

# **A Catalogue of Candidate MIDI Calibrators**



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# Overview of this talk

I. Selection of the candidate calibrators

II. Photometry

III. Estimating angular diameters

IV. Current status and future work

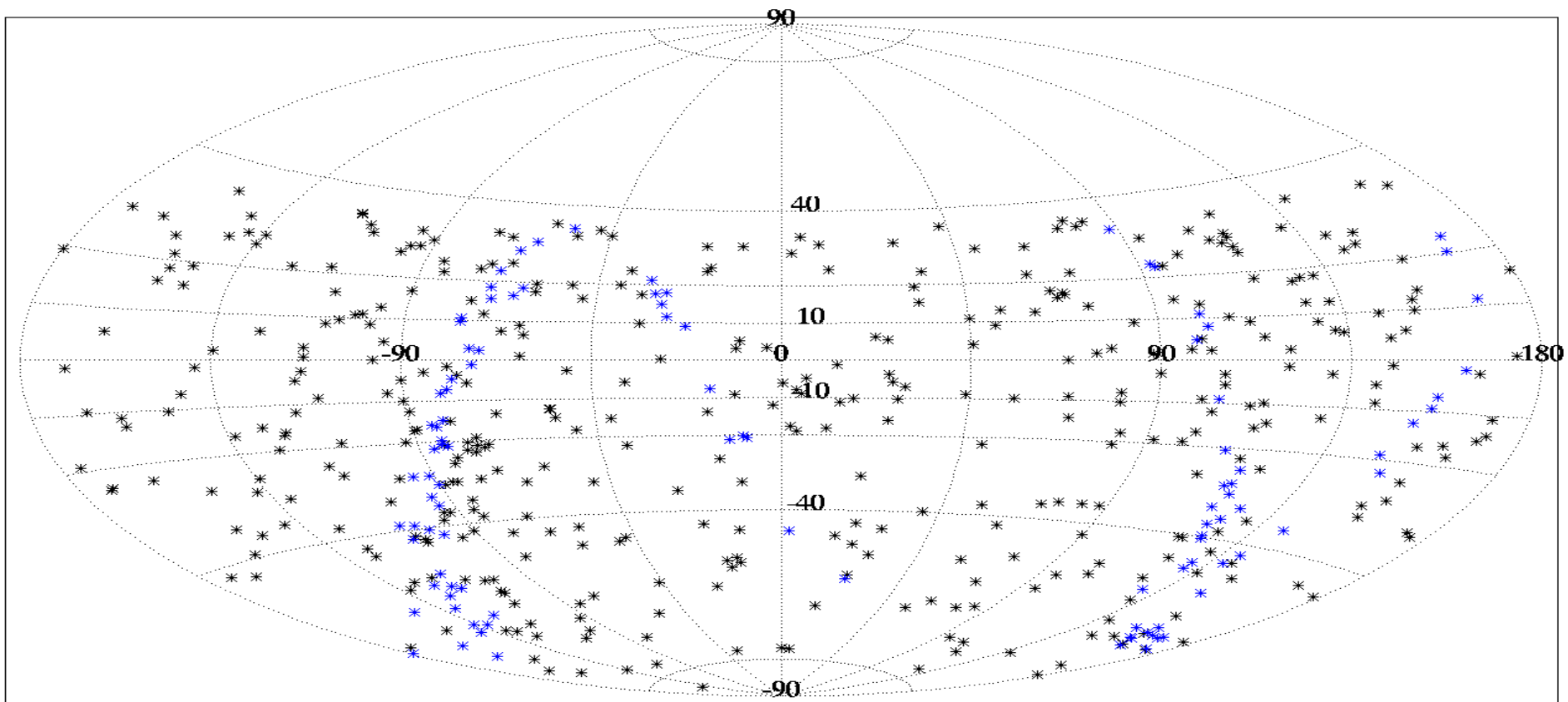
V. Things to consider

# MIDI Calibrator Candidates

- Point sources from IRAS PSC and MSX PSC
- Flux at 12 micron  $> 5$  Jy ( $N \approx 2$ )
- Declination  $\leq +35^\circ$
- IRAS: 12/25  $\mu\text{m}$  color temp.  $> 4000$  K
- MSX (SPIRIT III): A/C and A/D color temperatures  $> 4000\text{K}$
- Visual inspection on Digitised Sky Survey images
- $\Rightarrow$  511 MIDI Calibrator Candidates

