

MAVEN ROSE observations of the response of Martian ionosphere to dust storms

M. Felici (1), P. Withers (1), and L. Montabone (2) (1) Boston University, Boston, MA, USA (mfelici@bu.edu) (2) Space Science Institute, Boulder, CO, USA

Abstract

The Mars Atmosphere and Volatile Evolution (MAVEN) spacecraft has started orbiting Mars on September 2014. One of the main goals of the mission is to understand the composition, structure, and variability of the Martian upper atmosphere. The MAVEN Radio Occultation Science Experiment (ROSE) - since July 2016 part of MAVEN's scientific investigations - helps achieving such objective.

Planetary radio occultation is a remote measurement technique which relies on a particular configuration of the system, where the radio signal passes close to the solar system object of interest while travelling from the transmitter to the receiver (e.g. Fjeldbo et al., 1971; Withers, 2010). ROSE is a two-way radio occultations at X-band frequencies, and provides us with vertical profiles of ionospheric electron density. So far it has measured approximately 300 vertical electron density profiles distributed across all latitudes and solar zenith angles from 55 to 125 degrees. A geometric configuration suitable for radio occultations happens in seasons of a few months at the time, and during those seasons ROSE collects two pairs of observations per week.

In nearly three years of operations, ROSE observations include local dust events and storms, such as the global storm occurred during summer 2018, allowing a deeper investigation of the upper atmosphere response to such events. This paper will provide an overview of the ionospheric peak altitude observations during dust phenomena. We will show how dust storms and event raise the peak altitude, and how even a local dust event can increase the peak altitude as much as the 1971 global dust storm which was detected by Mariner 9 (e.g. Withers and Pratt, 2013, and references therein).

References

- [1] Fjeldbo, G., A. J. Kliore, and V. R. Eshleman, The neutral atmosphere of Venus as studied with the Mariner V radio occultation experiments, *Astron. J.*, 76, 123–140, 1971.
- [2] Withers, P. : Prediction of uncertainties in atmospheric properties measured by radio occultation experiments. *Advances in Space Research*, 46 (1), 58 - 73, 2010.
- [3] Withers, P., and Pratt, R.. An observational study of the response of the upper atmosphere of mars to lower atmospheric dust storms. *Icarus*, 225 (1), 378 - 389, 2013.