

Distribution of Peak Electron Density in Upper Ionosphere of Mars at High Latitude: Modeling and Observation

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In this paper, we use the measurements of mass density of 57 orbits #P0588 to #P0648 from September 30, 1998 to October 24, 1998 between latitude range (50-70°N) under spring equinox and medium solar activity conditions during phase 2 of the aerobraking in the thermosphere of Mars. Under photochemical equilibrium condition, electron density near peak varies as the square root of total peak ionization rate. Thus by averaging the longitudinal variation of latter, the mean primary and secondary peak electron densities in upper ionosphere of Mars using measured mass densities at LST 16 hrs are estimated to be $\sim 8.56 \times 10^4 \text{ cm}^{-3}$ and $\sim 1.81 \times 10^4 \text{ cm}^{-3}$. On comparison with mean electron densities at LST 3-4 hrs for observational period Dec. 24-31, 1998, at same solar zenith angle, it is found that the estimated primary peak electron density at LST 16 hrs is more by a factor of ~ 1.06 . With this analogy, the estimated secondary peak electron density should be $\sim 3.76 \times 10^4 \text{ cm}^{-3}$ instead of $\sim 1.81 \times 10^4 \text{ cm}^{-3}$. Thus, in order to obtain the estimated secondary peak electron density of $\sim 3.76 \times 10^4 \text{ cm}^{-3}$, soft X-ray flux should be increased by a factor of ~ 4.31 .