

*Exploring the contrast effect
for HD 189733 b*

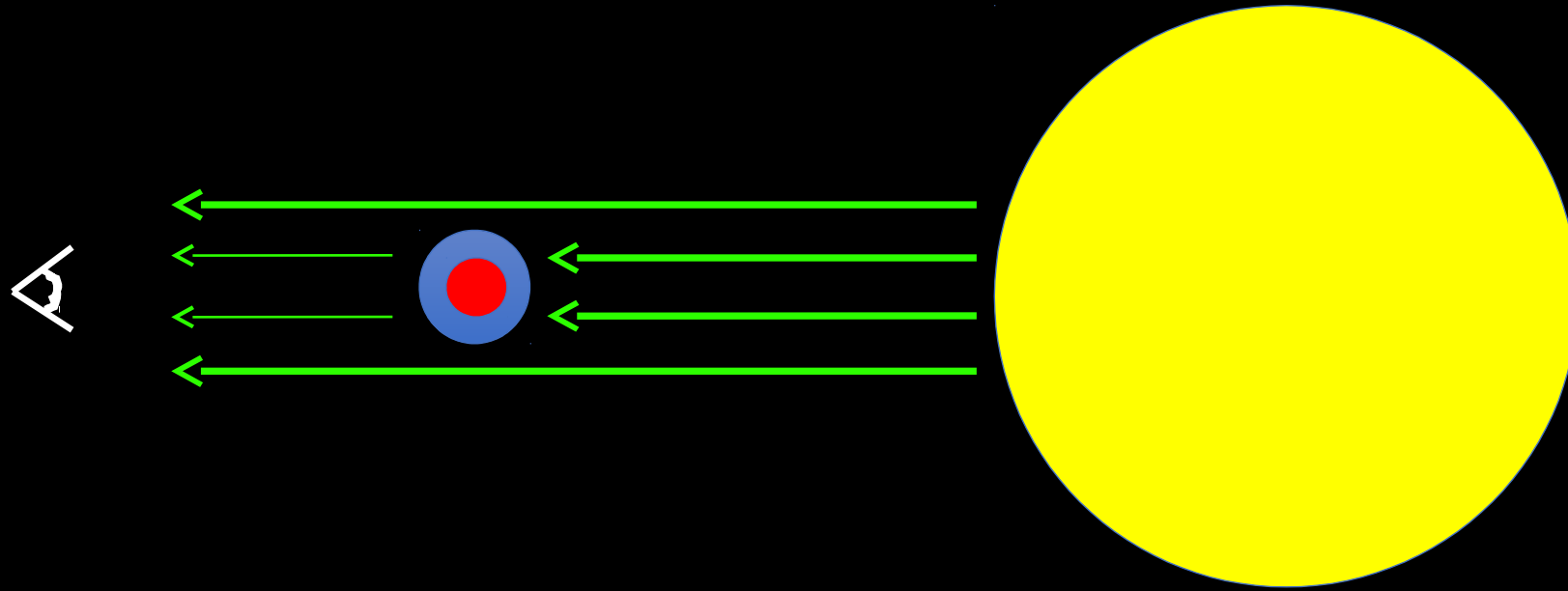
Wilson Cauley

In collaboration with Seth Redfield and Adam Jensen

Wesleyan University

06-12-2017

ERES III – Yale University

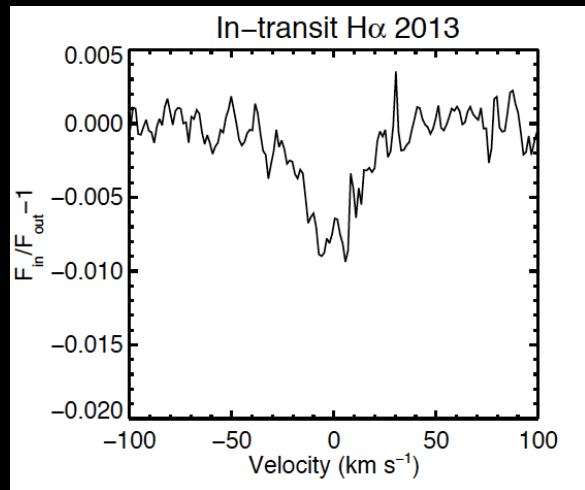


Can transmission signals be caused by the contrast effect in strong atomic lines?

