



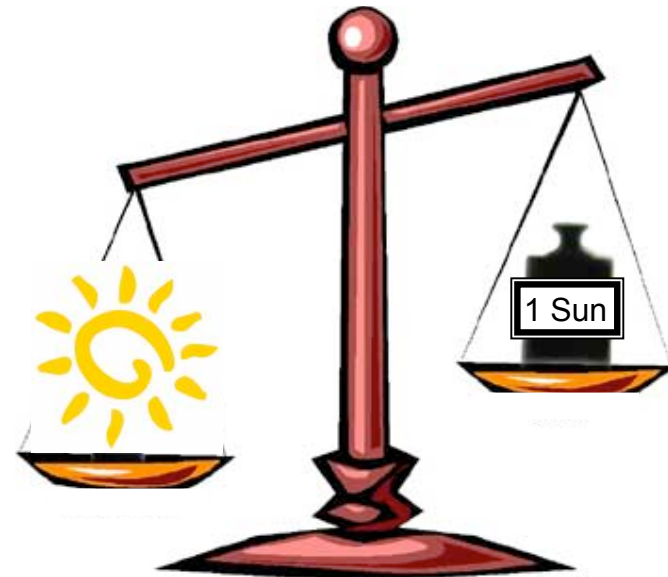
# Masses and Radii of Young Stars

**Russel White, Gail Schaefer (GSU/CHARA)**

**And:** Ellyn Baines, Tabettha Boyajian, Theo ten Brummelaar,  
Leslie Hebb, Ettore Pedretti, Nathalie Thureau

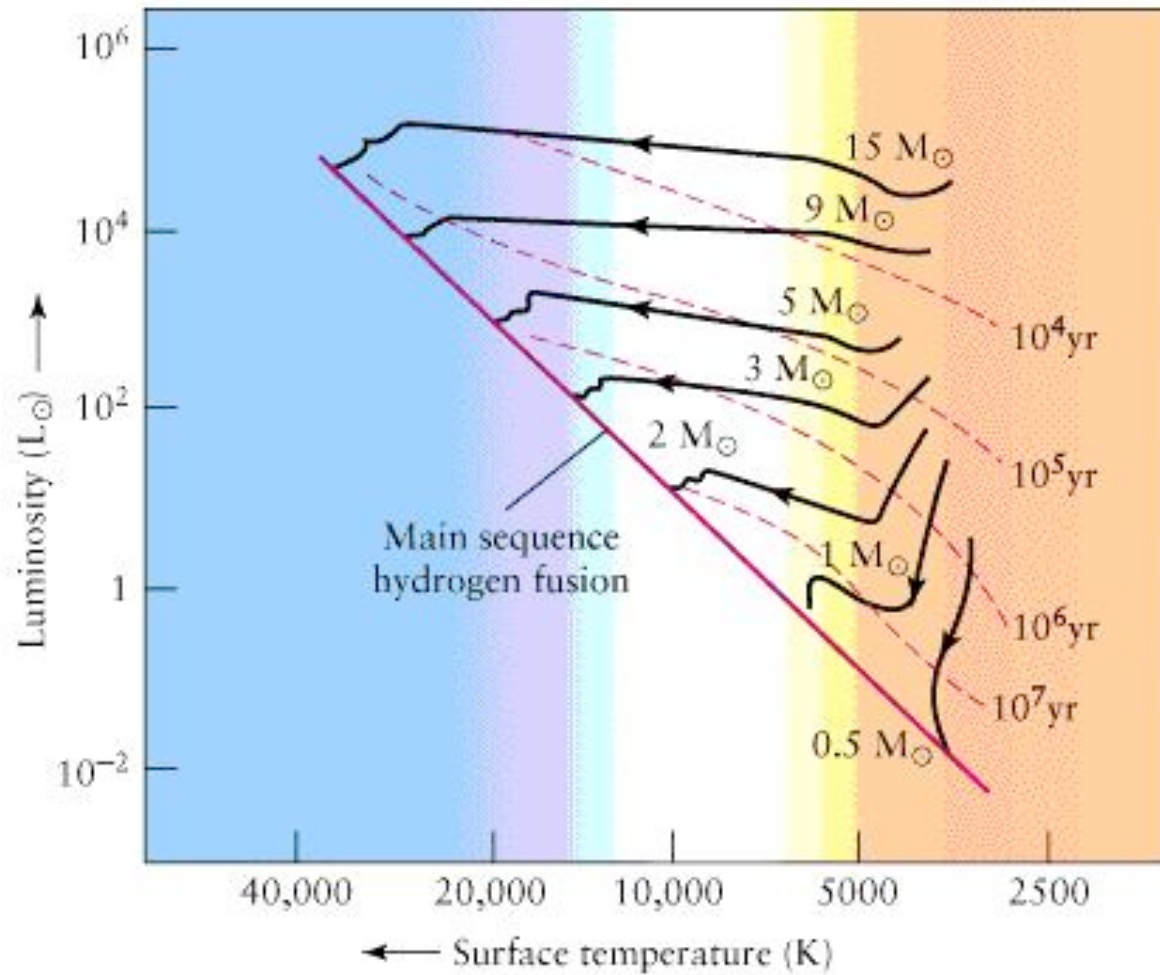


