

Science Results from CHARA Open Access Time

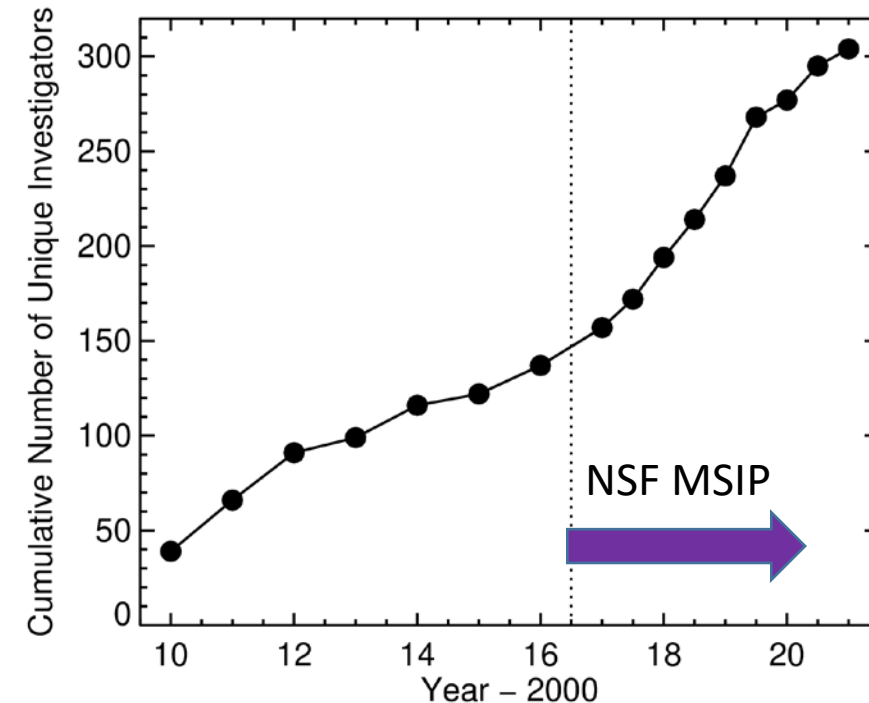
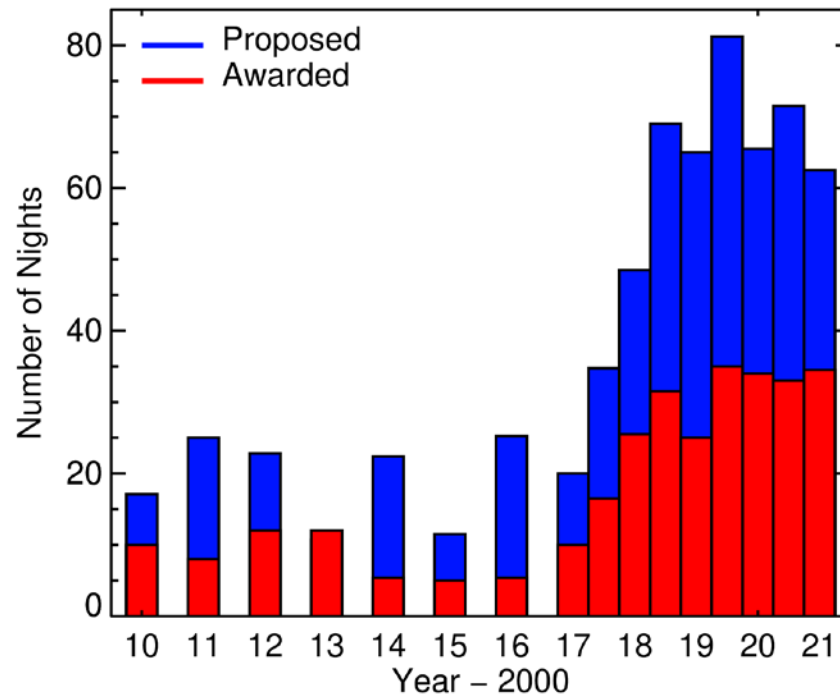


Gail Schaefer

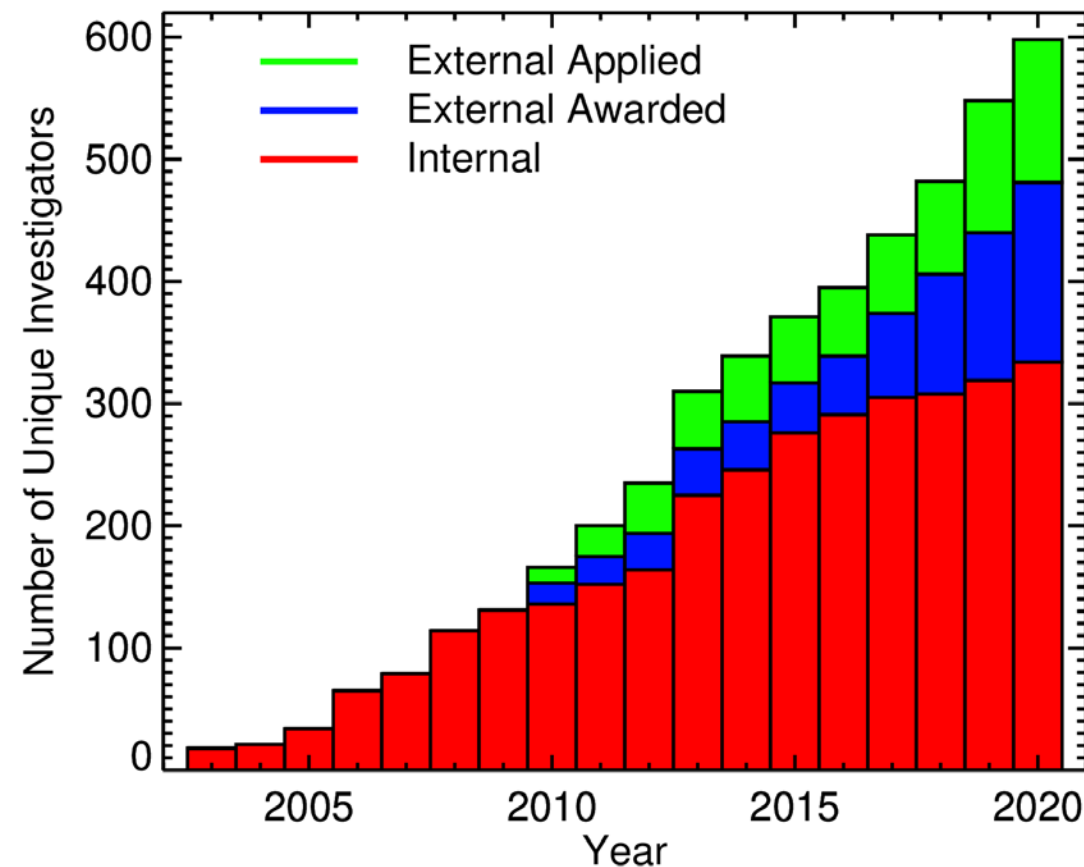
CHARA Array of
Georgia State University

Open Access Statistics

- Average over-subscription rate of 2.4
- Over 300 astronomers applied for open access time



