Temperature dependence of Artificial Field-Aligned Irregularities

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Artificial modification of the ionosphere using the high power HF heating facility at Tromsø in Northern Norway is known to give rise to field aligned irregularities (FAI). These locally depleted regions in the plasma density result from the anisotropic electron transport caused by the heating effects. Properties of the FAI may be diagnosed using the CUTLASS coherent scatter radars in Finland and Iceland, where the transmitted radio waves intersect the heated patch along a path perpendicular to the magnetic field, thus receiving backscatter from a single height at the upper hybrid resonance. FAI have characteristic rise and decay rates which depend on a number of factors, including the heater effective radiated power (ERP), beam direction and ionospheric F region peak frequency. Previous work indicates that the decay rate of FAI should be independent of their saturation amplitude and hence the heater effective radiated power (ERP). The transport coefficients which control the growth and decay rates of FAI are also known to be dependent on electron temperature. This is itself also modified due to anomalous absorption of the heater wave in the presence of FAI. In this study, analyses of CUTLASS data corresponding to heating experiments has been undertaken to ascertain whether there exists a relationship between the electron temperature changes in the upper hybrid resonance region, measured by EISCAT, and these characteristic decay times.