To improve  
mass & age  
estimates of  
young stars





# PMS Evolutionary Models

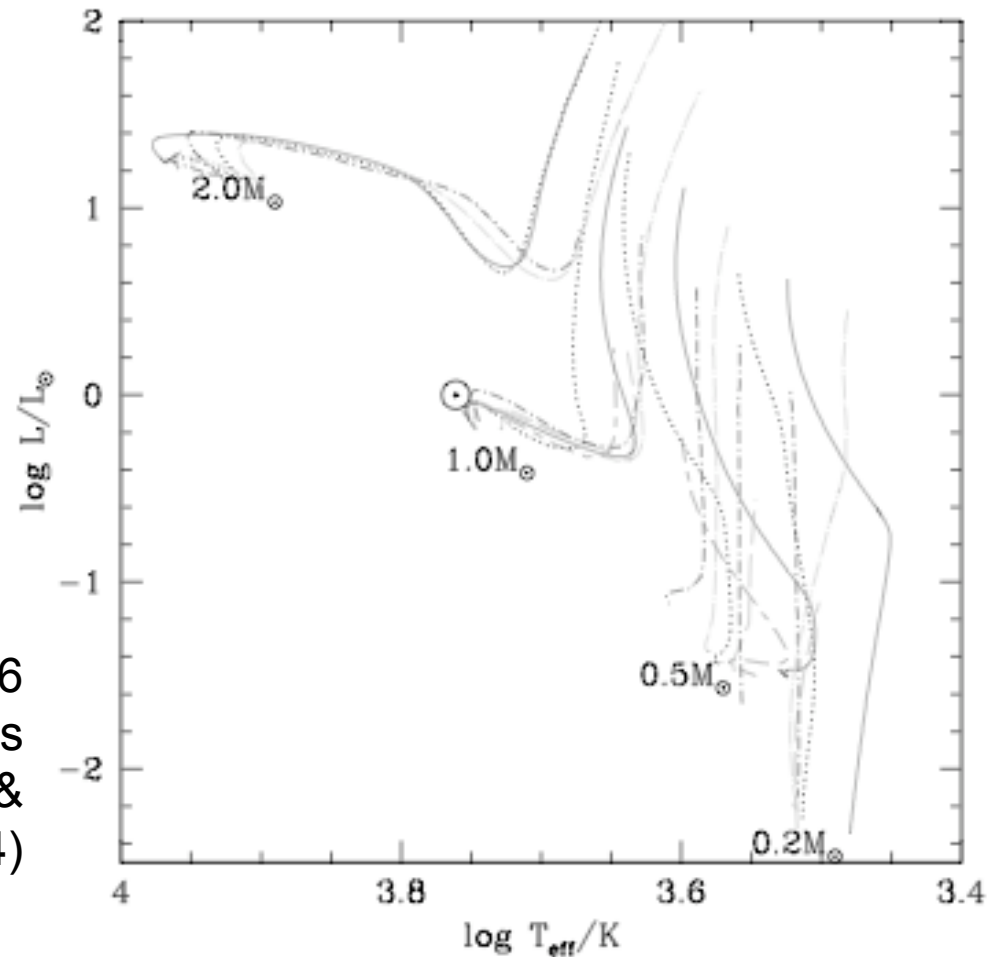




# PMS Evolutionary Models

Agree poorly at young ages and low masses

A comparison of 6 evolutionary models (from Hillenbrand & White 2004)