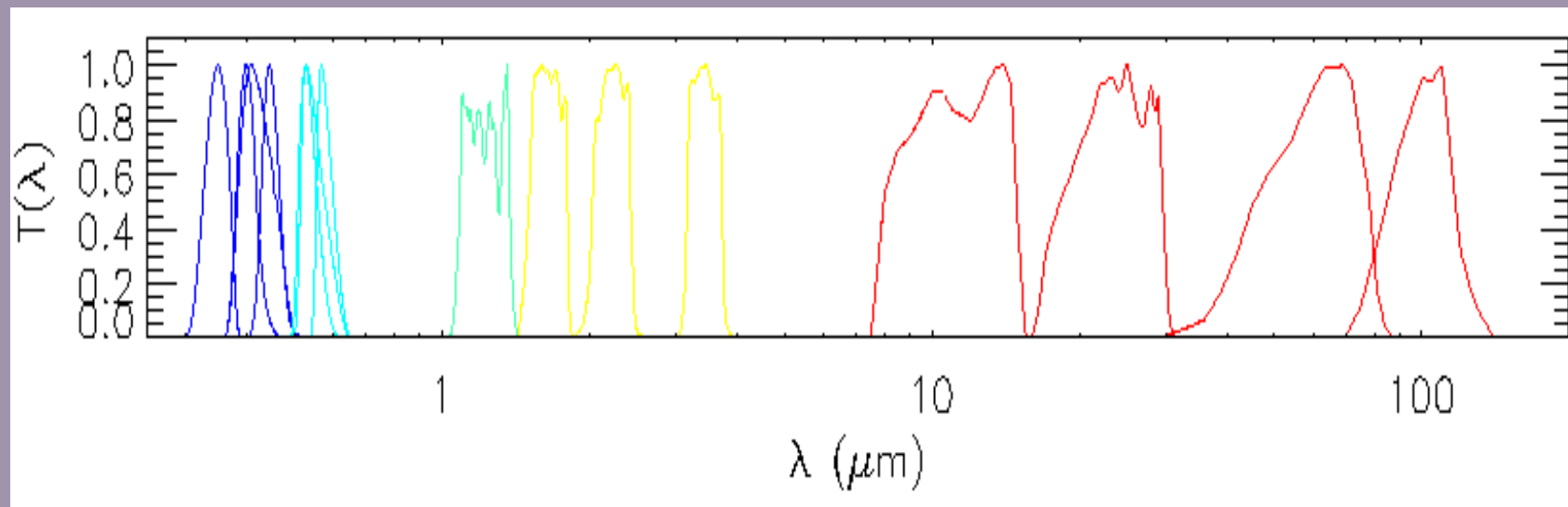
# Coverage

Only 136 of these 511 stars are in Cohen's (1999) catalogue!



