Stellar Diameters and Disk Asymmetries in Be Stars

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Collaborators:

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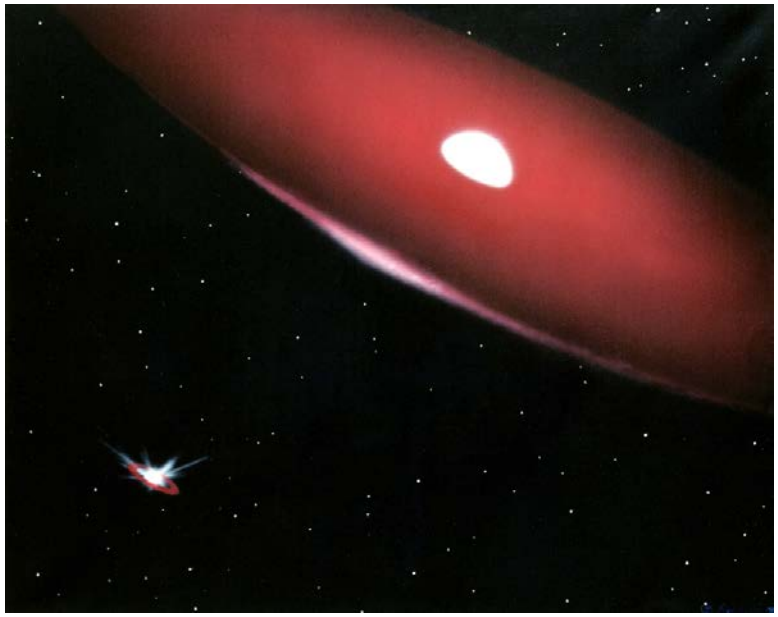
Be Star Properties

- Rapidly rotating B-type stars that eject gas into a circumstellar disk
- Evidence for disks observed in Hα emission lines, IR excess flux, linear polarization, interferometric images
  - e.g. Porter & Rivinius 2003
- Variable on timescales of days to decades

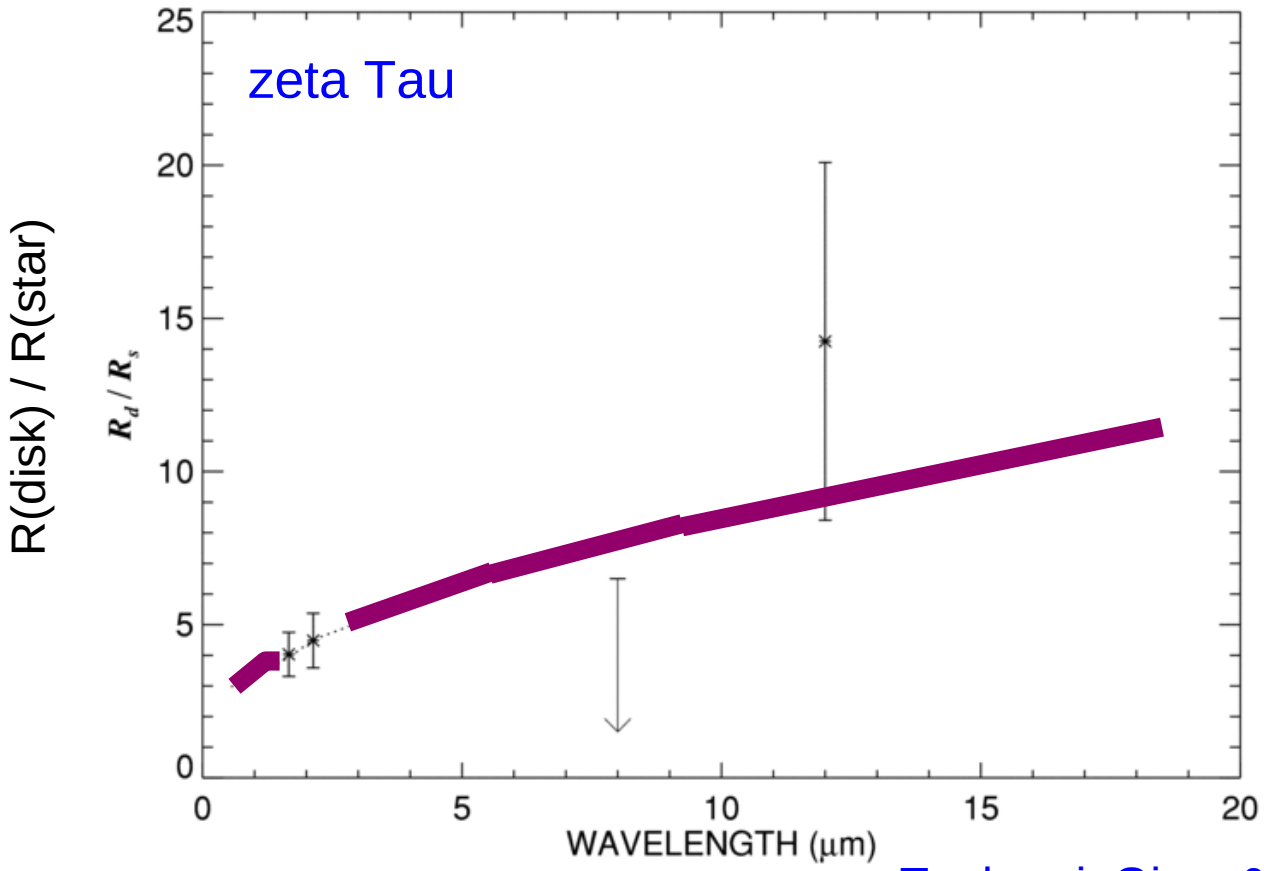


Bill Pounds

MIRC and PAVO Observations of Be Stars

- Stellar diameters of central star
- Geometry and size of disks in H-band and R-band continuum
- Asymmetries in the light distribution

How Does Disk Size Depend on Wavelength?



Touhami, Gies, & Schaefer 2011

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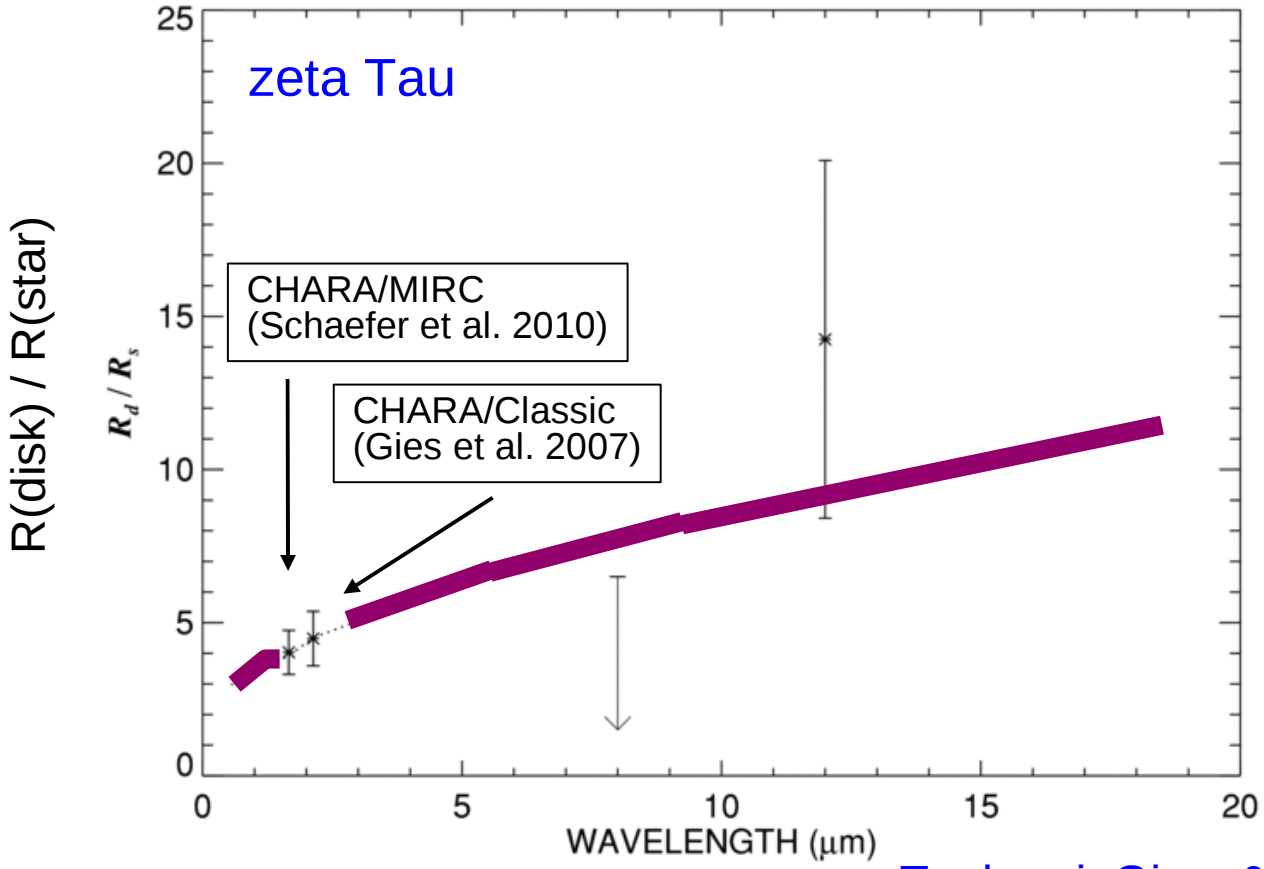

