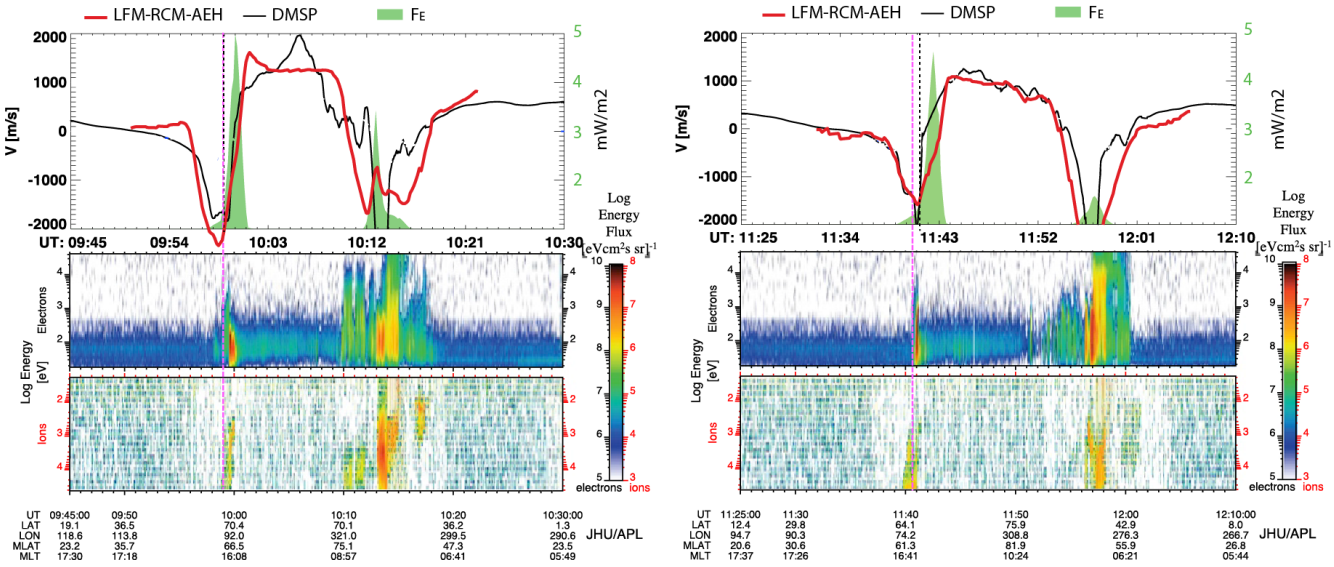

Figure 1. Cross-track velocity from LFM-RCM model run (red) along the DMSP spacecraft orbit path, compared to DMSP cross-track data (black) and DMSP ion and electron precipitation data (bottom panels).

2. Two-dimensional sector plots. We seek 2D plots of the same quantities as in plot type 1, namely zonal ExB drift velocity or, if available/possible, vector flow field, line-of-sight velocity, ionospheric convection electrostatic potential, and related quantities. In particular, plots could cover the area

corresponding to the North American sector (16 to 03 MLT more generally) extending from 50° to 70° magnetic latitude. In addition, related quantities such as GPS/TEC, auroral precipitation maps, F-region electron densities, and FACs, also plotted versus magnetic latitude and longitude, should be provided. For these latter quantities, the occurrence of SAPS velocity features, ionospheric troughs, and boundaries of FAC along with any other features relevant to the formation of SAPS should be indicated on the plots. Figure 2 gives a SuperDARN representative plot as a target example.

