Preliminary Results on Massive, Hot Stars from CHARA/PAVO

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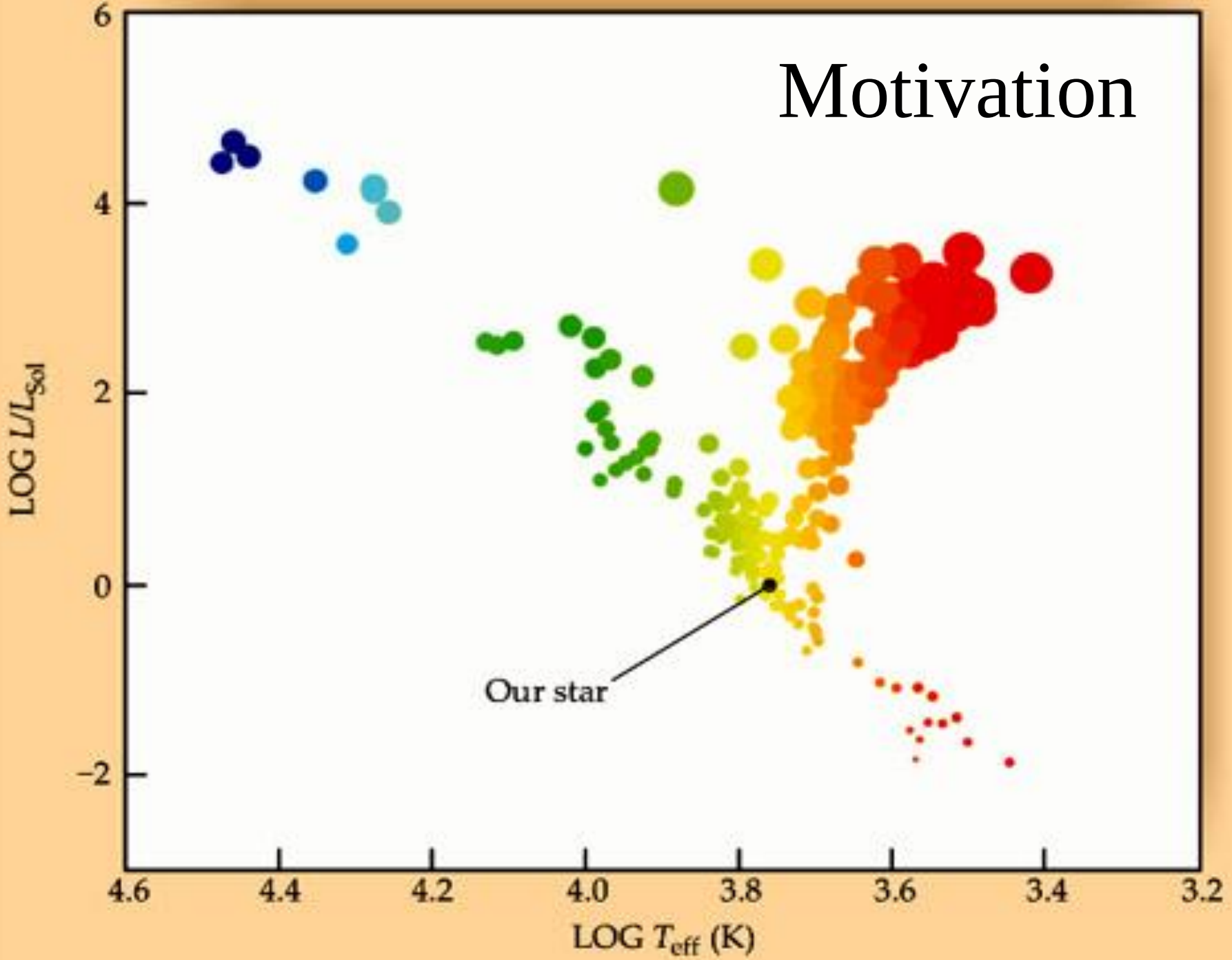
Along with Doug Gies, Mike Ireland, Gail Schaefer, and many others

Motivation



Hot Stars

- Most are extremely distant, because few massive stars are formed
- Nearest O star (ζ Oph) is ~150 pc away
- B stars are more common, but nearest (Regulus) is barely within 25 pc

Goals

- Obtain accurate angular diameters of hot (massive) stars
  - Diameter + parallax = Accurate Radius
  - Accurate temperature scale
  - Luminosity (if distance is well known)
    - Distance is a problem for most hot stars because parallax doesn't work well (stars bright and distant)
    - Re-reduction of HIPPARCOS does somewhat better
  - Rotational distortion
  - Multiplicity