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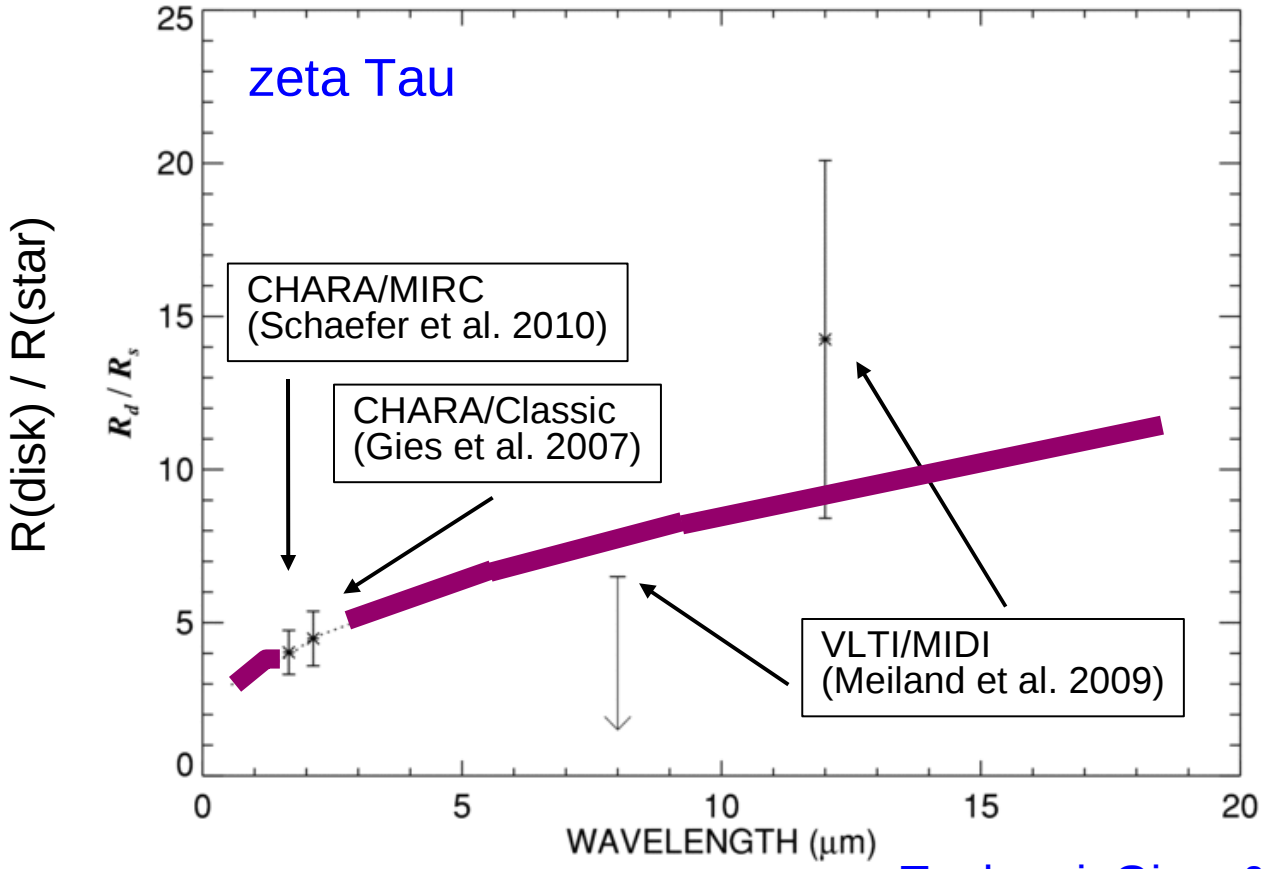
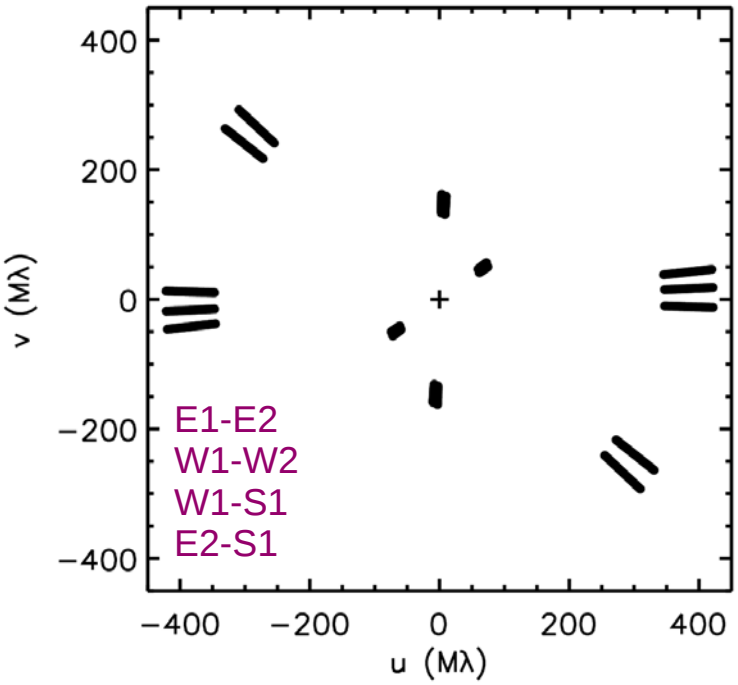
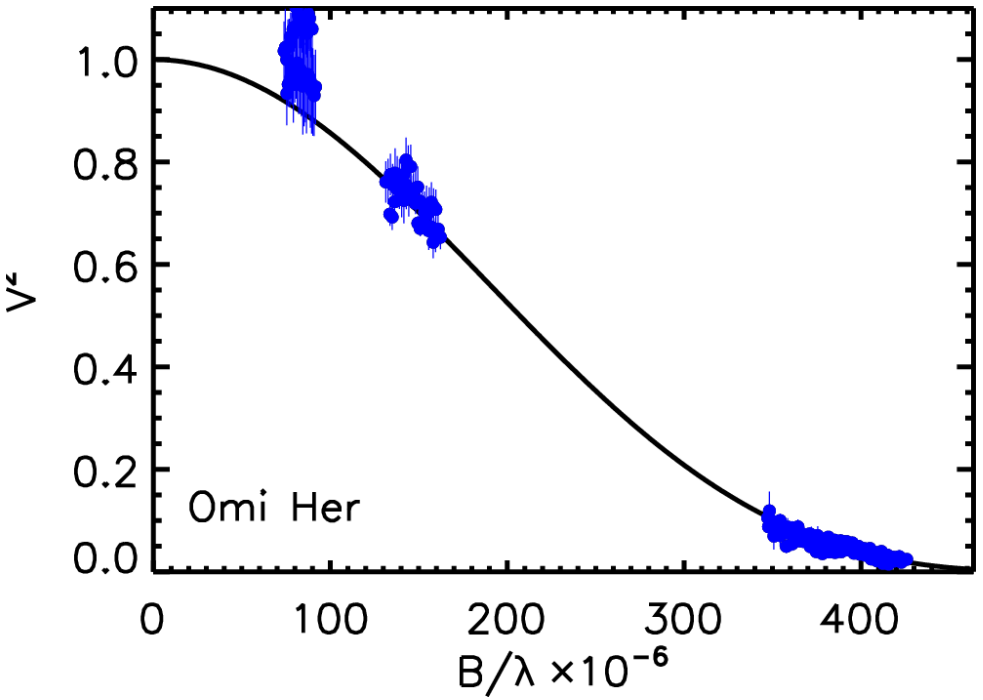


Touhami, Gies, & Schaefer 2011

2T PAVO - Omi Her

2011 Aug 10-12



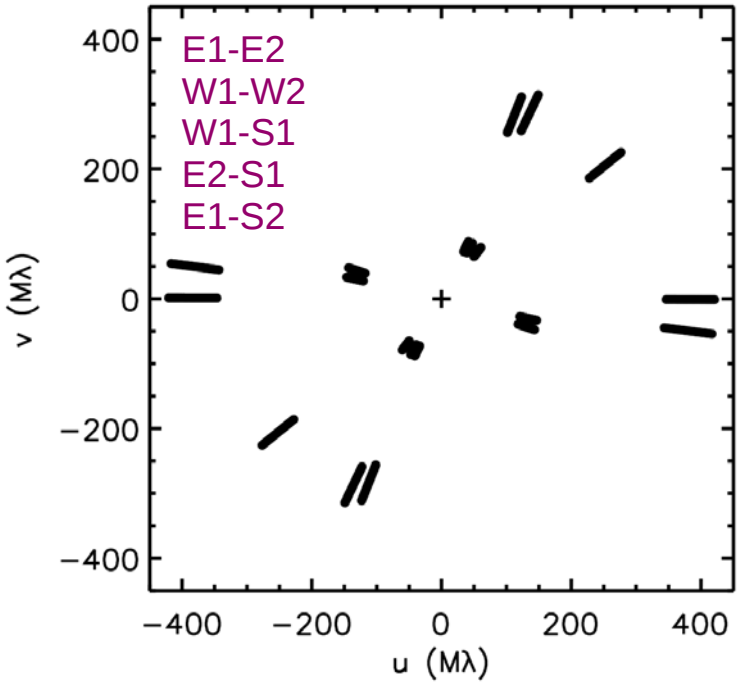


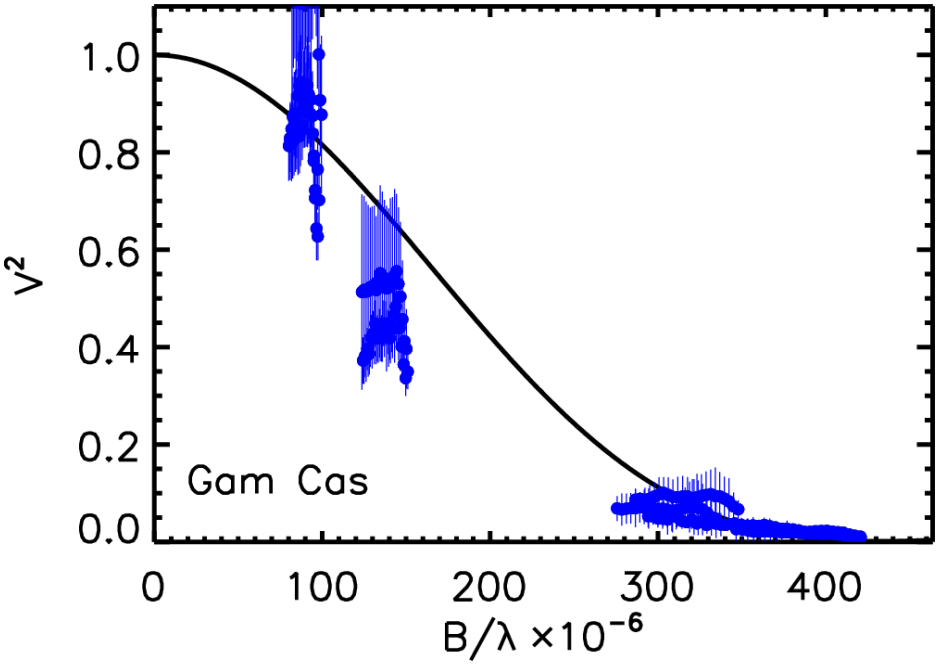
Stellar Diameter = 0.527 mas

Agrees with SED diameter of 0.52 mas (Y. Touhami)