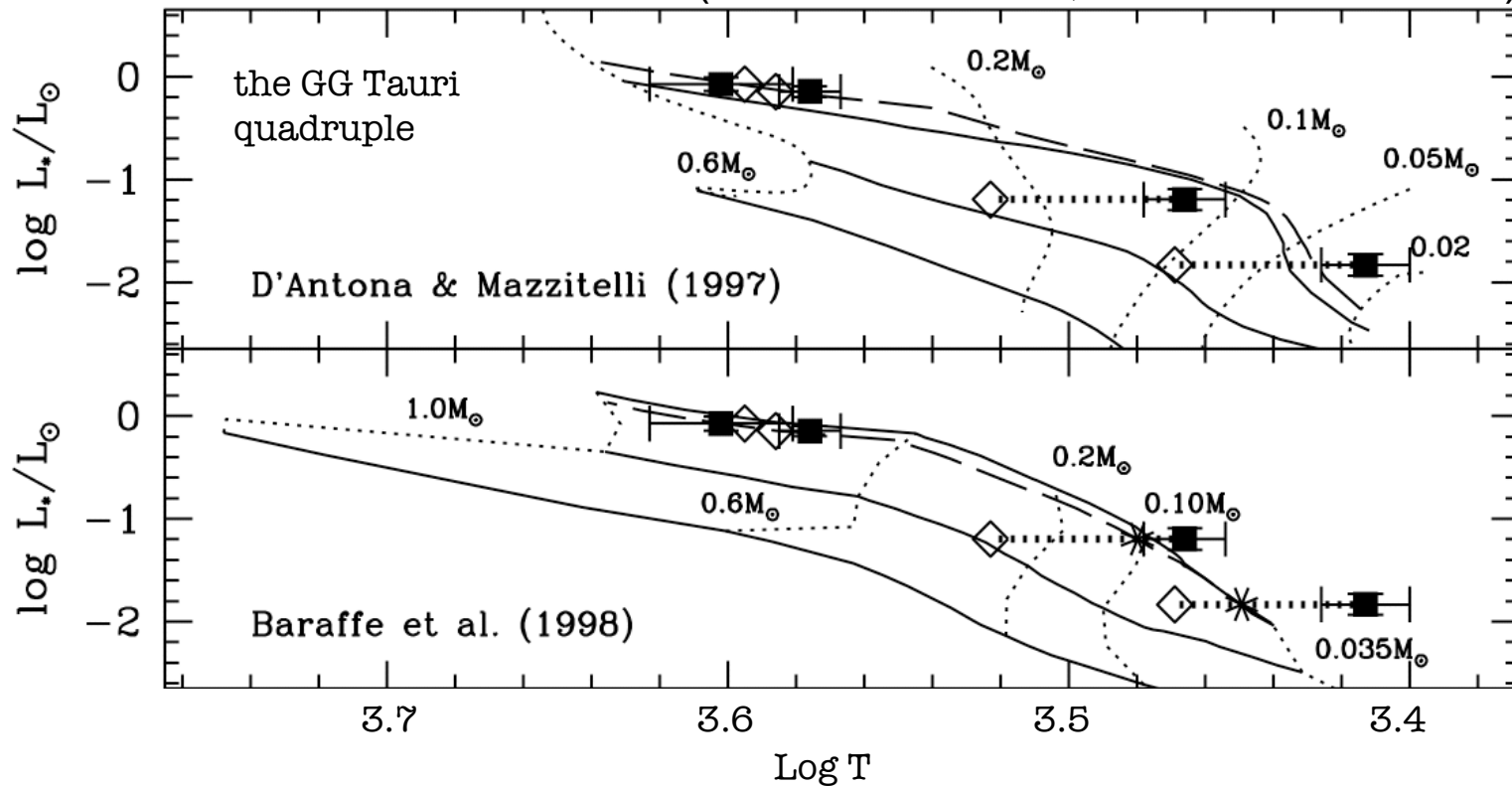




# Binary Star Constraints

## What's the right temperature?

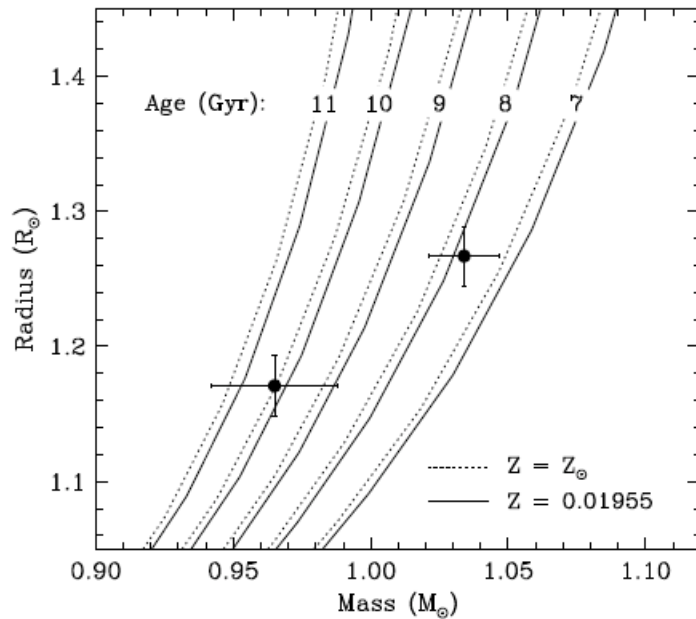
(White et al. 2001; Luhman et al. 2003)