# The Photometry

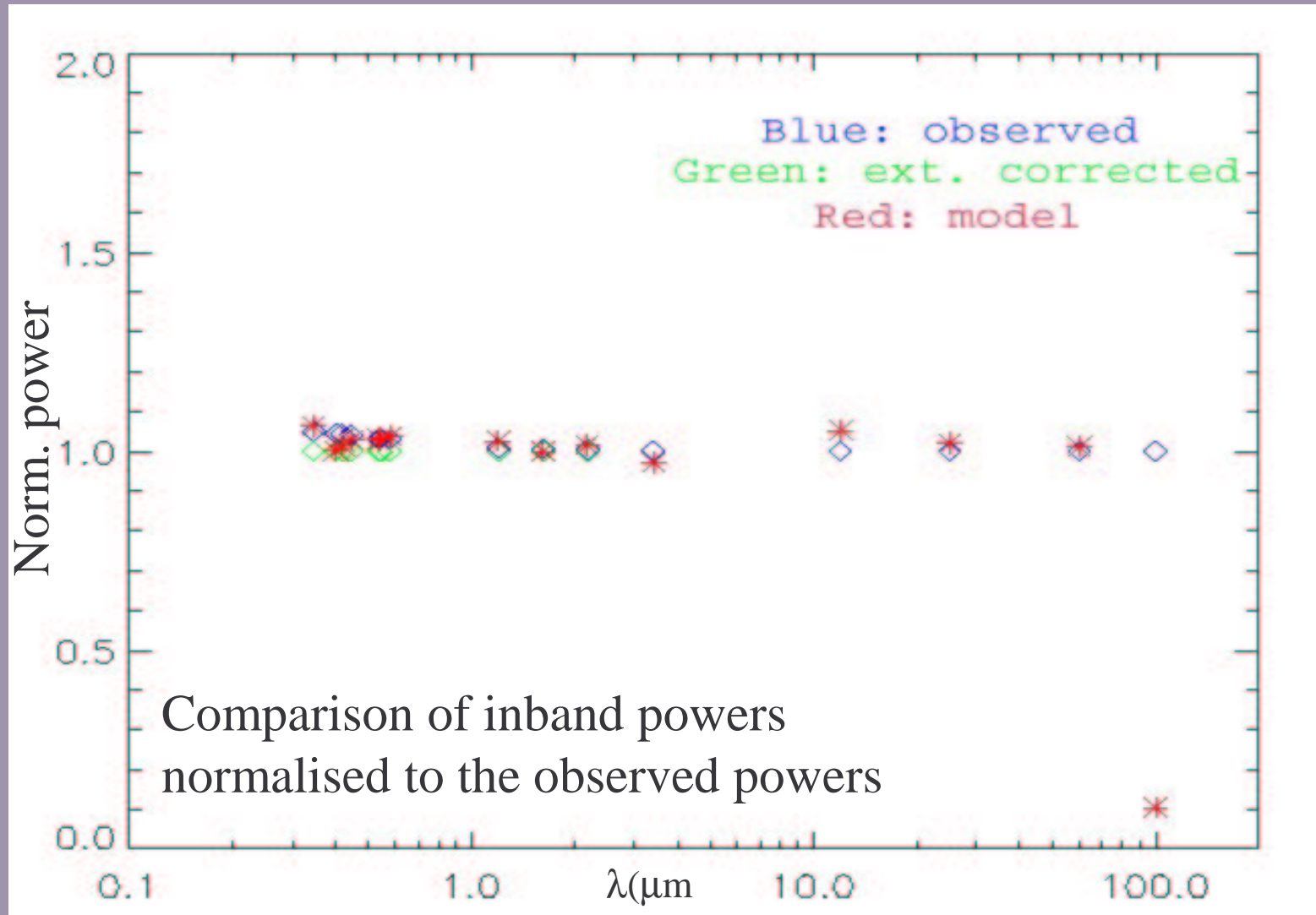
- UV/Optical: Geneva (7 filters)
  - Euler (La Silla) and Mercator (La Palma) 1.2 m telescopes
  - Calibration: Rufener and Nicolet (1988)
- NIR: SAAO JHKL
  - Calibration: Glass (Private communication); will be checked against other systems
- IR: IRAS (MSX)



