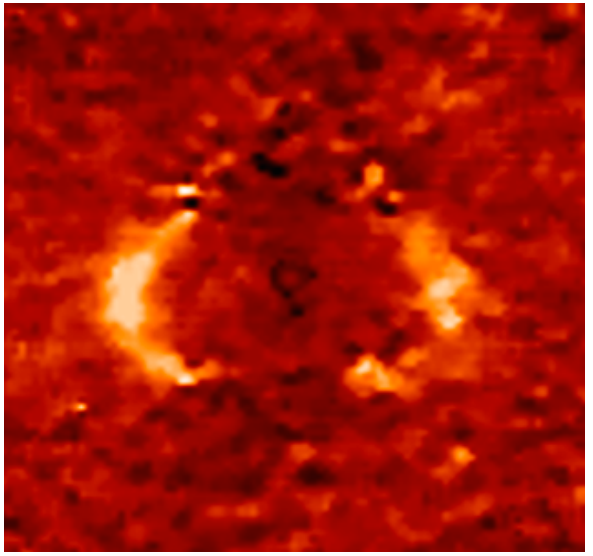
High Contrast Imaging of HD 163296

A search for the mysterious disk

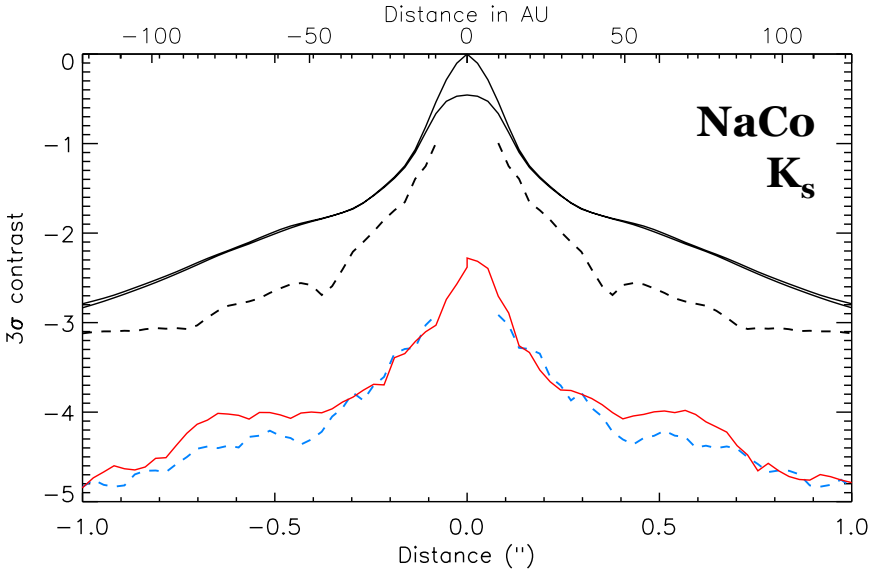
NaCo:
H & K_s polarization
Clear detection

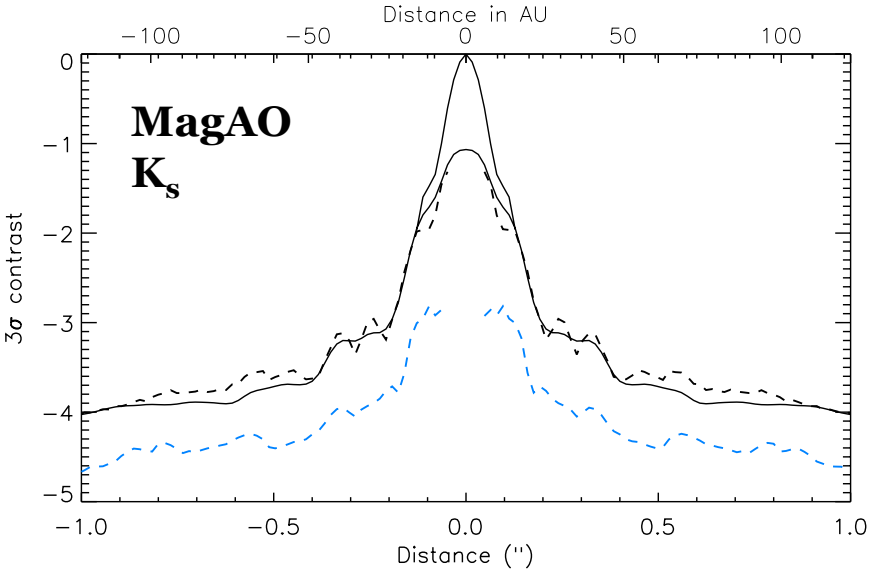
MagAO:
Hα, SII and K_s
No detection!



Jos de Boer
jdeboer@ESO.org

Julien Girard
Christoph Keller
Dimitri Mawet
François Menard





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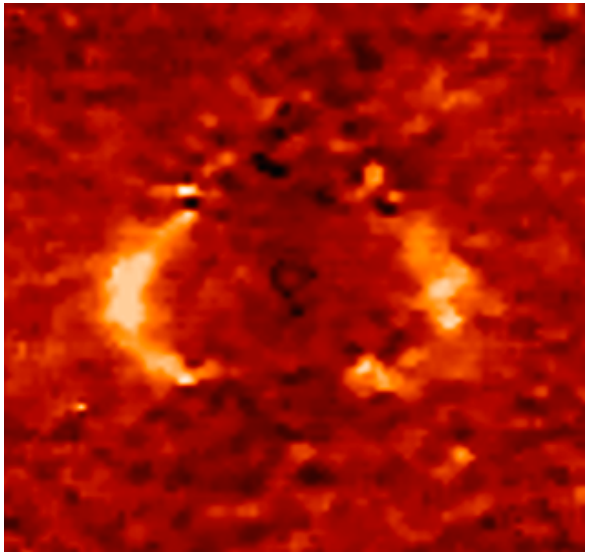

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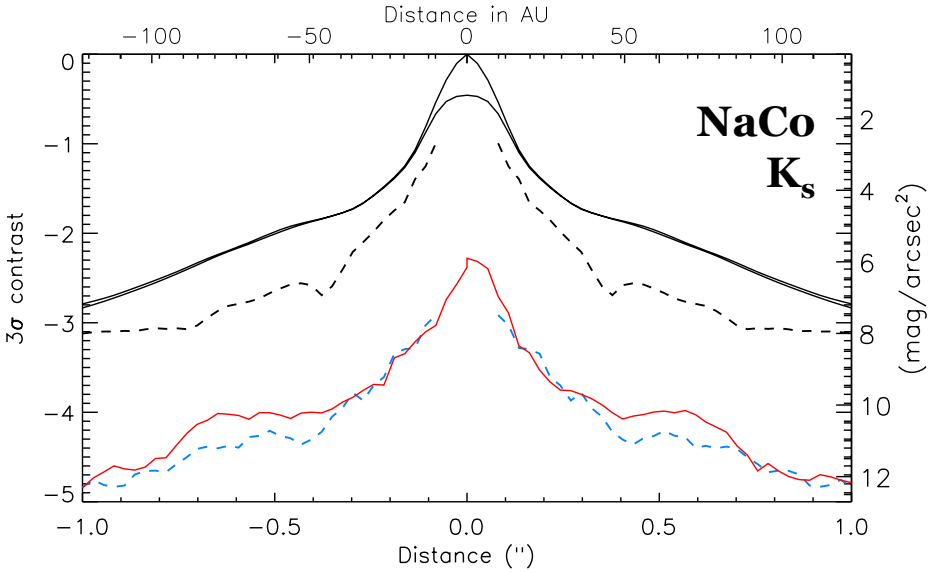
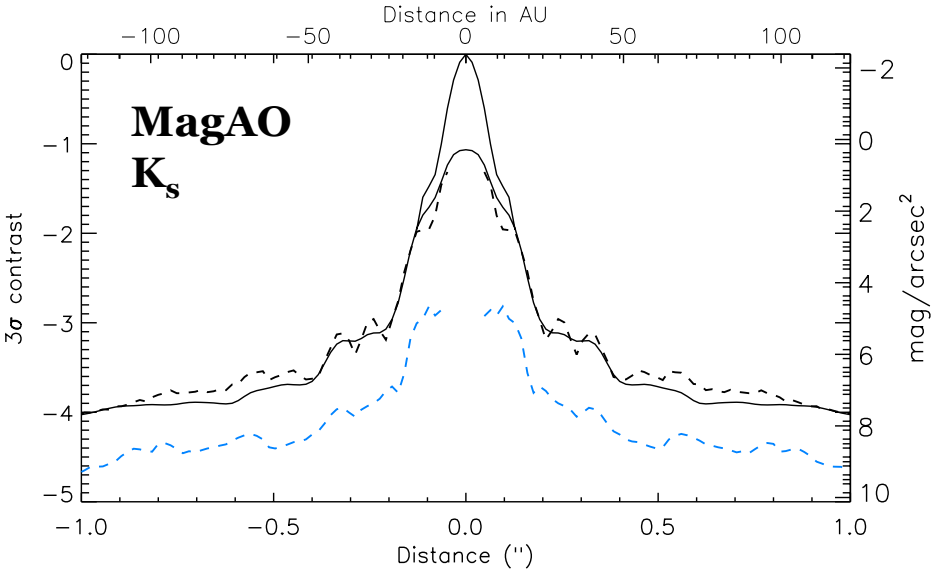
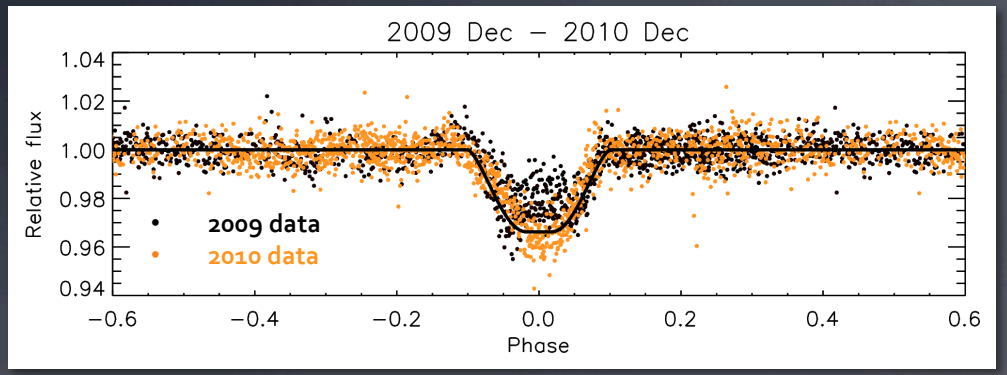