Comparison of Internal and External CHARA Observers



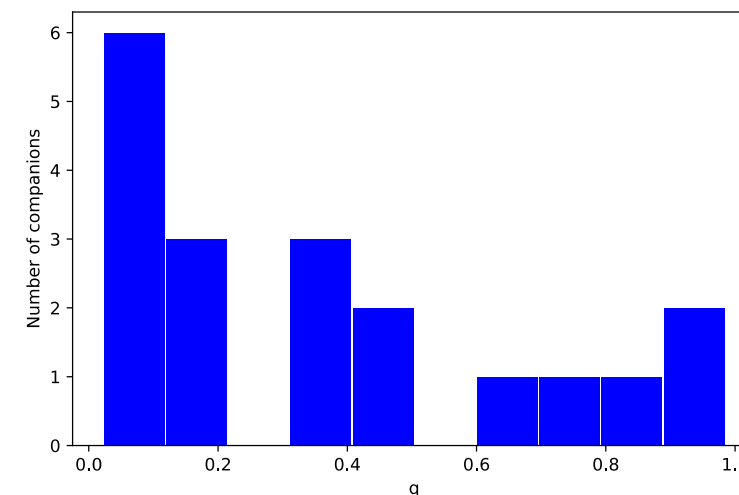
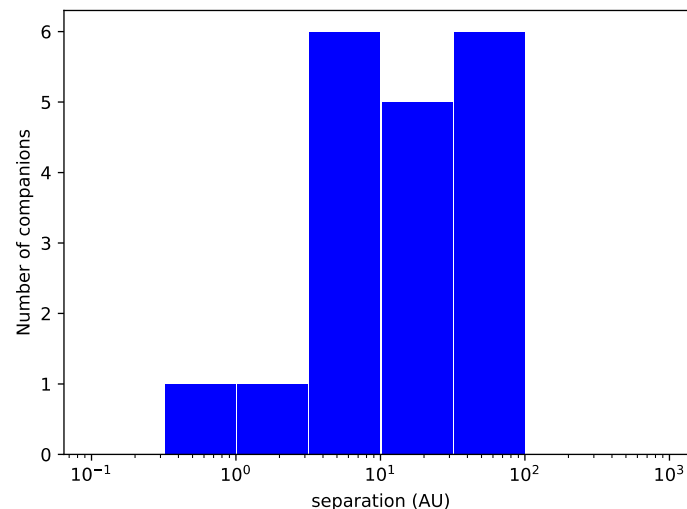
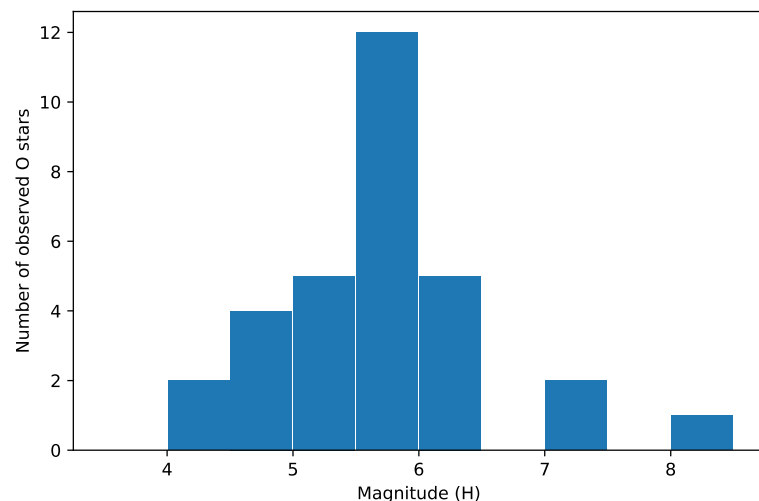


Science Results

**Thanks to NOIR Lab observers
who contributed slides!**



Demonstration survey of O-type stars with MIRC-X: PI Lanthermann



Results on 31 systems:

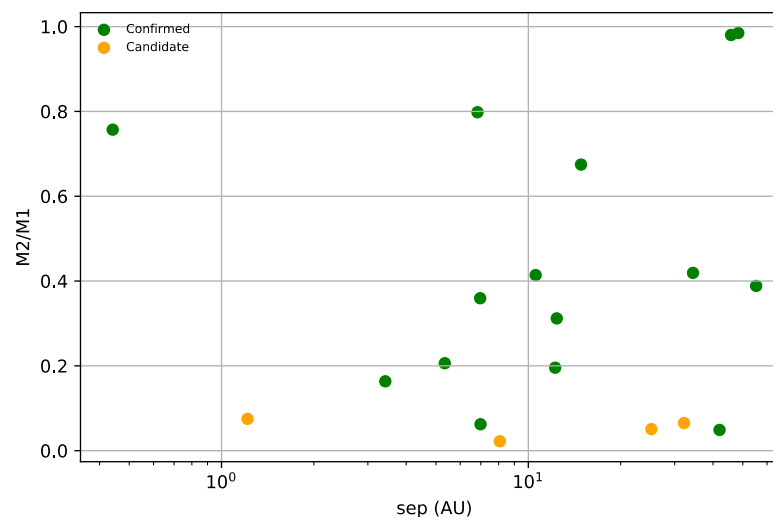
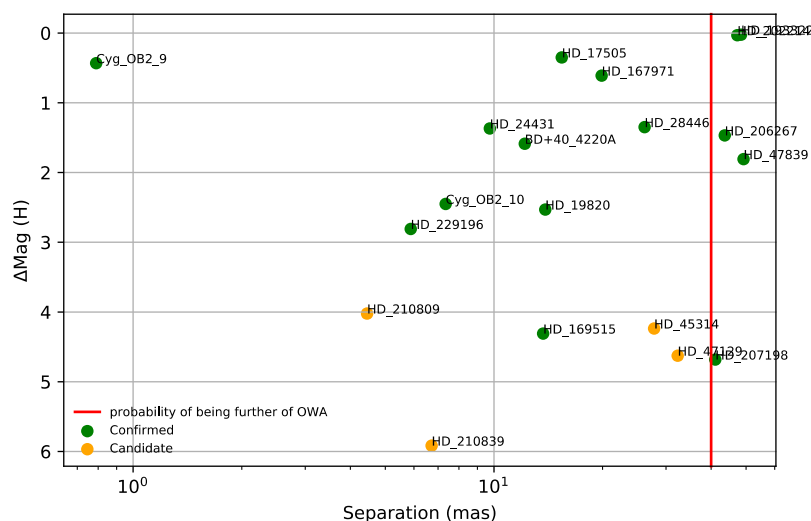
- H up to 8.2
- Bulk around H = 6