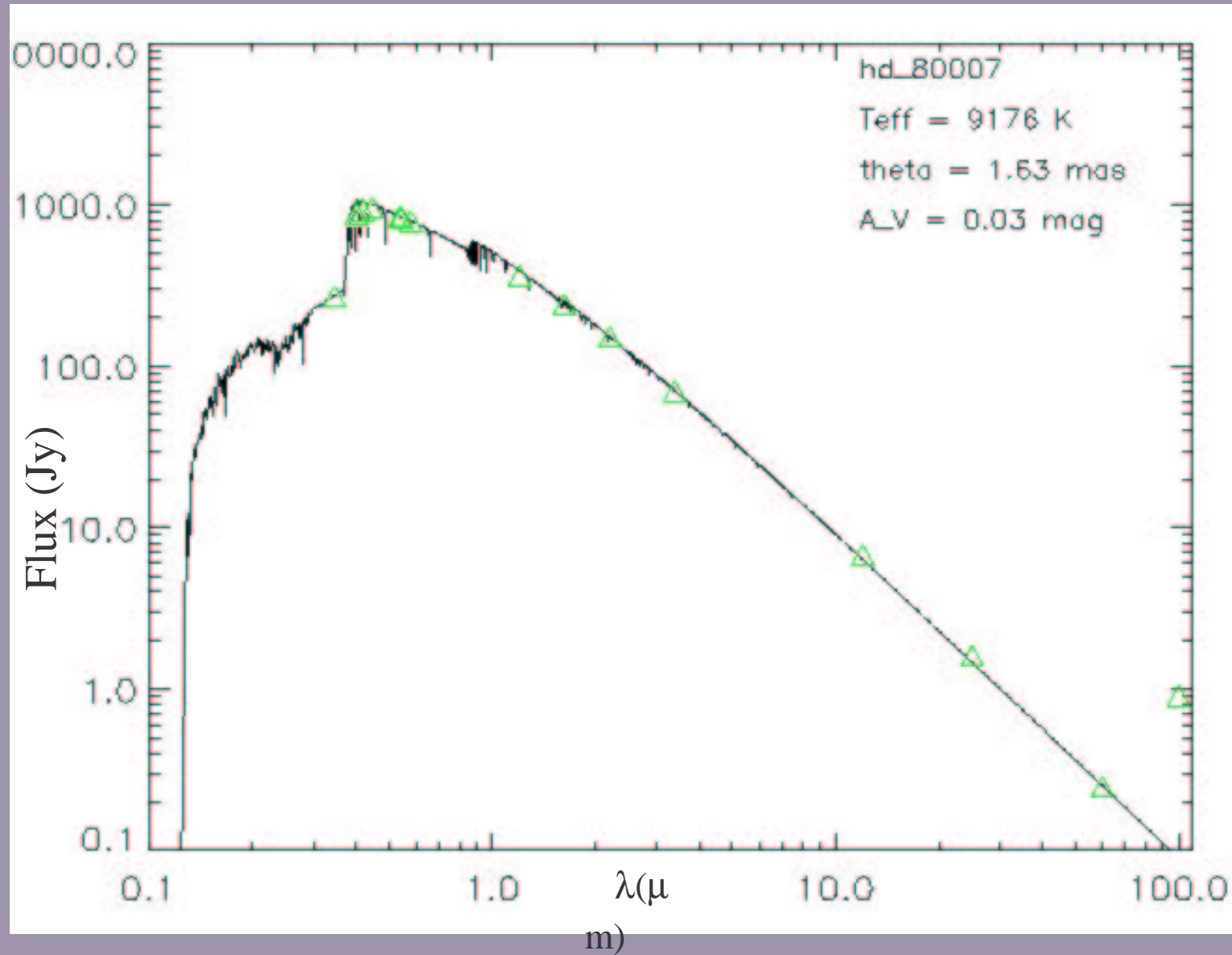
# Estimating Angular Diameters

- Idea: compare observed inband powers with synthetic photometry.
- Models: grid of 411 Kurucz models between which can be interpolated if needed.
- Free parameters:  $T_{\text{eff}}$ , Ang. Diam, IS Extinction
- Other parameters (e.g. Surface gravity) are determined from the Spectral Type or taken solar.

