



Nightside ionosphere of Mars: results from the MARSIS instrument

F. Nemeč (1), D. D. Morgan (2), D. A. Gurnett (2), M. O. Fillingim (3), R. J. Lillis (3), and F. Duru (2)

(1) Charles University in Prague, Faculty of Mathematics and Physics, Prague, Czech Republic (frantisek.nemec@gmail.com), (2) University of Iowa, Department of Physics and Astronomy, Iowa City, Iowa, USA, (3) University of California, Space Sciences Laboratory, Berkeley, California, USA

We present a study of the nightside ionosphere of Mars based on radar sounding data from the MARSIS instrument on board the Mars Express spacecraft. Although peak electron densities on the nightside are below the detection threshold of approximately $1 \times 10^4 \text{ cm}^{-3}$ more than 90% of the time, MARSIS can still provide much useful information. Ionospheric traces measured throughout the duration of the mission are evaluated along with the local electron density data determined from plasma oscillations in order to obtain the most complete experimental dataset from the Martian nightside available to date. Although most of the detected ionospheric reflections correspond to oblique echoes and cannot be used to derive altitude information, we have identified a few tens that are likely to correspond to vertical echoes. We have inverted these ionospheric traces, obtaining the corresponding electron density profiles and, most importantly, altitudes of peak electron density. These experimental results have been compared with recent numerical models that take into account electron impact ionization and recombination, using realistic electron energy and pitch angle distributions and accounting for effects of magnetic fields.