

# Recent results from HF pumping experiments of the ionosphere and mesosphere using the EISCAT facilities near Tromsø

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## Abstract

The EISCAT HF ionospheric heating facility has recently been upgraded in several key areas that allow more flexibility in changing parameters such as a frequency, power and phase, as well as allowing an HF radar receiver operation. These new capabilities were important for several recent results some of which are presented here. The HF radar capability has been used successfully to study how mesospheric echoes at 8 MHz are affected by artificial electron heating. Attempts have also been made to search for 8 MHz magnetospheric echoes related to auroral processes, without obvious success so far.

The more traditional F-region HF-pumping experiments have shown some unexpected results, especially during X-mode heating. These include the production of electron density striations, airglow, enhanced plasma and ion lines measured with the UHF incoherent scatter radar, and electron temperature increases, phenomena which are normally expected to occur only with O-mode heating. For O-mode we sometimes see a descending HF-induced ion line which is most likely due to ionization from pump-induced fluxes of suprathermal electrons. Quantitative comparisons between measurements of electron heating and models of Ohmic and resonant heating have been made, and comparisons between the observed and theoretical thresholds of the various plasma instabilities. Furthermore, there are often unexplained 933 MHz radar backscatter enhancements above the HF reflection height, seen with both polarisations but only in directions very closely aligned along the magnetic field.