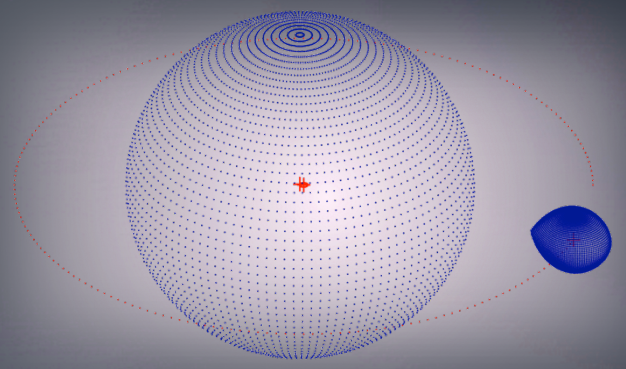


PTFO 8-8695b: A 3Myr-old T-Tauri Transiting Planet

Julian van Eyken, UC Santa Barbara/LCOGT

D. R. Ciardi (PTF Orion P.I.), J. W. Barnes, T. M. Brown, D. Dragomir, J. Eastman, C. A. Beichman, G. van Belle, K. von Braun, S. Carey, C. Crockett, J. J. Fortney, S. B. Howell, B. K. Jackson, C. Johns-Krull, S. R. Kane, T. Lister, B. Mazin, J. McLane, P. Plavchan, L. Prato, A. Shporer, J. R. Stauffer, and the PTF collaboration





- Known M3 Weak-lined T-Tauri
- $P \approx 11$ hrs, $R_p \approx 1.6 R_{Jup}$, $M_p \approx 3\text{-}4 M_{Jup}$

Transit shape change ➟ grav. darkening + orbital precession:

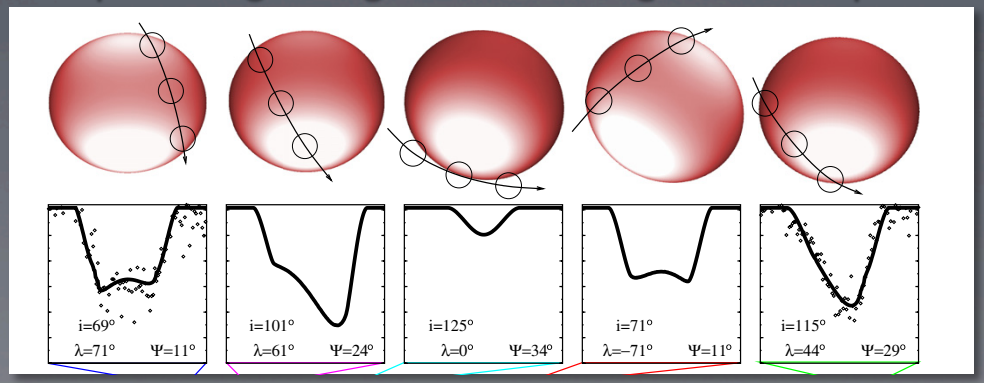
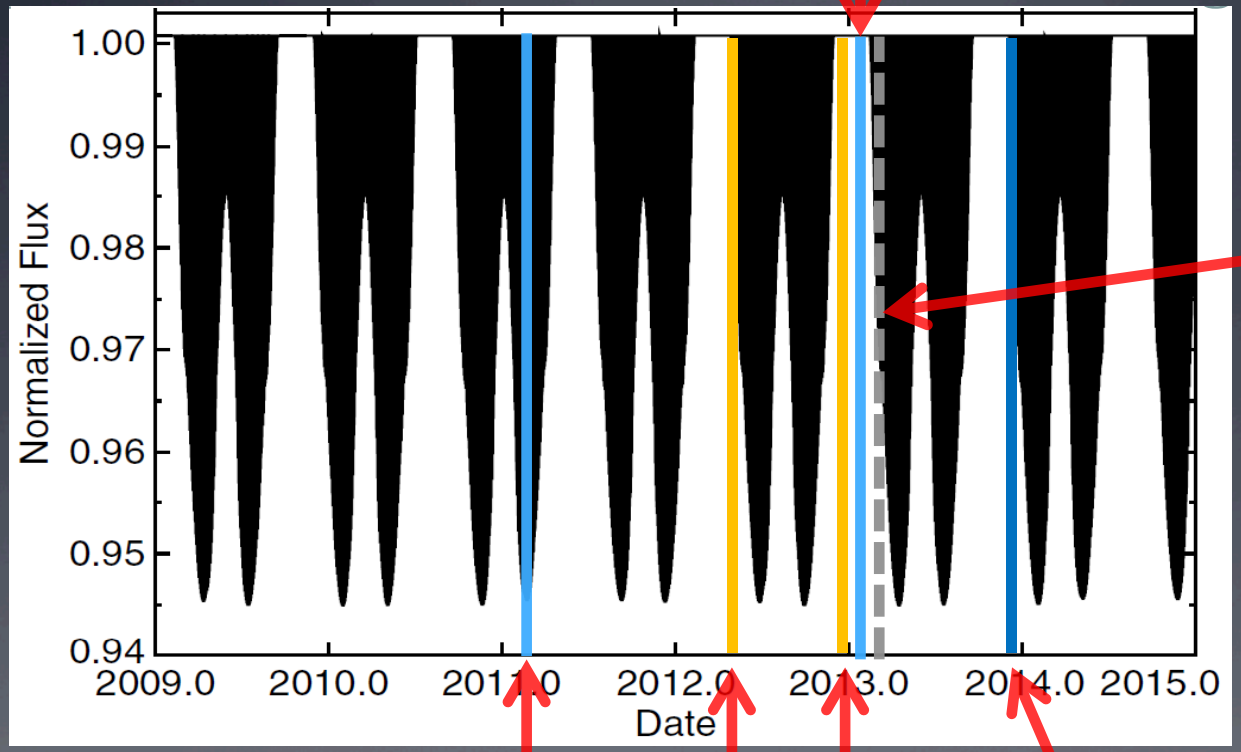


Figure from Barnes et al. 2013

Newer data fits predictions! (almost)

Model predictions for $M_* = 0.34 M_\odot$ from 2009/10 PTF Orion data:

Non-transit (LCOGT)



...LCOGT non-transit...

