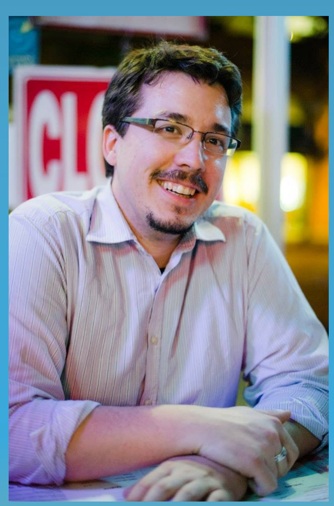


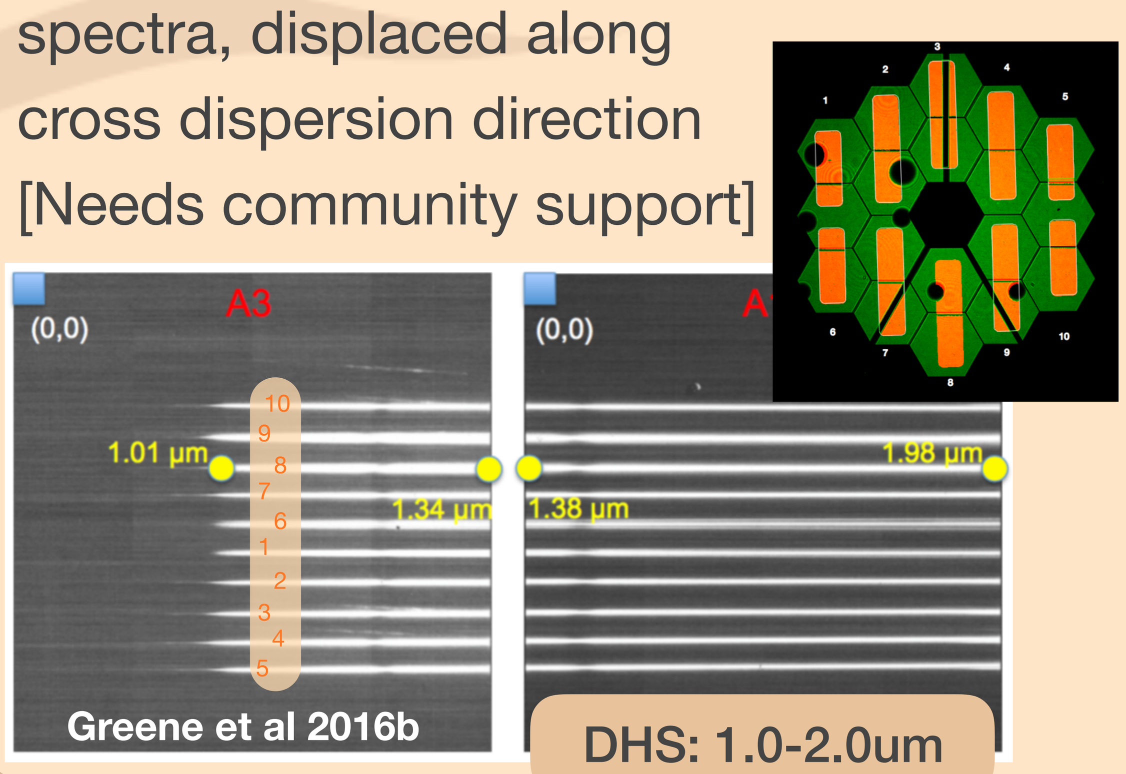
Exoplanet Transmission Spectroscopy with NIRCam

