Title: Characterizing Energy and Momentum Deposition During Auroral Events Reported by Citizen Scientists

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(1) 2018 Summer REU Site: Solar and Space Physics with the Boulder Solar Alliance

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Abstract:

The high latitude polar region is home to the most dynamic electromagnetic energy and momentum exchange processes between the magnetosphere and the ionosphere. As the aurora is a manifestation of coupling of the magnetosphere and ionosphere, it plays a key role in understanding these exchange processes. The focus of this research is to investigate the magnetosphere-ionosphere coupling processes during STEVE (Strong Thermal Emission Velocity Enhancement) events. These events are characterized by the presence of a thin, dynamic aurora-like structure in the pre-midnight mid-latitude sector as recently discovered by using reports from citizen scientists [MacDonald et al., 2018]. For this purpose, we use an AMGeO (Assimilative Mapping of Geospace Observation) procedure [e.g., Richmond and Kamide, 1989; Matsuo et al., 2005; Cousins et al., 2013] that is designed to derive maps of high-latitude electrodynamic variables by optimally combining geospace observations with climatological background models of the ionospheric convection and aurora. SuperDARN plasma drifts and ground-level magnetic fields observations are ingested into the AMGeO procedure to estimate the electrostatic potential distribution and Joule heating rate over five minute increments for the entirety of the STEVE event occurring on July 25, 2016. Preliminary analysis of the convection patterns resulting from the AMGeO procedure shows the development of enhanced westward plasma drifts (>1 km/s) in the pre-midnight mid-latitude sector, which is characteristic of subauroral ion drift, accompanied by the westward progression of a region of sharp convection reversal, likely associated with a substorm. This sharp convection-reversal pattern begins to appear prior to any citizen scientists' reports of optical emission from the STEVE, and intensifies over the course of STEVE event, before returning to a semi-symmetrical two-cell convection pattern. More comprehensive analysis of a collection of STEVE events is needed to obtain sufficient conclusions. Further investigation of STEVE events can also be improved by more integrated use of the unconventional citizen science observation data with the AMGeO procedure.