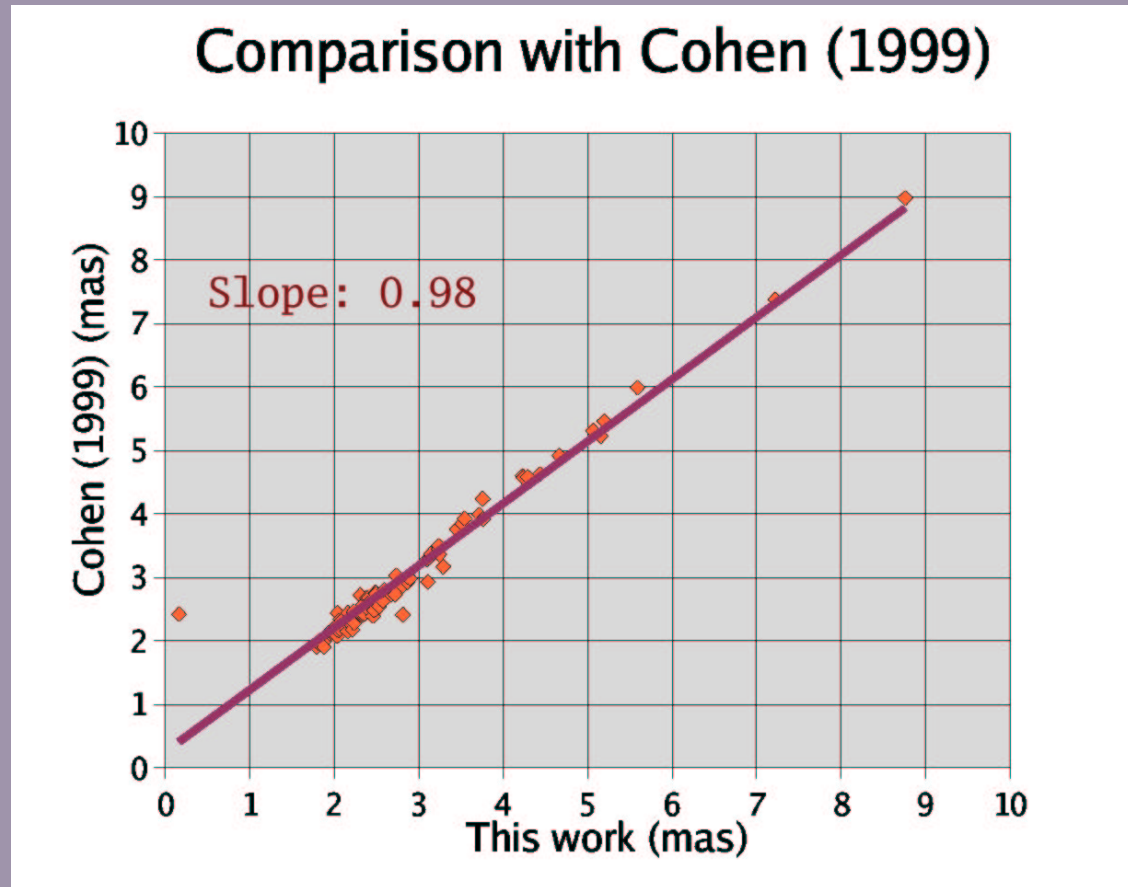
# Example: $\beta$ Car



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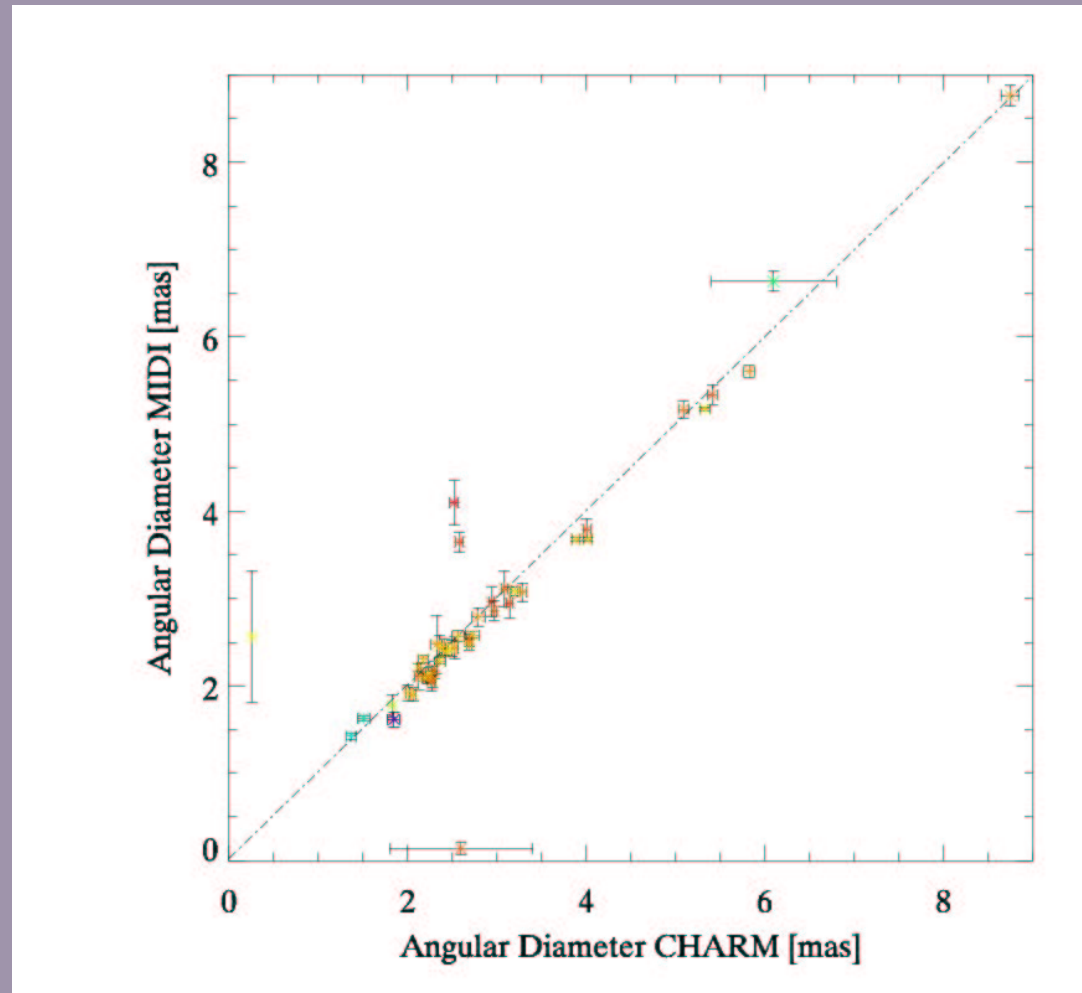
# Results:1



