Sharp electron density cutoffs observed by EISCAT Svalbard radar in the dayside polar cap

\# Jun Sakai[1]; Satoshi Taguchi[1]; Keisuke Hosokawa[1]
[1] UEC

A series of steep plasma depletion in the dayside polar cap was observed by the EISCAT Svalbard Radar (ESR) during an interval when the electron density was highly enhanced on 14 October 2000. Simultaneous observations of the electron density with the ESR 42 m and 32 m antennas, together with the DMSP ion observation and the GEOTAIL IMF observation, provided unprecedented information on the occurrence of steep plasma depletion in the high latitude ionosphere. The event started with a sudden increase in the electron density, and the increased density was as high as 3×10^{12} m^{-3} at F2 region altitudes. When a depletion occurred, the electron density in the F2 region fell sharply to as low as 10^{11} m^{-3}, and remained there for approximately 10 minutes before returning to the original state. These subevents took place five times, and propagated poleward at the speed consistent with the observed ion drift velocity. The DMSP ion density measurement indicates that the density was high in the near-noon sector, and that very low density plasmas were located in the prenoon sector adjacent to the near-noon high density region. Clear anticorrelation can be found in the electron density and electron temperature, which suggests that the density enhancement did not involve any particle precipitations in the polar cap. The IMF B_Z was negative throughout the period. The IMF B_Y occasionally changed the polarity, and these polarity changes were in good agreement with the appearance of the electron density cutoffs. From these observations, we suggest that very low density plasmas created in the morning sector cut in the tongue of ionization, which originates from the high density evening sector, in response to the rapid prenoon shift of the footprint of the reconnection line. We will discuss how the very low density plasmas are produced in the morning sector.