Detection of 15 multiple systems:

- $f_m = 0.48$

Preliminary results, more to come in Lanthermann et al. (in prep)

Large survey starting in July 2021



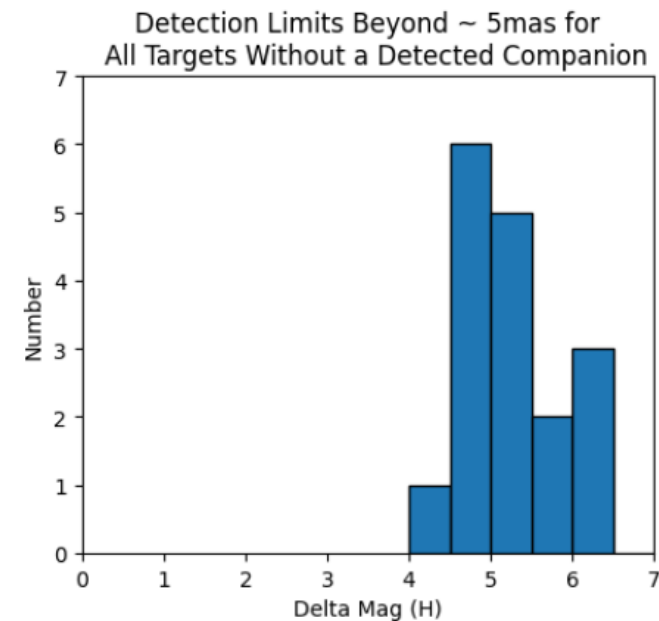
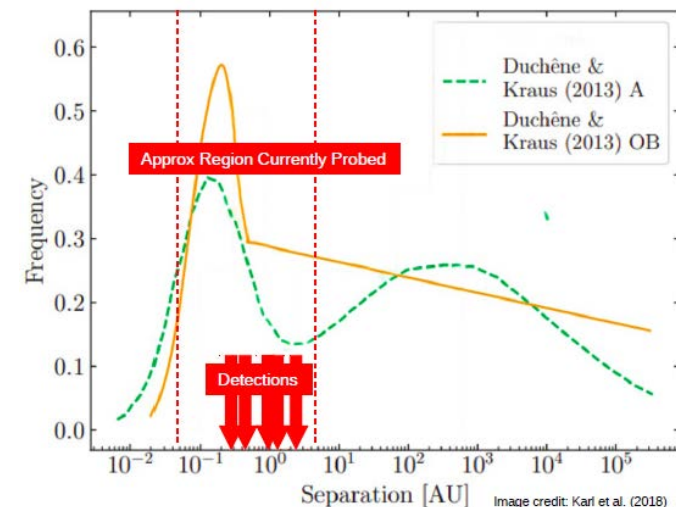
Pilot program to search for companions to main sequence A-type stars

PI: M. De Furio

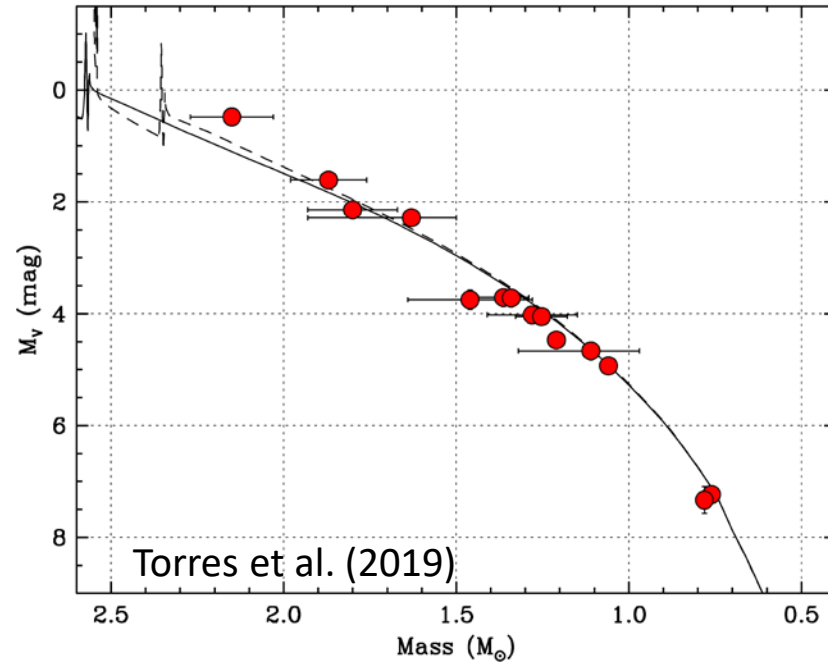
Prior Work: RV survey of Carquillat & Prieur (2007) around Am stars ($a < 1$ AU) and the AO survey of De Rosa et al. (2014) around typical A-type stars ($a > 30$ AU).

Our Goal: Determine whether the close companion population around chemically peculiar Am stars exists around typical A-type stars.

- Collaborators: M. Meyer, J. Monnier, and T. Gardner
- Awarded 2 nights in 2020B with MIRC-X
- Detected 5 companions to 22 A-type stars using open source software CANDID (Gallenne et al. 2015)
- Detections range from 6 – 65 mas in separation and down to 1:50 in flux ratio
- We were sensitive to ~ 5 magnitudes in contrast or 1:100 in flux ratio for the 17 targets without companions



