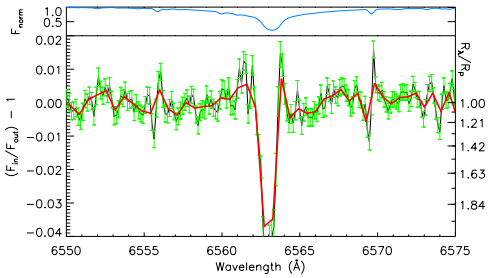
POSSIBLE Hα AND SODIUM D ABSORPTION IN WASP-12B. A. G. Jensen[1], P. W. Cauley[2], S. Redfield[2], W. D. Cochran[3], and M. Endl[3], and, [1] University of Nebraska at Kearney, Department of Physics & Astronomy, 2401 11th Ave, Kearney, NE 68849; JensenAG@unk.edu, [2]Van Vleck Observatory, Astronomy Department, Wesleyan University, 96 Foss Hill Drive, Middletown, CT 06459; pwcauley@wesleyan.edu, sredfield@wesleyan.edu, [3]University of Texas, Department of Astronomy, Austin, TX 78712; wdc@astro.as.utexas.edu, mike@astro.as.utexas.edu.

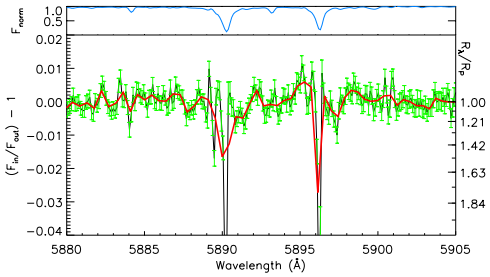
Introduction: Transmission spectroscopy of exoplanetary atmospheres is an extremely useful tool that can be used for understanding exoplanetary composition as well as potentially revealing star-planet interactions from radiation, magnetic fields, and more. The hot Jupiter planet WASP-12b is interesting in that it is very close to its star (0.02 AU) [1], has a large calculated scale height, has had water and metals detected in its atmosphere [2], and has had varying observational and theoretical constraints placed on its C/O ratio [3]. Here we present a preliminary analysis of the optical transmission spectrum of WASP-12b taken with the Hobby-Eberly Telescope (HET). Our data covers the optical wavelength range from approximately 4800 to 6850 Angstroms. Most notably this includes two Balmer lines of hydrogen (Hα at 6563 Å and Hβ 4861 Å) and the sodium D doublet (at 5890 and 5896 Å). Due to the relative faintness of the system's central star and different instrumental settings, the analysis involves several challenges that are not present in previous transmission spectroscopy observations with the HET.

Results: At Hα the transmission spectrum shows a strong feature. Our investigation concludes that this transit-correlated feature cannot be due to a lack of sky or telluric subtraction, or the presence of faint companions to WASP-12 at the edge of the fiber. A Monte Carlo-style analysis indicates that the significance of this result is between 2.5σ and 4σ, depending on our choice of error estimation. The Hα transmission spectrum is shown below.



We also find a marginal detection of sodium D that is consistent with a tentative detection by [4]. The sodium D transmission spectrum is shown below.

The possible presence of Hα absorption is worth additional study, as our previous HET detection of Hα in HD 189733b [5] was confirmed and strengthened by follow-up Keck observations [6, 7]. The presence of significant hydrogen in the n=2 state in hot Jupiters is



not well-understood. The only known detections, HD 189733b and WASP-12b, provide an interesting comparison as WASP-12b is closer to its star but WASP-12 is a less active star than HD 189733.

Studying Hα allows us to potentially access hydrogen envelopes in the visible, something that will be necessary when the Hubble Space Telescope's UV capabilities will no longer be available. Furthermore, even though hot Jupiters are not good targets for habitability studies, they are the most likely planets to show exospheric signals that may be relevant to understanding atmospheric loss and evolution, including by star-planet interactions, for other potentially habitable planets such as super-Earths close to M dwarfs.

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