

O/CO₂ RATIO IN THE THERMOSPHERE AND IMPLICATIONS FOR THE IONOSPHERE OF MARS: FIRST RESULTS FROM MAVEN. Jane L Fox¹, Paul R Mahaffy², Bruce M Jakosky³, and the MAVEN NGIMS Team, ¹Department of Physics, Wright State University, Dayton OH 45435 (jane.fox@wright.edu), ²Goddard Space Flight Center, Greenbelt, MD, ³Laboratory for Atmospheric and Space Physics, University of Colorado, Boulder.

Introduction: The mixing ratio of O in the Martian thermosphere was unknown prior to MAVEN except for that inferred from the Viking Retarding Potential Analyzer ion density measurements [1] and the remote sensing of O emissions from the Mariner 6, 7, and 9 [2]. The Neutral Gas and Ion Mass Spectrometer (NGIMS) on the MAVEN spacecraft has sampled the ion and neutral densities in both open and closed source modes. The NGIMS in open source mode has measured the densities of O and CO₂ directly, and in closed source mode, the CO₂ is also measured directly, along with the products of recombination of O as O₂ and other molecules or molecular fragments. Usually the measurements range from periapsis at about 150 km to very high altitudes where chemistry no longer determines the ion densities. Periapsis was at a lower altitude for the deep dip that occurred in February.

Chemistry of ions: The major ion produced by photons and photoelectrons in the lower ionosphere is CO₂⁺. This ion is converted to O₂⁺ by reaction with O. O⁺ also reacts with CO₂ to produce O₂⁺. Although dissociative ionization of CO₂ produces O⁺ + CO with probabilities that range from 5% to 10% by solar photons and photoelectrons with energies greater than about 19 eV, the major source of O⁺ is direct ionization of O at altitudes where O is the major neutral. Thus the major ion over most of the ionosphere is O₂⁺; the O⁺ densities become comparable to those of O₂⁺ at altitudes of 250 to 300 km. We here present some of the dayside measured profiles of the major neutral species, and those of the major ions. Using ion and electron temperatures that have been measured by the STATIC and LPW instruments, and the measured neutral densities in the range from periapsis to 300 km, we model the ion densities. We illustrate the chemical and physical processes that control the ionospheric density profiles.

References: [1] Hanson, W. B. et al. (1977) *JGR*, 82, 4351-4363. [2] e.g., Stewart, A. I. F. et al. (1992), *JGR*, 17, 91-102.