

Observations of the electron density perturbation in the cusp region during ICI-2 campaign

Takumi Abe[1]; Manabu Shimoyama[1]; Joran Moen[2]

[1] ISAS/JAXA; [2] Dept. of Physics, Univ. of Oslo

The ICI-2 (Investigation of Cusp Irregularities-2) sounding rocket campaign was conducted in Svalbard, Norway on December 2008. The scientific objective of ICI-2 is to investigate generation mechanism(s) of coherent HF radar backscatter targets. Strong coherent HF backscatter echoes are a well-known characteristic of the polar cusp, and are obtained from field-aligned plasma irregularities of decametre scale length (1/2 the radar operating wavelength). The generation mechanism of backscatter targets has not yet been agreed upon, and we do not know even the altitude profile of HF cusp backscatter.

It is suggested that the electric field noise itself may play a dominant role and is likely responsible for generating the plasma irregularities in the cusp. High-resolution (meter scale) in-situ measurements by sounding rockets is the only experimental approach to discriminate between the suggested production modes of HF backscatter irregularities. Therefore, high-resolution in-situ measurements are needed to reveal the formation mechanisms of decametre scale plasma irregularities.

The ICI-2 rocket was launched at 10:35:10 UT at Ny-Alesund, and reached an apogee of 330 kilometers. All onboard systems functioned flawlessly. Measurements of the plasma density, low energy electron flux, AC and DC electric fields, and field-aligned currents were made to conduct a comprehensive study with the aim to exploit the potential role of the gradient drift instability versus the other suggested mechanisms. We present a result obtained from a fixed-bias Langmuir probe which was installed to measure fine-scale (~ 1 m) electron density perturbation.