# Binaries Aren't All Coeval

Eclipsing Binary CV Boo  
(Torres et al. 2008)

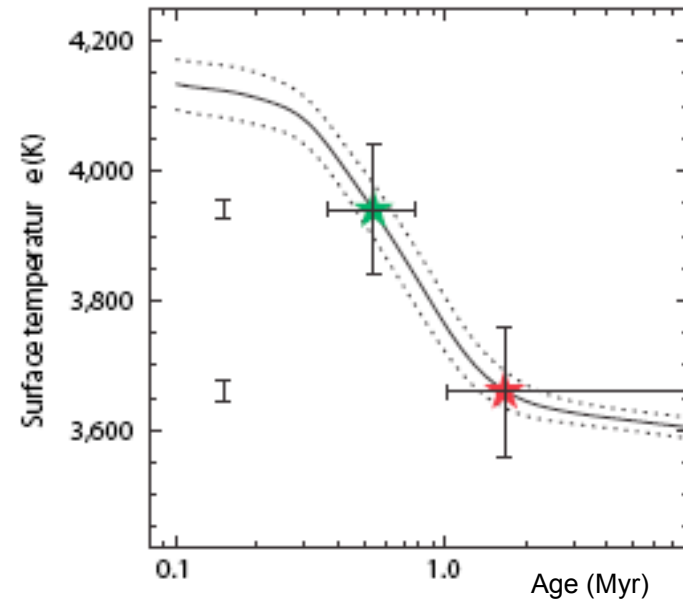


Activity Effects?

Eclipsing Binary Par 1802

$$M_A = 0.41 \pm 0.01 = M_B$$

(Stassun et al. 2008)



Formation Effects?