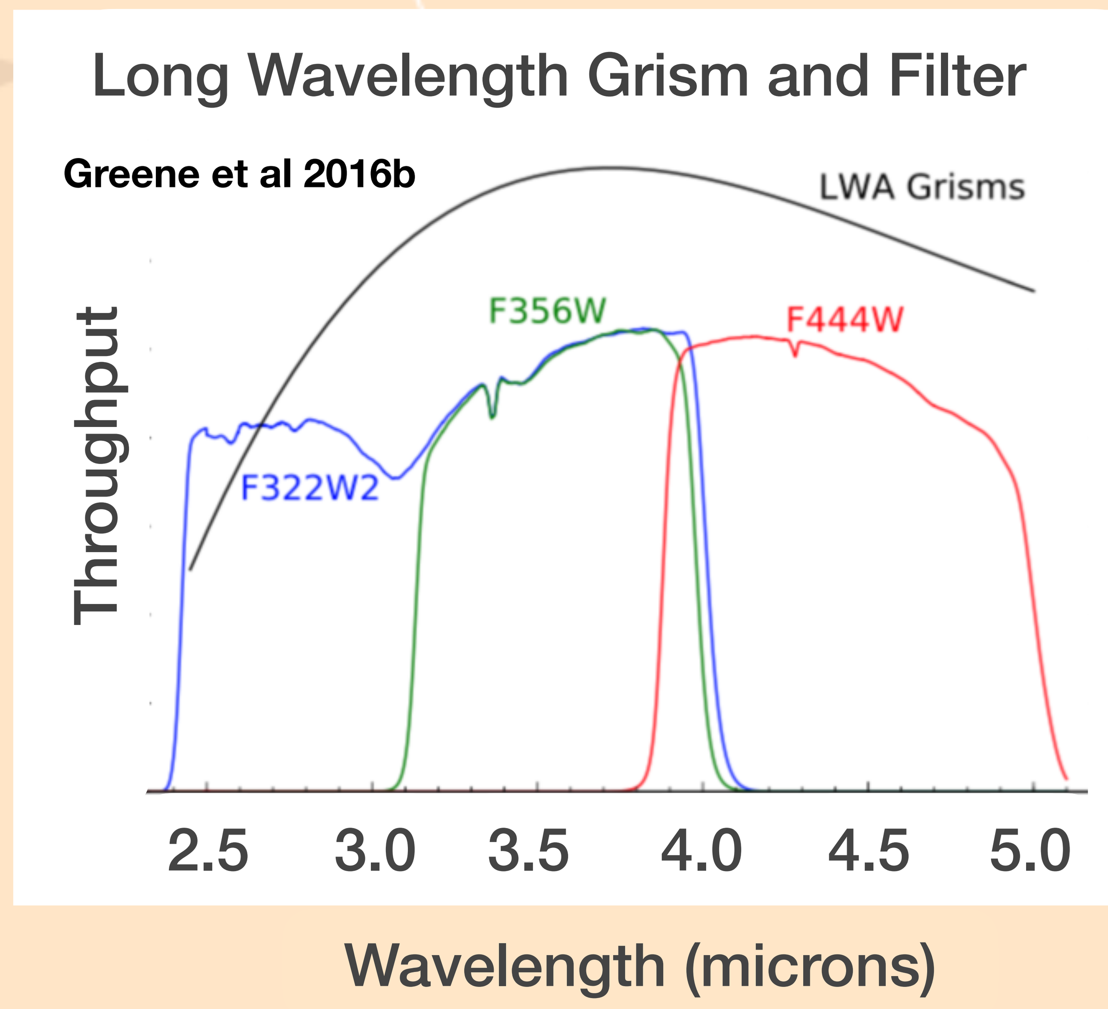
J.Fraine[1], N.Lewis[2], T.Greene[3], M. Rieke[1], E. Schlawin[1], R. Bushra[1]
[1]Steward Observatory, [2]Space Telescope Science Institute, [3]NASA Ames

