



Magnetically controlled structures in the ionosphere of Mars

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The ionospheric sounding data obtained by the Mars Advanced Radar for Sub-surface and Ionospheric Sounding (MARSIS) instrument on the Mars Express spacecraft show that the dayside ionosphere displays considerable structure over regions of strong crustal magnetic fields. These irregularities are typically seen as hyperbola-shaped echoes in a plot of apparent range versus time. The shapes of the hyperbola-shaped echoes are consistent with oblique reflections from regions of enhanced electrons that are fixed with respect to Mars. Comparisons with the Cain et al. [2003] model for the crustal magnetic field of Mars show that the apex of the hyperbolas, which identify the approximate center of the regions of enhanced electron density, usually coincide with regions where the crustal magnetic field is nearly vertical. The electron density enhancements are believed to arise due to increases in the scale height of the ionosphere, possibly due to heating of the ionosphere by solar wind electrons that can reach the base of the ionosphere along the nearly vertical (open) magnetic field lines. Analyses of the size and likely geometry of the regions of enhanced density, and their relationship to the magnetic field structures represented by the Cain et al. model will be given.