# Dynamical Masses

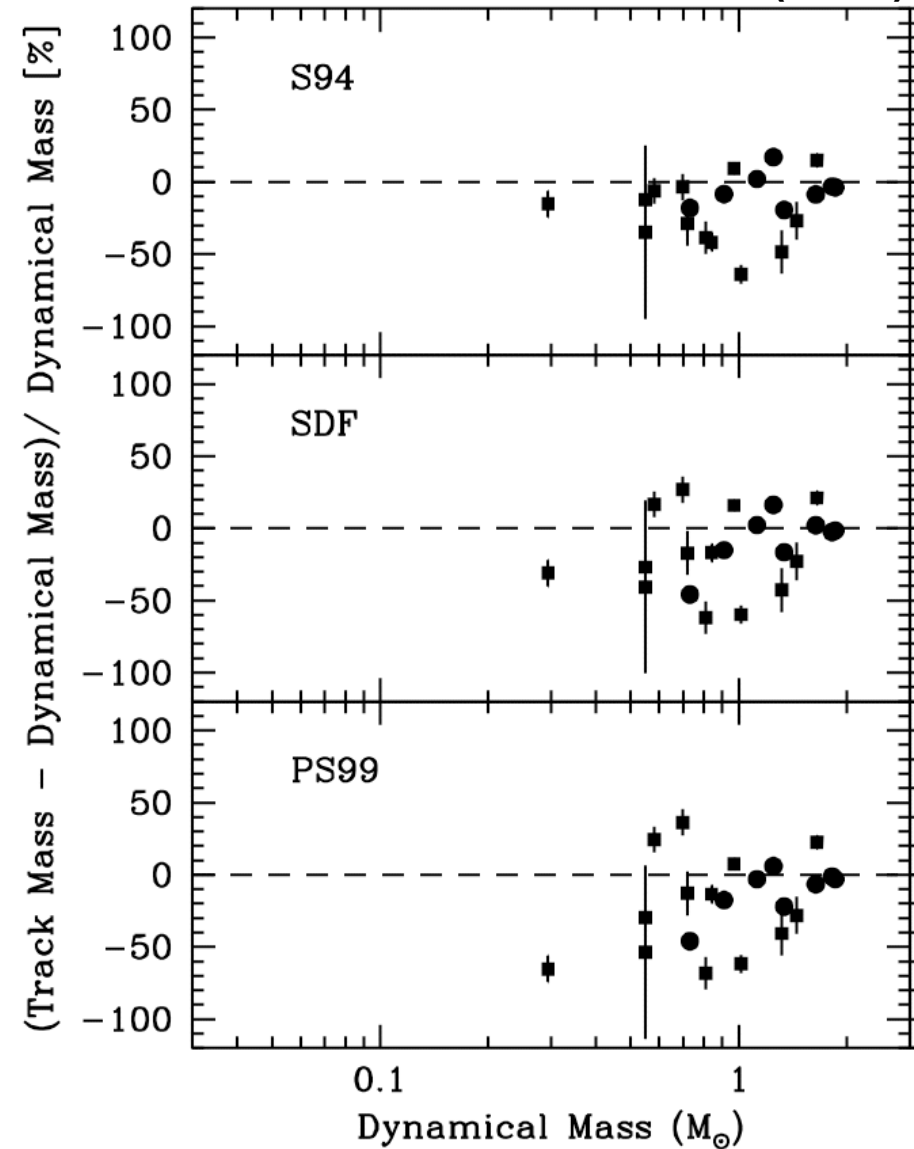
*Tests of evolutionary models are limited by poorly determined stellar properties!*

Example:

045251A (K5,  $1.45 \pm 0.19 M_{\text{Sun}}$ )

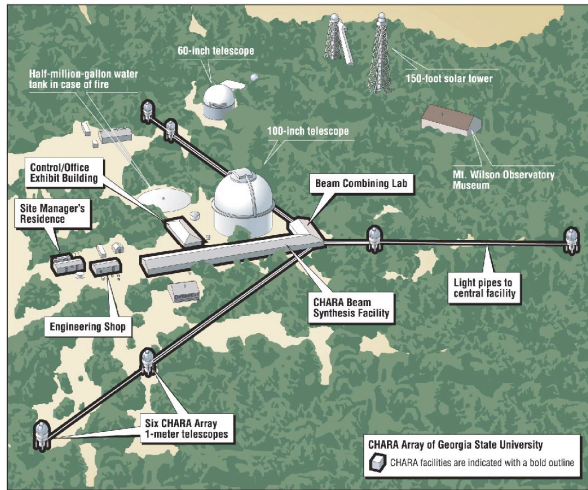
LkCa 15 (K5,  $0.97 \pm 0.03 M_{\text{Sun}}$ )