Hyades M-L Relation



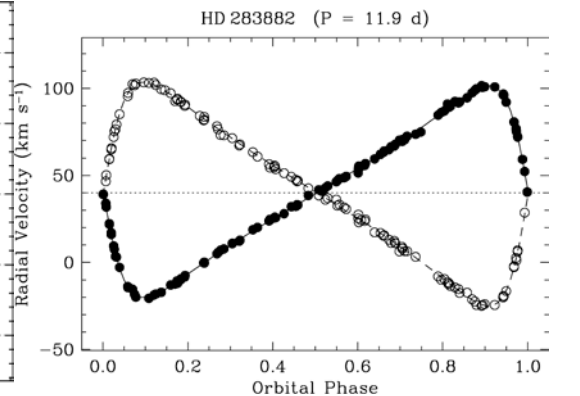
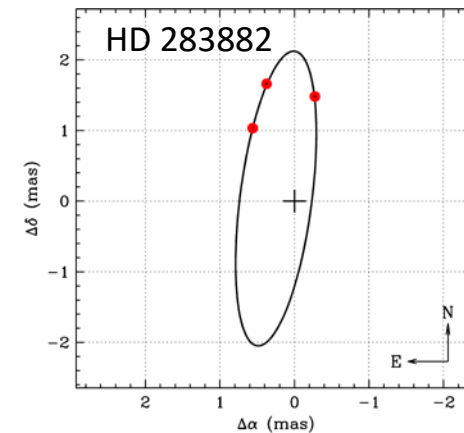
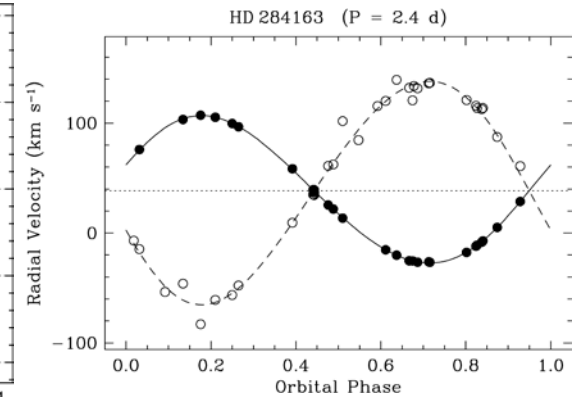
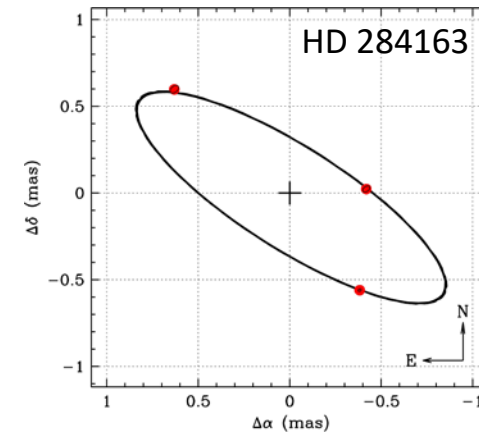
Goals

- Resolve a sample of 8 binaries for the first time with CHARA
- Combine astrometry with radial velocity measurements from CfA
- Measure accurate masses and luminosities with mass errors < 3%
- Provide stringent constraints on stellar evolution models

Improving the Mass-Luminosity Relation in the Hyades Cluster with CHARA

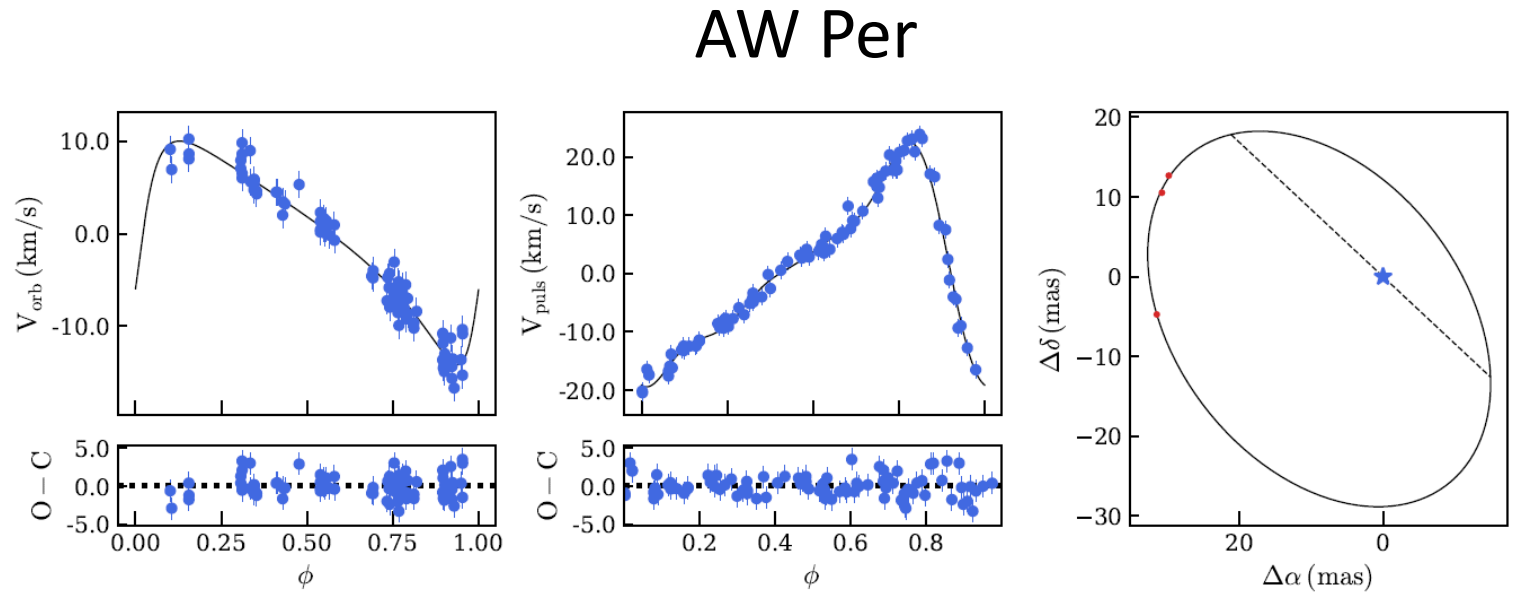
Torres & Stefanik (M25/NOAO8)

