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Model calculations of sub-auroral arc emissions

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Through a recent collaboration between the scientific community and citizen scientists, a previously undocumented in the scientific literature, auroral phenomenon has been discovered. The emissions, called the Strong Thermal Emission Velocity Enhancements, appear at sub auroral latitudes in an east-west aligned, stable arc in the pre-midnight sector in magnetic local time. In the first study of this phenomenon, by MacDonald et al. 2018, it was found that the emissions are predominantly purple in color and are associated with a strong westward ion flow and a significant temperature increase.
Gallardo-Lacourt et al.(2018) found that the emissions are not directly associated with high energy particle precipitation, and in a statistical study of 28 events, Gallardo-Lacourt et al.(2018a) further found that the emissions have an average latitudinal width of $\sim$20 km and a duration of about 1 hour.
Currently, little is know about the origin and dynamics of the "new" emissions.
In the present study, we present model calculations of ionosphere responses to physical phenomena proposed to account for the emissions. Phenomena considered include fast ion drifts and low-energy electron precipitation. Effects on airglow emission rates, plasma density, and plasma temperature are calculated with the one dimensional self-consistent high latitude ionosphere model (SCIM) [Fallen 2011].