Mathieu et al. (2007)





# Two Important Advances

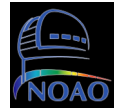
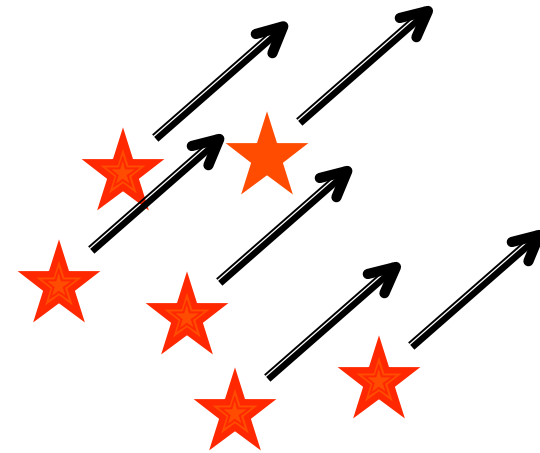


## CHARA

330-m baselines,  $K_{\text{lim}} \sim 7$

$\theta_{\text{res}} \sim 0.4 \text{ mas}$

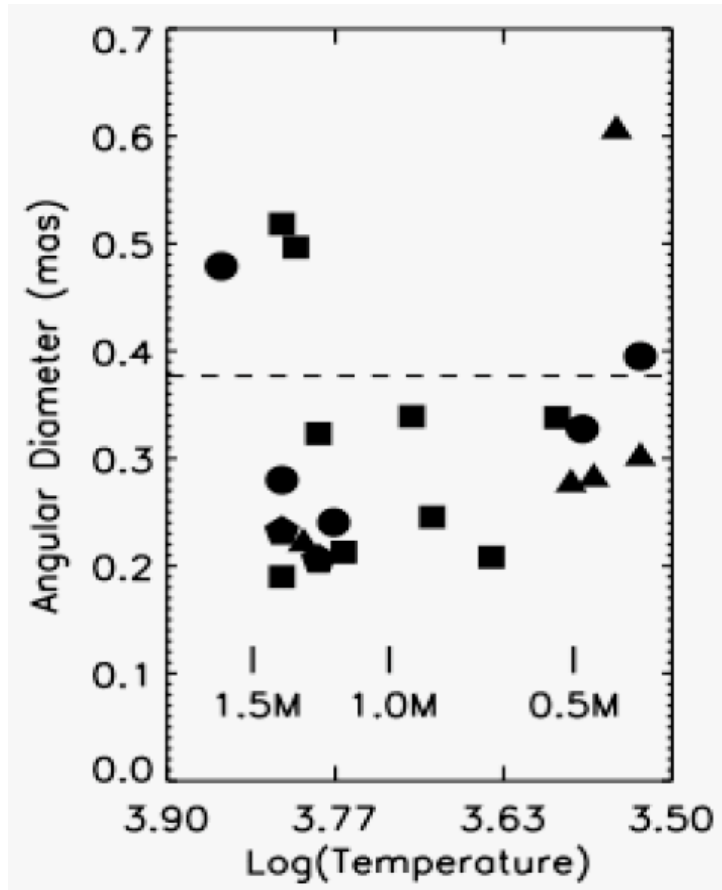
**Nearby (< 50 pc)  
Young (10-50 Myr)  
Moving Groups**  
Zuckerman & Song (2004);  
Torres et al. (2008)





# A CHARA Survey

Moving Group Members with  $K < 7$  and  $Dec > -5$



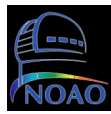
Goals: Radii ( $T_{eff}$ )  
Binaries (Dyn. Masses)



Apr 27-28, 2008

Sept 4-6, 2008 (7 stars H band)

Nov 10-12, 2008 (2 stars K band)