Preliminary Results



Multiplicity of Galactic Cepheids

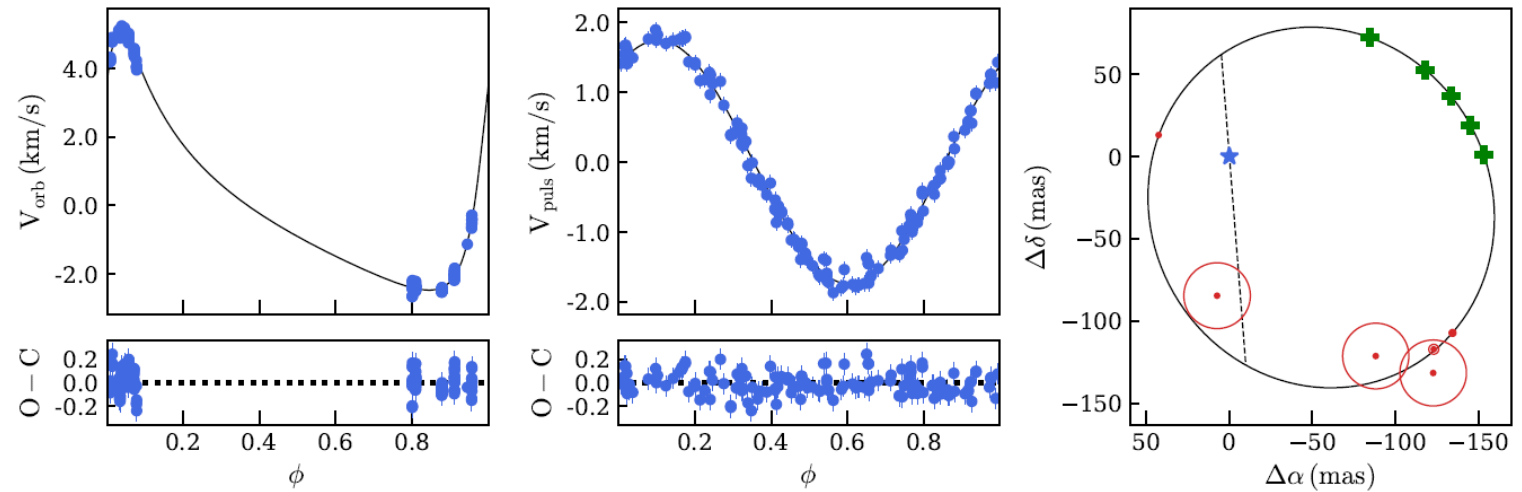
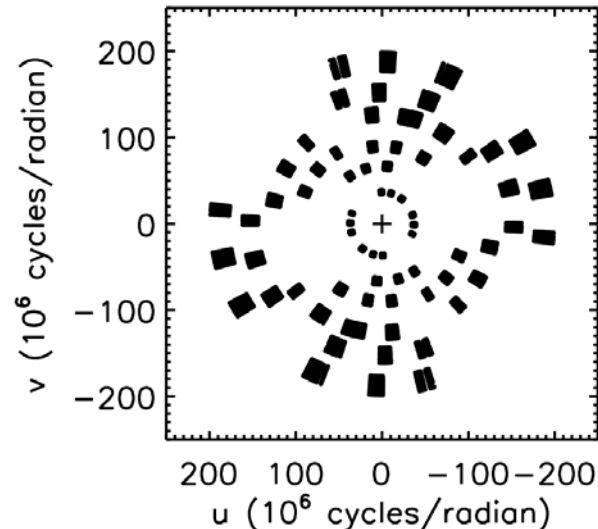
PI: A. Gallenne



- Sample of 16 Cepheids
- Orbital periods: 1.5 to 5 years
- Companion contrasts: $3 < \Delta H < 6$ mag
- Separations: $1 < \rho < 40$ mas
- Precision dynamical masses and distances

Dynamical Mass of the Nearest Cepheid – Polaris

PI: Nancy R. Evans

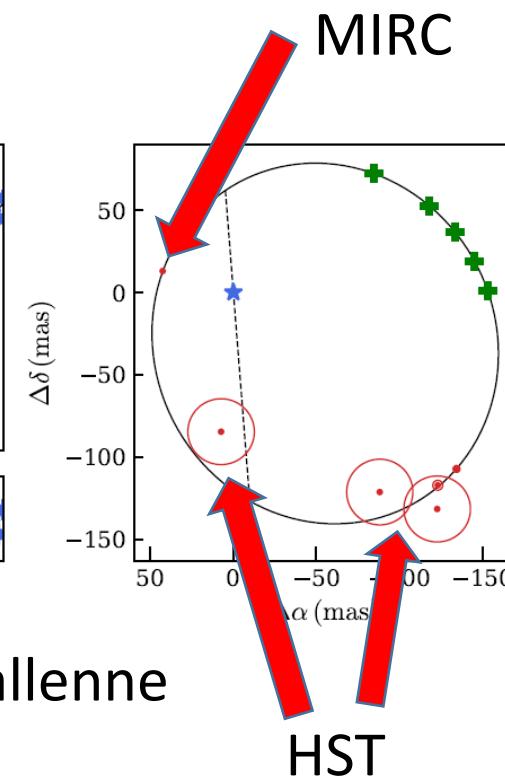
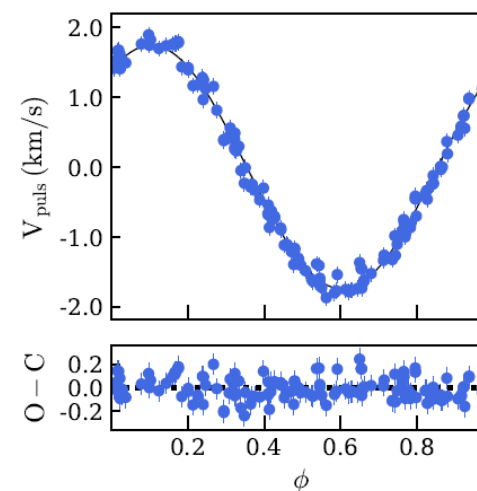
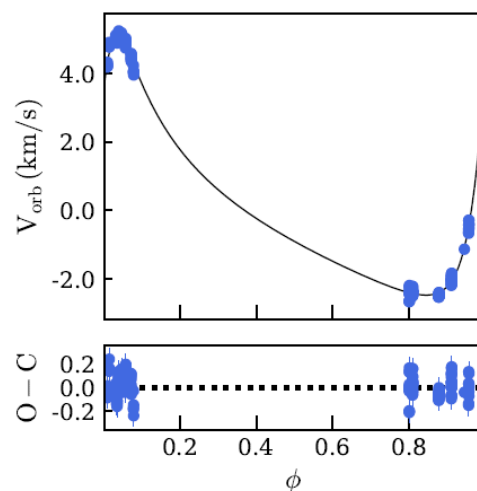
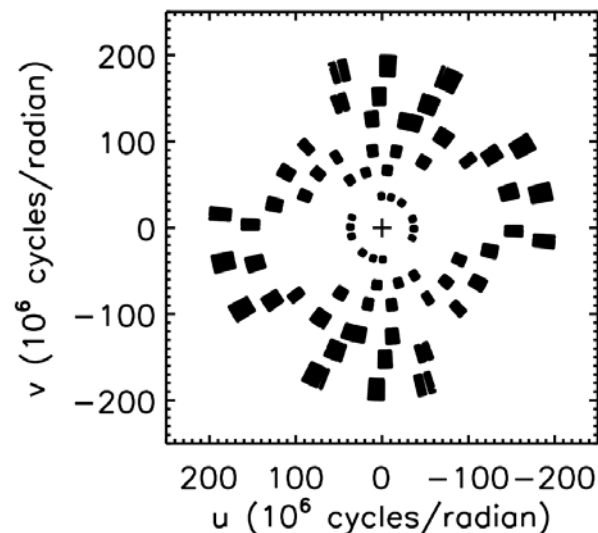


Preliminary Orbit: A. Gallenne

- Diameter of Polaris Aa ~ 3.1 mas.
- Possible surface features.
- Companion separation now outside of Prism50 field of view. Switched to using Grism190.