Figure from Barnes et al. 2013

Early Keck Suspected RM data point

Shallow Spitzer transit

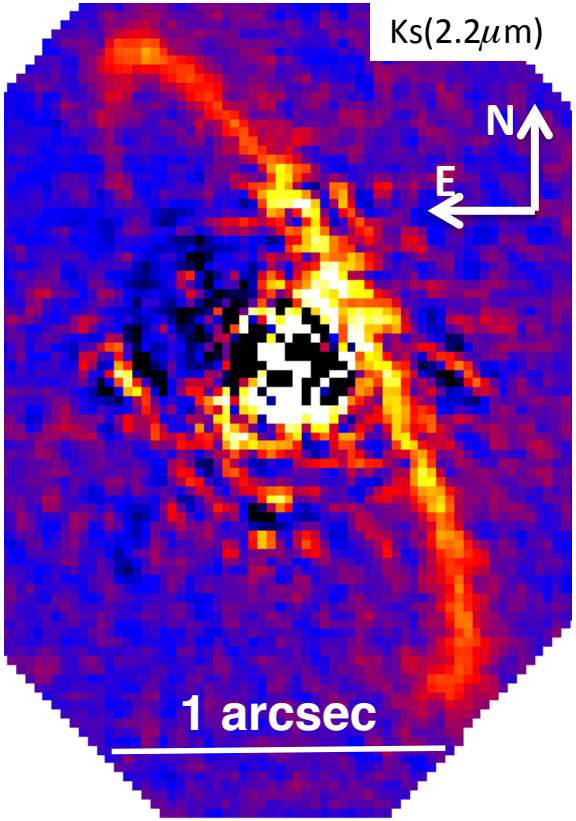
Keck NIRSPEC RM non-detection

Latest LCOGT photometry shows returned transits – work in progress

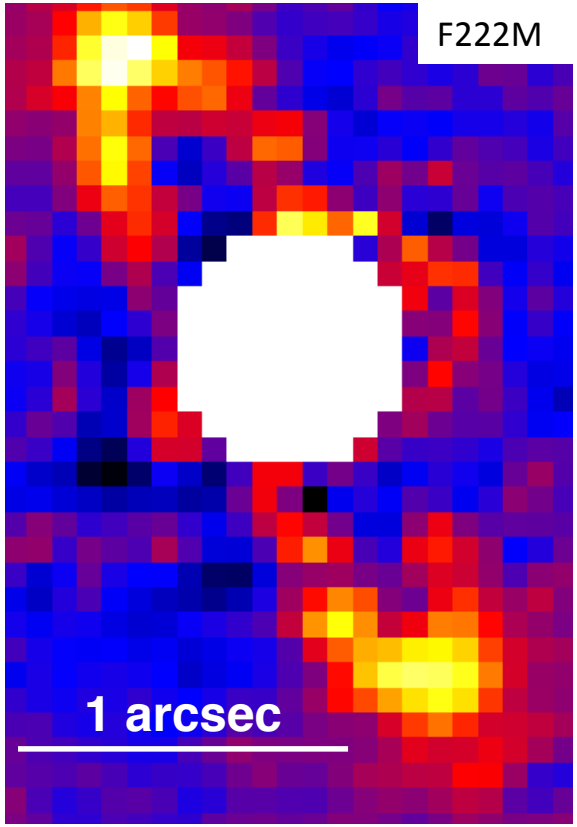
Dust around HR4796: a polarizing view

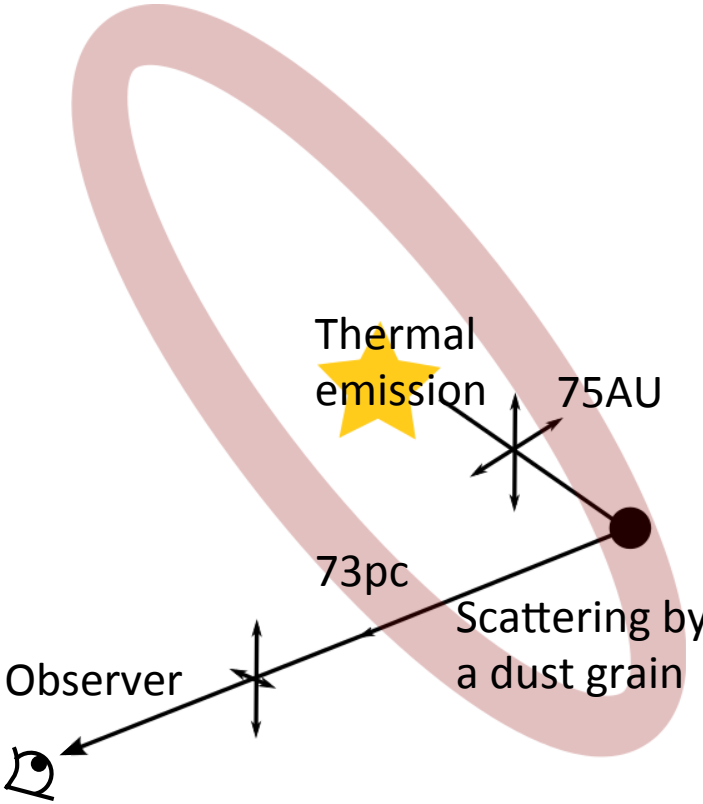
A striking asymmetry is detected in polarimetry

Polarized intensity (VLT/NaCo)



Total intensity (HST/NICMOS)

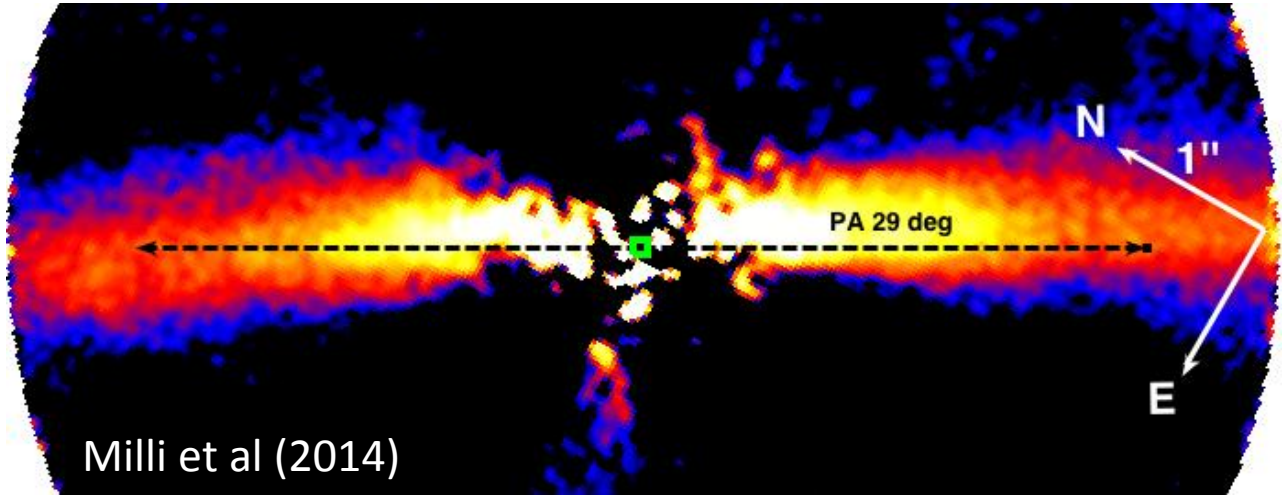




Milli et al, submitted

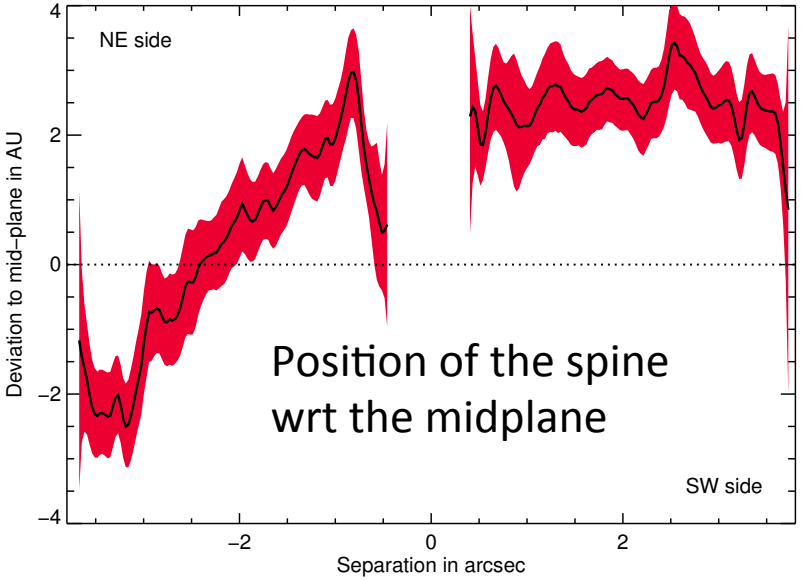
J. Milli, D. Mawet, D. Mouillet, C. Pinte, J.-C. Augereau, A.-M. Lagrange

Deep images of the innermost regions of the β Pictoris debris disk at L'



<u>Unique data reduction technique:</u>

- Combination of deep L' images from 7 epochs
- Correction for ADI biases by iterations and forward modeling