LESIA







# Early Results

## HD25457 (F5V)

Observed =  $0.54 \pm 0.05$

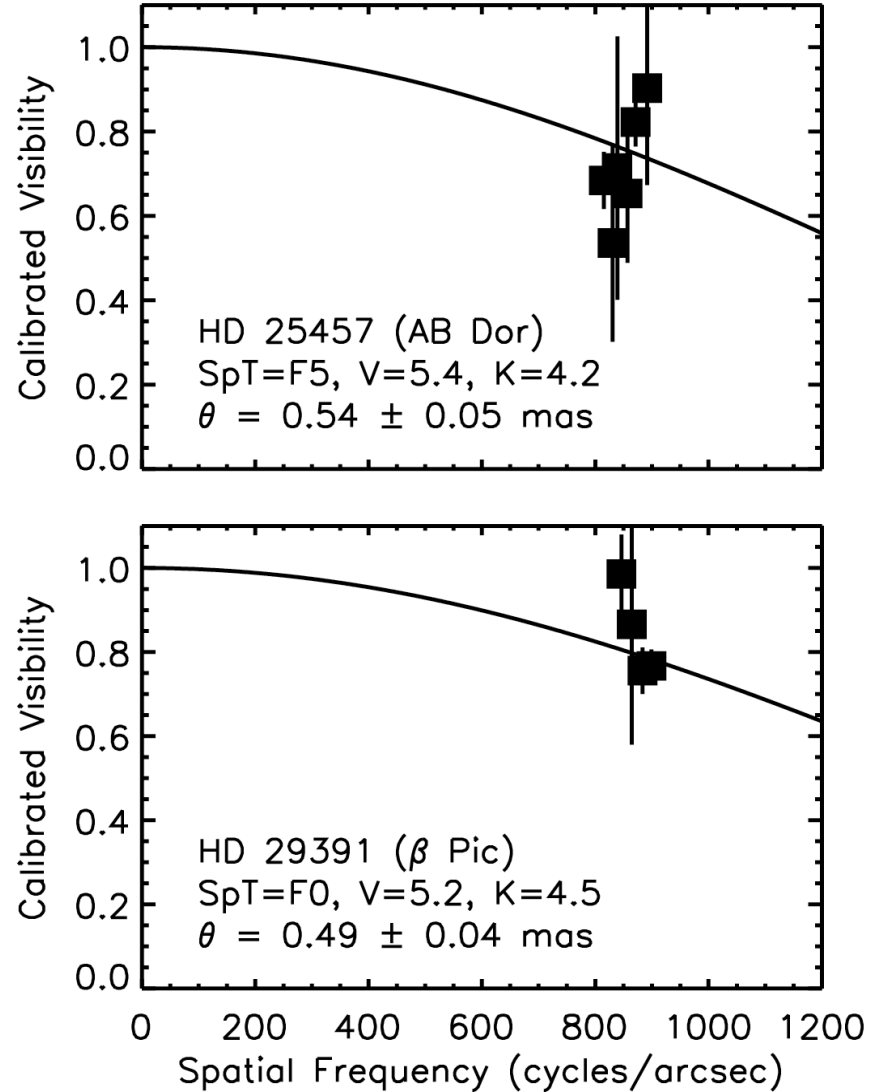
$\theta_{\text{Predicted}} = 0.52$

## HD29391 (F0V)

$\theta_{\text{Observed}} = 0.49 \pm 0.05$

$\theta_{\text{Predicted}} = 0.48$

Large scatter is likely due to destructive (noisy) readout (apertures will eliminate this)