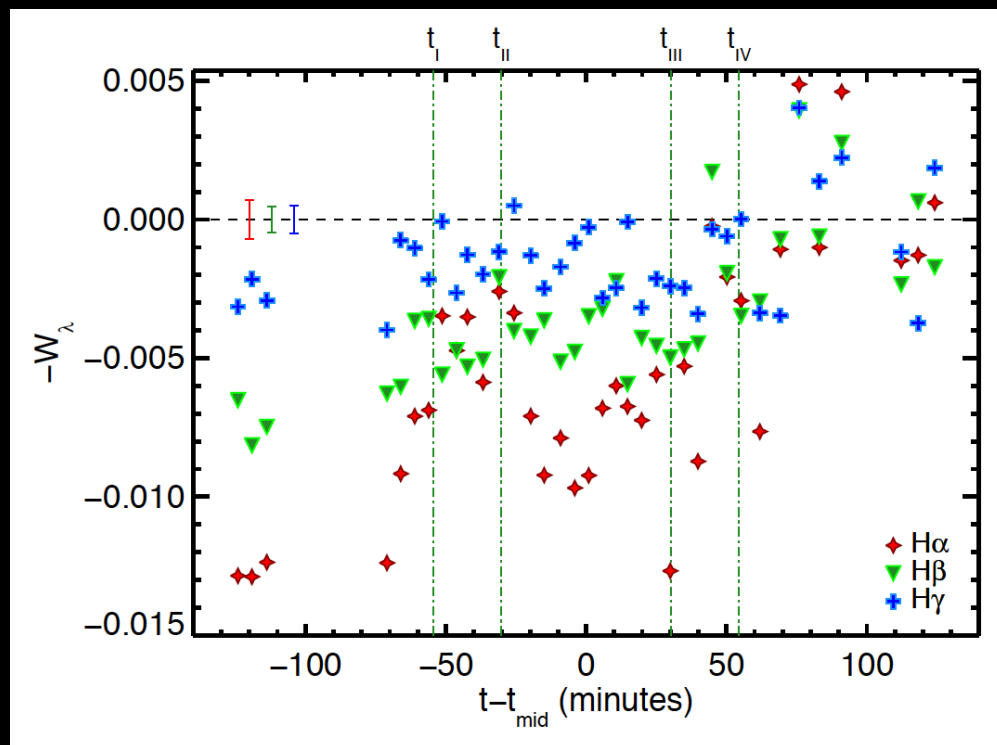
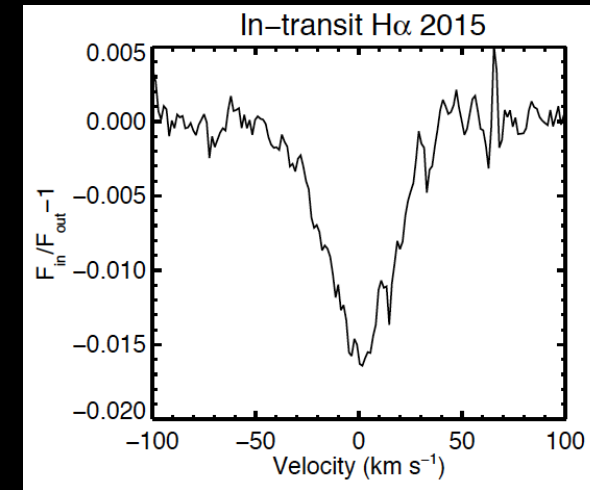
HD 189733 b