Dynamical Mass of the Nearest Cepheid – Polaris

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Preliminary Orbit: A. Gallenne

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Eclipsing Giant System KN11C025172

Rob Siverd + KELT Collaboration

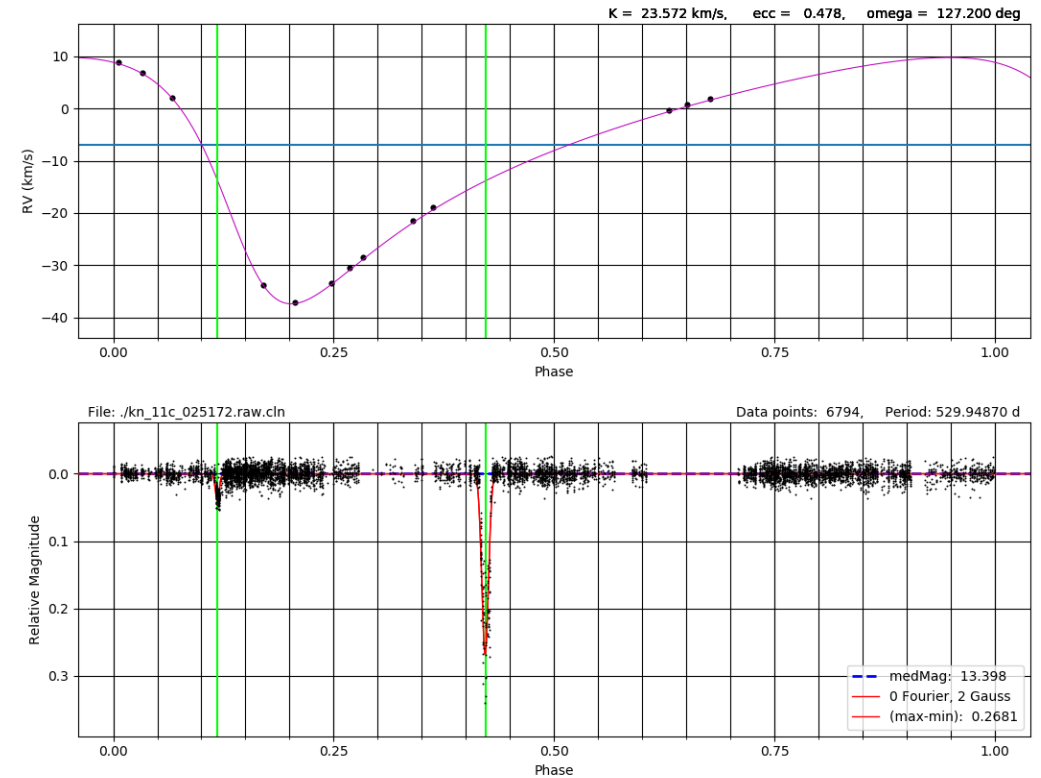
Background: Few detached eclipsing binaries with giant star components are known, largely due to discovery difficulty. The KELT Transit Survey identified a V~8 candidate system with 530-day orbital period. TRES RV confirmed the orbit but only identified a single stellar spectrum, perhaps suggesting a hot, rapidly rotating companion. CHARA observations were requested to measure EB component separation and, using Gaia parallax, measure the components' mass ratio.

Progress: CHARA/MIRC-X successfully resolved the components' separation and flux ratio. Gaia + RV + CHARA data point to a dwarf-giant system with very approximate component parameters:

- 3.1 Msun, 21 R_{sun}, T_{eff} ~ 5200 K (giant)
- 2.4 Msun, 2.3 R_{sun}, T_{eff} ~ 11000 K (dwarf)

Comparison to isochrones implies a system age of ~350 Myr.

Ongoing: Multi-color photometry from Swift and Las Cumbres Observatory have been obtained for both eclipses. These will be used to further refine stellar parameters. TESS observations provide a further opportunity to directly compare dynamical masses and radii to asteroseismology.

