

## **Cluster observation of electric field variations in the magnetosphere related with ionosphere HF heating**

A.B. Pashin<sup>1</sup>, A.L. Kotikov<sup>2</sup>, T. Yeoman<sup>3</sup>, M.I. Pudovkin<sup>2</sup>, A.A. Mochalov<sup>1</sup>, A. Maulini<sup>2</sup>, Yu.A. Kopytenko<sup>4</sup>, T.I. Sergienko<sup>5</sup>, H. Nilsson<sup>5</sup>, M.T. Rietveld<sup>6</sup>

<sup>1</sup>*Polar Geophysical Institute, Fersmana 14, 184200 Apatity, Russia, pashin@pgi.kolasc.net.ru, tel. +7-81555-79781, fax +7-81555-74339*

<sup>2</sup>*St. Petersburg State University, St. Petersburg, Russia*

<sup>3</sup>*University of Leicester, Leicester, UK*

<sup>4</sup>*St. Petersburg Branch of IZMIRAN, St. Petersburg, Russia*

<sup>5</sup>*Swedish Institute of Space Physics, Kiruna, Sweden*

<sup>6</sup>*EISCAT, Ramfjordbotn, Norway*

On February 16, 2003 EISCAT-Heating experiment was carried out on observation in the magnetosphere of heating induced disturbances. Pump wave of 4.04 MHz in X-mode was used for the ionosphere modification from 19:55 to 23:59:59 UT in square modulation regime with 5 minutes ON / 5 minutes OFF cycle. During interval of good conjugation of CLUSTER with the heating facility spacecraft 4 (Tango) has recorded clear variations of electric field at modulation frequency lasting around 30 minutes. Spectral peak of the variations at 1.67 mHz is more pronounced in the y-component. Slow temporal variations of the conductivity in the heated volume due to electron density increasing in the E-region related with the heating duty cycle provide the same variations of disturbed electric field. Polarization of the disturbances is almost linear; it corresponds to constant ratio of Hall to Pedersen conductivity variations. Analysis of the signal waveform shows that at ~ 20.30 UT phase of the variations is changed together with a sign of DC electric field. Transverse size of the disturbed structure in the magnetosphere is near 0.1  $R_E$ . Observed behavior of the disturbances may be interpreted in terms of Alfvén mode propagation of the disturbed ionospheric electric field into the magnetosphere. The electric field disturbances being uniform in the region of modified conductivity have a discontinuity at its border of the region and decay as two-dimensional dipole outside it. Field-aligned currents are related with conductivity gradients and distinct magnetic field variations are clear seen in quick-look plots around 20.30 UT. For further study of this event records of magnetic variations onboard CLUSTER satellites would be very important.