# Future Improvements

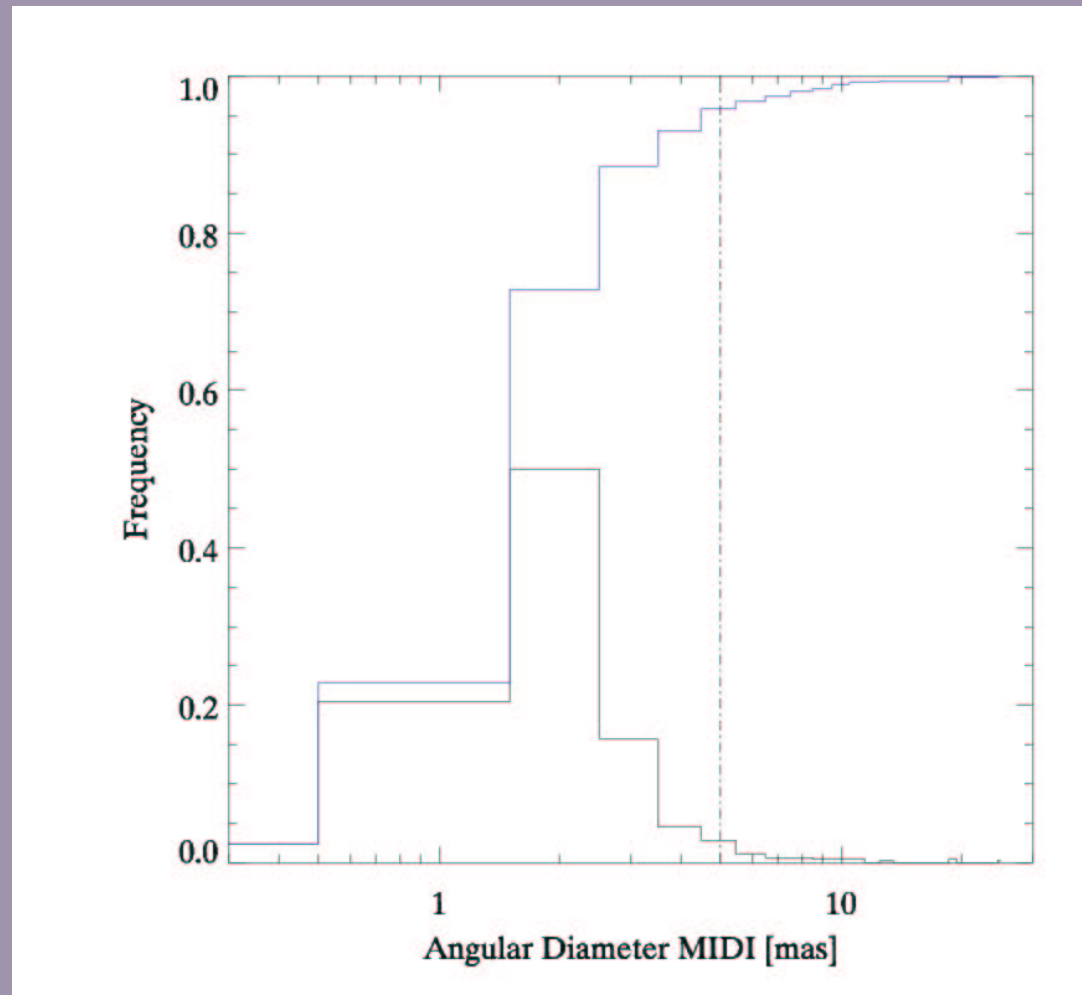
- Checking against VINCI measurements
- Cool star atmosphere models (MARCS) for the many M-type stars
- Visual checking for anomalies in the SED
- Converting these diameters into wavelength dependent limb-darkened intensity profiles (possible with the Kurucz and MARCS models)
- Empirical study of the wavelength-dependence of the diameter due to strong molecular features (already started in collaboration with the FLUOR-team)
- ...