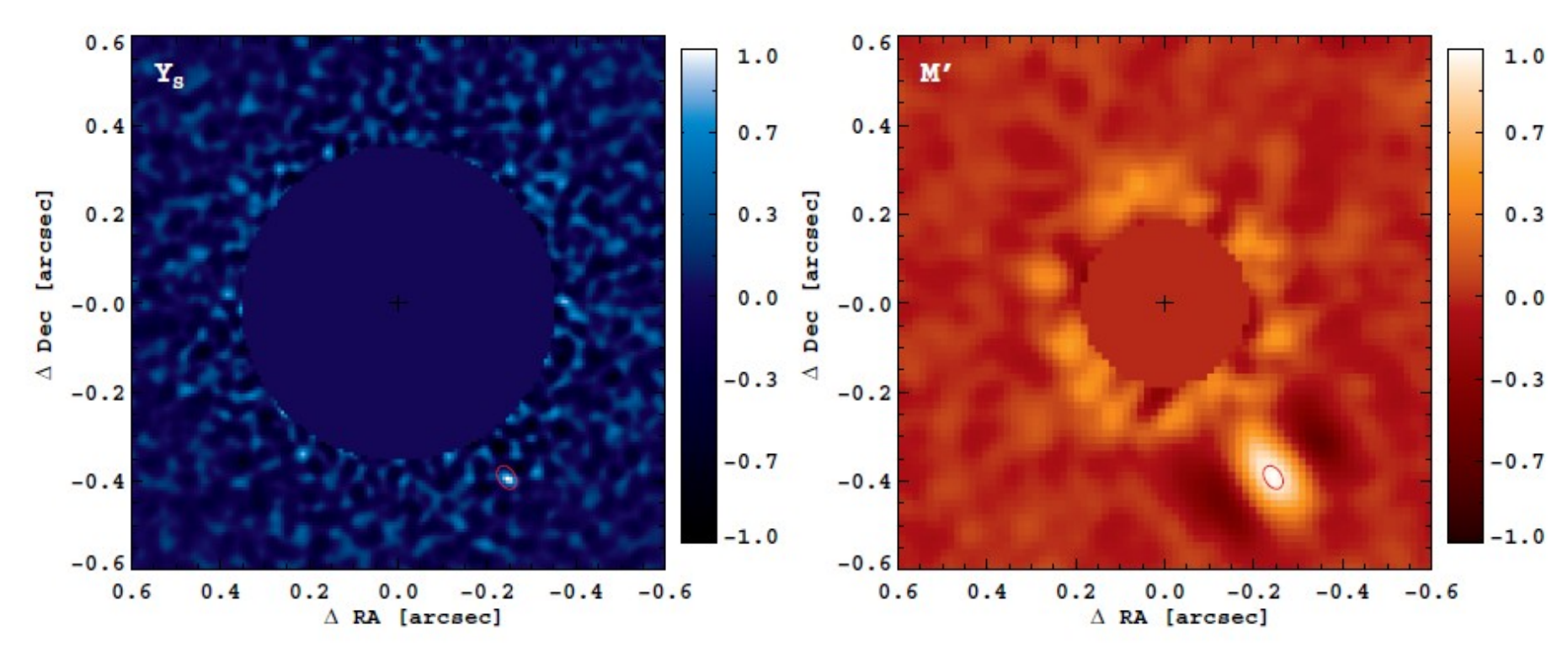


- Image compatible with a disk inclined by 86° scattering light anisotropically
- Overall offset of the spine towards the NW
- Intriguing large ripple of the spine at 0.8''

See Poster

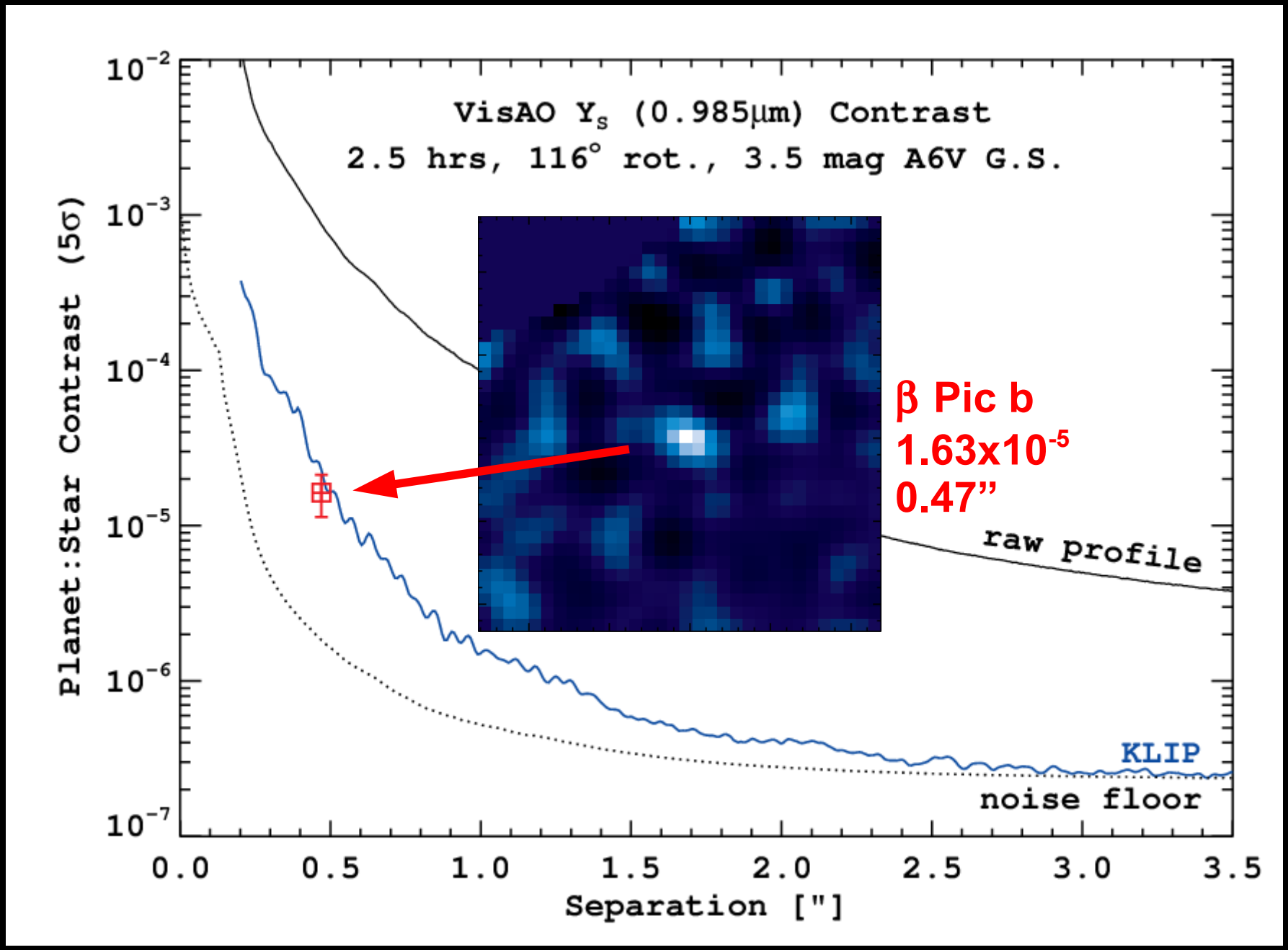
β Pictoris b wth MagAO

Jared R. Males, Laird M. Close, Katie Morzinski, and the MagAO Team



VisAO Ys (0.985 um)
Males et al., 2014 (ApJ)

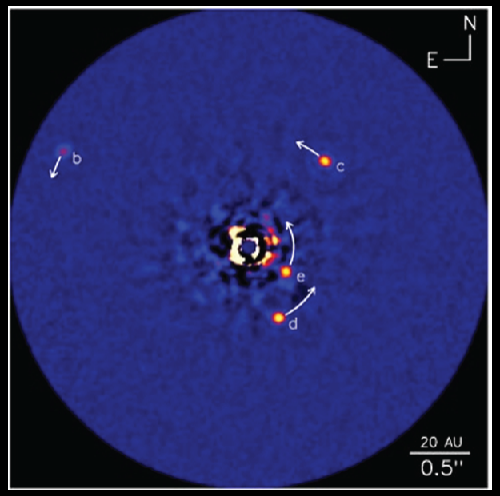
Clio2 M' (4.7 um)
Morzinski et al., in preparation
Also 3.1, 3.3, L'


VisAO Y_s (0.985μm) Contrast
2.5 hrs, 116° rot., 3.5 mag A6V G.S.
β Pic b
1.63x10^{-5}
0.47"
raw profile
KLIP
noise floor
Planet:Star Contrast (5σ)
Separation ["]
10^{-2}
10^{-3}
10^{-4}
10^{-5}
10^{-6}
10^{-7}
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5