Survey

- Approximately 20 B and10 O stars
- Try to gauge earlier B stars and O stars, where we have no measurements from long baseline optical interferometry
  - CHARA baselines not long enough in K-band
    - Classic would saturate on these stars in H-band
  - Best option is measuring diameters at shorter wavelengths
  - PAVO has 3 times better angular resolution than Classic (K-band)

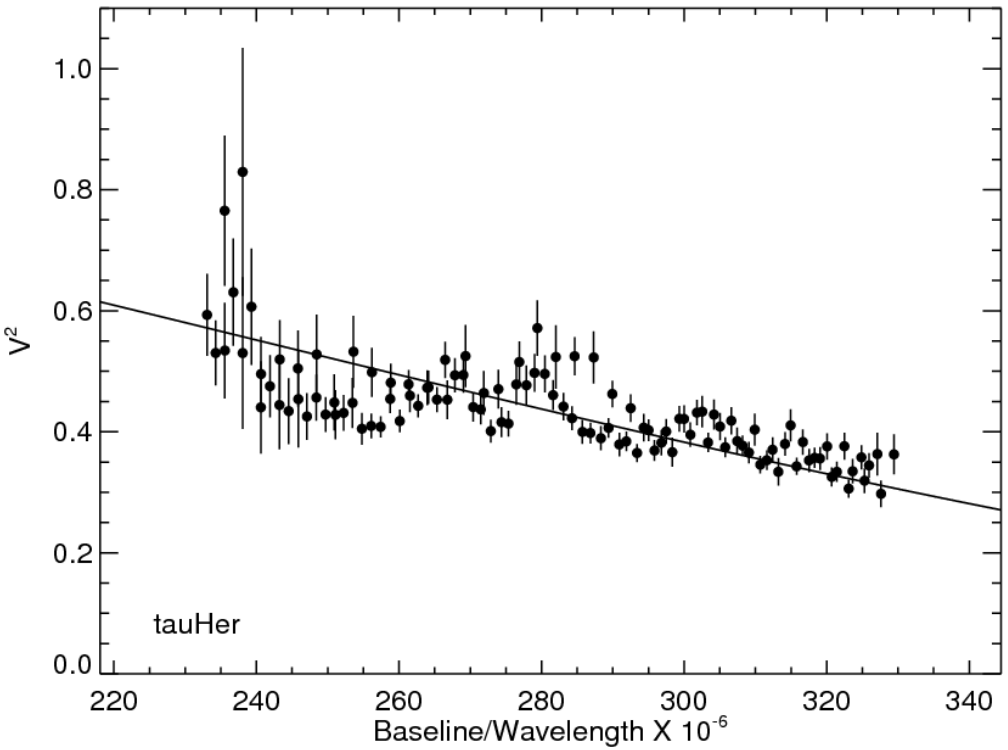
Observing Run stats

- Fall 2008 (W1W2S2; inaugural observing season for PAVO)
  - Lost some nights due to weather/bad seeing
  - 3 good nights; 1 with 2T, 2 w 3T
- Spring 2009
  - May: Lost 2 nights due to engineering problems, 1 due to seeing; 1 night of 3T data
  - June: ~3 hours (2T); then fog for the next 4 nights

Observing Run Stats

- Summer 2009
  - August: Not many good targets, but 5 good half nights on β Cep (will look for pulsations when PAVO data fully understood)
- Winter 2009
  - Half night on ξ Per; likely bad calibrators; lost several nights due to clouds/snow
- 2010
  - Run in May (bad weather); run in October (bad weather)

Results



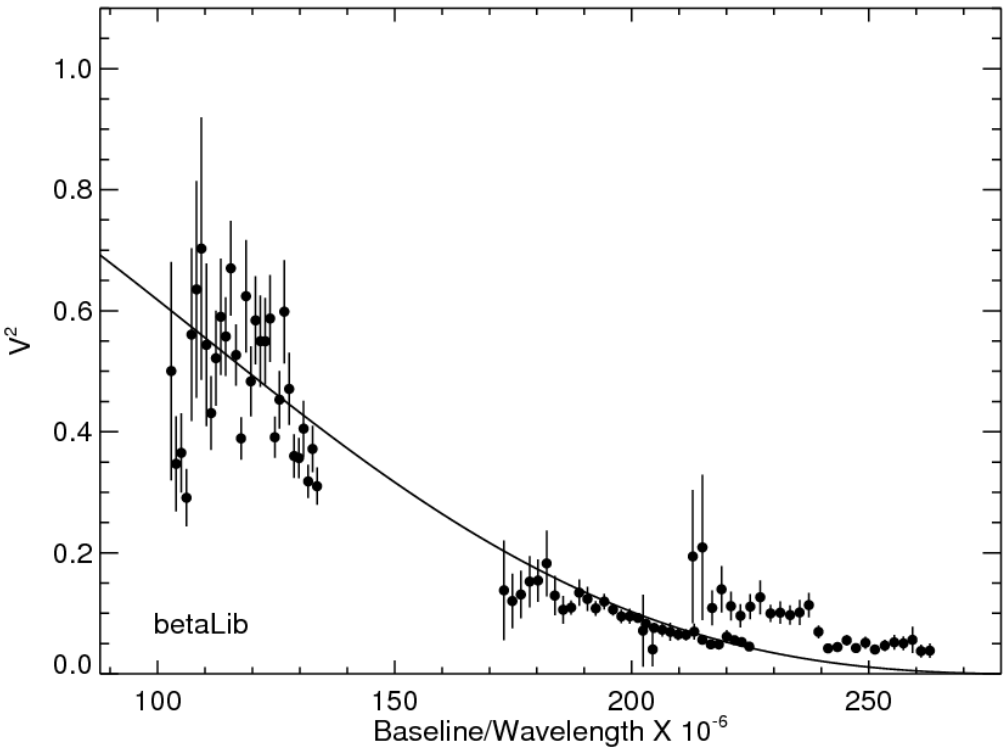
τ Her (B5IV)