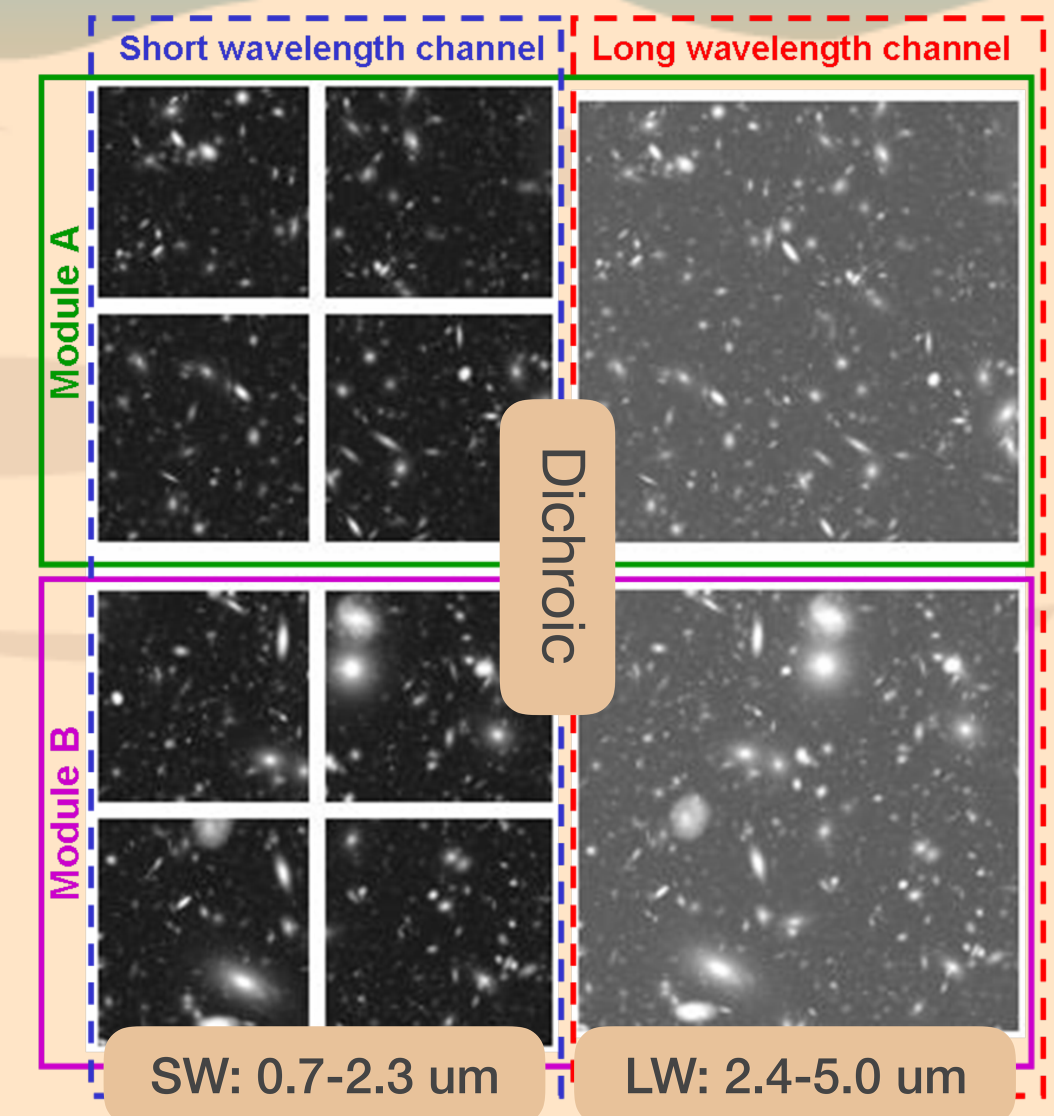
How NIRCam works

A story of … 10 Detectors, 2 Channels, 3 Grisms, and 5 Filters

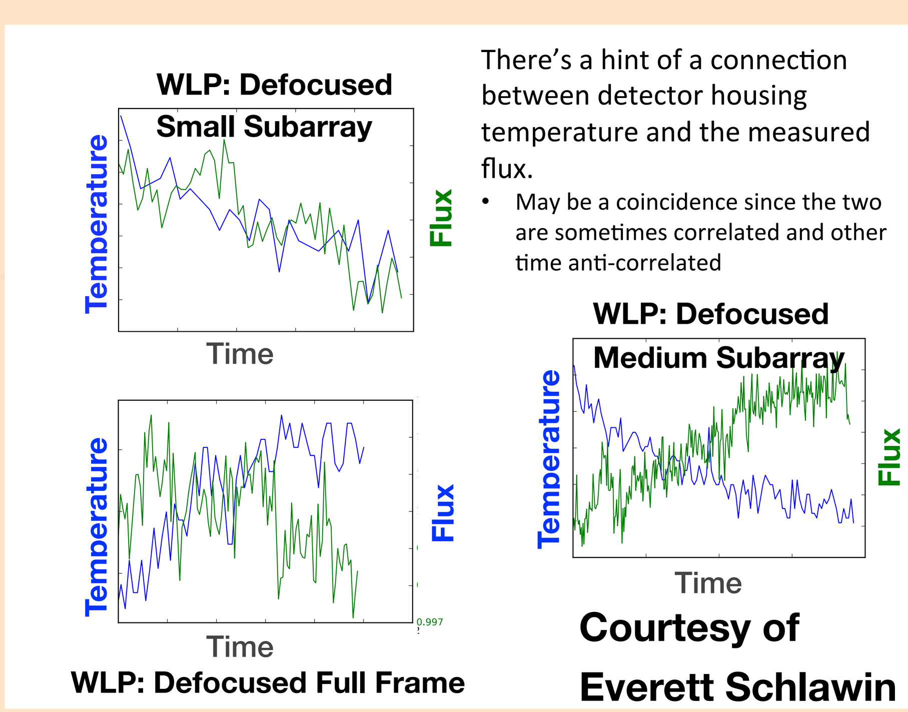
DHS: Short Wavelength "Grism"
Dispersed Hartman Sensor splits the aperture into 10 equal spectra, displaced along cross dispersion direction
[Needs community support]



