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Radar observations in the vicinity of pre-noon auroral arcs

H. Nilsson (1), A. Kozlovsky (2), T. Sergienko (1), A. Kotikov (3)

(1) Swedish Institute of Space Physics, Kiruna, Sweden (hans.nilsson@irf.se), (2) Sodankylä Geophysical Observatory, Sodankylä, Finland, (3) St Petersburg State University, St Petersburg, Russia

A combination of EISCAT incoherent scatter radar measurements, optical and magnetometer data is used to study the plasma in and around pre-noon structured precipitation and auroral arcs. Particular attention is paid to regions of comparatively low E region density observed adjacent to arcs / structured precipitation in the EISCAT Svalbard radar field-aligned measurements. It is shown through comparison between luminosity and incoherent scatter electron density measurements that the low density regions occur due to the absence of diffuse (CPS-like) precipitation rather than to any cavity formation process. Regions of high electric field and low luminosity / conductance are observed prior to intensification of the structured precipitation. The ionospheric current is enhanced in the low conductance region, indicating that the strong electric fields do not result only from ionospheric feedback, and thus are driven by magnetospheric processes. The average energy of the precipitating electrons in the arcs and structured precipitation is according to EISCAT measurements 500 eV, and the energy spectra are similar for the FLR and shielding cases. The average energy is thus significantly less than in the diffuse precipitation region which show CPS like energy spectra. The magnetospheric region or plasma population behind the arc formation thus appear to be related to the boundary plasma sheet (BPS) or low-latitude boundary layer (LLBL). It is suggested that the low ionospheric conductance is favorable for the arc formation process, which result in response to the dynamics of BPS /LLBL plasma in the magnetosphere.