National Aeronautics and Space Administration

Retrieval and Removal of Telluric Spectral Variations from Ground-Based Exoplanet Transit Observations

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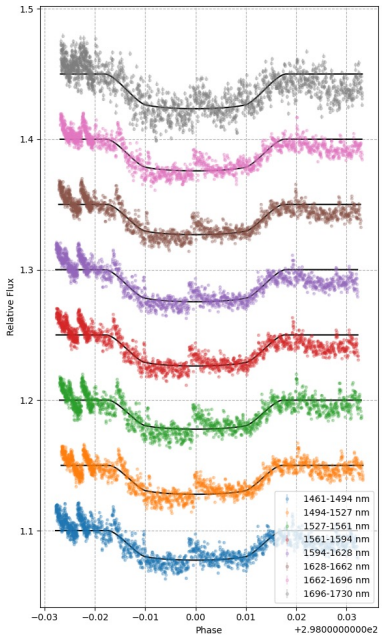
Objectives: Improve the quality of ground-based exoplanet transit spectroscopy measurements by using the data to infer Telluric changes occurring during the measurement sequence.

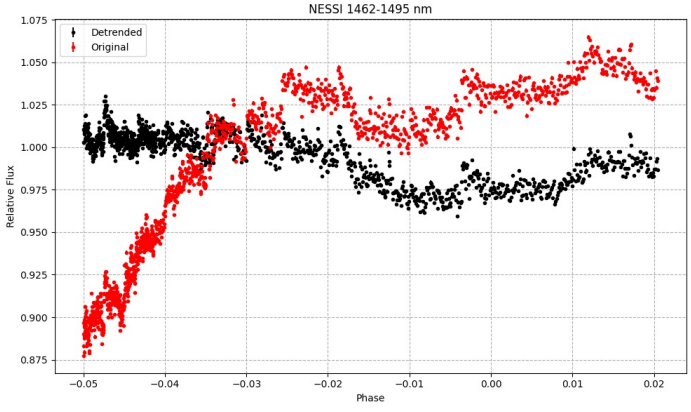
Background: Exoplanet transit spectroscopy observations, which are typically several hours in duration, are sensitive to Telluric changes.

Approach and Results: High fidelity atmospheric models were generated in the form of an atmospheric model grid covering the range of atmospheric conditions typical for the Palomar Observatory. Exoplanet transit spectroscopy observations, obtained with the NESSI instrument on the Palomar 5 meter telescope, were corrected for Telluric absorption by retrieval of the atmospheric H_2O column temporal changes and an airmass model. The approach shows promise and further improvements are likely possible. Current limitations include guiding errors.

Significance/Benefits to JPL and NASA: This project supports the broader goal of the study of exoplanet atmospheres by enabling ground-based measurements to be used in conjunction with space-based measurements to extend wavelength coverage or provide increased spectral resolution.



Above: Exoplanet transit light curves corrected for Telluric changes show guiding improvements are needed.



Left: NESSI spectral time series showing before (red) and after (black) correction for Telluric H2O absorption. The exoplanet transit is between Phase values -0.15 and 0.15.

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