

Proposal Evaluation

Proposal Information

Proposal Title: Solar Activity Variations of the Ionospheres of Venus and Mars: Implications for Comparative Planetology

Proposal Number: 19-PLANET19-0134

PI Name: Paul Withers

PI Institution: TRUSTEES OF BOSTON UNIVERSITY

Future Investigator (FI) Name:

Kerrin Hensley

BRIEF DESCRIPTION OF RESEARCH:

The proposed research would seek to analyze and interpret the radio occultation data from ESA and NASA spacecraft, such as PVO, Vex, MGS, and MAVEN, to study solar cycle variations on the ionospheres of Venus and Mars. The proposed study will also make use of existing photochemical models of ionospheres of Mars and Venus to help understand the effect of solar cycle on the ionospheres of both planets. The proposed research would seek to inform current understanding on electron density and ion composition change in these conditions (lacking a global magnetic field).

Major Strengths of Proposal:

Understanding the response of planetary ionosphere to the solar cycle is important in terms of overall atmospheric evolution. The proposal aims to understand this with radio occultation data from two planets: Mars and Venus. The proposed study is specifically focused on the altitudes above the ionospheric peak, where dynamics, transport and photochemistry can cause larger variations compared to the ionospheric peak, and characterization of this region will definitely lead to better understanding of ion loss processes on Mars and Venus.

The team is very well established and experienced in the analysis of radio occultation data.

Minor Strengths of Proposal:

Inclusion of two planetary bodies with no global magnetic field and similar atmospheres would help characterize the observed variations which are similar on both planets as well as unique to each planet.

Major Weaknesses of Proposal:

None noted.

Minor Weaknesses of Proposal:

The proposal lacks the information about how this characterization of topside ionosphere will better help explain this loss to space. The proposal did not include discussion about the recent, relevant observations by MAVEN which specifically focused on important of ion loss and top side ionospheric variabilities (Jakosky et al, 2018, Fowler et al, 2018, Mayyasi et al, 2018), which might have been useful in identifying some of the variability mentioned in the proposal.

There was a lack of proper citation in the figures. E.g., Proposers mentioned that figure 1 is the typical ionospheres of Mars and Venus, which may not be the case. Specifically for Mars, where solar min and max difference is not very obvious and would not be a typical ionosphere picture (especially at SZA 75-80 degree).

OPTIONAL COMMENTS TO PROPOSER. Beyond this Proposal's Strengths/Weakness. There is no requirement to provide additional comments to the proposer. Please limit proposer remarks to constructive or advice-like comments.

Data used in the figures should be complete with regards to date/time/spatial/season, or have an explanation for why limited data is sufficient.