# Early Results

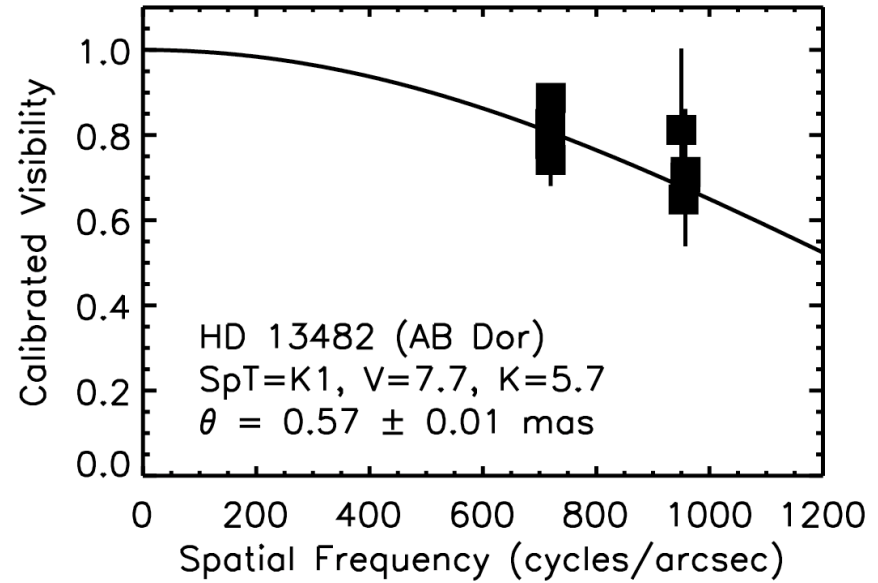
HD25457 (F5V)

Observed =  $0.57 \pm 0.01$

$\theta_{\text{Predicted}} = 0.34$

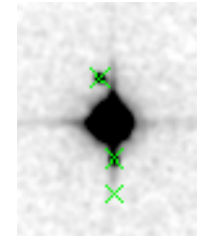
Already a known  
wide binary

A Young Triple?



Couteau (1962);  
Salaman et al. (1999)

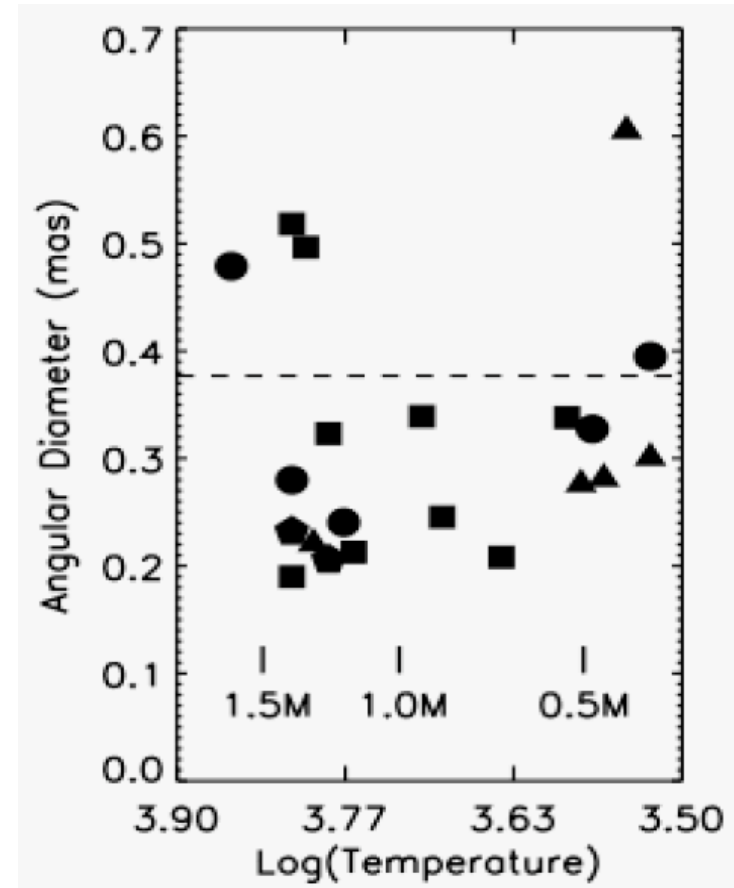
$\rho = 1''.77$ ,  $\Delta R = 1.5$





# Summary

- Testing of evolutionary models requires accurately determined stellar properties
- Next run April 2009
- Would benefit from improved sensitivity and resolution!





# Temperatures and Gravities from Synthetic Spectra

