The Variability of Martian Proton Aurora

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Research Developments and Progress Resulting from NAI Award

This project, which serves as part of my PhD dissertation, entails characterizing proton aurora at Mars using the Imaging UltraViolet Spectrograph (IUVS) onboard the Mars Atmosphere and Volatile EvolutioN (MAVEN) spacecraft. Because of funding provided by The NAI Early Career Collaboration Award, I was able to collaborate in-person with my external committee member, Dr. Michael Chaffin, at the Laboratory for Atmospheric and Space Physics (LASP) in Boulder, CO. Dr. Chaffin's expertise in Martian atmospheric hydrogen, involvement in the IUVS team, and proficiency in analyzing IUVS and other Martian atmospheric data make him a valuable collaborator for my research. This collaboration allowed me to work with many other MAVEN and IUVS instrument team members in addition to Dr. Chaffin.

During my visit to LASP I worked on identifying atypical Martian proton aurora in IUVS data. Our collaboration will result in a deeper understanding of the processes driving Martian proton aurora. This trip allowed me to work with MAVEN/IUVS team members on the next two research chapters of my PhD dissertation: searching for upstream connections to magnetic fields and creating/comparing effective models of Martian proton aurora. These topics will enable a deeper understanding of the mechanisms driving proton aurora formation. I had numerous meetings and discussions with MAVEN team members in order to create a clearly defined research path and publication timeline. Part of this work is currently in preparation to be published in a journal article in Spring 2020.

This project is relevant to NASA Science Mission Directorate's Planetary Science field. Our research provides a deeper understanding of the phenomenology of proton aurora covering multiple Mars years. The results of is study will deepen our understanding of the connection between the solar wind and Mars' upper atmosphere/hydrogen corona. Additionally, because proton aurora formation depletes hydrogen from the corona, studying these events has important astrobiological implications, informing our understanding of the history of Martian atmospheric loss and conditions that shaped the planet and influenced habitability. Lastly, understanding proton aurora occurrence will be important for future Mars missions, as predicting these events will be important for protecting technology and the safety of astronauts in space.

The NAI Early Career Collaboration Award gave me to opportunity to collaborate with the MAVEN/IUVS team. The NAI funding has helped further my research and career goals, as well as to advance our current understanding of the evolution of the Martian atmosphere through time, and the implications that these changes have on the astrobiology of planetary bodies like Mars.