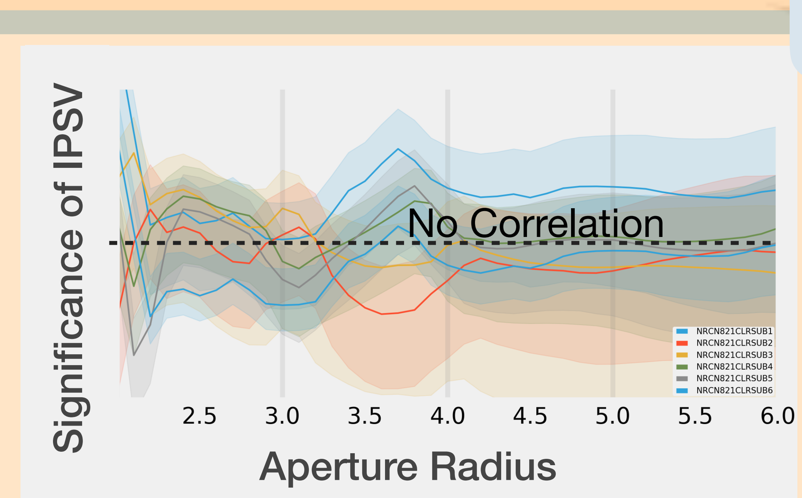




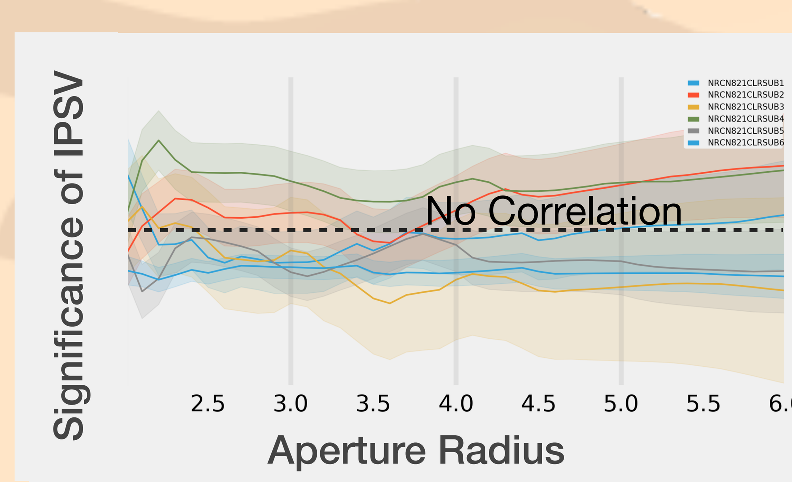
What we know about it so far



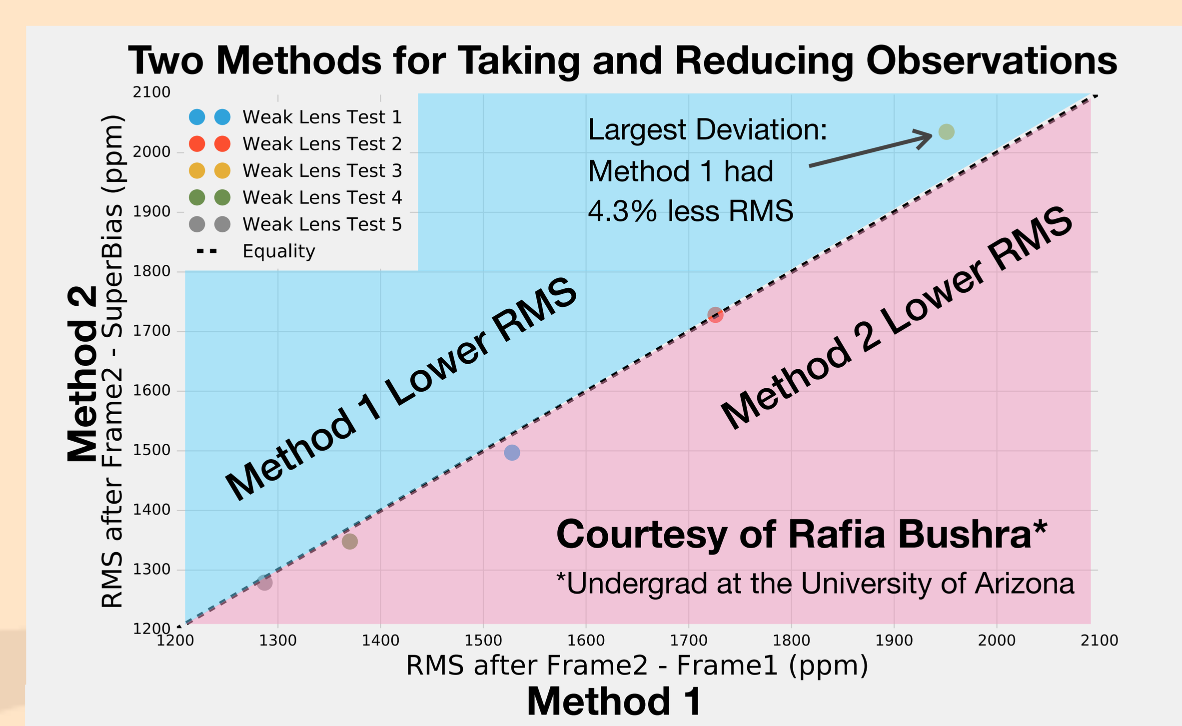
Weak Lens: Defocused Imaging
During our weak lens tests, we discovered a possible correlation with the detector housing temperature.



Standard Photometry:
Our in-focus photometry tests revealed no sign of Spitzer's intrapixel effect (IPSV) w/in the errors.
[Commissioning tests still to come]