-Hot Jupiter transiting an active star

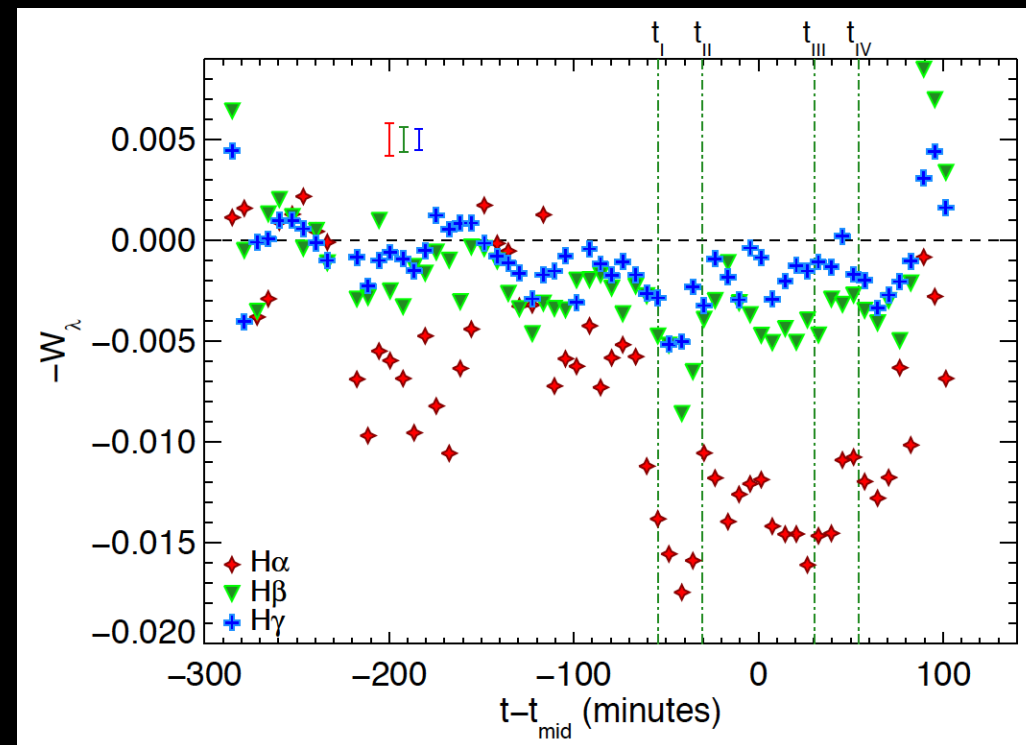
2013



2015

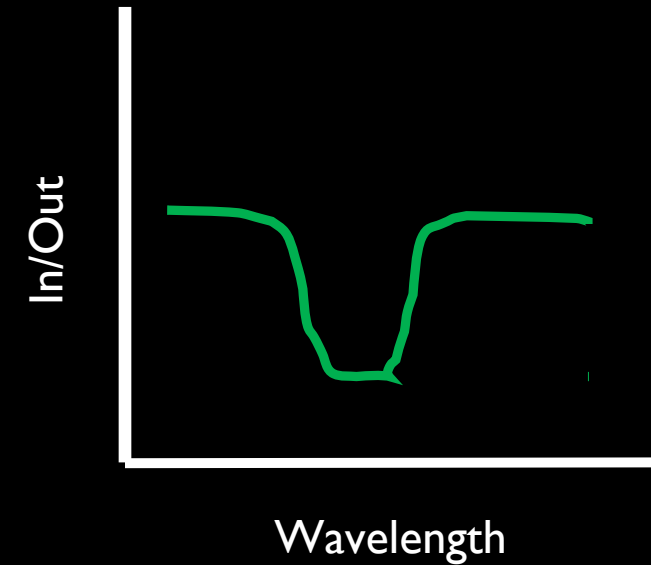
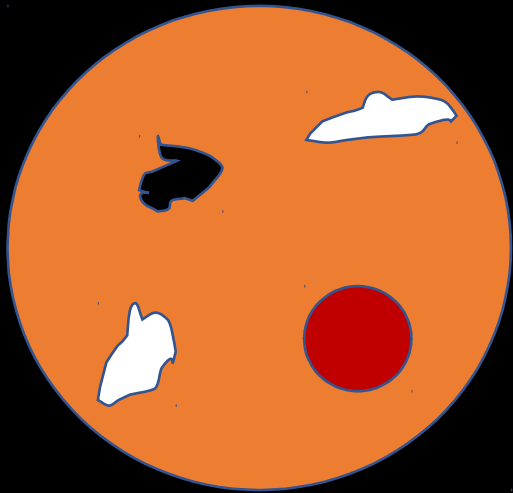
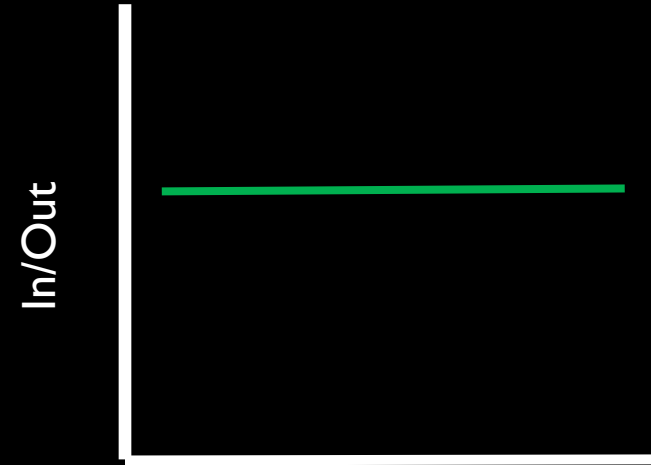
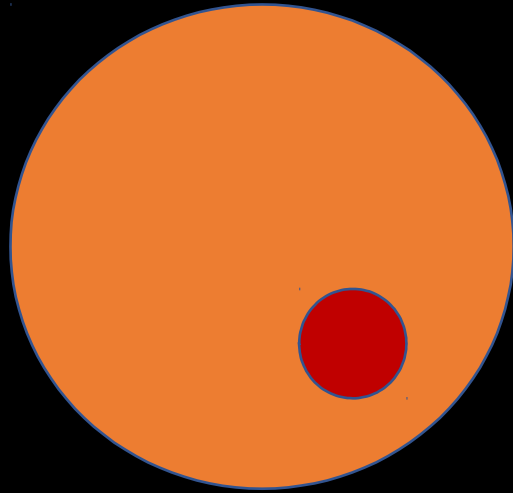


