Detecting hazy exoplanet atmospheres from the ground with K-band photometry

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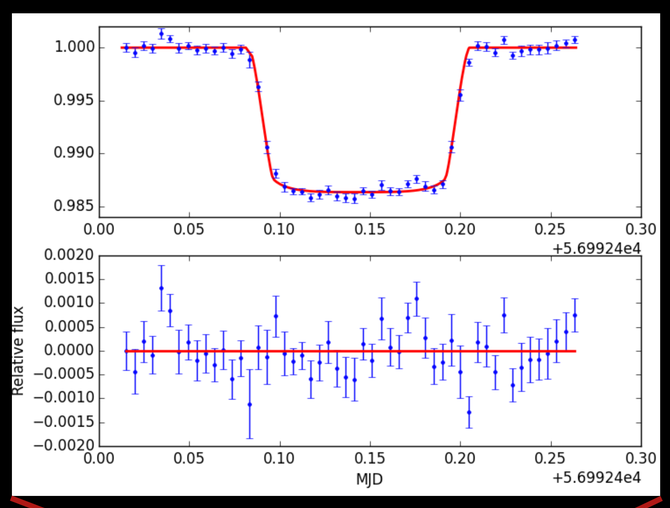
Abstract

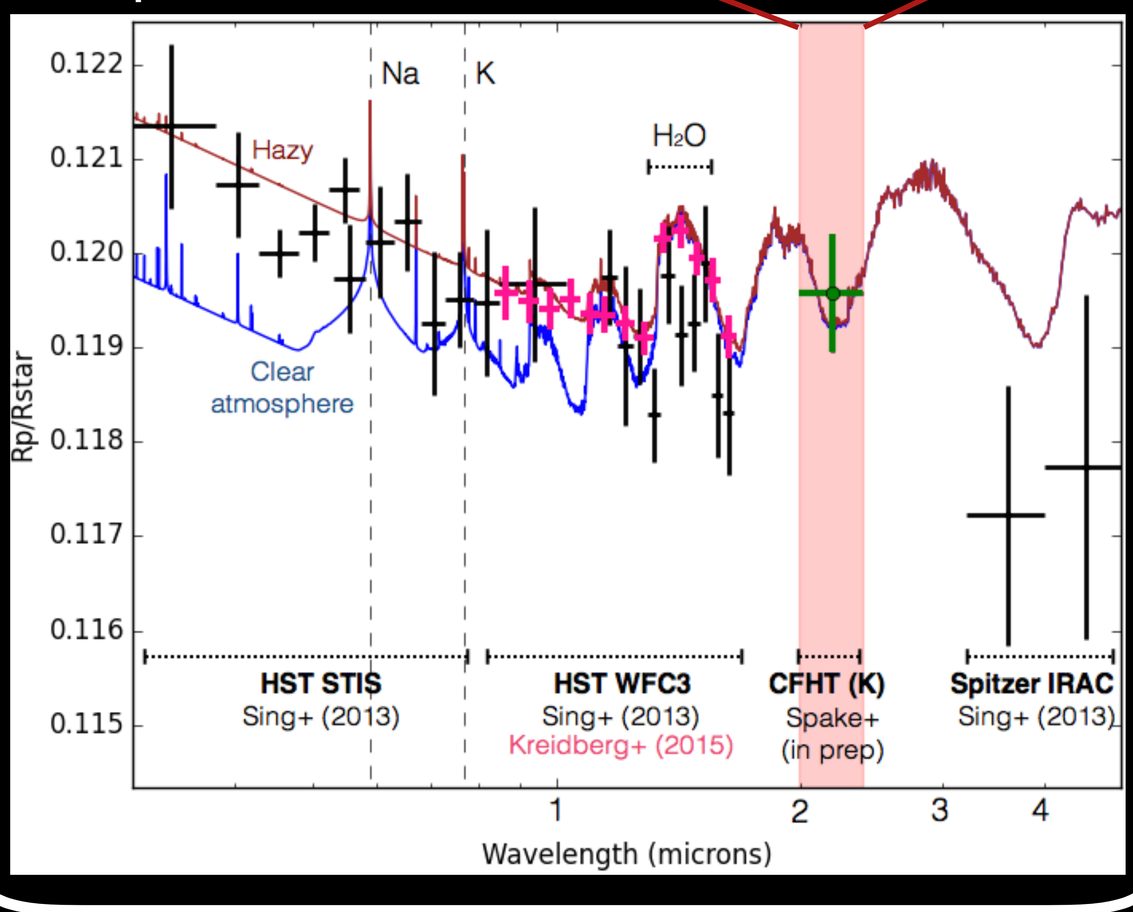
High-altitude haze can mask absorption features in exoplanet atmospheres. It would thus be beneficial to detect haze, before precious time on space-based telescopes is spent on atmospheric chatacterisation. Here we present two K-band transits from CFHT in a pilot project to see if ground-based photometry is sensitive enough to be used for this purpose.

