

Characteristics of Auroral Precipitation Using DMSP Observations

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Energy input into the Earth's upper atmosphere via the magnetosphere is the driving force of the formation of the auroral oval. It is composed of precipitating energetic ions and electrons. The conductivities are highly dependent on the particle precipitation, and the ion convection together with the conductivities define the energy input known as Joule heating. Strong auroral precipitation and fast ion convection are produced by strong solar storms. Careful alignment of the regions of high electron energy flux and fast ion drift velocities can optimize these effects. Therefore, this alignment is essential in numerical models. The results from the Defense Meteorological Satellite Program's (DMSP) Precipitating and Electron Ion Spectrometer (SSJ/4) were used in a study of the relative positions of the peak auroral electron energy fluxes in the Earth's upper atmosphere. The SSJ/4 sensor was carried by the DMSP F13 satellite following a sun-synchronous, dawn-dusk orbit. SSJ/4 recorded the electron and ion particle fluxes between 30 eV and 30 KeV every second. Three months of data (January-March) from the 2005 DMSP archive were smoothed over 25 second averages. These results were plotted to analyze trends in the relative location and magnitude of the peaks in electron energy flux and their corresponding $1/e$ poleward and equatorward fall-off values. A Gaussian fit was then applied to the peaks between the fall offs. OMNI data was used to calculate the average IMF conditions for each pass. Accordingly, the electron energy flux peaks were binned with respect to particular IMF conditions. Through comparing the alignment of these relative peaks in electron energy flux with those of the ion drift, regions of optimum energy input can be located and used for input into the Thermosphere-Ionosphere-Electrodynamics General Circulation Model (TIEGCM). Further analysis using the remaining DMSP data from 2005 in combination with ion drift data from the Ion Driftmeter (IDM) must be done in order to quantify the relationship.