Geophysical Research Abstracts
Vol. 13, EGU2011-10861, 2011
EGU General Assembly 2011

An alternative estimation of the RF-enhanced plasma temperature during SPEAR artificial heating experiments

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In this study, EISCAT Svalbard Radar observations during artificial ionospheric modification experiments using the SPEAR heating facility on Svalbard are presented. In particular, the ion line measured is noted to exhibit the Purely Growing Mode (PGM) feature at the centre of the spectrum which does not disappear after a few seconds but persists throughout the heating interval, unlike observations made at the Tromsø heating facility which is outside the polar cap. Recent work based on EISCAT UHF measurements at Tromsø has demonstrated that substantial underestimation of the electron temperature may result when the standard incoherent scatter analysis software is used to analyse spectra containing such features, but an alternative method that involves removing a Gaussian PGM from the affected spectrum has been shown to produce much improved estimates. However, this method has only been tested with the EISCAT 'CP1K' long pulse experiments to date but it should be equally applicable to the SPEAR-ESR ion line spectra which also exhibits the PGM.
We show initial results where this new method has been effective in removing a Gaussian component from the centre of the ion line spectrum, leading to a lower fit residual and an increase in the estimate of the average electron temperature during SPEAR artificial heating. More significantly though, the results may shed light on why negligible enhancements, if any, of the ESR electron temperatures, have often been observed during SPEAR heating experiments to date.