Geophysical Research Abstracts
Vol. 21, EGU2019-10434, 2019
EGU General Assembly 2019

Investigation of hydrogen exosphere from foreshock electron impact ionization at Mars

Christian Mazelle (1), Karim Meziane (2,1), Abdelhaq Hamza (2), Norberto Romanelli (3), Philippe Garnier (1), David L. Mitchell (4), Ali Rahmati (4), Jasper S. Halekas (5), Jared R. Espley (6), Emmanuel Penou (1), and Bruce Jakosky (7)

(1) IRAP CNRS-University of Toulouse-UPS-CNES, PEPS, Toulouse, France (christian.mazelle@irap.omp.eu), (2) Physics Department, University of New Brunswick, Canada, (3) NASA Goddard Space Flight Center, Greenbelt, USA, (4) Space Sciences Laboratory, University of California, Berkeley, USA, (5) University of Kansas, Lawrence, KS, USA, (6) Department of Physics and Astronomy, University of Iowa, Iowa City, Iowa, USA, (7) Laboratory for Atmospheric and Space Physics, University of Colorado, Boulder, Colorado, USA

The electron spectrometer SWEA on board the MAVEN spacecraft orbiting Mars often measures backstreaming electrons emanating from the bow shock when located inside the foreshock. They display a systematic flux fall off with the distance from the shock along the magnetic field direction which was unexpected, since not observed at other planetary foreshocks so far including the terrestrial one. It has been shown recently that this can be explained by impact ionization of exospheric neutral hydrogen atoms and that the flux decay is consistent with the electron-atomic hydrogen impact cross-section for a large range of energy. The relative variation of the electron flux gives an insight into the far exosphere compared to other methods to investigate the neutral environment. It basically reproduces as expected the seasonality for the hydrogen though other variations are often superimposed. Moreover, there is a sharp variation of the pickup protons – generated ULF waves amplitude when crossing the electron foreshock boundary as well as a decrease of this amplitude correlated with the increasing distance from the shock along the magnetic field. This shows that foreshock electrons play an important role in locally increasing the number of pickup ions which contribute to the atmospheric escape.