2T PAVO - Gam Cas

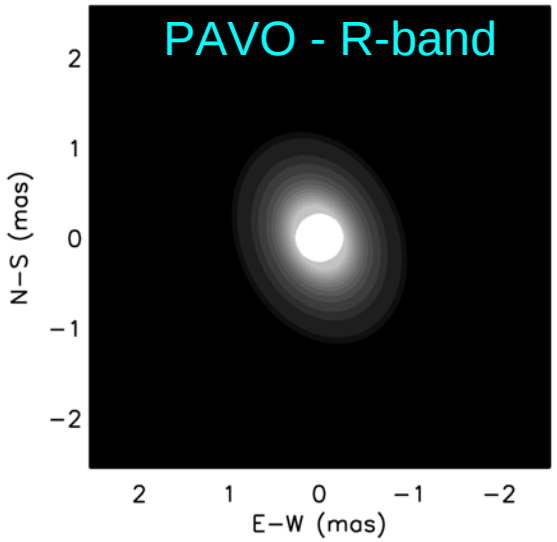
2011 Aug 10-12

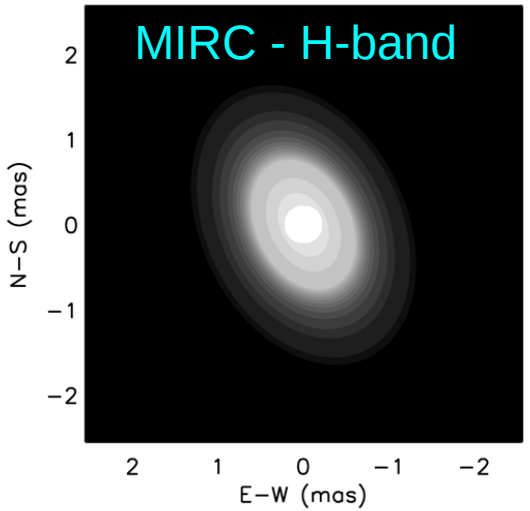


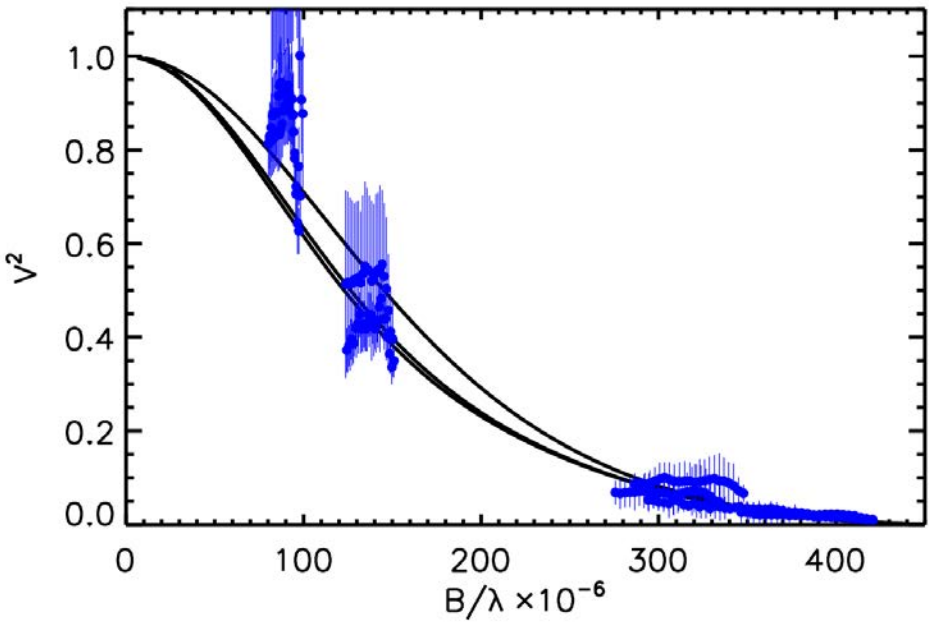


Disk Contribution?

2T PAVO - Gam Cas





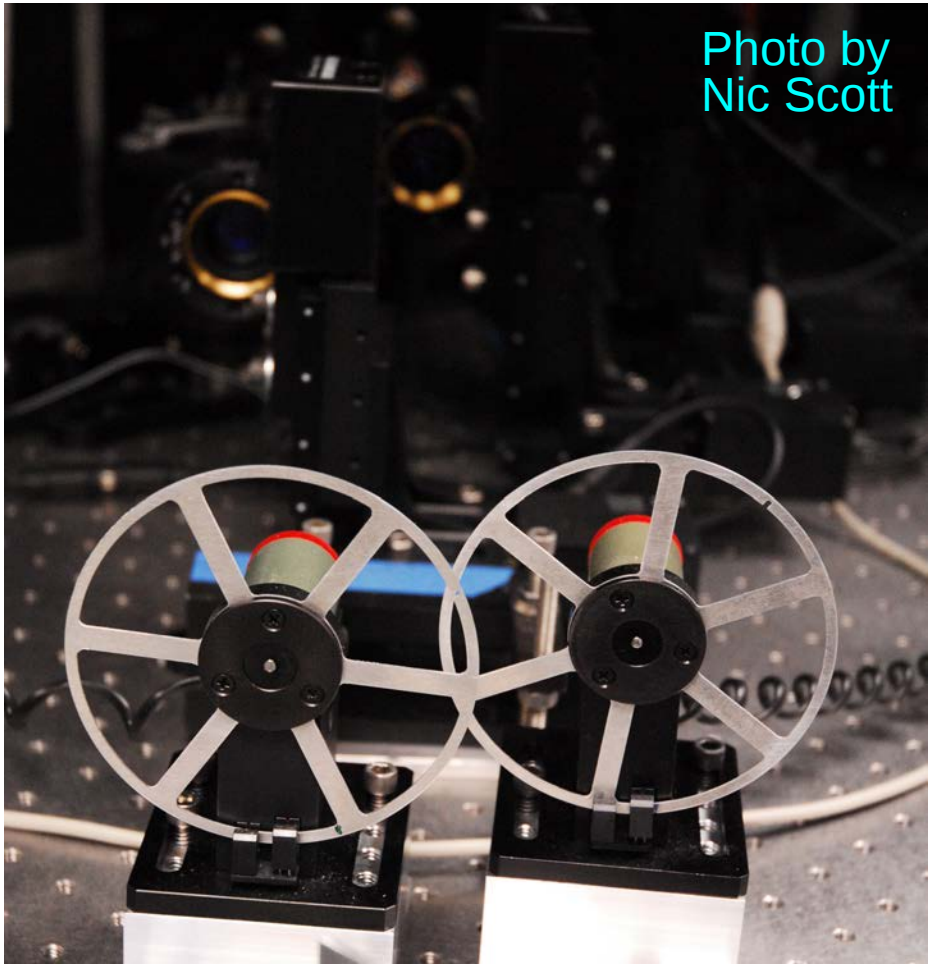


- Fix position angle and axis ratio based on infrared models
- Star diameter: 0.52 mas
- Disk FWHM: 0.84 mas
- 37% of light from disk
- Degeneracy between star/disk size and flux

Is there hope for 3T PAVO data...?