θ (UD) = 0.411 (0.02) mas

π= 10.61 (0.11) mas

R = 4.17 (0.04) Rsun

Results



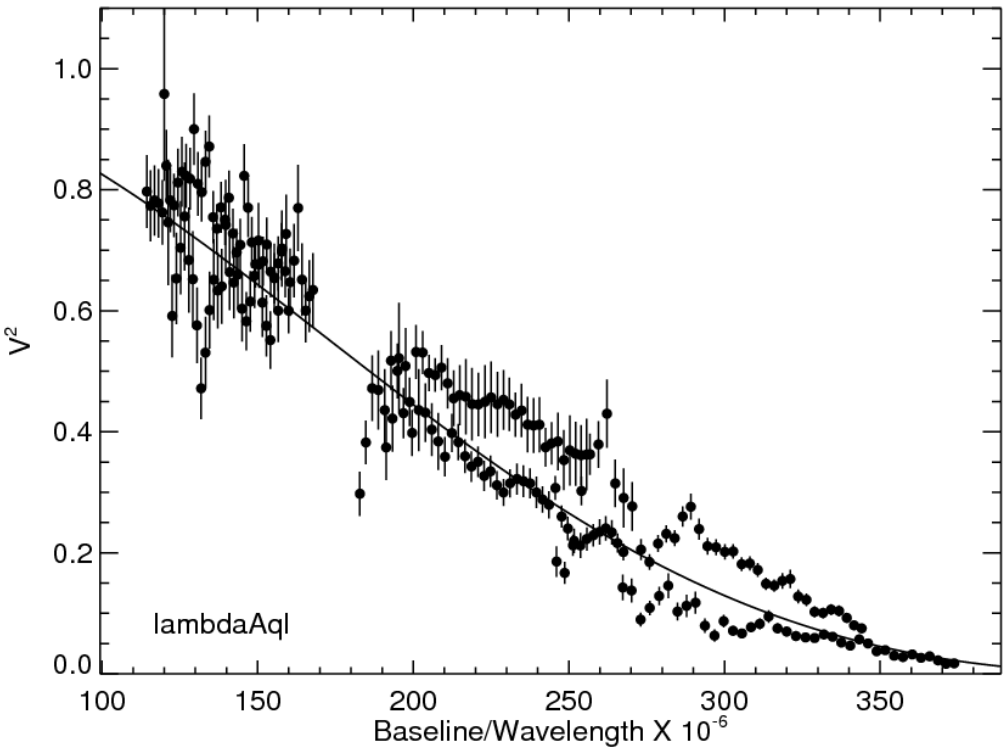
β Lib (B8V)