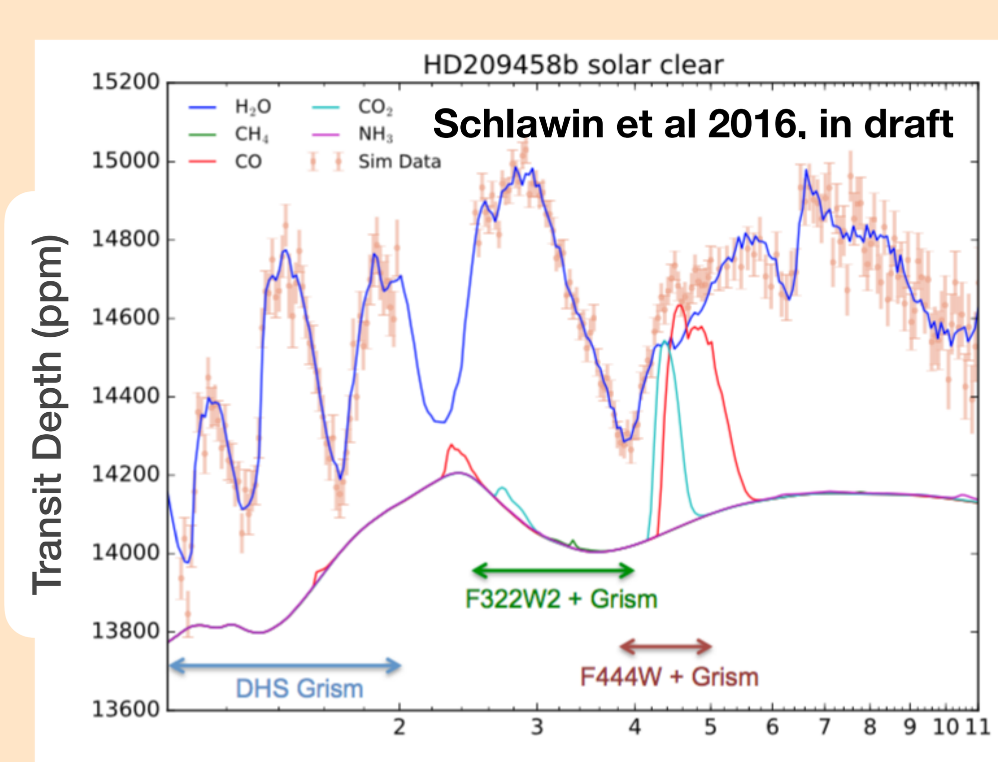


Using a SuperBias provides better Saturation limits, but could lead to larger RMS

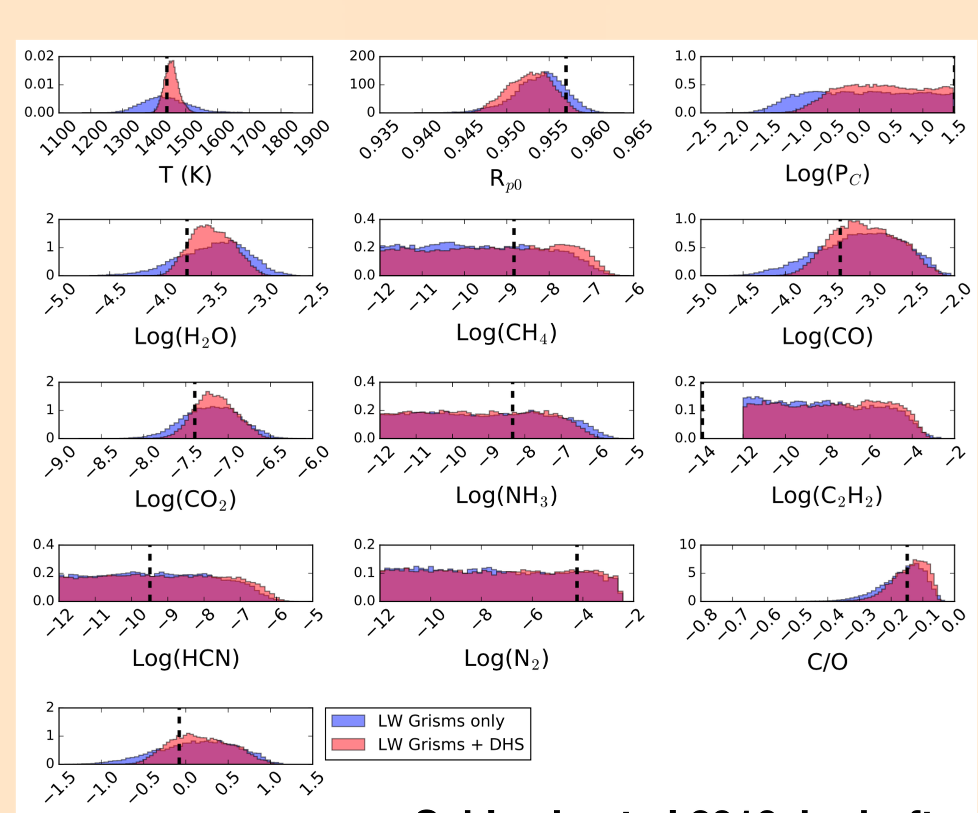


SuperBias: SuperBias calibration frame from global testing data. Allows for brighter targets
- Most RMS measurements are close to equality
- In test 3: the SuperBias frame is worse