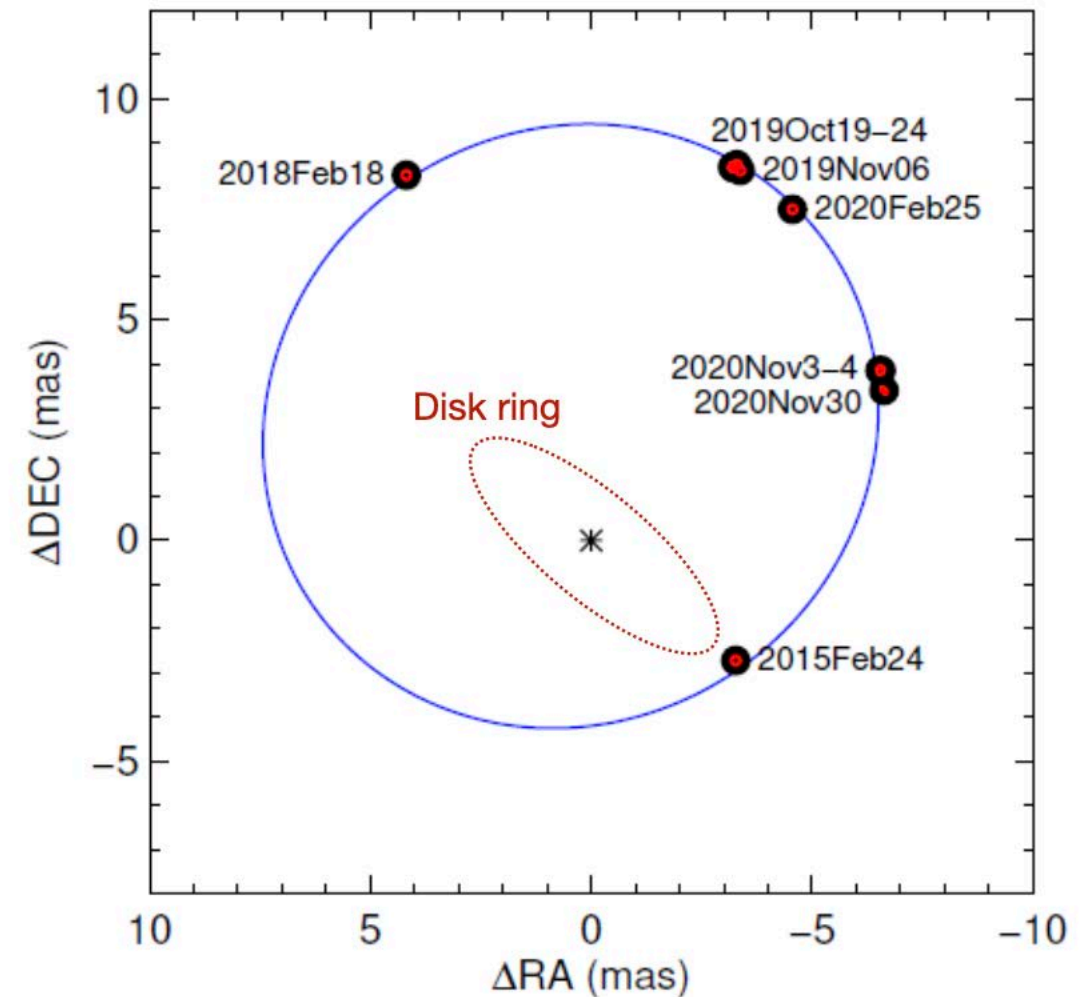
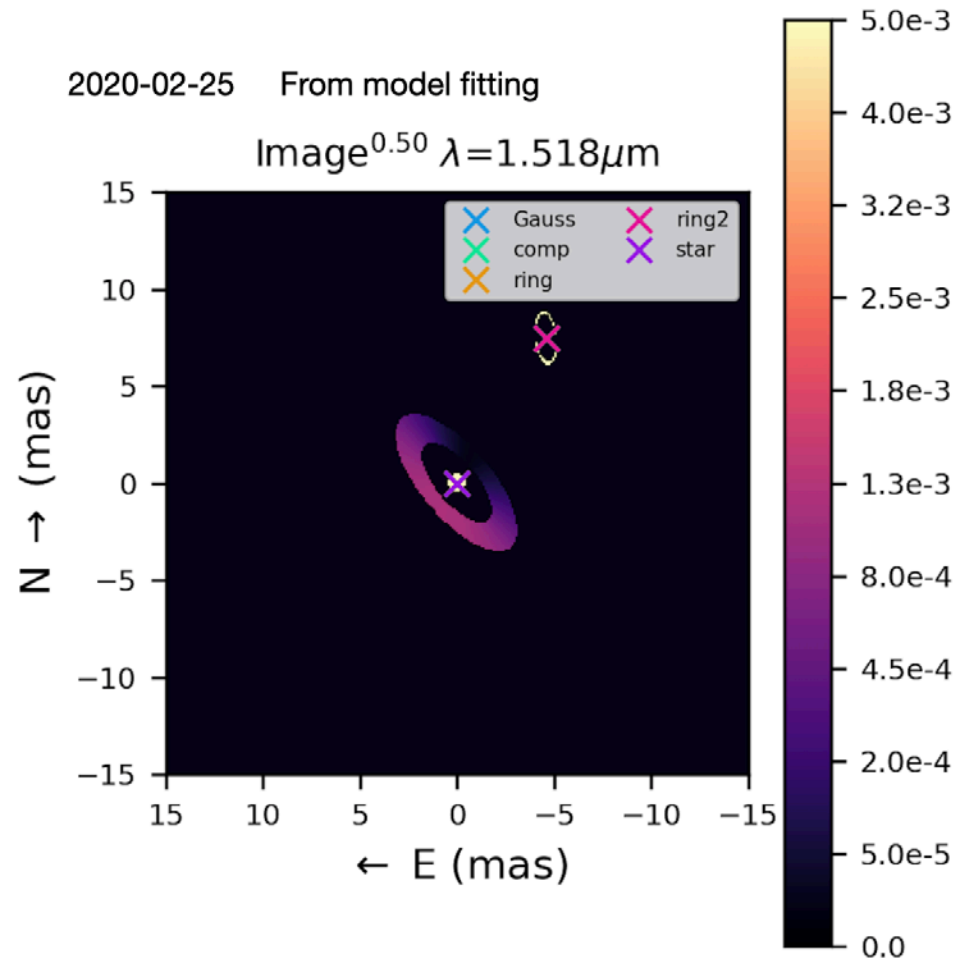


Above: KELT discovery light curve (bottom) and TRES RV orbit (top) that prompted the CHARA observations.



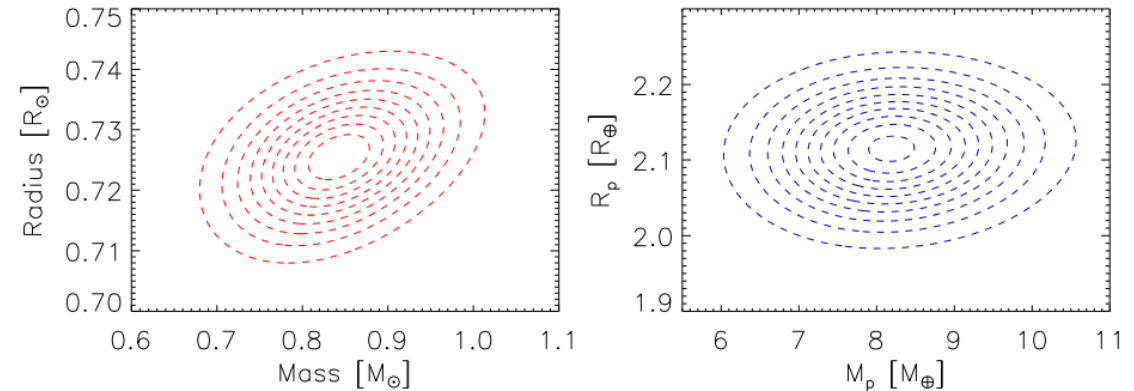
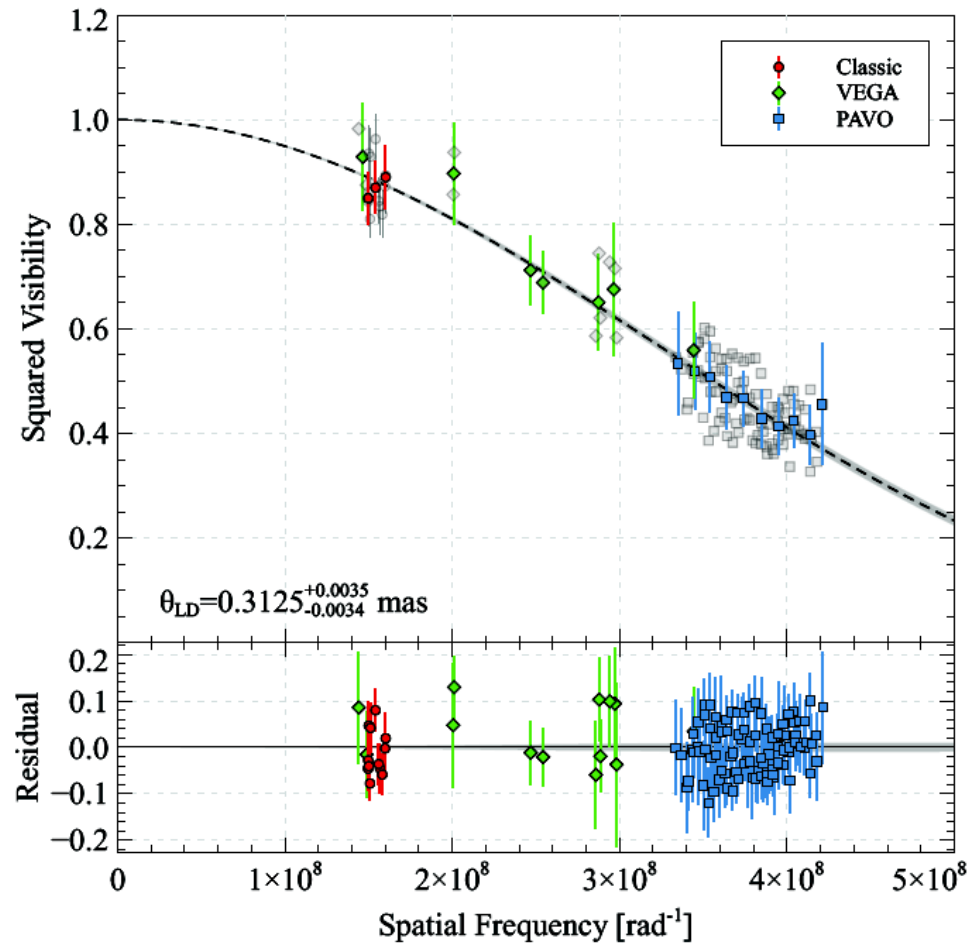
Diving into the Close Stellar Environment of U Mon

