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MARSIS Active Ionospheric Sounding: a survey of electron density profile results

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Since the antenna deployment of the Mars Advanced Radar for Subsurface and Ionospheric Sounding, aboard the ESA Mars Express spacecraft, on June 17, 2005, the spacecraft has covered a large fraction of the planetary surface of Mars. We have derived electron density profiles from ionospheric traces for 20 orbits between September 2005 and December 2006. Where possible, we derive the physical parameters of Chapman layers for these profiles. We analyze the results of these operations as a function of various solar inputs, including F10.7, x-ray flux, and solar energetic particles. Values of the Chapman parameters are approximately as follows: subsolar maximum density = 1.3×10^5 /cm^3 $\pm$18%, subsolar peak altitude = 113 $\pm$ 12 km, neutral scale height = 15 $\pm$ 3 km. We also note an increase in the maximum observed density during solar energetic particle events.