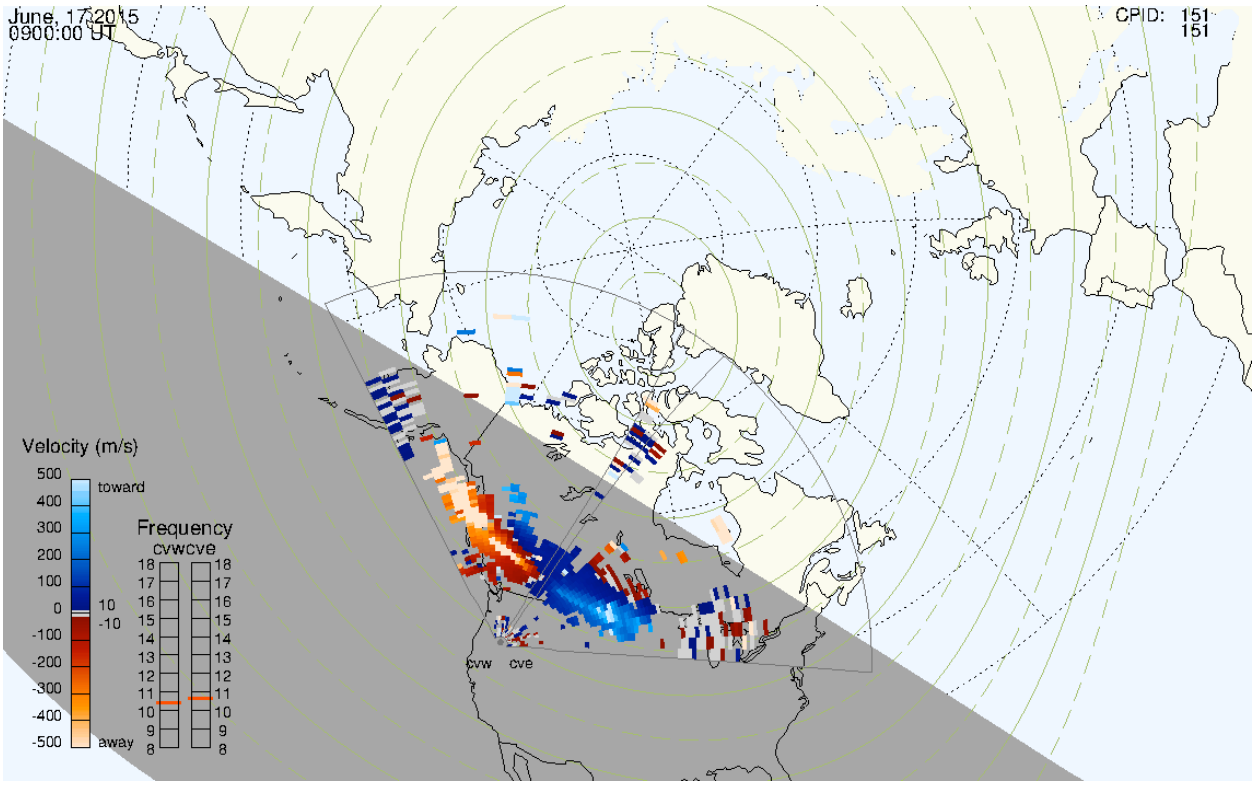

Figure 2. Regional electric field measurements from SuperDARN mid-latitude radars, showing a 1-2 degree wide SAPS/SAID feature over several hours of MLT.

3. Time series format. The types of plots indicated in 1. and 2. above can be provided initially at one or more UT values in the selected event intervals. For analysis time evolution of SAPS features and conditions, we also ask that these plots be provided as time sequences covering the intervals of interest. Time cadence can be chosen by the presenter as appropriate to the particular data type or model output frequency. In addition, we encourage the provision of "reduced" plots, showing chosen quantities at a given MLT, latitude, or point location as a function of time. For these "reduced" views, a sequence of such plots for various UT values would suffice, but assembled animation plots or movies are certainly welcome as well. Figure 3 gives a representative plot example.