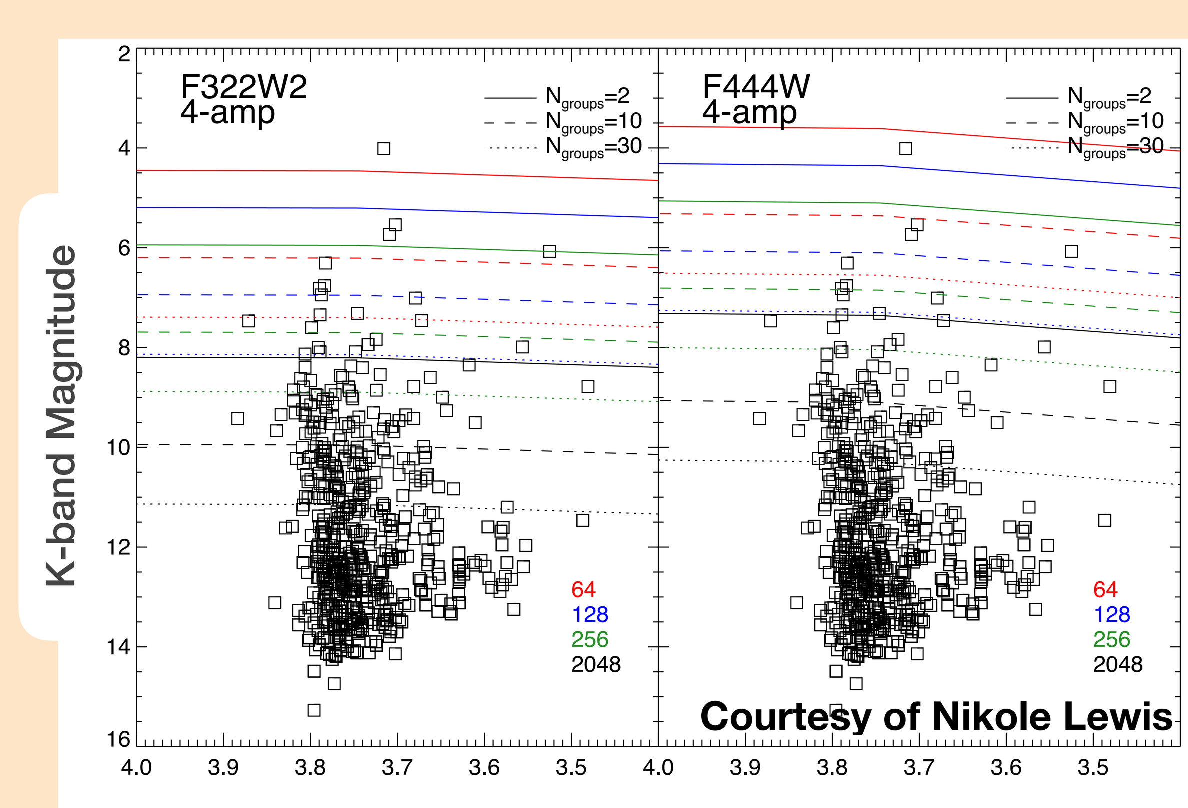
What can NIRCam do?



Synthetic Spectrum of HD 209458b from Schlawin et al., draft. The standard Long Wavelength (LW) grism overs from 2.4-5.0 microns. Adding DHS (SW) increases the wavelength coverage down to 1.0 micron.



MCMC Results using LW grisms and LW +DHS grisms. By adding the short wavelength grism (DHS) we are able to remove the correlation between Water and Carbon-based molecules. **DHS improves detection of Water, CO, CO2, C/O, & Fe/H.**



Detectability: NIRCam is able to observe (without saturation) almost all known exoplanets host stars (all before 2016). NIRCam is the only NIR instrument capable of observing targets as bright as 55 Cnc.

Background graphic courtesy of http://swanh.net/