MagAO

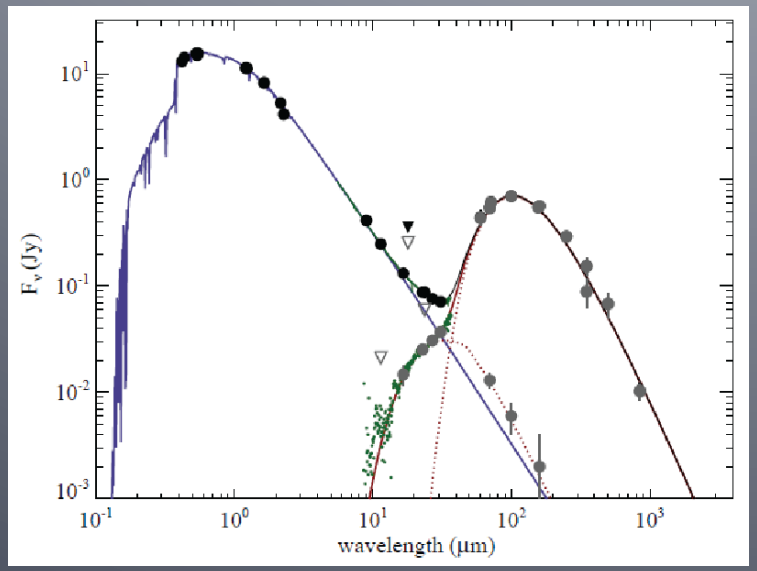
Far Infrared and Sub-millimetre Imaging of HR 8799

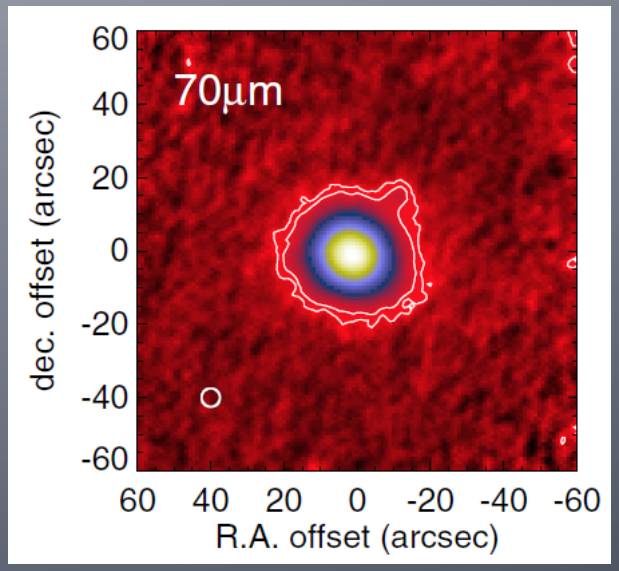
Mark Booth, Pontificia Universidad Católica



Herschel:

Spectral energy distribution is well fit by two temperatures but the Herschel imaging shows dust spread over a wide range of radii.

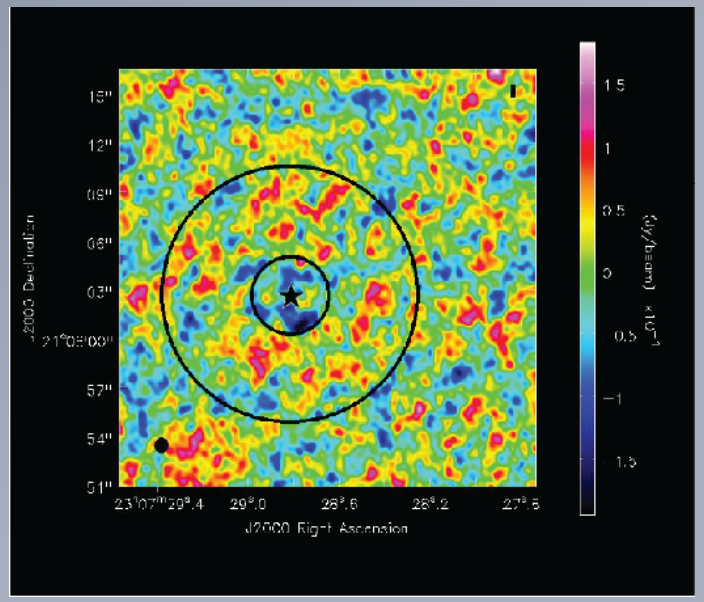


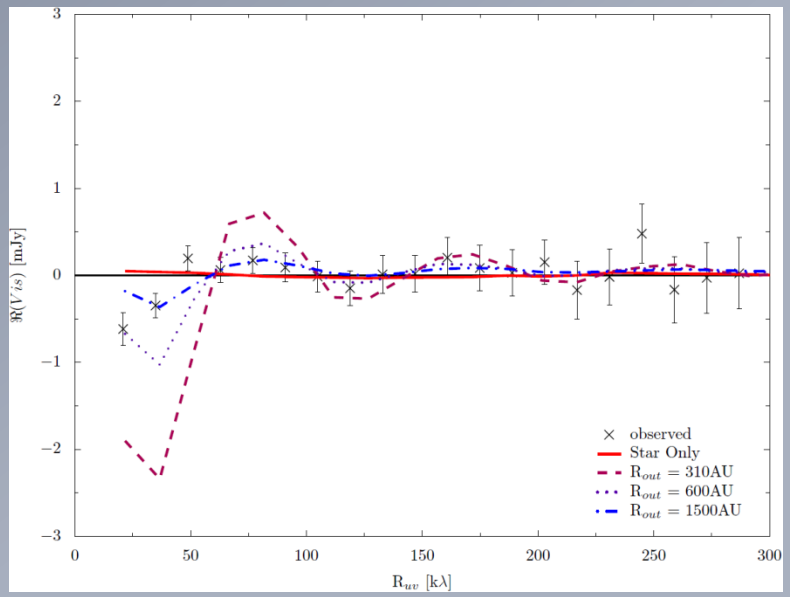


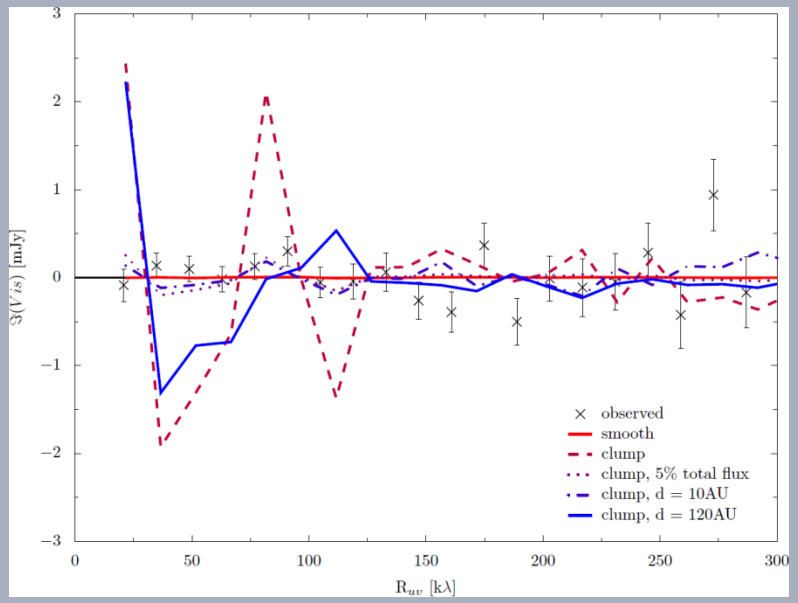
ALMA Cycle 0:

Nothing detected in the image.

Visibilities allow us to constrain the parameters of the planetesimal belt and the clumpiness of the disc.