MIRC Choppers moved to PAVO

Encode light from each telescope with different temporal frequency



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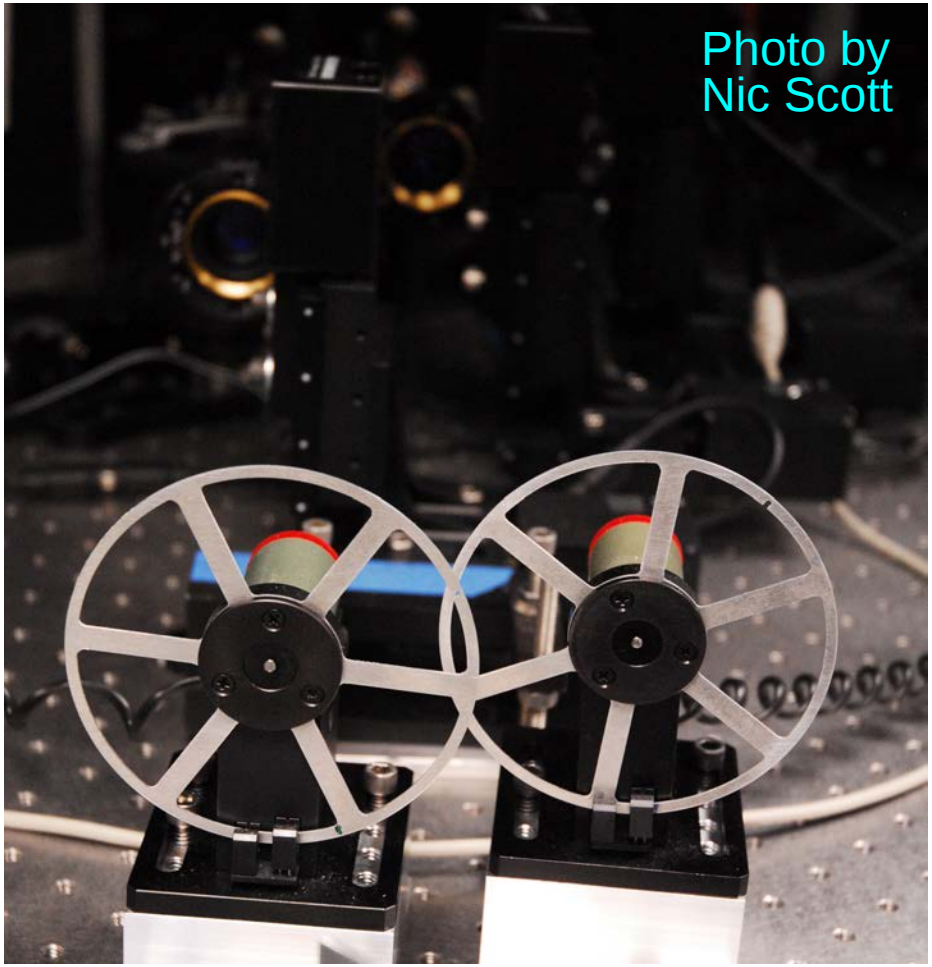
Vicente Maestro working to update reduction pipeline



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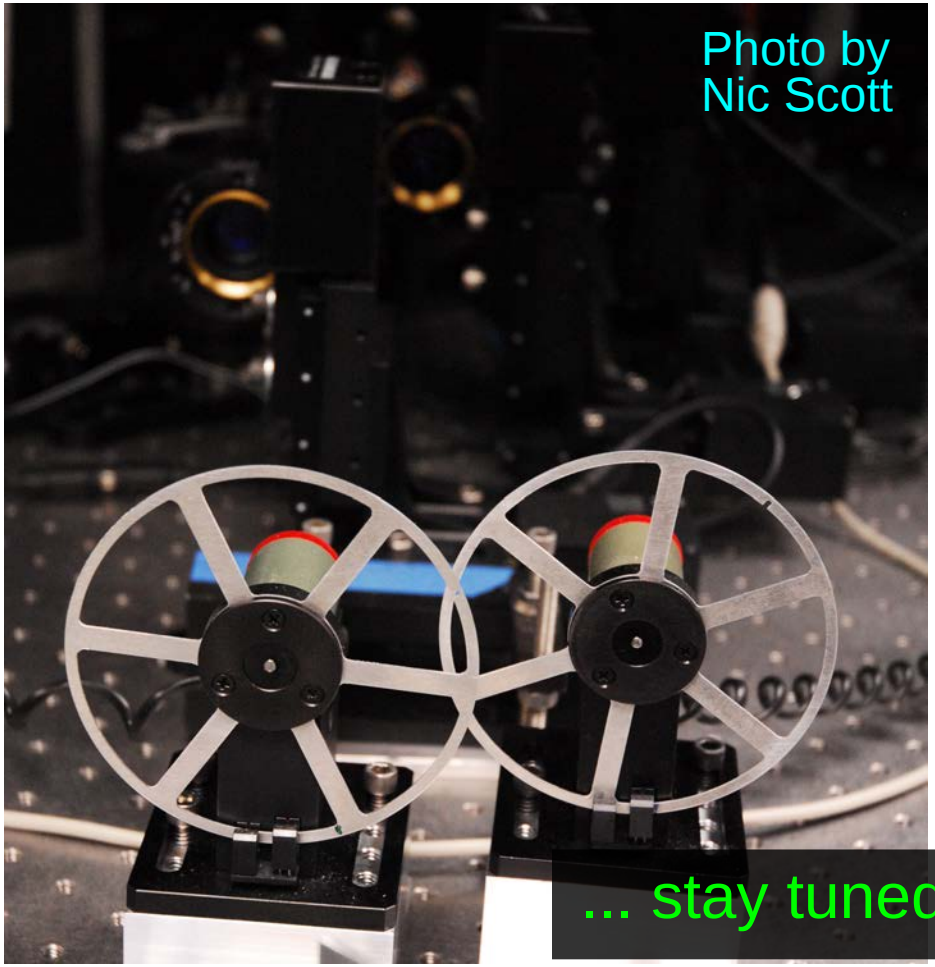


3T data taken with choppers during Oct 30 - Nov 1 run on Be stars

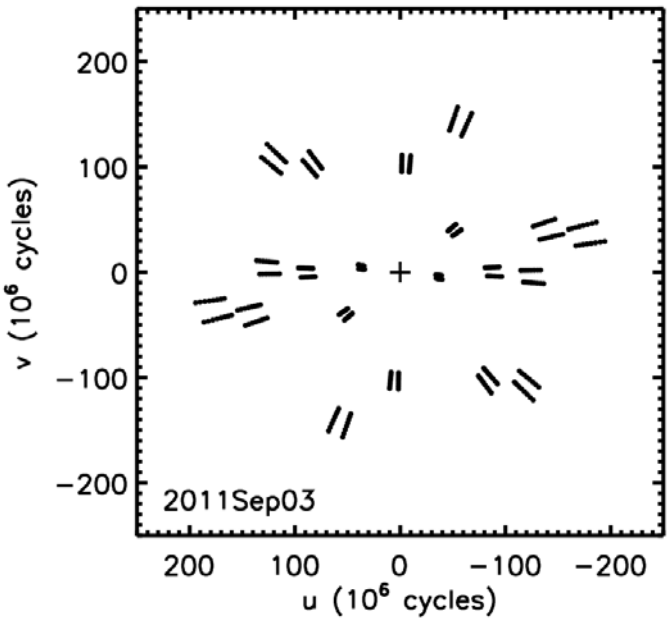
... stay tuned for results ...

MIRC Observations of Be Stars

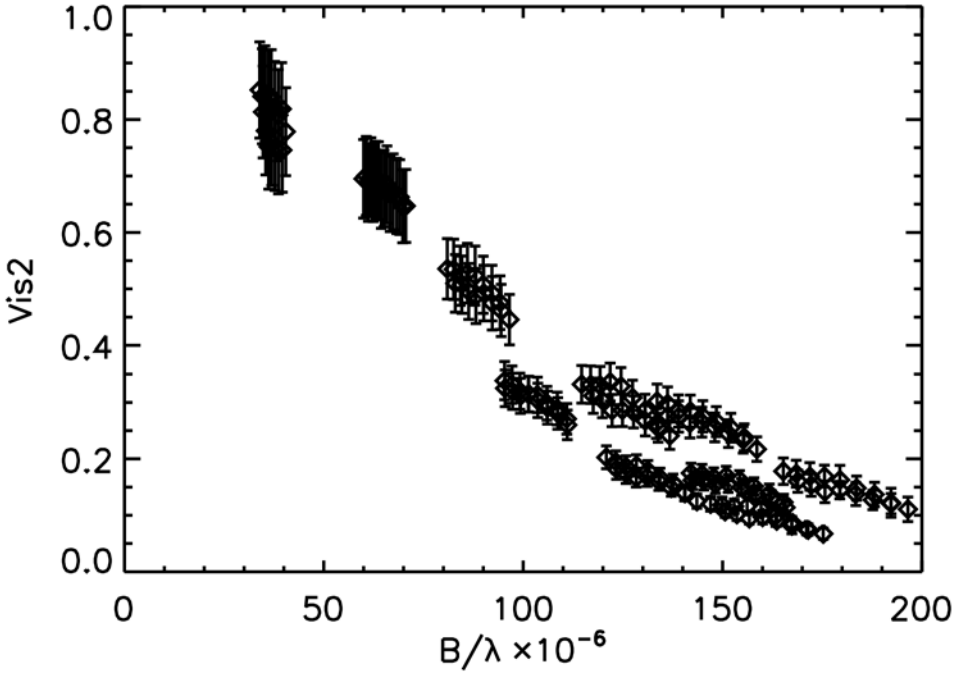
- Disk size and orientation in H-band
  - visibilities
- Asymmetries in light distribution
  - closure phases

