



Temperature of electrons during heating and the influence of heating on the charge balance in the D-region

Margaretha Myrvang^{*(1)}, Carsten Baumann⁽²⁾, Björn Gustavsson⁽¹⁾ and Ingrid Mann⁽¹⁾

(1) UiT The Arctic University of Norway, Department of Physics and Technology, Tromsø, Norway

(2) German Aerospace Center, Institute for Solar-Terrestrial Physics, Neustrelitz, Germany

During heating, the energy of high power radio waves is transferred into thermal energy of electrons, increasing the electron temperature. The increase in electron temperature in the heating experiments considered here has a maximum in the D-region. However, observations and modelling of the electron temperature in the D-region can be challenging since the D-region has a complicated ion chemistry, low electron density and high collision frequency. The increase in electron temperature that happens during heating will be modelled with an electron velocity distribution described by a Maxwellian distribution and a non-Maxwellian distribution. These two will be compared to each other. In addition, the modelled electron temperature will be compared to observations. [1] [2] Depending on ionospheric conditions, heating can influence PMSE (polar mesospheric summer echoes), as seen in the overshoot effect. Different rocket measurements have provided experimental evidence that MSP (meteoric smoke particles) influence the D-region charge balance. Below 95 km, electrons and positive ions alone do not conserve quasineutrality and MSP are considered to be a negative charge carrier to conserve quasineutrality. [3] In this work, we will look at the influence of heating on the charge balance in the D-region. We will investigate if heating influences the charging of MSP/ice particles and find out whether this explains the changes that is observed on PMSE during heating.

References

- [1] M. Kassa, O. Havnes and E. Belova, "The effect of electron bite-outs on artificial electron heating and the PMSE overshoot," *Annales Geophysicae*, **23**, December 2005, pp. 3633–3643, doi:10.5194/angeo-23-3633-2005.
- [2] A. Kero, T. Bösinger, P. Pollari, E. Turunen and M. Rietveld, "First EISCAT measurements of electron-gas temperature in the artificially heated D-region ionosphere," *Annales Geophysicae*, **18**, June 2000, pp. 1210–1215, doi:10.1007/s00585-000-1210-8.
- [3] C. Baumann, M. Rapp, A. Kero and C. -F. Enell, "Meteor smoke influence on the D-region charge balance –review of recent in situ measurements and one-dimensional model results," *Annales Geophysicae*, **31**, November 2013, pp. 2049–2062, doi:10.5194/angeo-31-2049-2013.