θ (UD) = 0.411 (0.02) mas

π= 17.62 (0.16) mas

R = 5.45 (0.06) Rsun

Results



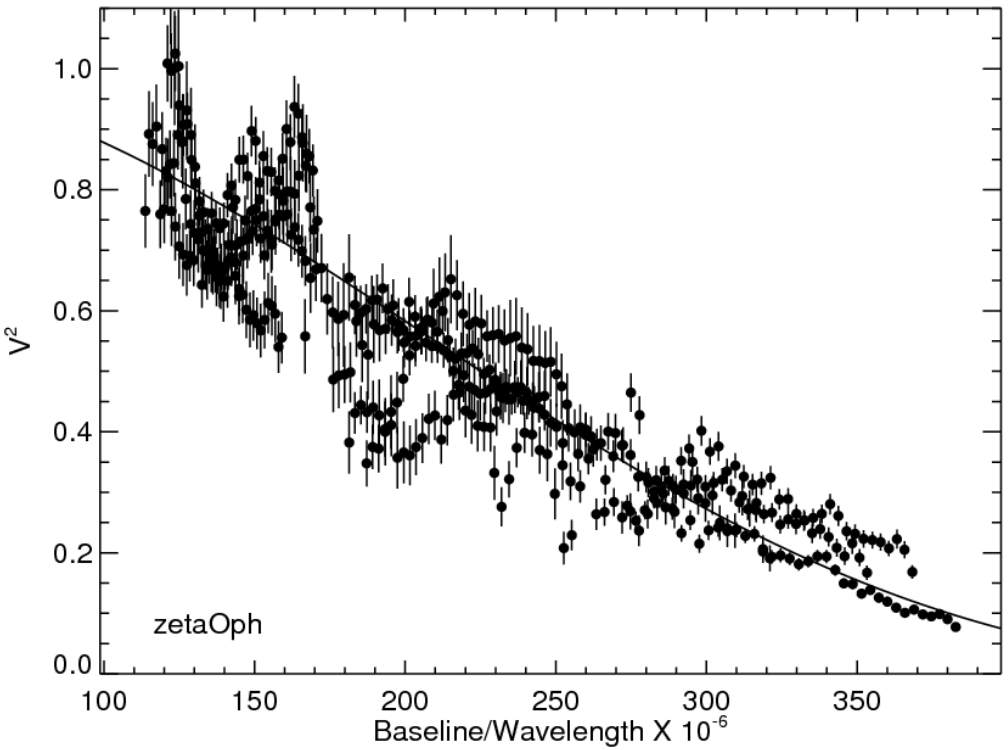
λ Aql (B9Vn)

θ (UD) = 0.571 (0.02) mas

π= 26.37 (0.64) mas

R = 2.33 (0.06) Rsun

Results



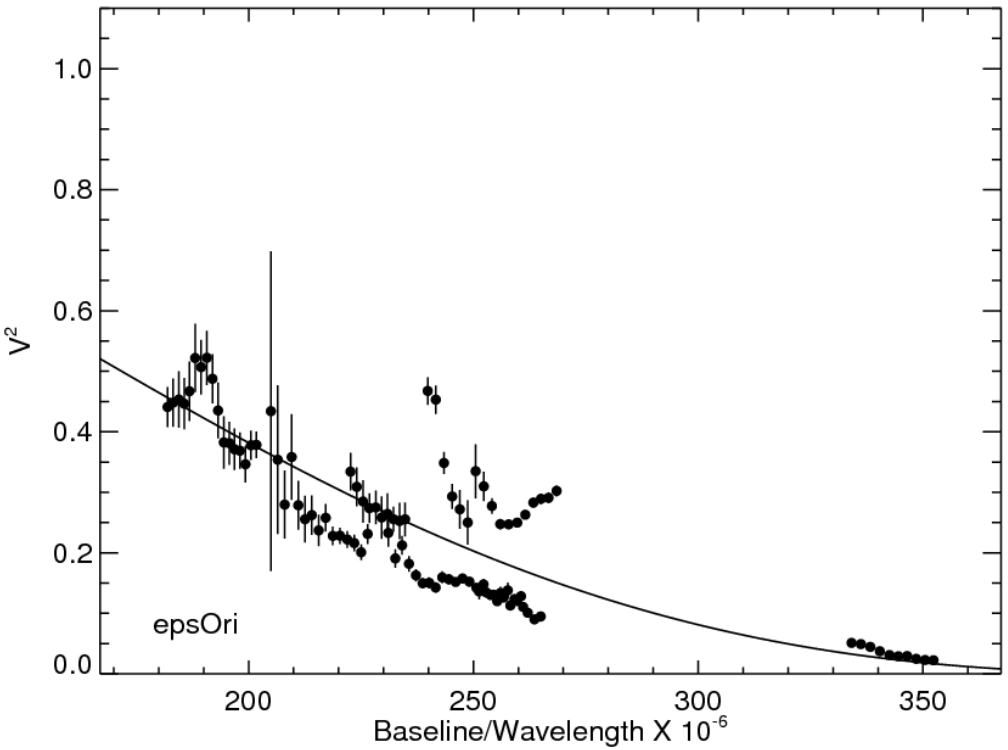
ζ Oph (O9V) – rapid rotator

θ (UD) = 0.471 (0.02) mas

π= 8.91 (0.20) mas

R = 5.61 (0.13) Rsun

Results



ε Ori (B0Ia) – wind

θ (UD) = 0.62 (0.03) mas

π= 1.65 (0.40) mas

R = 40.25 (9.76) Rsun

Also observed in K'-band to gauge IR excess and determine fundamentals of wind properties.

Conclusions

- For good V^2, we need to use 2T mode for PAVO.
- Most data collected in 3T mode
  - Problems may(?) go away with larger number of brackets – see ζ Oph
- Resolution looks good for hot stellar diameters.
  - But we need better weather (doesn't everyone?)