WASP-12b

Canada-France-Hawai Telescope K-band transit photometry

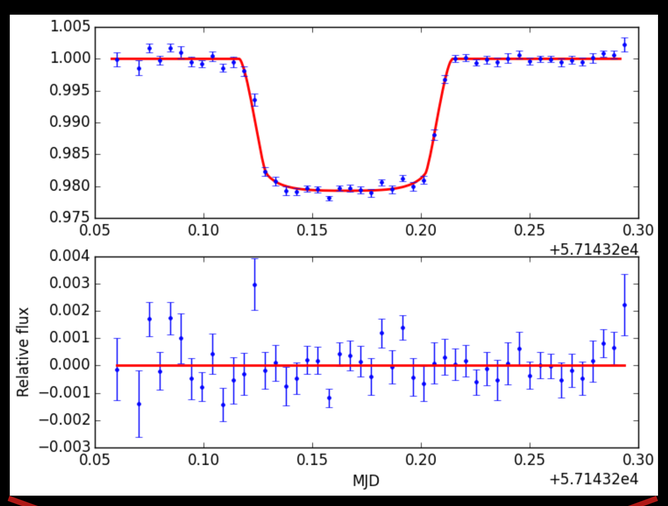


Transmission spectrum

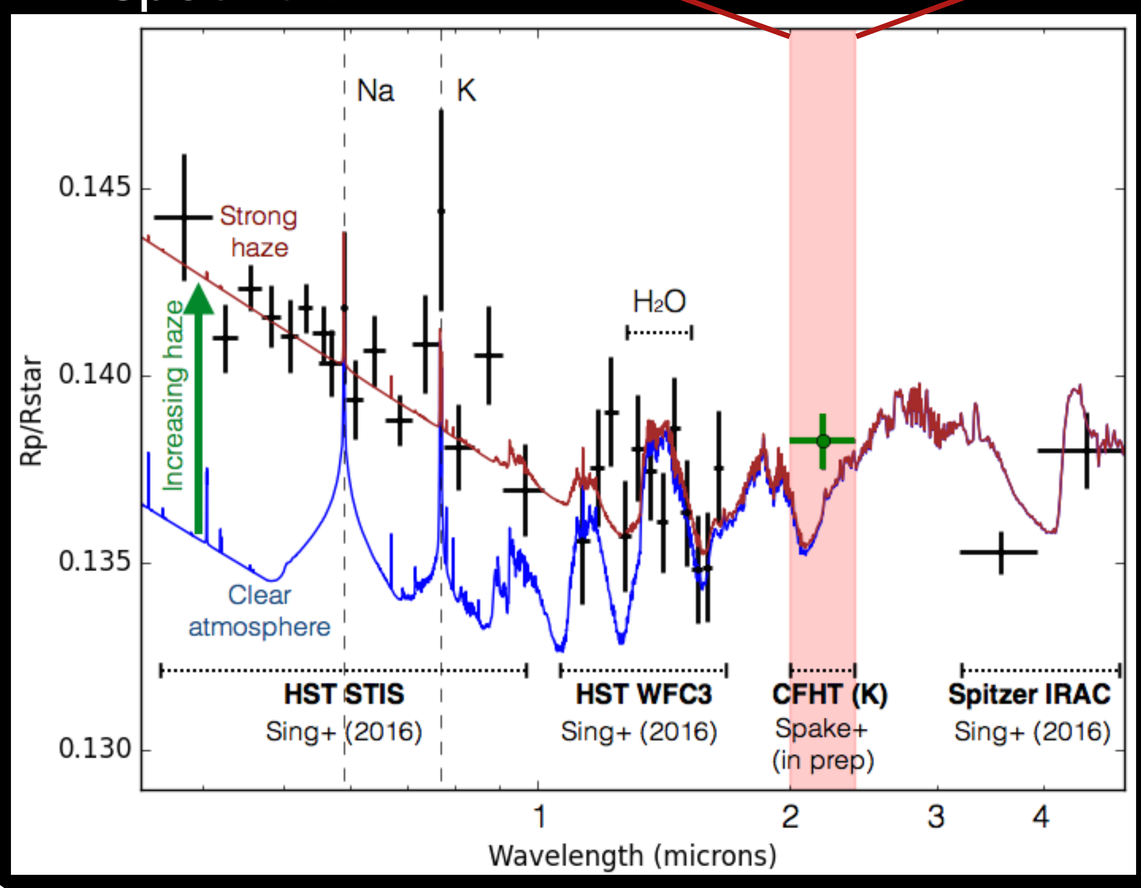


HAT-P-12b

Canada-France-Hawai Telescope K-band transit photometry



Transmission spectrum

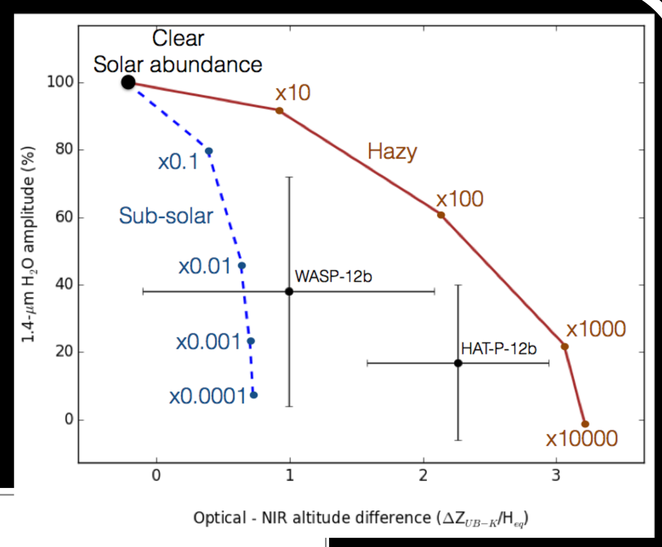


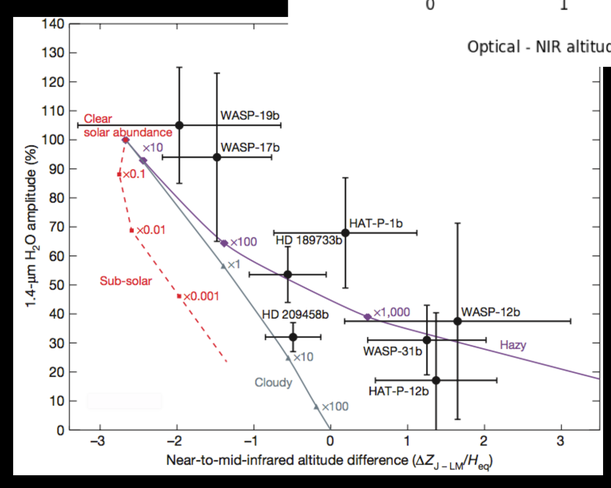
Conclusions

1) The K-band transit depths of both WASP-12b and HAT-P-12b are consistent with hazy atmospheres, in agreement with data from Hubble and Spitzer Space Telescopes (Sing et al. 2013, 2016).

2) The precision from CFHT at K-band is as good as or better than Spitzer, and can be used in conjunction with B-band photometry to find hazy planets.

3) A ground-based B & K photometric survey will be able to find high-value clear-atmosphere planets for JWST





Above: Transmission spectral index diagram of $\triangle Z_{UB-K}$ versus H_2O amplitude.

Left: Similar plot for $\triangle Z_{UB-LM}$, from Sing et al. (2016)

References:
Sing D. K. et al., 2016, Nature, 529, 59
Sing D. K. et al., 2013, MNRAS, 436, 2956
Kreidberg L. et al., 2015, ApJ, 814, 66

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