Characterizing the Altitude and Variability of the Martian Mesopause Over the MAVEN Mission

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The mesopause in the Martian atmosphere is the point at which the temperature is the coldest. It also divides the upper and lower atmospheres. In order for scientists to land spacecraft on Mars, they need to be able to understand where the Mesopause occurs. However, the exact altitude and variability of said mesopause is unknown. In order to discover more information about the mesopause, we wrote a computer program using the software IDL that would be able to interpret data received from the EUVM that is located on the MAVEN spacecraft. The EUVM takes wavelength measurements of the sun through the Martian atmosphere that can be converted into temperature data points using several equations. Our code organized the data into arrays and then compared temperature and altitude of the mesopause on several different graphs, accounting for different latitudes, local time, and season. We found that there is distinct trending during aphelion and perihelion in the northern hemisphere. This suggests that the mesopause altitude increases at temperature during perihelion due to the global dust storms that occur along the surface. Additionally, we found that at aphelion, the altitude of the mesopauses decreases with temperature because of adiabatic cooling and distinct air circulation patterns. There did not seem to be any trending along equinoxes, which may suggest that mesopause temperature could be related to pressure. We have also found that the mesopause occurs between 90 and 150 km across the board, with more specific parameters depending on season, local time, and latitude.

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