Cauley et al 2015



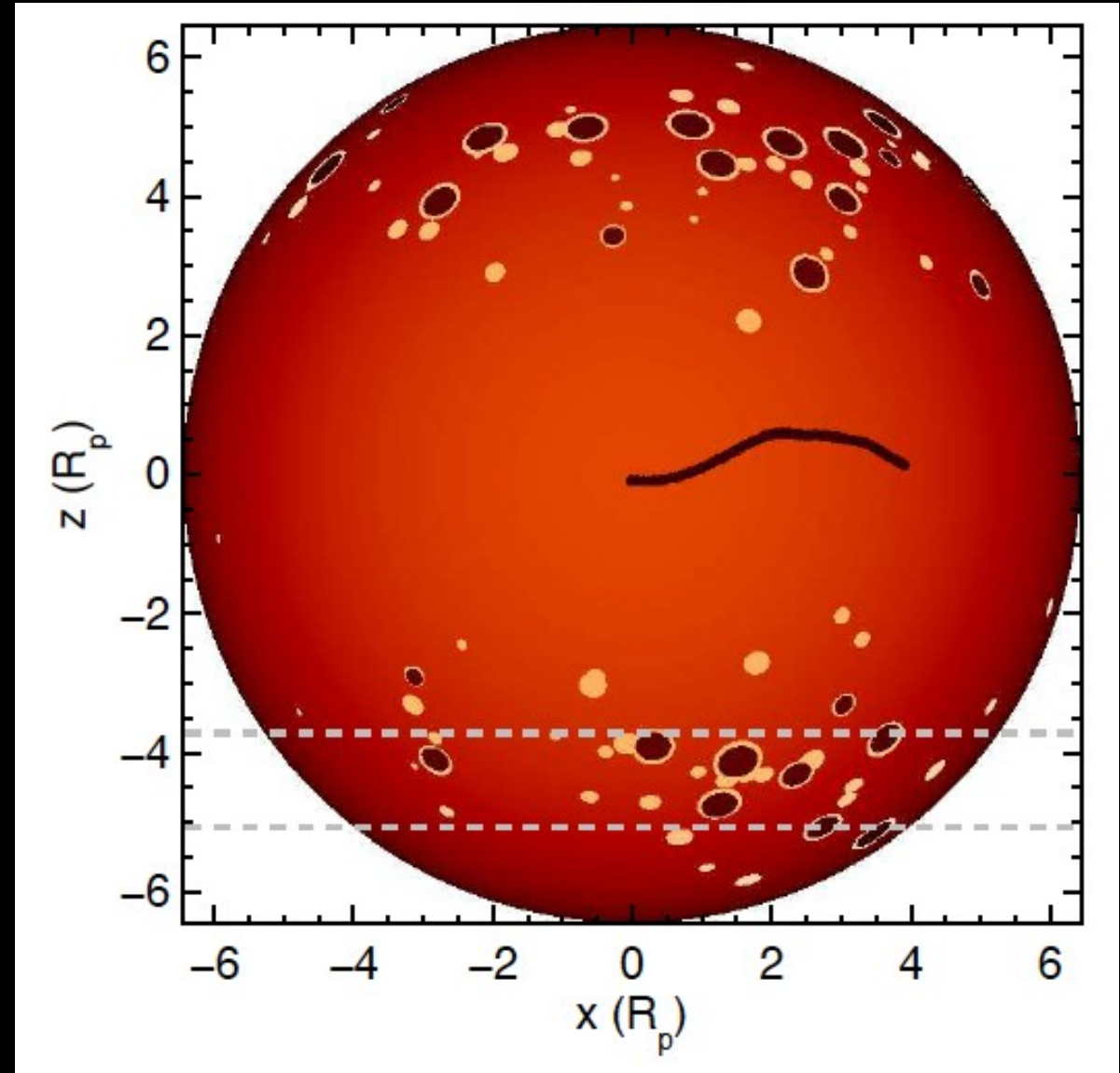
Cauley et al 2016

In-transit contrast effect

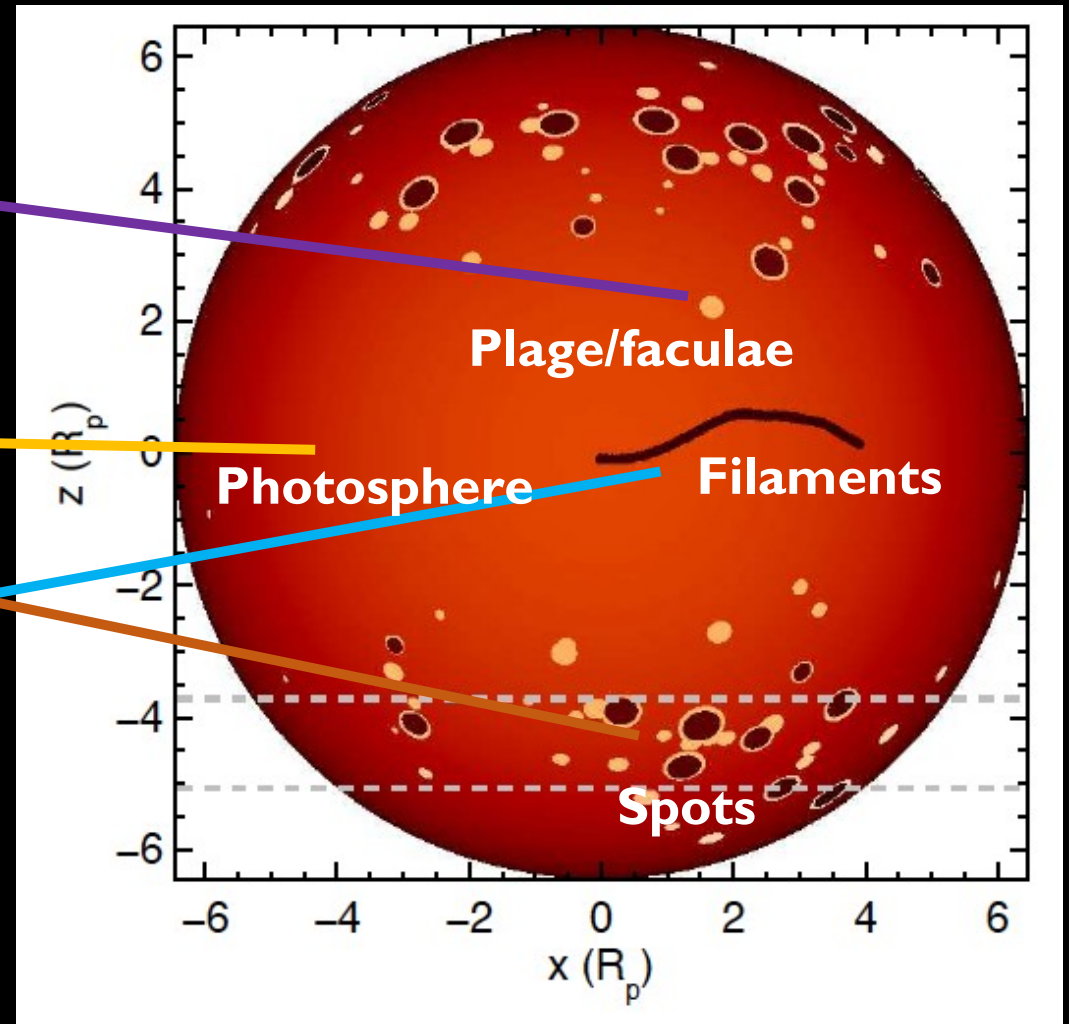
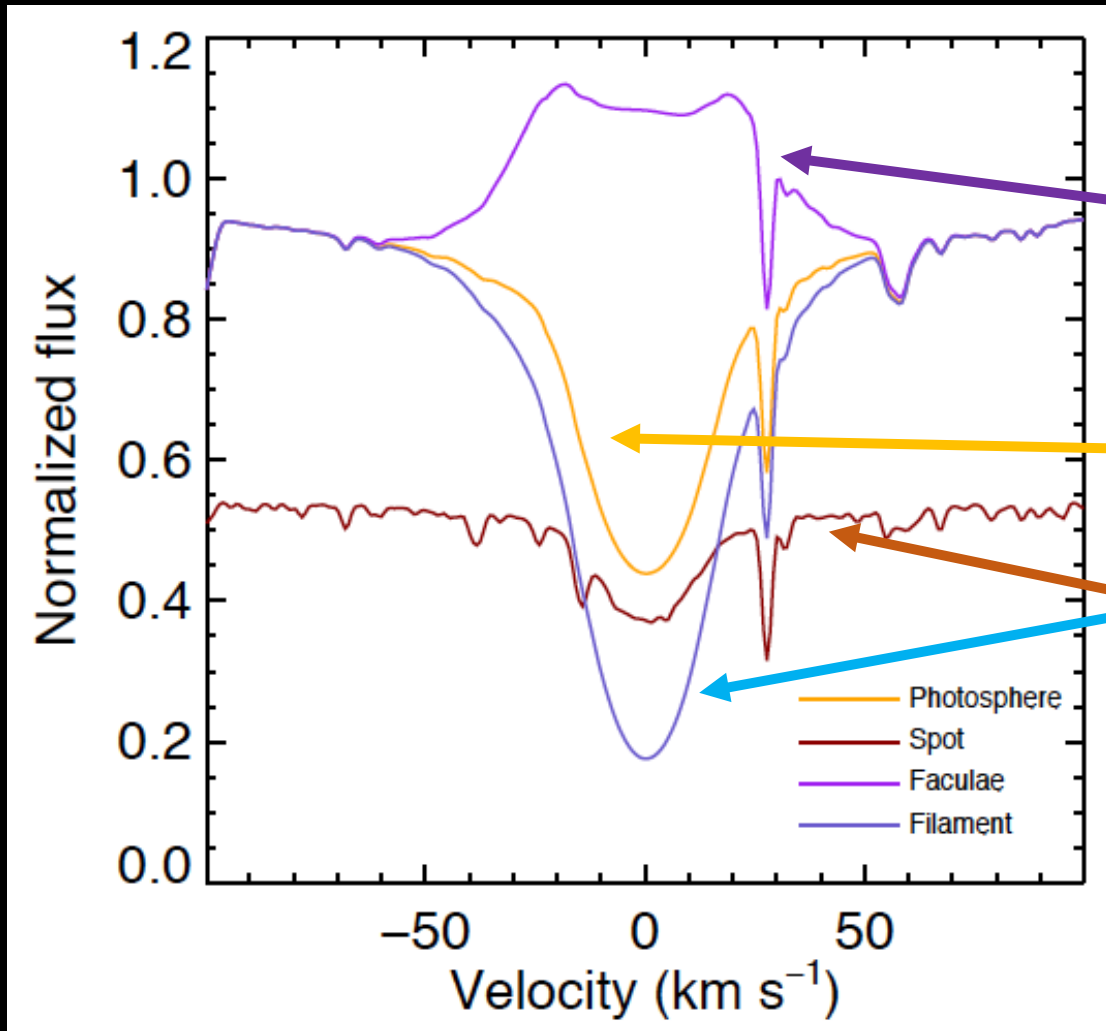


H α contrast simulations

- Active stellar surface transits
- Randomly placed features
- Features to include:
 - Spots
 - Plage and faculae
 - Filaments
 - Photosphere
- Center to limb variations
- Stellar rotation
- Stellar RV variations (small)



H α simulation spectra



Transit animations

Center-to-limb variations

Transiting a
weakly active
latitude

Transiting a very
active latitude

Transiting off of a
very active
latitude

Summary and future work

- Contrast effect is non-negligible for active stars
- *Specific* configurations can reproduce HD 189733 b H α signal
 - Large faculae/plage coverage
 - Very large emission strength, 4x line core
 - Concentrated latitudinal distribution
- Favor the planetary absorption interpretation
 - Cannot explain pre- and post-transit signals
 - H α atmosphere modeling – Huang et al., under review
 - WASP-12 b detection!
 - Extend to other lines – Na I D, Ca II H & K, K, Mg I
- *Better understand local active region emission (!)*