MIRC: Gamma Cas

UV Coverage



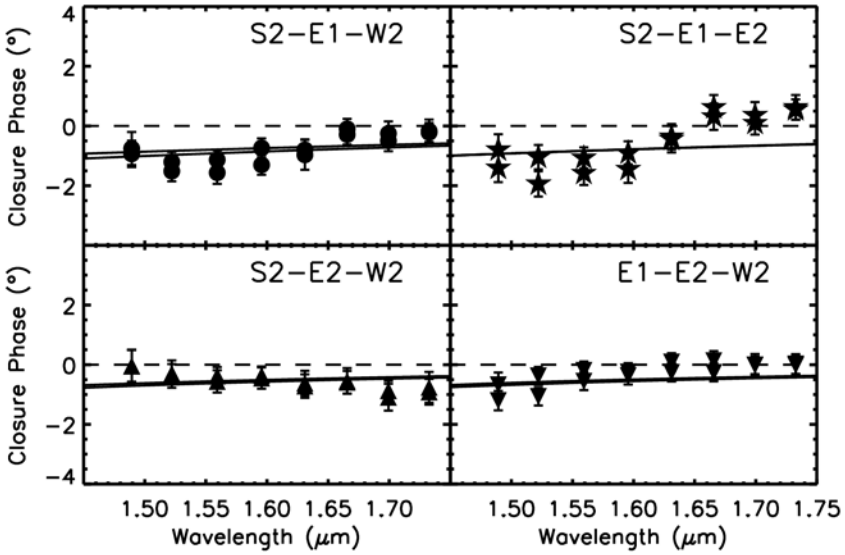
Visibilities

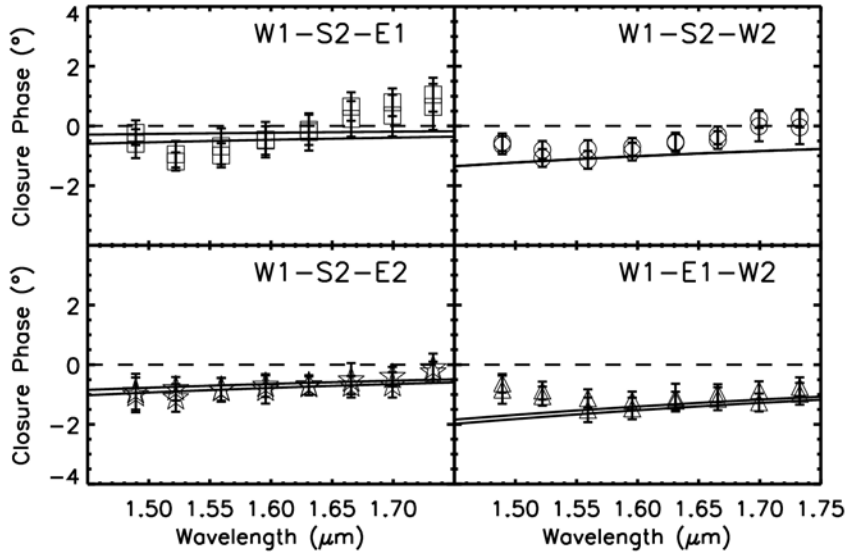


MIRC - 5T H-band data from 2011 Sept 3

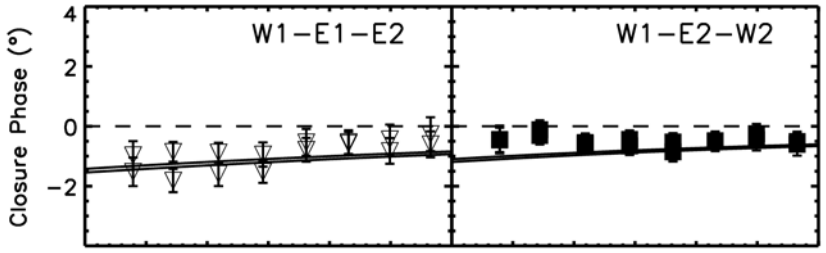
MIRC: Gamma Cas

Closure Phases

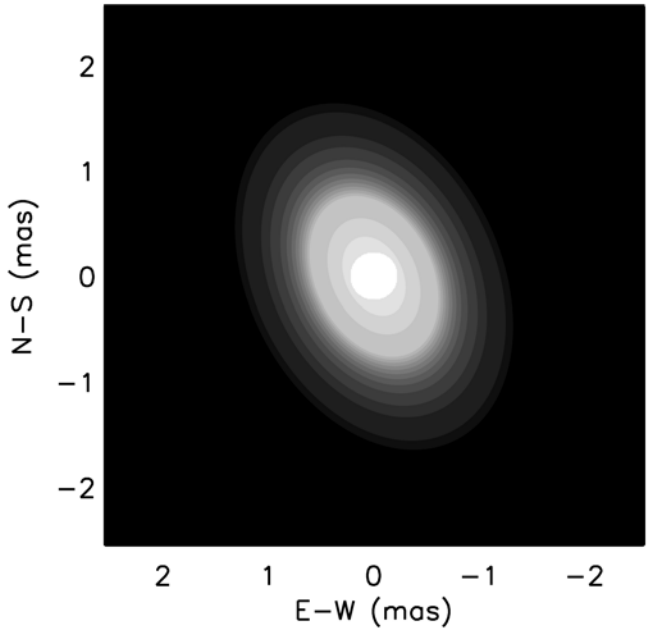




MIRC 5T



Simple Geometric Models

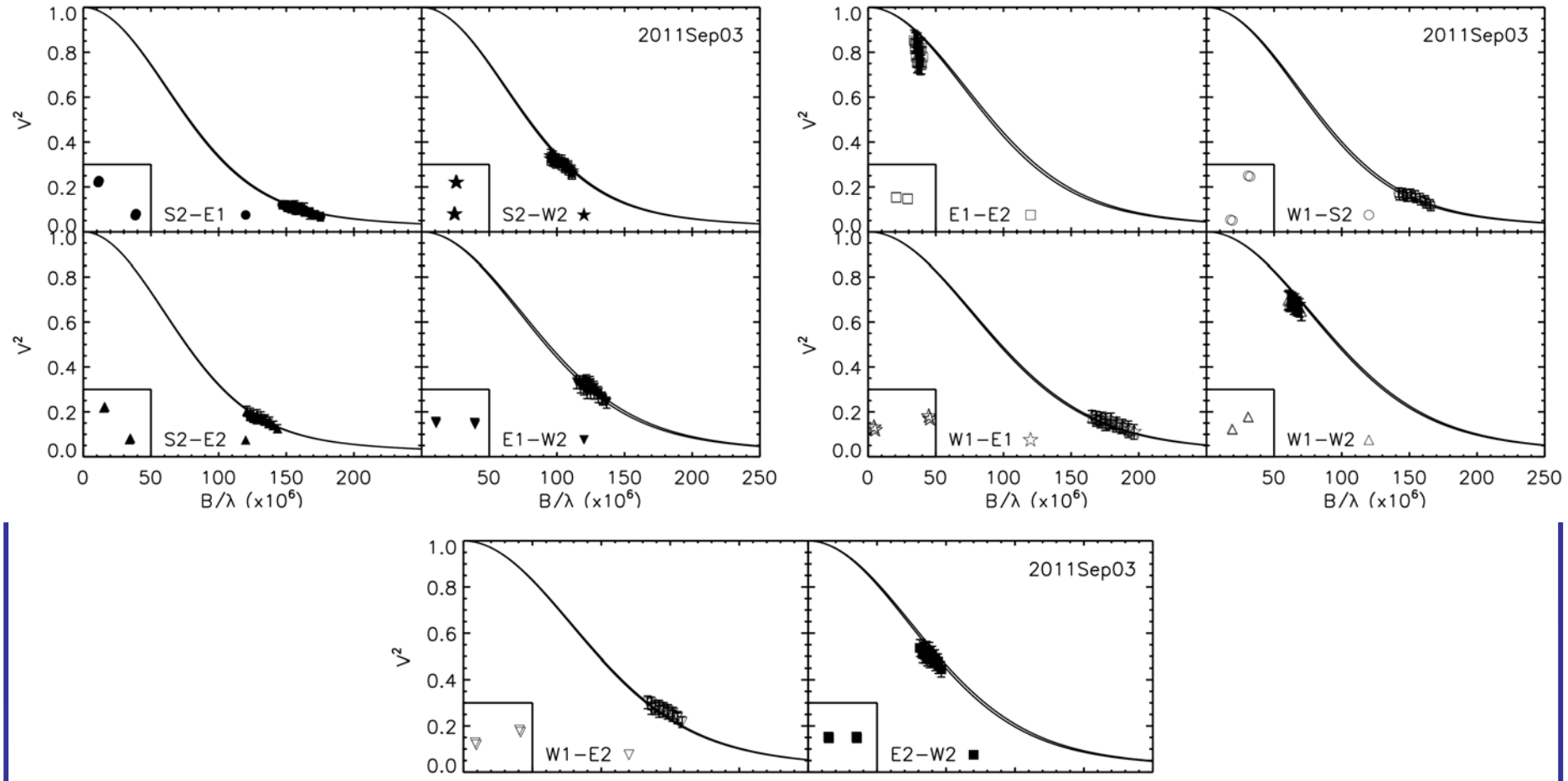


Fix stellar diameter: 0.44 mas

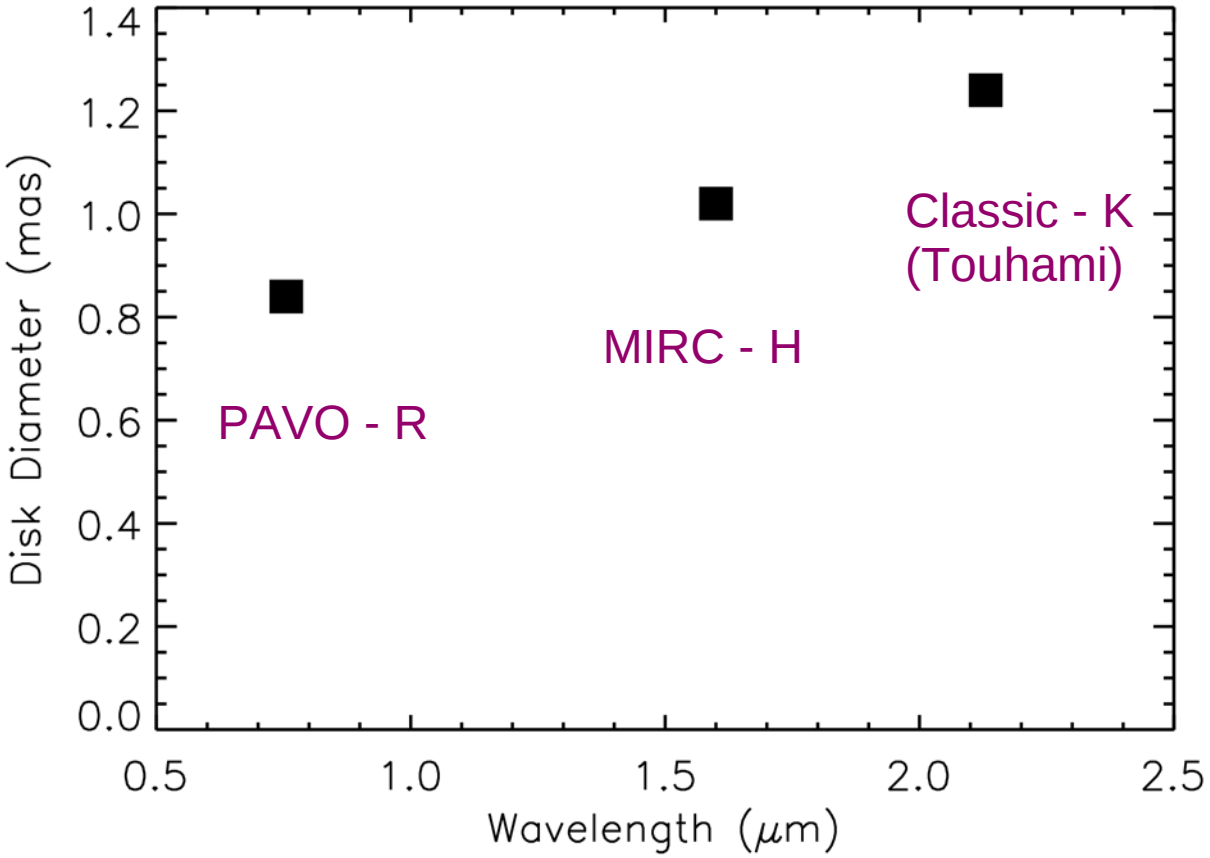
Model Parameters:
Disk major axis: 1.02 mas