# Comparison CHARM-MIDI



47 HD stars with LO/IF measurements: slope  
0.996, relative accuracy ~5%

# MIDI diameter statistics



Distribution of 504 stellar diameters; the vertical line indicates the partial resolution limit

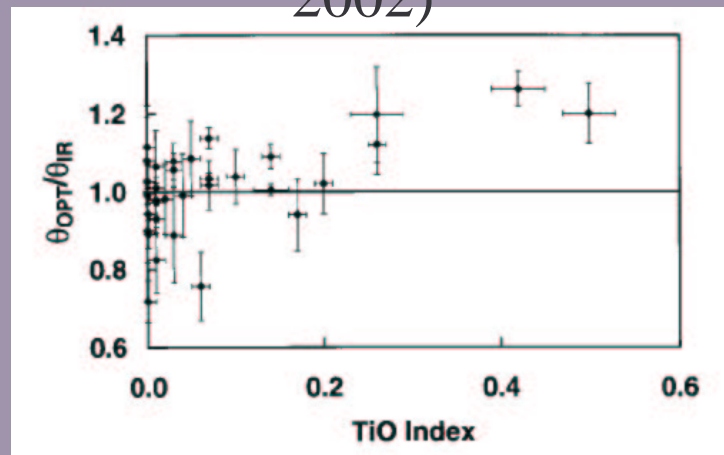
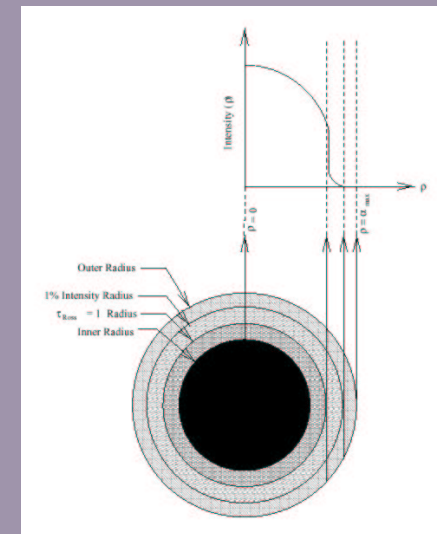
# Is there a unique stellar diameter ?

$$T_{\text{eff}} = \left[ \frac{4\mathcal{F}_0}{\sigma\theta_{\text{LD}}^2} \right]^{1/4}$$

Basic relation between  $T_{\text{eff}}$ , bolometric flux  $\mathcal{F}_0$ , and angular diameter  $\Theta$

Most of the MIDI candidate calibrators (~95%) are giant stars -> extended atmospheres

Relationship between angular profile and optical depth (Aufdenberg & Hauschildt 2002)

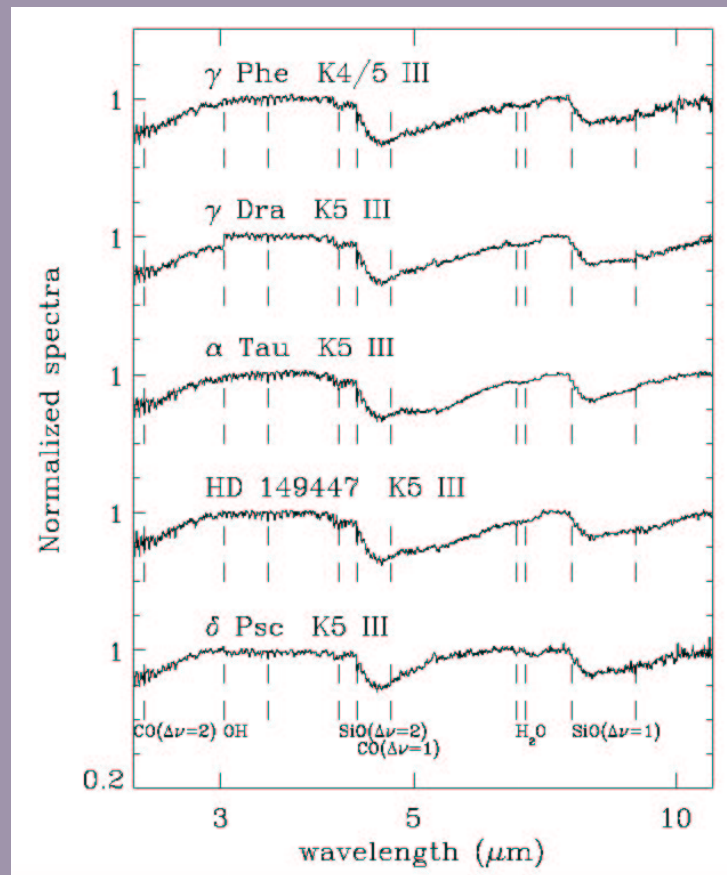


Ratio between optical and NIR angular diameter for 33 stars based on NPOI measurements (Dyck & Nordgren 2002)

# The MIR appearance of stars

How to scale NIR diameters to the thermal infrared ?

