A Ground-based Emission Spectrum of WASP-12b

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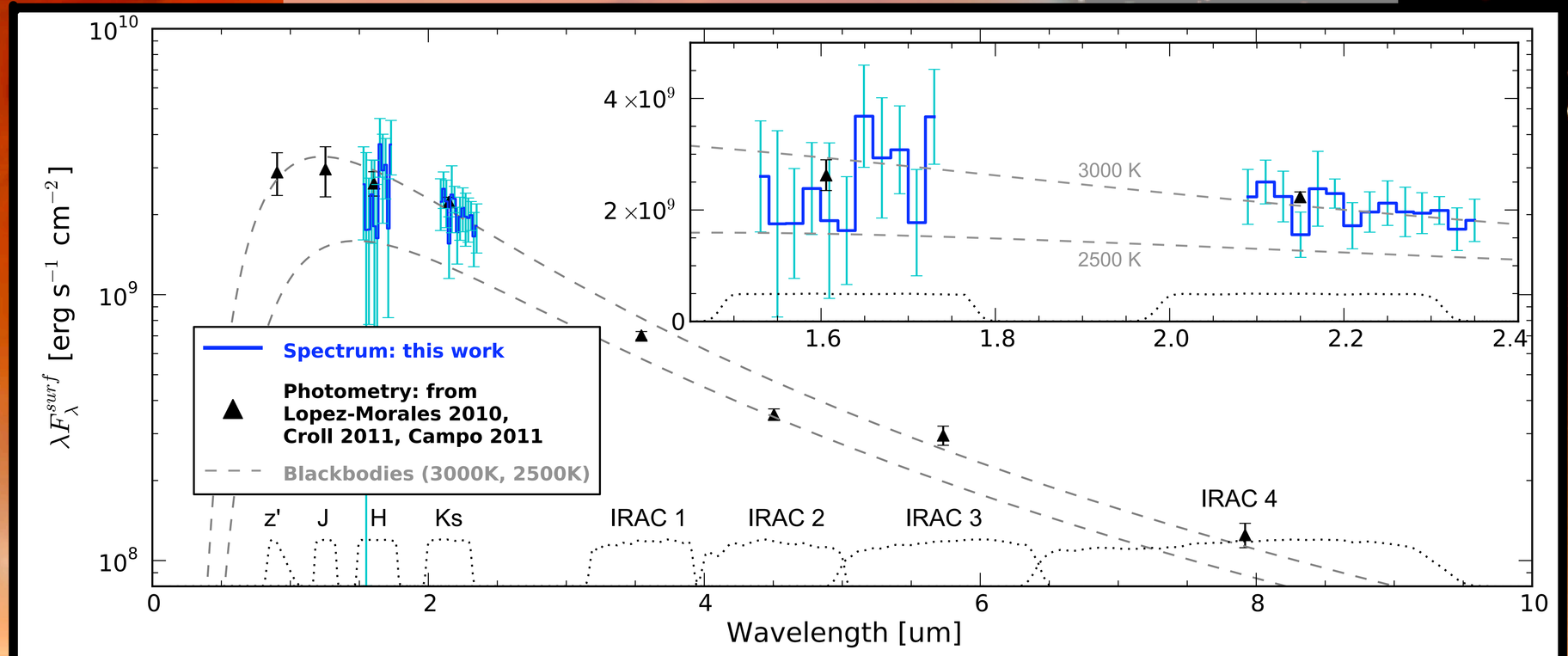
The inflated Hot Jupiter WASP-12b is one of the hottest known exoplanets, making it a prime target for atmospheric characterization via eclipse spectroscopy. We observed WASP-12b during two eclipses in low-resolution mode (R ~ 100) on the SpeX NIR spectrograph to search for the planet's emission spectrum. We calibrate out flux variations from the telescope and telluric sources with an instrumental model and an empirical slit loss term. **We detect the planet's emission in the H and K bands, but individual spectral features remain poorly constrained.**



Our spectrum, shown above, matches past, photometric measurements (Croll et al. 2011) and is consistent with a 3,000 K blackbody. We see a hint of a spectral break at 1.64um and see no CH_4/CO absorption near 2.32 um, but we cannot tightly constrain particular spectral features. Using the full ensemble of past secondary eclipse observations we predict a day/night effective temperature contrast of 200-1,000 K. Spitzer phase curves will soon test this prediction.

The Future:

Single-slit exoplanet spectroscopy is feasible but requires many photons, large slits, and photometric observing conditions. Few large-aperture telescopes have very wide (3") slit NIR spectrographs, so this technique may be limited to the brightest host stars. This semester we are using SpeX to observe four transits of one such system, Super Earth GJ 1214b, to test recent claims about the planet's NIR radius.

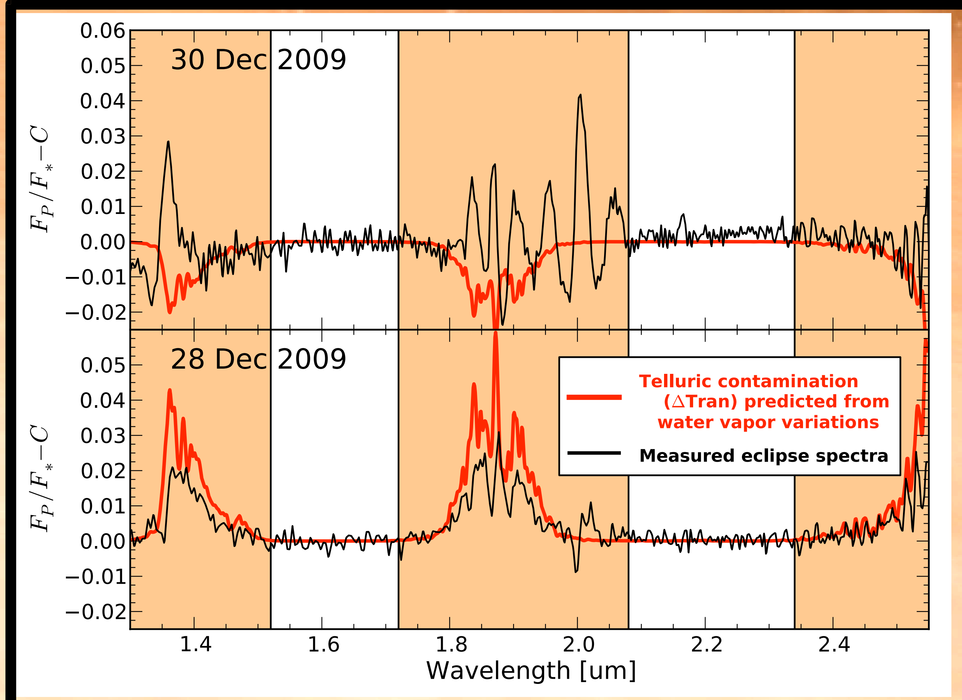
Multi-object spectrographs may be the best tools available on large-aperture telescopes (Bean et al. submitted). Our upcoming Subaru/MOIRCS observations of WASP-12b in eclipse will use this new technique to improve on the spectrum we show here.

Relevant talks to see:

Thursday talks by J. Bean (0830), B. Croll (0915), N. Cowan (1615).

References:

Campo et al. 2011
Croll et al. 2010
Lopez-Morales et al. 2010
Mandell et al. 2011
Swain et al. 2010



Past ground-based spectroscopy has been challenged on the basis of telluric water vapor variations (Swain et al. 2010, Mandell et al. 2011). We model telluric transmittance and radiance (*above*) and show that our observations are unaffected by these phenomena in well-defined spectral regions.