Disk minor axis: 0.76 mas
Position angle: 204.3º
63% light from disk
37% light from star

- Uniform disk star
- Elliptical Gaussian disk

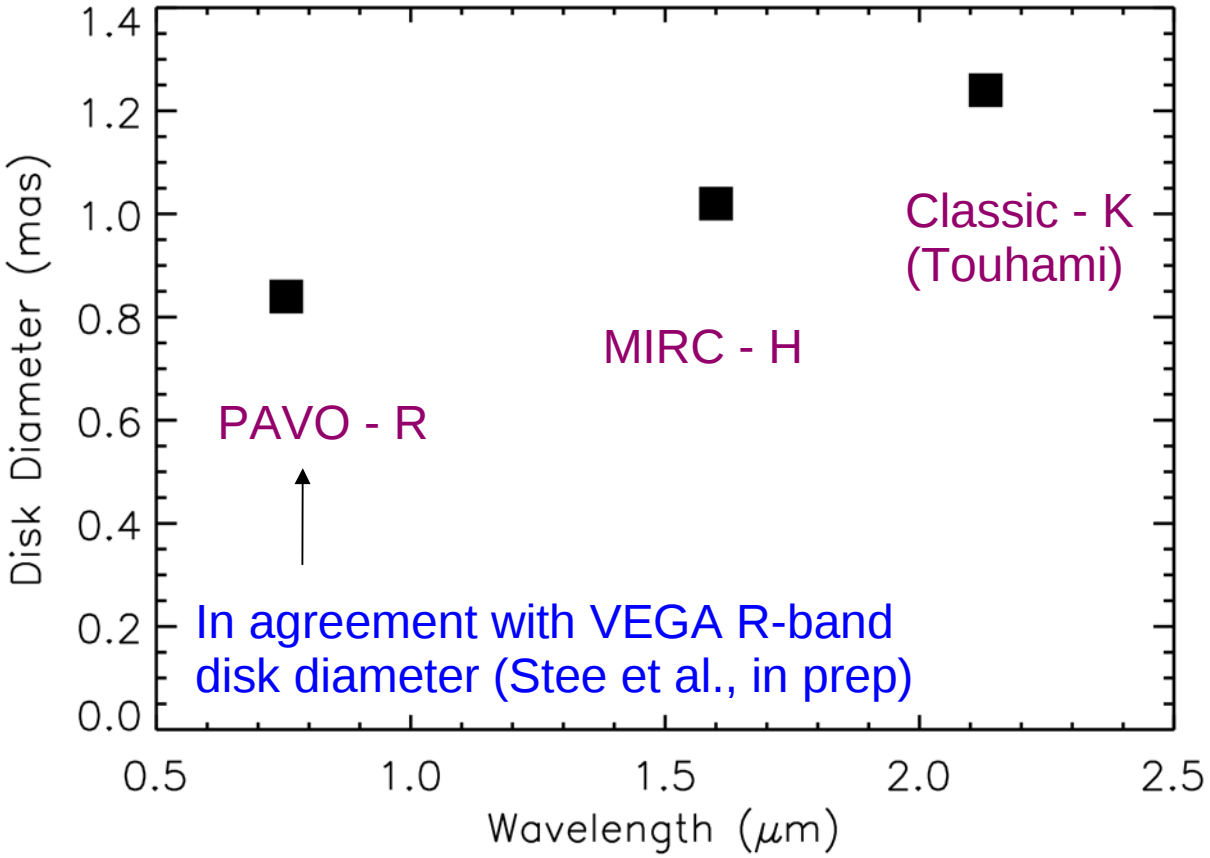
Fit to Visibilities



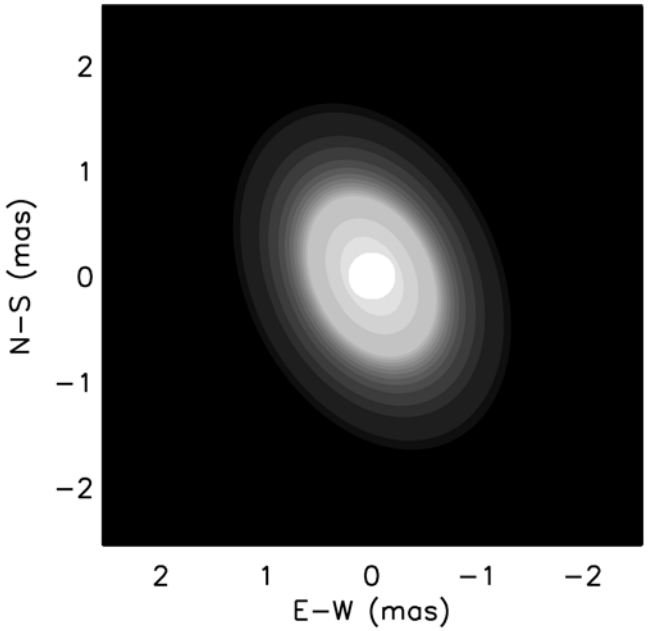
Gam Cas Disk Diameters



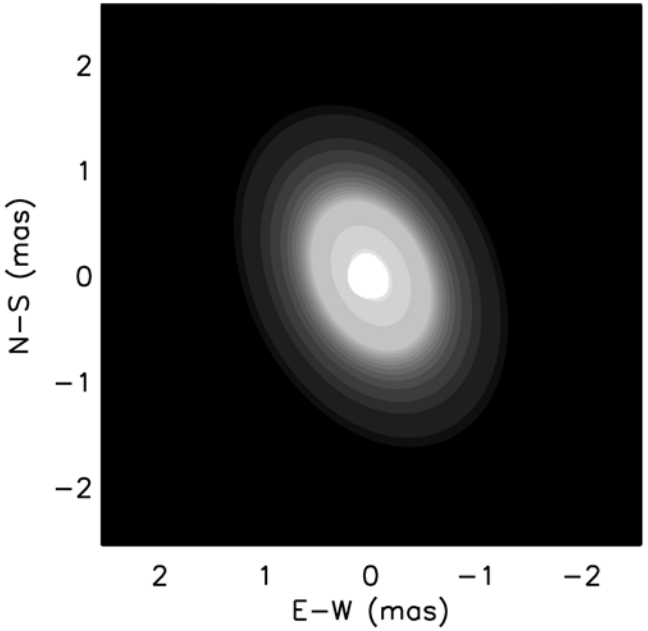
Gam Cas Disk Diameters



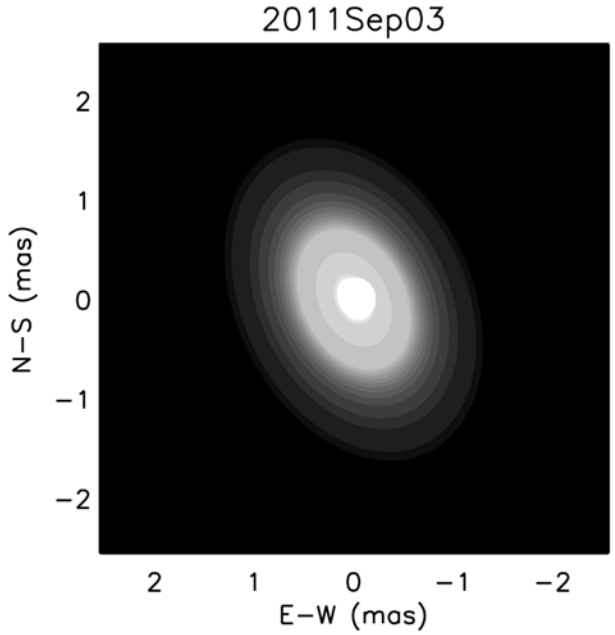
Updates to Simple Geometric Models



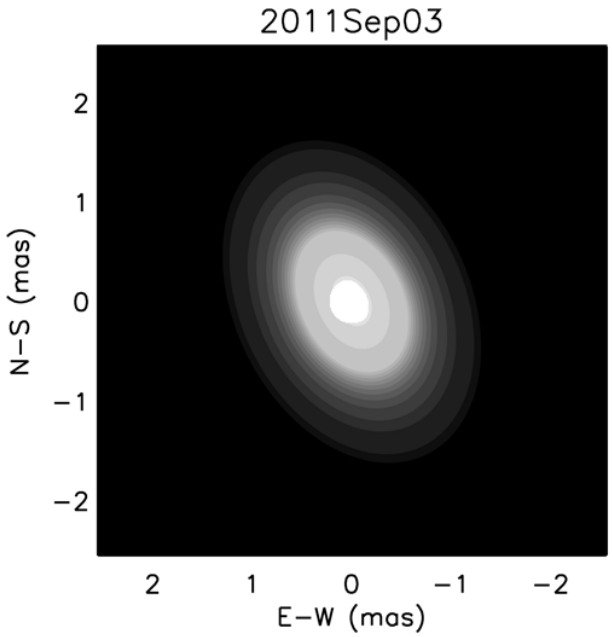
- Uniform disk star
- Elliptical Gaussian disk