PI: N. Anugu (2020A-M23-NOAO9) + PI: L. Sabin (2020B-M26/NOAO9)



Properties of Transiting Super-Earth Host HD 97658

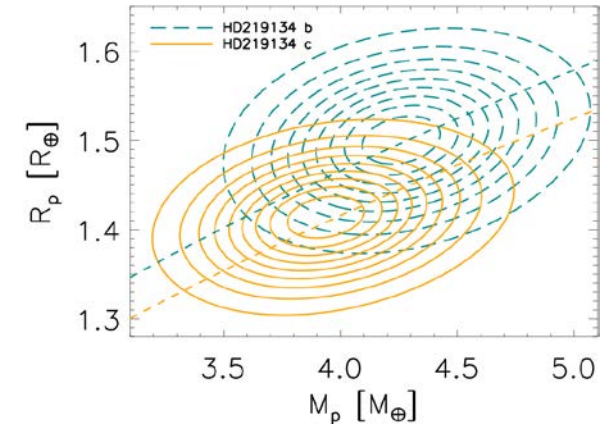
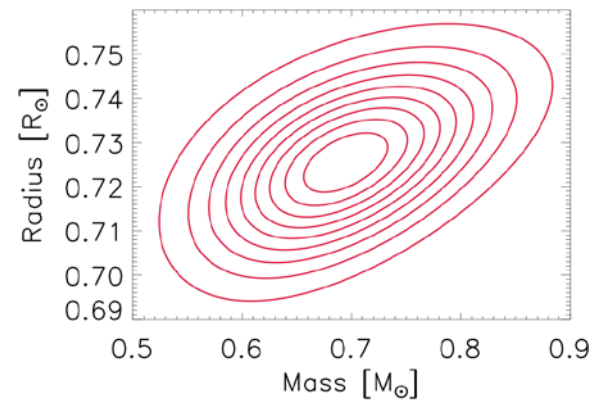
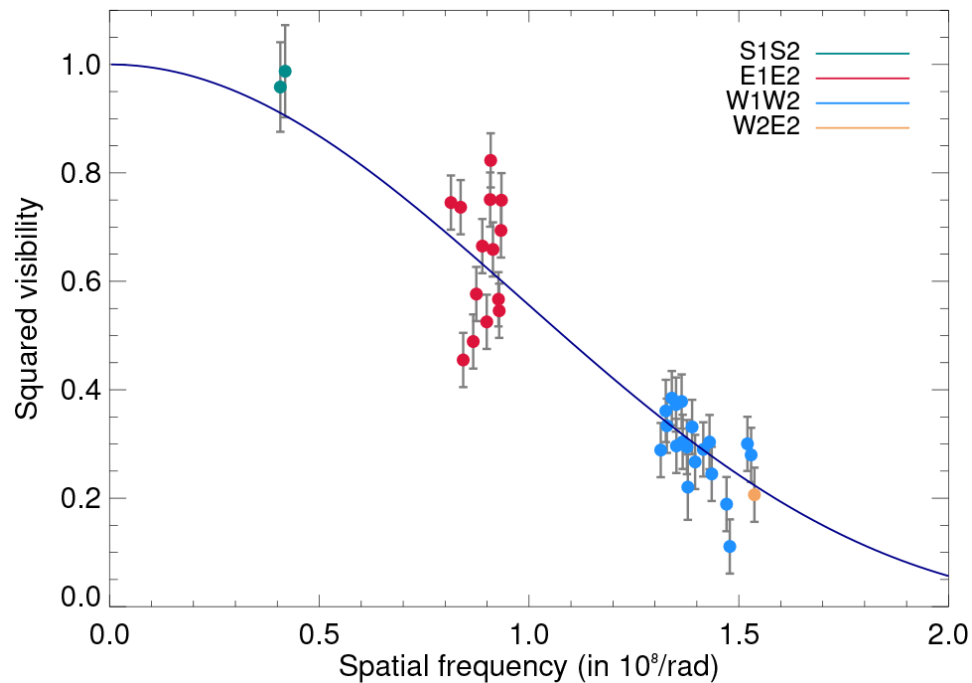
PI: Tyler Ellis



- Stellar radius from CHARA angular diameter and GAIA distance
- Stellar properties + evolutionary tracks
 - Mass and age of host star
- Combined with TESS light curve
 - Properties of exoplanet

From Stellar Properties of HD 219134 to Internal Compositions of its Transiting Exoplanets

R. Ligi et al. 2019, A&A, 631 A92



- Stellar radius, density, and mass determined from interferometric angular diameter, Gaia distance, and transit light curves
- Properties and internal composition of two transiting exoplanets



Imaging the Evolution and Expansion of Nova Ejecta

Target of Opportunity Program

- Recurrent nova V3890 Sgr
 - PI: L. Chomiuk
 - Data collected on 6 nights during outburst using MIRC-X
 - 2019 Aug 30 – Sep 5
- Nova Per 2020
 - PI: E. Aydi
 - Data collected on 9 nights using MIRC-X and CLIMB
 - 2020 Nov 30 – 2020 Dec 10





Apply for CHARA Time!

- Current call for proposals – due March 31, 2021
 - Semester 2021B (August – December)
- Next call for proposals – due September 30, 2021
 - Semester 2022A (March – July)
- 30 nights per semester available through NOIRLab
 - Expect to expand up to 50 nights per semester over the next 3 years