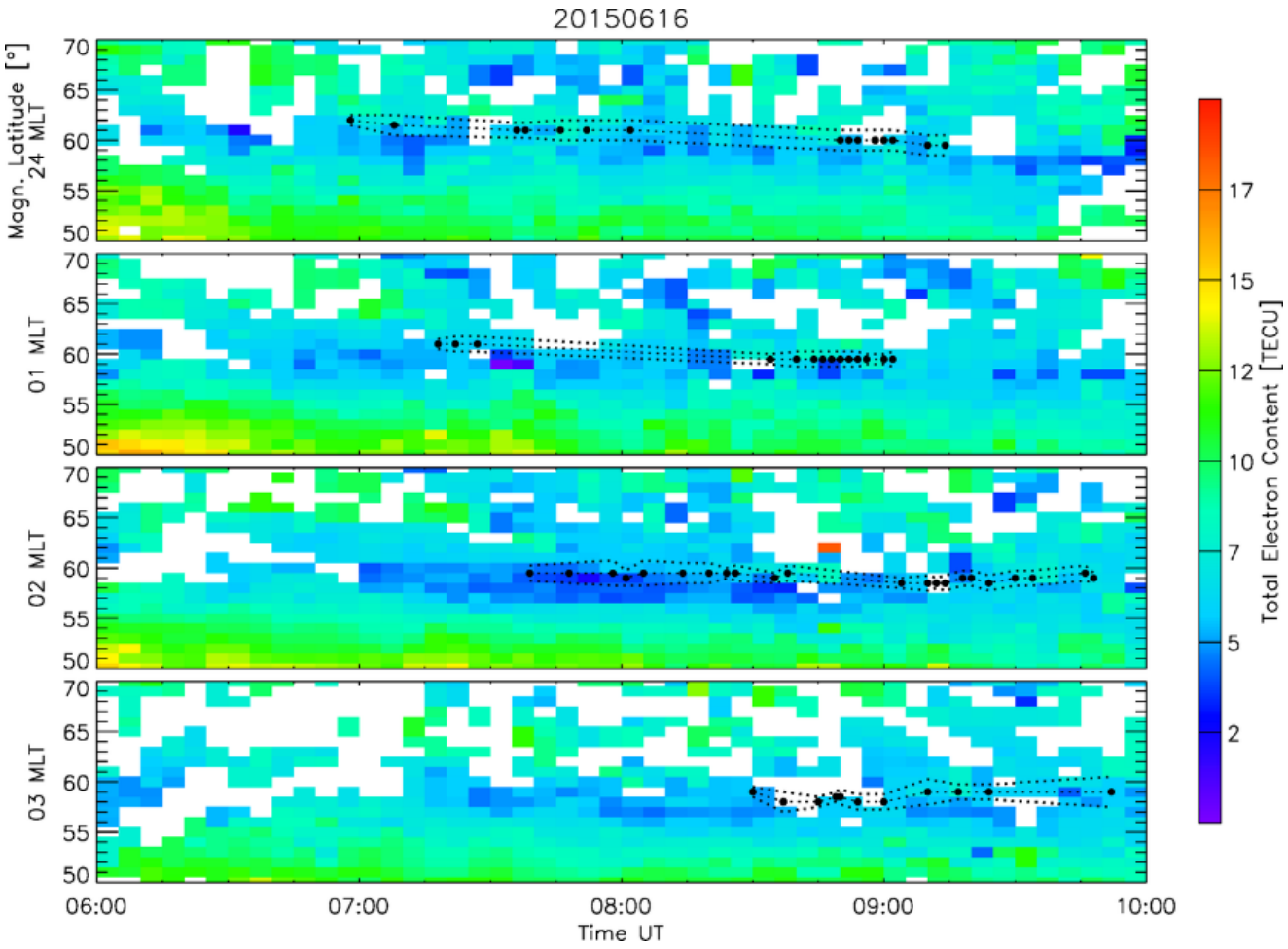

Figure 3: TEC data shown in color, along 00, 01, 02, and 03 MLT meridians from 0600-1000 UT for the June 16, 2015 non-storm event. Overlaid as black dots are the central location of the high-speed SAPS/SAIDs flow as derived from SuperDARN mid-latitude radar observations. The width of the feature (1-2 degrees) is shown by dotted lines.