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Sodankylä Geophysical Observatory

Abstracts

Sodankylä Geophysical Observatory SKY-i Network

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In project Revot we extended the Sodankylä geophysical observatory (SGO) ground based one-shot-color (OSC) all-sky-camera (ASC) network (SKY-i Network) to the North-East part of Lapland in Finland. Presently the SGO SKY-i Network monitors optical events between [65, 70] latitude and [24, 29] longitude degrees with a mean minimum distance of <D> ~ 98 km between adjacent SKY-i units and images sky for one and half seconds in two second interval during Solar elevation is 8 degrees bellow horizon. Relatively dense network of SKY-i reduces local observation interference (e.g. due to overcast or electric outages) which increase the probability and coverage to observe variety of optical events over the network. With unprecedented level of ground-based visual now-casting and occurrence Aurora and intuitively approachable data format (color images), the SKY-i Network has an outstanding outreach and educational potential. The SKY-i Network produces roughly 5 million images (possible events) per SKY-i unit annually which solely benefit from AI driven methods to mitigate resources spend in the event parsing process and provides instrument-uniform, coherent training-set over different spatial locations to improve now- and forecast models and automating a tracing of variety of optical events.

Electrodynamics of an isolated substorm: Currents and spectra of precipitating electrons

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We investigate an isolated substorm that took place on 7.11.2018. Our aim is to study the development of ionospheric currents during this event, with focus in the field-aligned currents (FACs). The main data sources are EISCAT UHF incoherent scatter radar and IMAGE magnetometer network measurements. In general, FACs are hard to estimate from ground-based observations, but in this study, we determine them using two advanced methods: electron precipitation obtained from EISCAT electron density data with the ELSPEC method and SECS-based method to estimate the curl of the equivalent currents for IMAGE measurements. We also use NASA's OMNIWeb solar wind data and auroral all-sky cameras to support our findings. The two methods for estimating FACs give relatively similar results with enhancement in the upward FAC during increased electron precipitation. The most intense currents and auroras occur at the end of the expansion phase, along with a unique vortex structure seen in both.