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The near-UV transmission spectrum of the prototypical hot Jupiter HD 209458 b

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Abstract

There is growing observational and theoretical evidence suggesting that atmospheric escape is a key driver of planetary evolution, thus shaping the observed exoplanet demographics. We present how the near-ultraviolet (NUV) spectral range offers ample possibilities to directly observe and constrain the properties of exoplanet upper atmospheres. To date, WASP-12 and HD 209458 are the only systems with observed and published spectrally resolved NUV transit observations collected with HST [2, 3, 4]. The first analysis of the prototypical hot Jupiter HD 209458 NUV observations, concentrated exclusively on the analysis of two Mg features, led to an unexpected result with respect to the Mg ionisation balance in the planetary upper atmosphere. However, past experience with far-UV transit observations has shown that analyses of the same data-sets carried out in different ways may lead to significantly different results. Therefore, we carried out an independent re-analysis of the HST NUV transit observations of HD 209458 b and present here its results. We partially confirm the previous result and show how our re-analysis may lead to resolving the tension between observations and modelling with respect to the Mg ionisation balance. We further show that the transmission spectrum displays a number of previously undetected planetary absorption features that help constrain the physical conditions of the planetary upper atmosphere. We finally show how in the near future the CUTE Small Satellite mission [1], focused on the collection of NUV transmission spectra, will significantly improve our general knowledge of atmospheric escape and of circumplanetary environments.

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References

[1] Fleming, B. T., France, K., Nell, N., et al. 2018, Journal of Astronomical Telescopes, Instruments, and Systems, 4, 014004

[2] Fossati, L., Haswell, C. A., Froning, C. S., et al. 2010, ApJL, 714, L222

[3] Haswell, C. A., Fossati, L., Ayres, T., et al. 2012, ApJ, 760, 79

[4] Vidal-Madjar, A., Huitson, C. M., Bourrier, V., et al. 2013, A&A, 560, A54