

MODELING OF LOW, MID AND HIGH LATITUDE IONOSPHERE OF MARS USING MGS/ACC DATA

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Abstract

In this paper, we use the measurements of mass density of 112 orbits (#P0790-P0910) from December 1-22, 1998, between latitude range (0-25°N), mass density of 115 orbits (#P0670-P0789) from November 1-30, 1998, between latitude range (17-42°N) and mass density of 57 orbits (#P0588-P0648) from September 30 – 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. These measurements of mass densities are obtained from the Accelerometer Experiment onboard Mars Global Surveyor. From these mass densities, the neutral densities of different gases are derived from their mixing ratios. Using these neutral densities, the longitudinal distribution of various peak ionization rates, peak electron densities and their corresponding peak altitudes are obtained due to incident radiation of wavelength range 1-102.57 nm at solar zenith angle 78° in the dayside atmosphere of Mars using analytical yield spectrum model. From these ionization rates, the primary and secondary peak electron density will be estimated at different latitudes. This technique is going to be useful for future planetary missions having no instrument for measuring electron density. Further, using the Fourier analysis of the various peak ionization rates of CO₂⁺, N₂⁺ and O⁺ an attempt will be made to ascertain

the presence of two dominant harmonic regions at low and mid latitude in the upper atmosphere of Mars as predicted long time back in the earth lower atmosphere. The first is a class of long planetary-scale waves which may be associated with the fixed topography of Martian surface. The second is a class of rapidly moving transient disturbances which may be associated with baroclinic instability processes.