

# **Statistical study of Ionospheric Conductivity Dependence of the Subauroral Polarization Streams using the SuperDARN Hokkaido East HF Radar**

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In this study, we investigate characteristics of the subauroral polarization streams (SAPS), focusing on ionospheric conductivity dependence, especially the solar zenith angle(SZA) dependence, using the Super Dual Auroral Radar Network (SuperDARN) Hokkaido East radar, National Oceanic and Atmospheric Administration (NOAA) Polar Operational Environmental Satellites (POES) system and Meteorological Operational Satellite Program of Europe (MetOp) system data. The time span for the present study is from 2008/1/10 to 2016/12/31, and we limited the time range of the analysis to 3-8 UT (12-17 LT). In addition, in order to achieve a more precise mapping of scattering locations, we applied a new empirical virtual height model introduced by [Chisham et al., 2008] to the SuperDARN Hokkaido East radar. The new model uses different coefficients in the model when mapping backscatter targets propagate via different propagation paths. We found 60 SAPS events over seasons except for summer, and for each event we examined the SZA and the peak Line-of-sight velocity observed in the SAPS, in order to identify the threshold of the possible SZA and illuminated ionospheric altitude for SAPS to be generated. We also took into account the effect of EUV absorption in the atmosphere. As a result of the statistical study, we find that SAPS tend to appear when the SZA is larger than 95 degrees, and that the minimal threshold of illuminated ionospheric altitude for SAPS occurrence is about 126 km, which is just above the altitude of the peak of Pedersen conductivity. This result suggests that the low background Pedersen conductivity plays an important role in the generation of SAPS by leading to a positive feedback which enlarge the electric field that consequently generates SAPS.

In addition, in order to investigate the magnetospheric electric field during SAPS events, we are collecting the conjunction observations of SAPS by the Arase satellite and SuperDARN Hokkaido East radar. By using the electric field data and particle flux data provided by Arase, we expect to examine the variation of the electric field when SAPS occurs, which would help us further understand the mechanism of SAPS.

**Keywords:** solar zenith angle, sub-auroral polarization stream, magnetosphere-ionosphere coupling, Pedersen conductivity, SuperDARN Hokkaido East radar, Arase satellite