Results of Synthetic High-Resolution Spectra From Titan Surface Observations

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In the early 2000s, NASA sent Cassini to explore the outer reaches of the solar system. Onboard Cassini, the Visual and Infrared Mapping Spectrometer (VIMS) observed Titan, a moon of Saturn. Titan has many similarities to Earth, such as lakes, dunes, and an atmosphere. Yet, the combination of Titan's thick atmosphere and the low resolution of VIMS makes it extremely difficult for accurate identification of surface compounds. However, systematic instrument drift caused the peak sensitivity wavelength value of each VIMS channel to shift. In other words, there was an increasing gap between the wavelengths VIMS was measuring and those it was designed to measure. My goal was to develop and implement a technique to leverage this behavior to create a higher-resolution spectrum of Titan's equatorial dunes. I organized the data into an SQL database, as the publicly available NASA database is not consolidated into one volume. I also determined the best filter and correction pair to remove outliers and remove the effect of the atmosphere. After applying the shift to all spectra, I increased the resolution of VIMS fivefold, and reduced the effect of the atmosphere. However, there still is atmospheric influence on the dataset, and the current resolution increase is not enough to resolve narrow spectral features. In the future, I plan to implement a more efficient SQL querying technique, along with a more comprehensive atmospheric model. This technique can be applied to any other body observed by VIMS.

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