25th IAA SYMPOSIUM ON SMALL SATELLITE MISSIONS (B4)
Small Space Science Missions (2)

Author: Prof.Dr. Edgar Bering
University of Houston, United States, eabering@uh.edu

Prof. Ji Chen
University of Houston, United States, jchen23@central.uh.edu
Prof. David Jackson
University of Houston, United States, DJackson@uh.edu
Prof. Lawrence Pinsky
University of Houston, United States, pinsky@uh.edu
Dr. Laila Andersson
Laboratory for Atmospheric and Space Physics (LASP) at University of Colorado, United States, laila.andersson@lasp.colorado.edu
Prof. James Cutler
University of Michigan, United States, jwcutler@umich.edu
Dr. J.P. Sheehan
University of Michigan, United States, sheehanj@umich.edu
Prof. Mark Moldwin
University of Michigan, United States, mmoldwin@umich.edu
Prof. Kentaro Hara
Texas A&M University, United States, khara@tamu.edu
Prof. Mark Lemmon
Texas A&M University, United States, lemmon@tamu.edu
Prof. Rod Heelis
University of Texas at Dallas, United States, heelis@utdallas.edu
Prof. Russell Stoneback
University of Texas at Dallas, United States, rstoneba@utdallas.edu
Prof. James Forbes
McGill University, Canada, james.richard.forbes@mcgill.ca
Mr. Thomas Heine
University of Michigan, United States, heinet@umich.edu
Dr. Paul Withers
Boston University, United States, withers@bu.edu

TRIMETRIC TOMOGRAPHY OF THE MARTIAN IONOSPHERE USING CUBESATS

Abstract

The MARSCAT Mission will be a multiple 6U CubeSat mission to study the ionosphere of Mars. The mission will investigate the plasma and magnetic structure of the Martian ionosphere, including how the ionosphere responds to solar wind dynamics, what small scale structures exist in the lower ionosphere of Mars, and what processes are responsible for the maintainance of the nighttime ionosphere. The Mars transit proposed is piggy back with a major mission, using an on-board thruster burn or a carrier burn for

Mars Orbit Injection (MOI). MARSCAT will make correlated multipoint studies of the ionosphere and magnetic field of Mars. MARSCAT will make in situ observations of the energetic particle flux, plasma density, temperature, and convection in the ionosphere of Mars. They will also make total electron content measurements along the line of sight between any two of two spacecraft. Following the successful exploration of the Mars ionosphere and its interaction with the solar wind and the crustal magnetic field of the planet, there remain several key questions, which will complete a description of the space environment of Mars. The key questions involve the transport proper-ties of the ionospheric plasma, its role in redistributing the plasma and the role of the magnetic field in modifying the plasma motions. A focus for advancing our current understanding may be obtained by addressing the following key questions. How does the ionosphere respond to solar wind dynamics? What small-scale structures exist in the lower ionosphere of Mars? What processes are responsible for the maintenance of the nighttime ionosphere? The key to advanc-ing or understanding lies in using multiple platforms to increase the temporal cadence with which a particular volume of the ionosphere can be sampled. With recent advances in small satellite capabilities it is now possible to consider the deployment of a small satellite constella-tion to accomplish this task. Suitably instrumented satellites could be carried as a secondary payload to a major Mars mission in much the same way as small CubeSat missions have been successfully conducted in low Earth orbit.