



Modeling the Polar Cap Topside Ionosphere

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For the polar cap region a plasma density profile model from hmF2 to several R_E is being developed using IMAGE RPI measurements in the magnetosphere and ISIS-2 measurements in the topside ionosphere. The vary-Chap function, which is a Chapman-like function with a scale height that varies continuously with height, has been used to connect the radio plasma imager (RPI) density profile to the ionosphere profile above hmF2. In the polar cap where there is upflow/outflow of charged particles, the electron density (Ne) distribution depends largely on the distribution of the electron velocity. It should therefore be feasible to derive the velocity distribution from the Ne profile. Using the mass conservation equation, we derived the parallel electron upflow velocity in the topside ionosphere. The velocity profiles are calculated using the measured ISIS-2 electron density profiles and neutral species density profiles from the MSIS model. Use of a simple analytical function parameterizes the profile function, and the function parameters are determined by a multivariate least-square fit of the calculated profiles to the analytical function. We show the dependence of these parameters on latitude as well as solar and geomagnetic activity making use of a large set of ISIS-2 profile data.