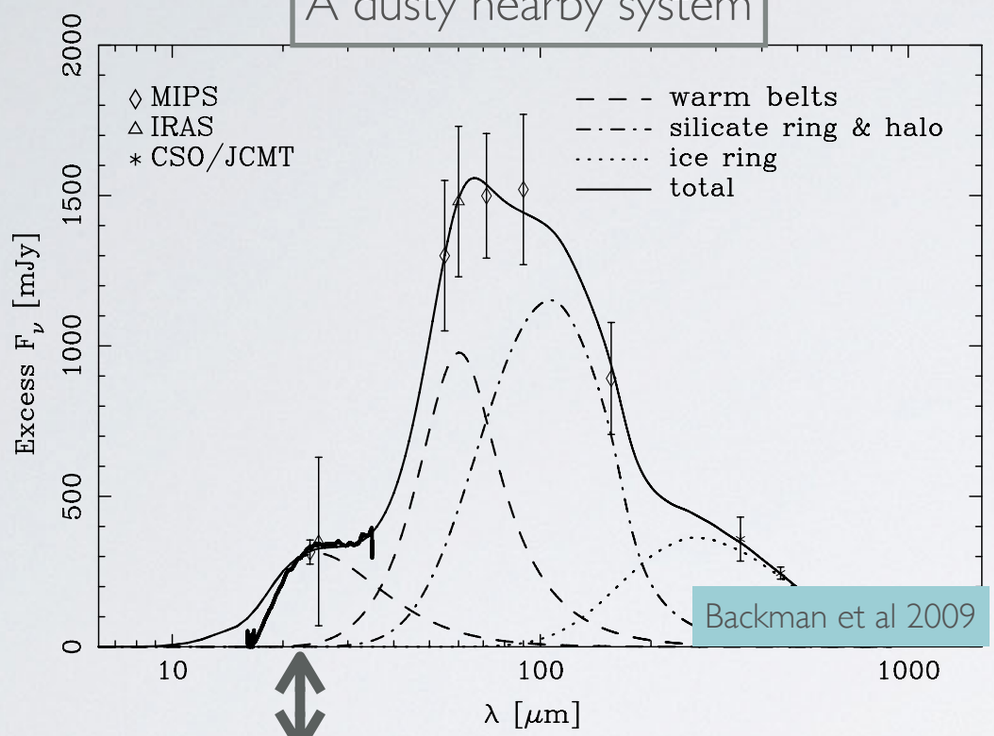
July 2014, douglase@bu.edu

Imaging the ϵ-Eridani system in visible light from a sounding rocket

Ewan Douglas
Boston University, Department of Astronomy

Science

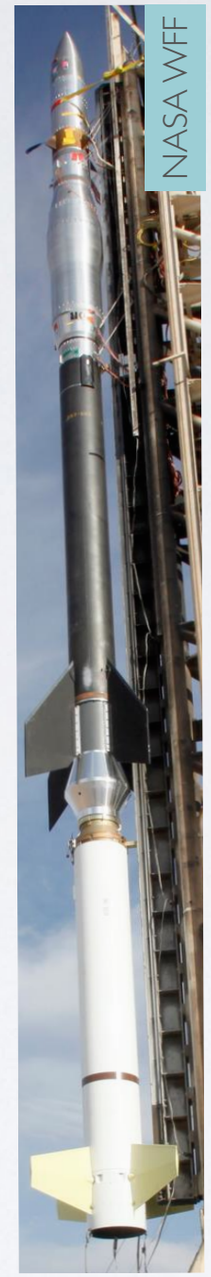
A dusty nearby system



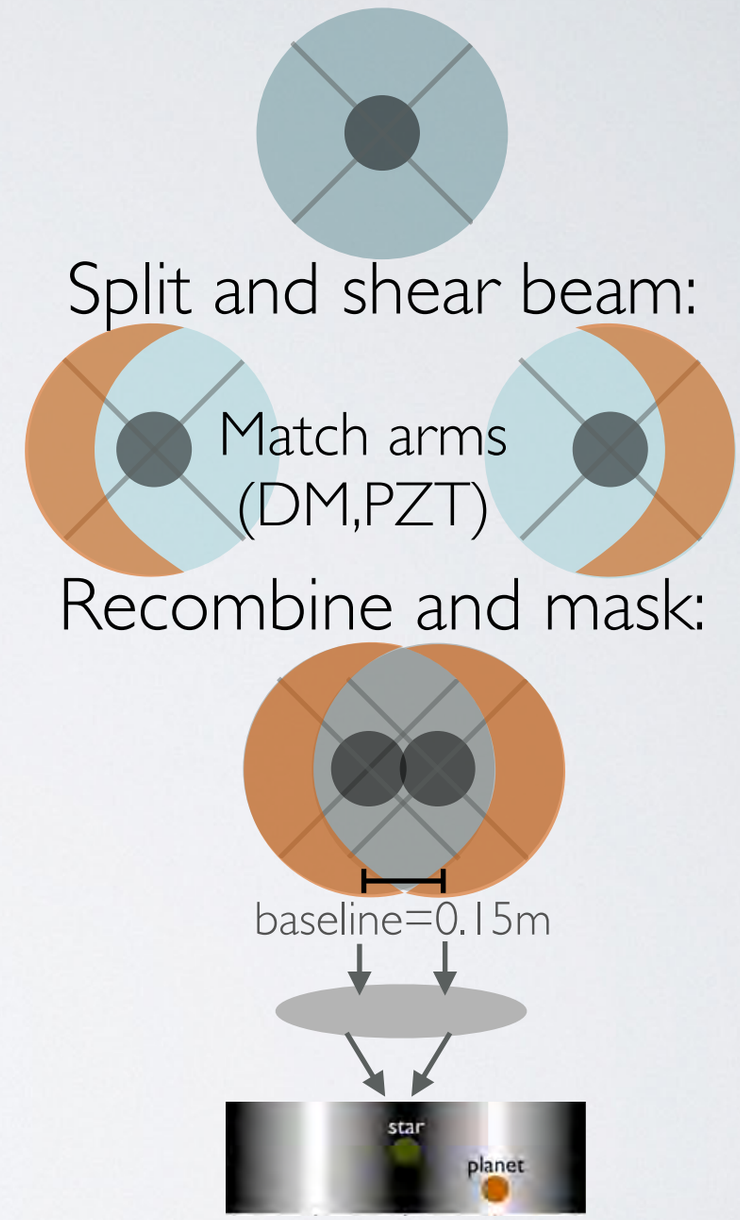
Backman et al 2009

IR excess implies a warm belt at 3AU (1")

Mission Stats:
0.5m telescope
~230 sec. observing time
~240 km apogee



A Visible Nulling Coronagraph



PICTURE Team:

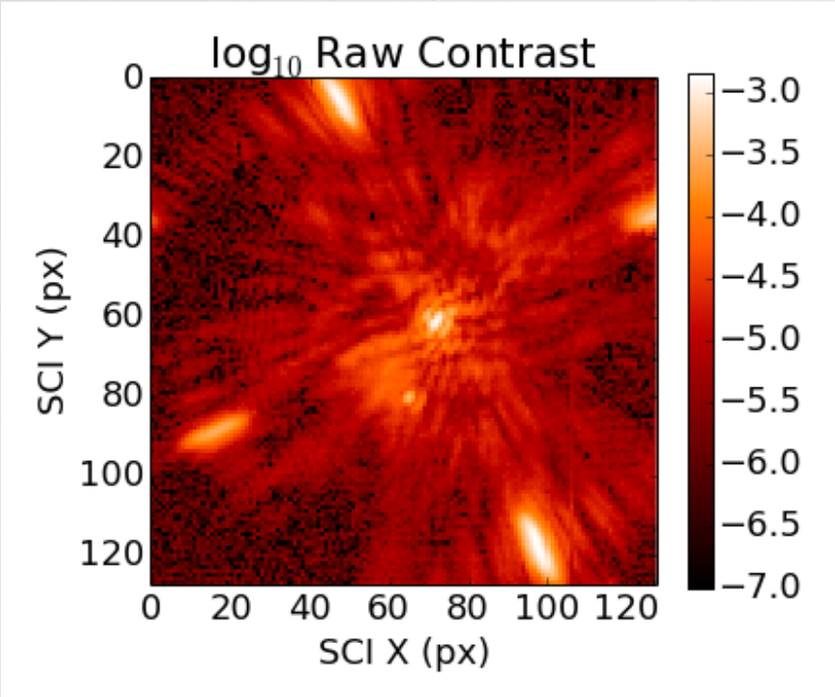
1st flight:
- JPL
- MIT
- Boston University

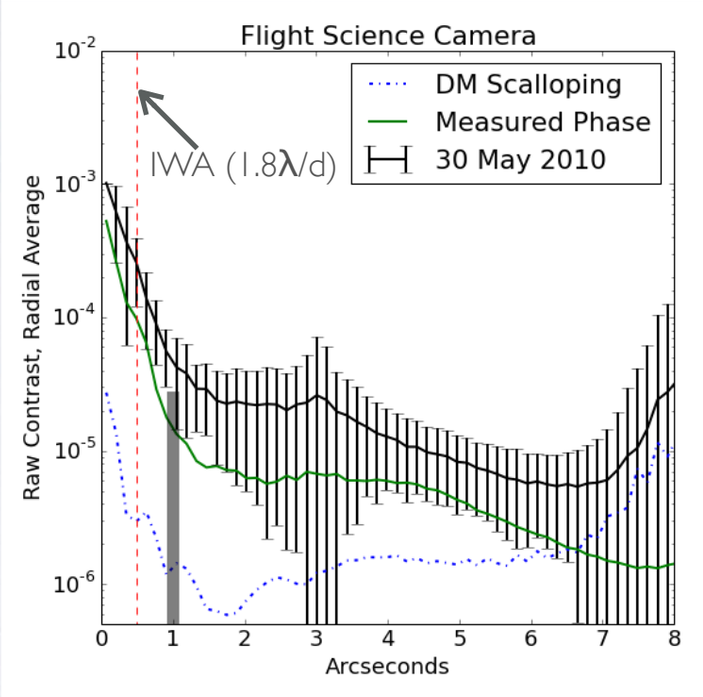
Reflight:
- UMass Lowell
- Northrop Grumman/AOA Xinetics