- Star partially shaded by disk



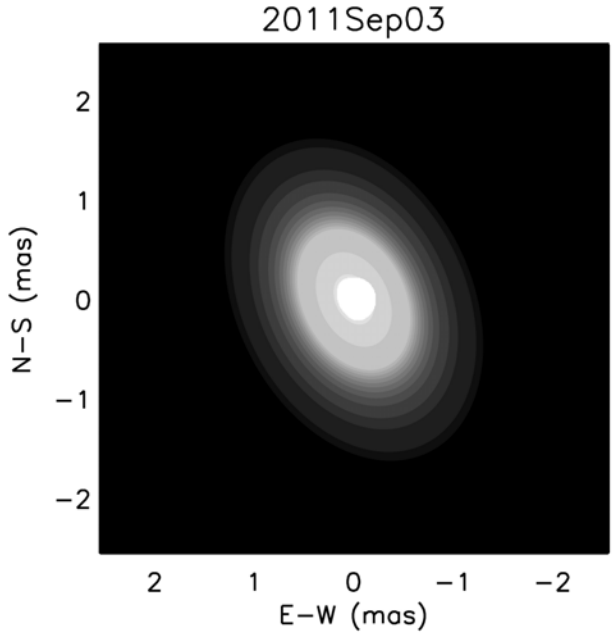
Bottom of star shaded by disk

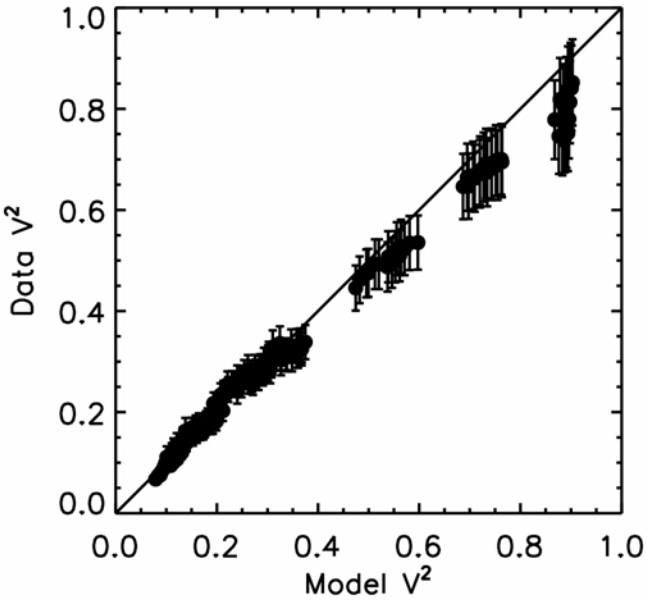


Top of star shaded by disk

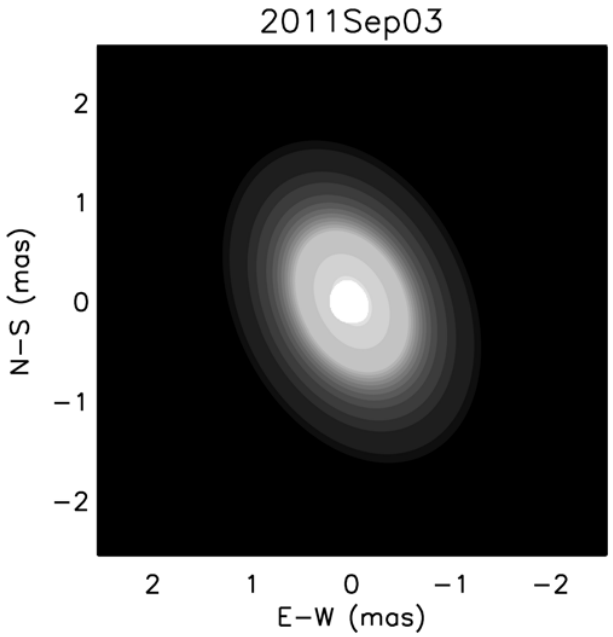
Can we measure the difference?

Visibilities





χ_ν^2=0.6



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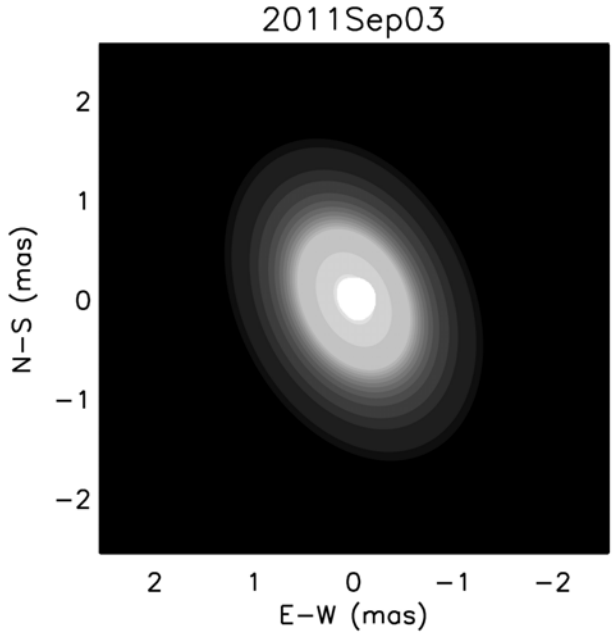

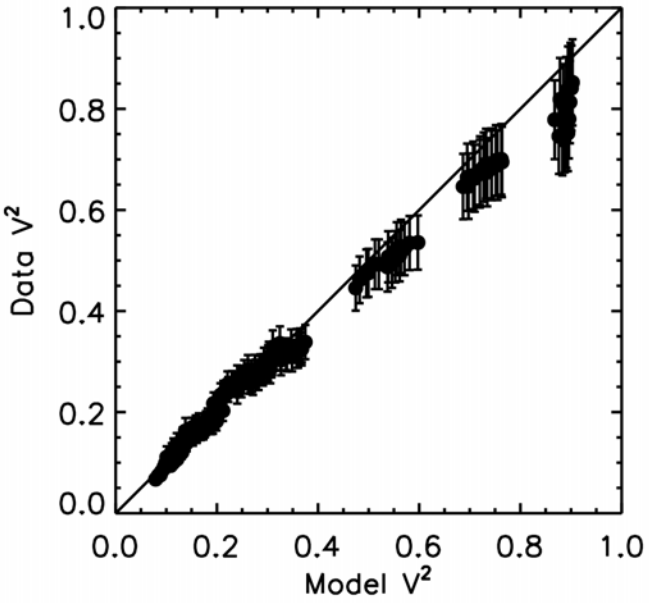

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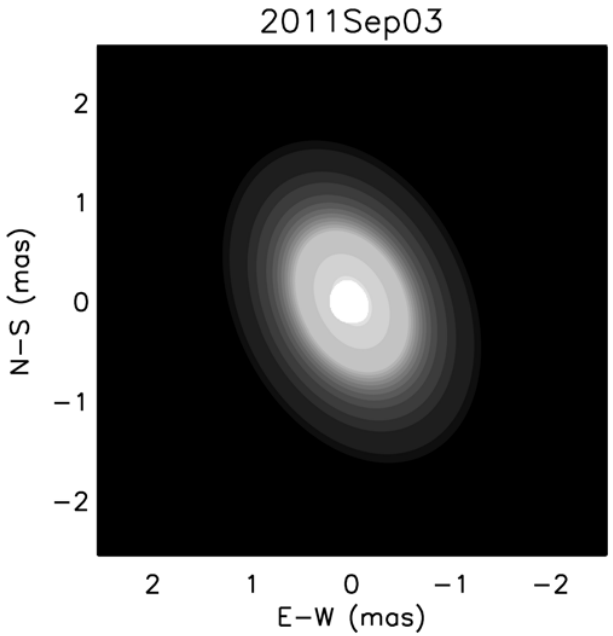

