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Turbulence and non-linear effects in ionospheric Alfven waves

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From observations it is demonstrated that the k-spectra of Alfven waves observed above the auoral ionosphere contain distinct inertial and dissipative subranges ranges separated by the local values of the electron skin depth and ion gyro-radii. In the dissipative range it is demonstrated that these waves heat electrons parallel to the geomagnetic field and ions transverse to this field leading in some cases to nearly complete depletion of ionospheric plasma and the formation of deep density cavities. It is shown that the Alfvenic turbulence embedded in these cavities is capable of supporting large parallel fields through anomalous resistivity and convective nonlinearities. These processes are shown to lead to a macroscopic depletion of ionospheric plasmas over latitudinal widths of 100s kilometers and the population of the magnetosphere at high latitudes with large fluxes of plasmas of ionospheric origin.