July 2014, douglase@bu.edu

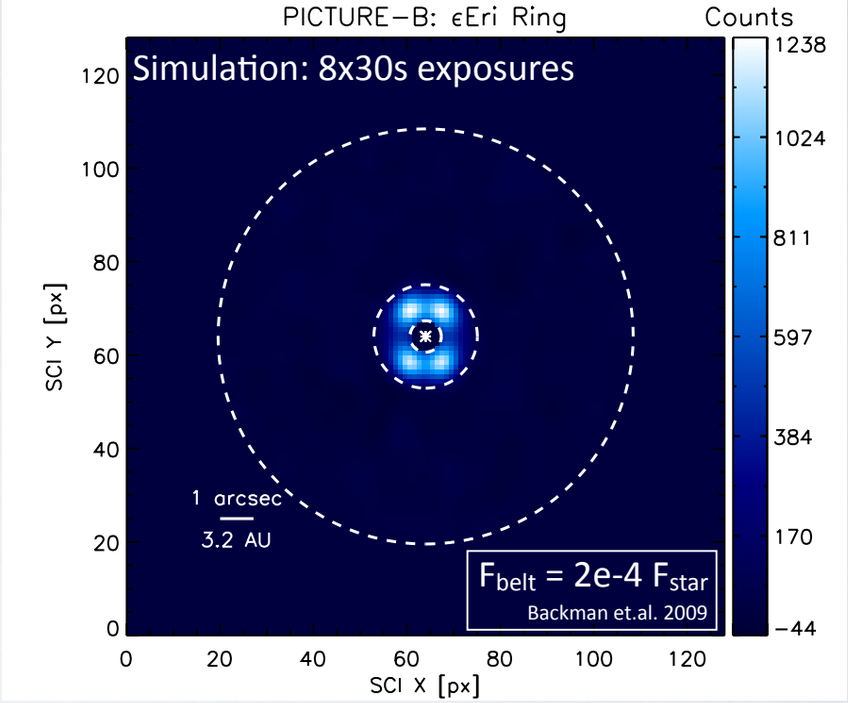
Imaging the ϵ-Eridani system in visible light from a sounding rocket

Raw flight instrument contrast, measured in air





Simulated Observation
(Calibration PSF subtracted)

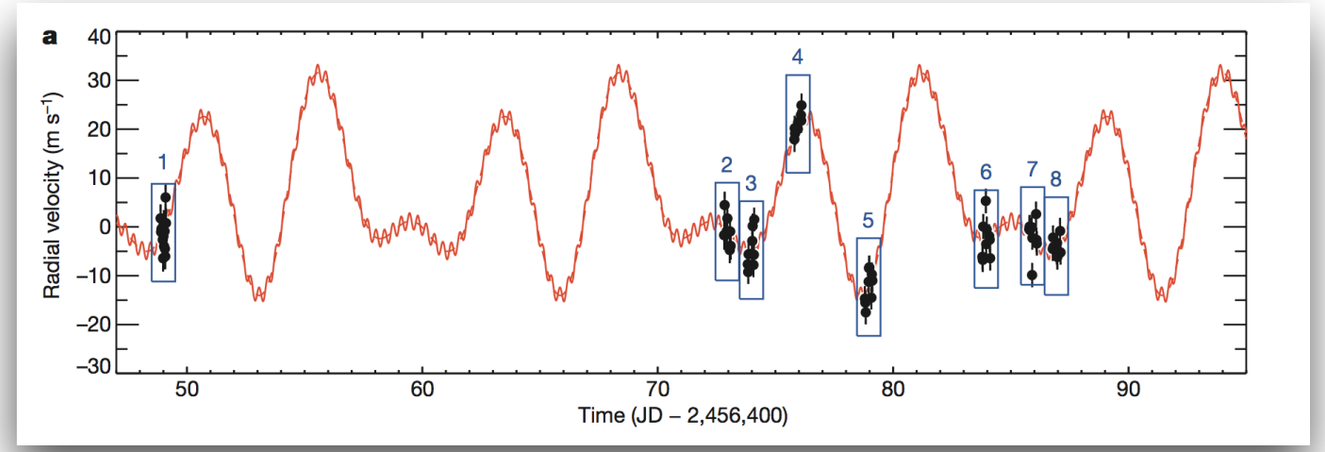


Central Star Null Depth: ~1/700
@ Science angle (1") $<10^{-4}$
Effective Bandwidth (600-750nm): >10%

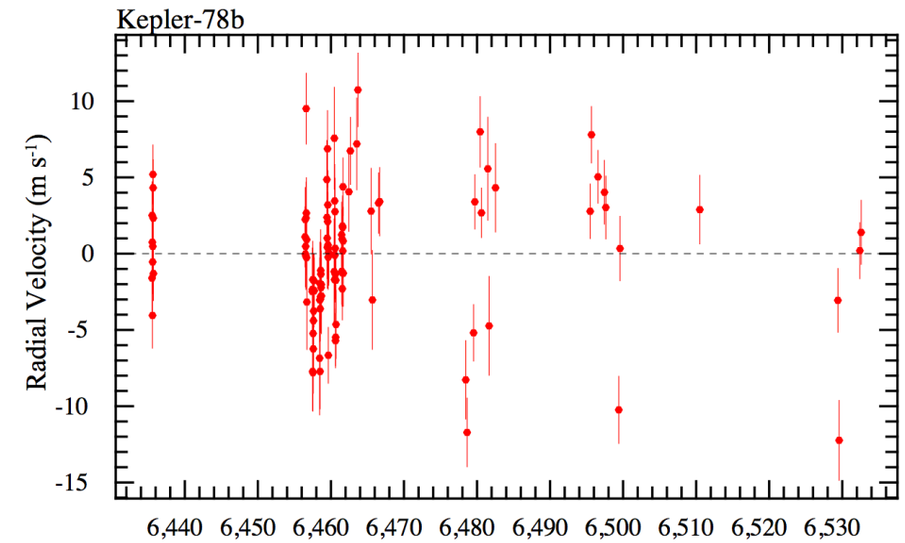
Background and References:
umlcar.uml.edu/pictureb.html, blogs.bu.edu/douglase/

Backman, D. et al. (2009), Epsilon Eridani's Planetary Debris Disk: Structure and Dynamics Based on Spitzer and Caltech Submillimeter Observatory Observations, ApJ, 690(2), 1522–1538
Mendillo, C. B., et al., (2012) Flight demonstration of a milliarcsecond pointing system for direct exoplanet imaging, Appl. Opt., 51(29), 7069–7079,
Mendillo, C. B. et al. (2012), PICTURE: a sounding rocket experiment for direct imaging of an extrasolar planetary environment, in Proc. SPIE, vol. 8442.
Rao, S. R. et al. (2008), Path length control in a nulling coronagraph with a MEMS deformable mirror and a calibration interferometer, Proc. SPIE, 68880B–68880B,

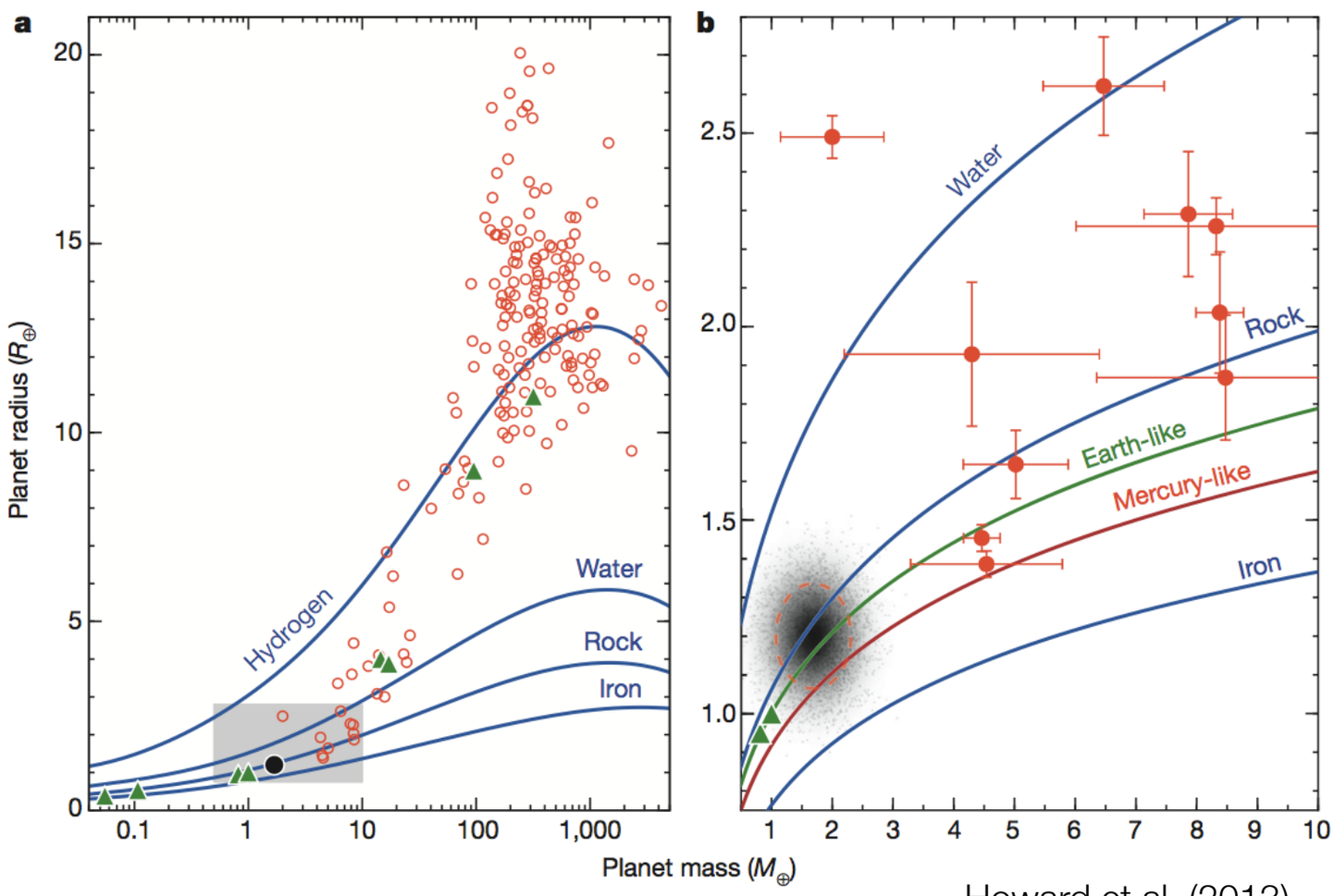
Kepler-78b: An Earthlike planet… but how Earthlike?