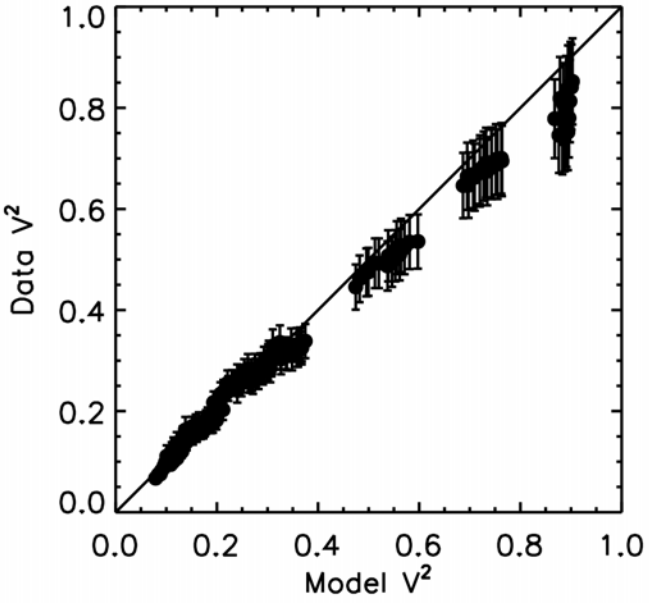

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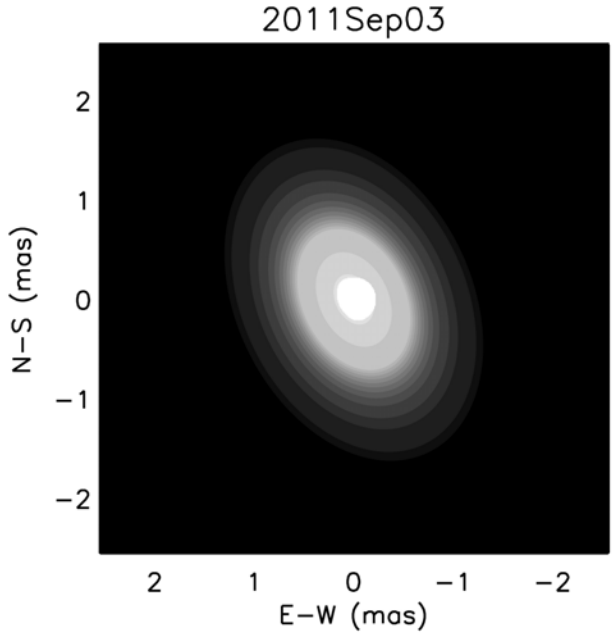
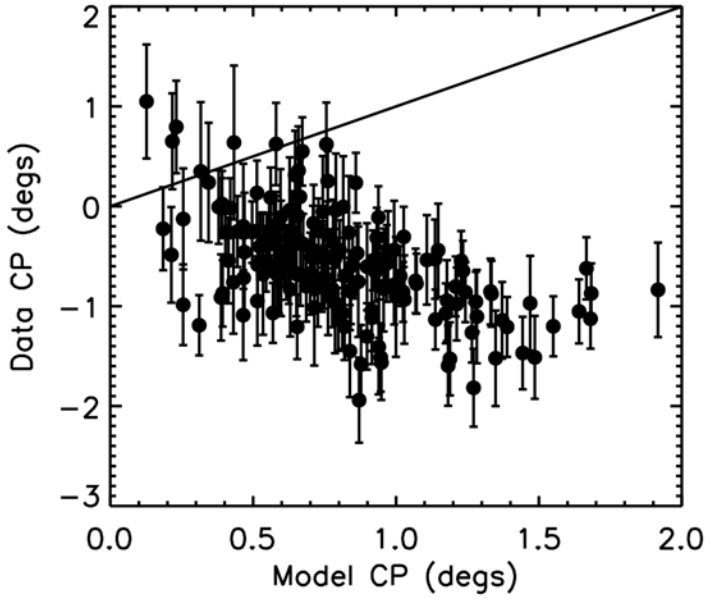
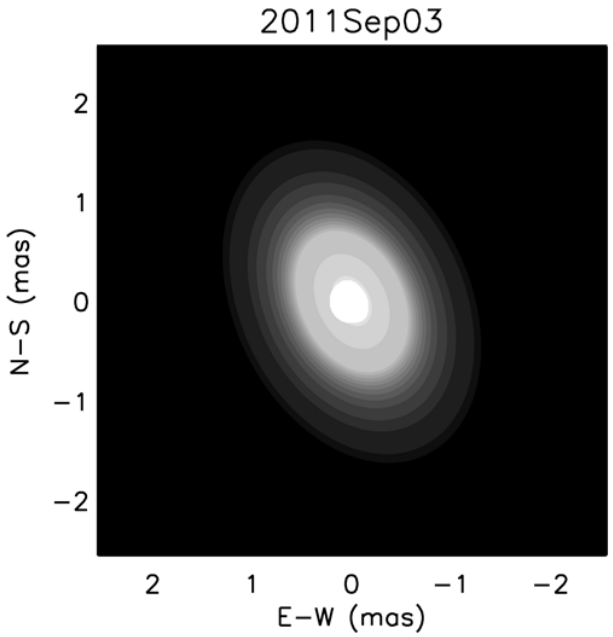
Closure Phases





χ_ν^2=20.4



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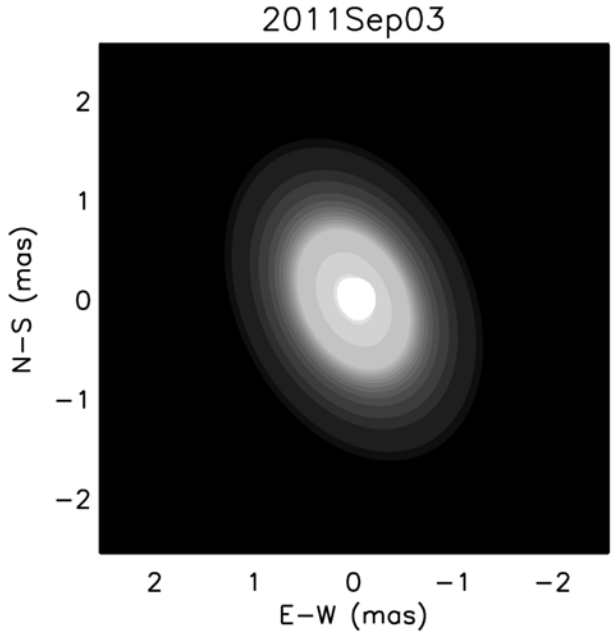

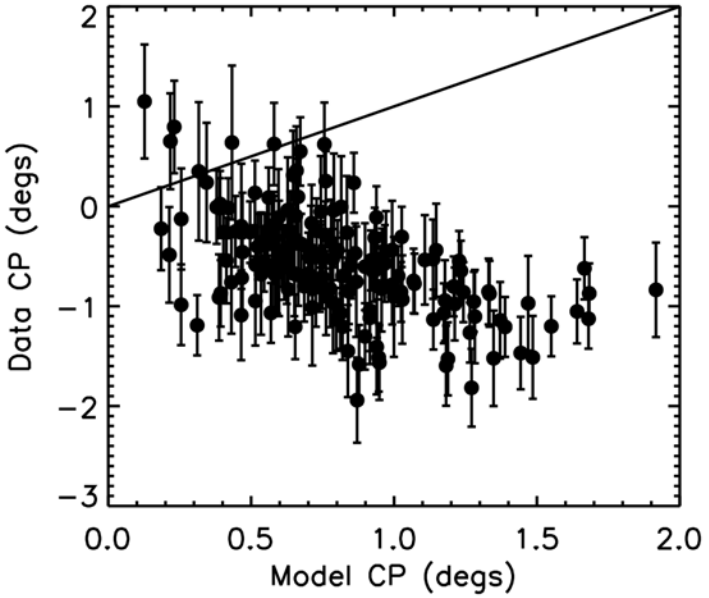

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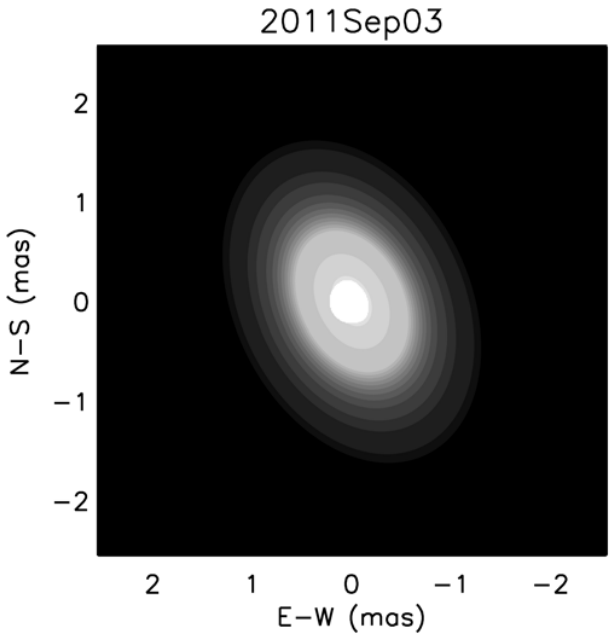

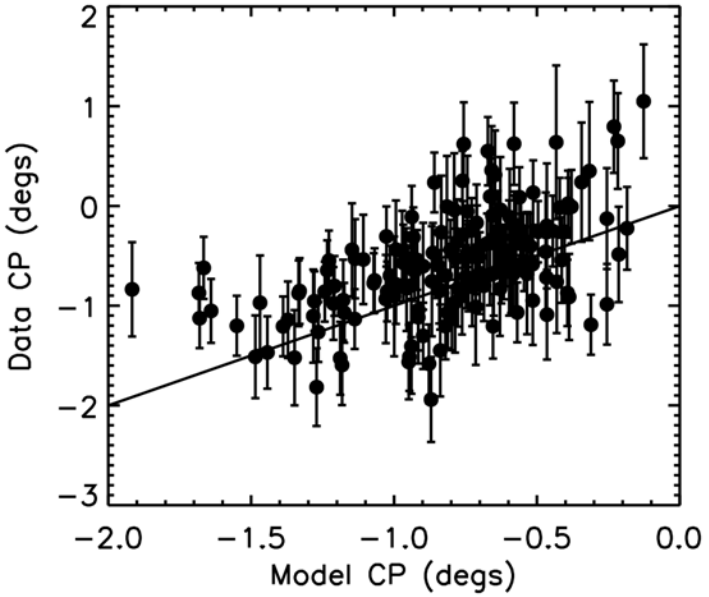

χ_ν^2=1.8

Summary

- Beginning to measure preliminary stellar diameters for Be stars from PAVO data
- Might be resolving some disks in the R-band continuum, although more uv-coverage required
- Shading the star by the disk could account for small scale asymmetries in MIRC closure phases of Be stars