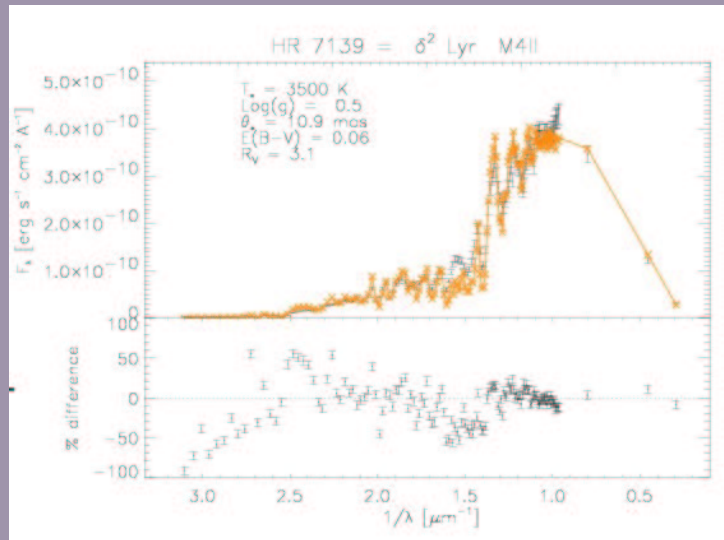
Do we have to care about molecular features of MIDI calibrators?



Example: ISO LWS spectra of K stars (Heras et al. 2002)

SiO fundamental of primary concern

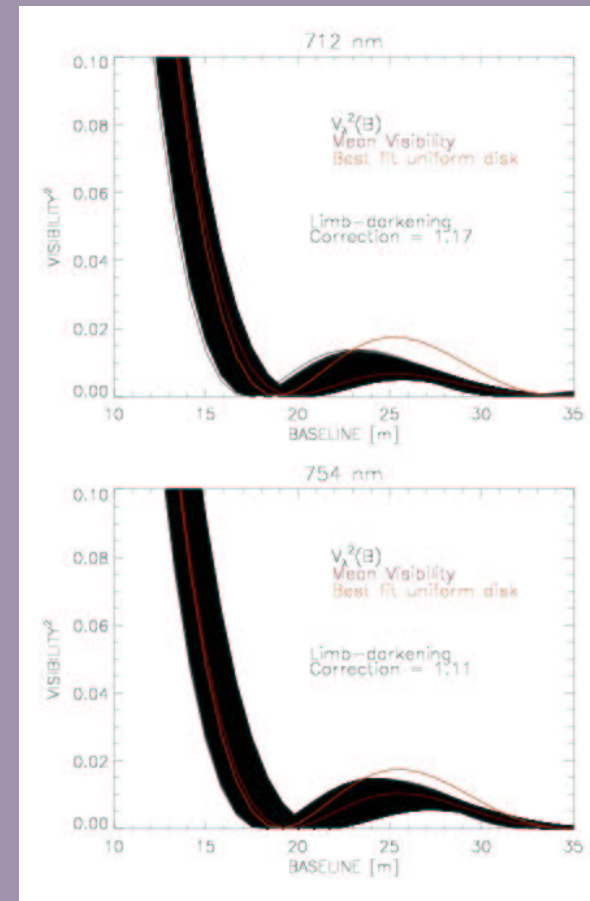
# Photometry vs. Spectroscopy



Example: HR 7139

Observed spectrum and model fit  
(yields  $T_{\text{eff}}$ ,  $\log(g)$ ,  $A_V$ ,  $\Theta$ ) from  
Aufdenberg & Hauschildt 2002

-> high-res spectroscopy (e.g. using the  
Tautenburg Echelle spectrograph) and  
modeling of stellar atmospheres with the  
PHOENIX code (in collaboration with P.  
Hauschildt)



Comparison of  
observed and  
modeled  
visibilities