Howard et al. (2013)



Pepe et al. (2013)



Howard et al. (2013)

$M_{HIRES} = 1.69 \pm 0.41\ M_E$

$M_{HARPS} = 1.86 + 0.38/- 0.25\ M_E$

$\rho = 5.3 \pm 1.8\ g\ cm^{-3}$

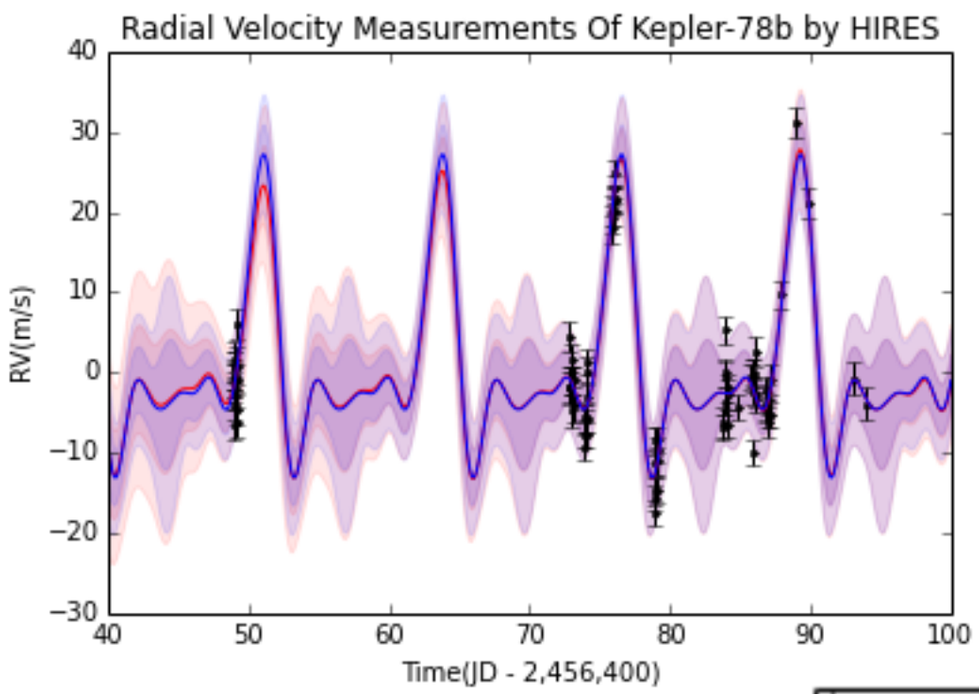
Sam Grunblatt

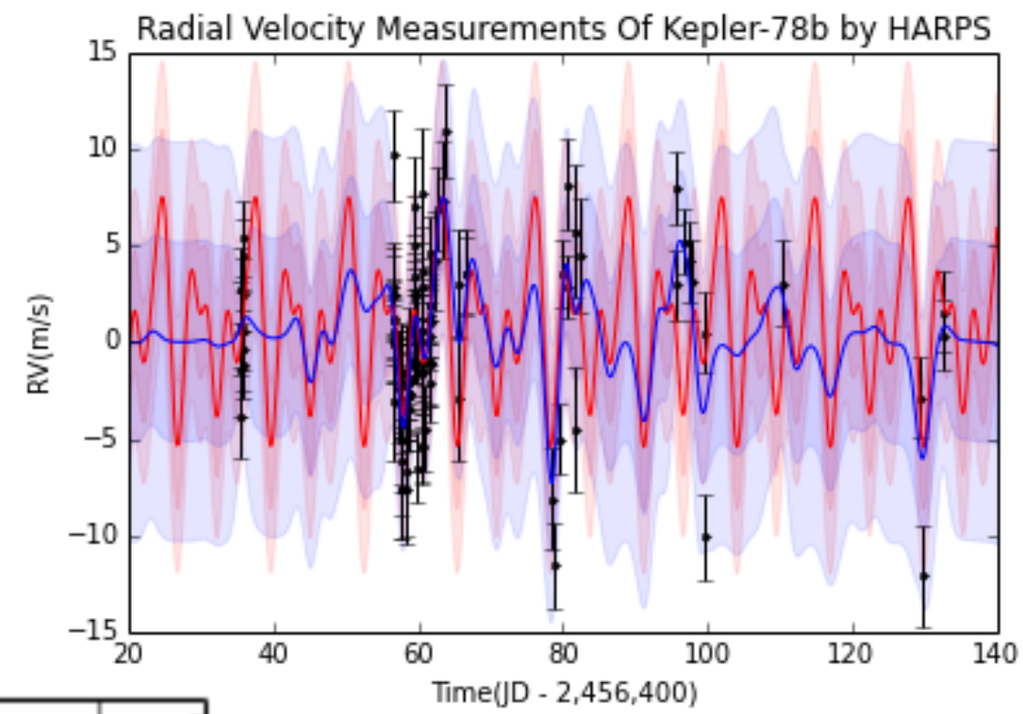
U. Hawaii

Institute for Astronomy

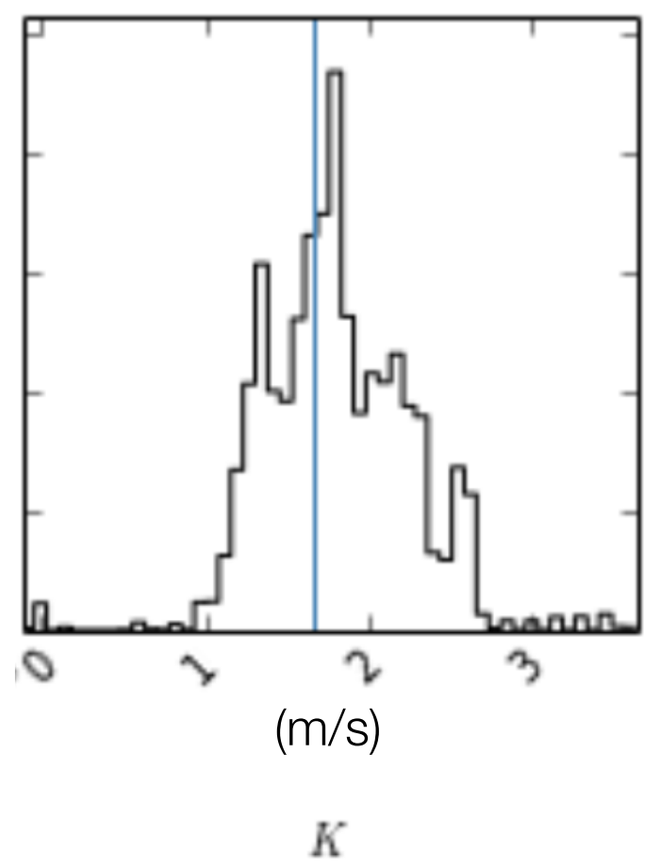
A Combined Analysis Method

- Gaussian Process regression fit to RV stellar activity:





- MCMC analysis of Gaussian Process regression for both datasets + planetary signal.



Result: Consistent with previous work.

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