Updates and Future Plans at the CHARA Array

Gail Schaefer

Director of the CHARA Array
Georgia State University

Tribute to Michal Simon

September 28, 1940 – April 18, 2025

Mike Simon
September 28, 1940 - April 18, 2025
Mike has left us for his last observing run.
He promised to let us know if he finds anything interesting.

NASA IRTF 10 Dec 2001

Georgia State University · NSF · NOIR Lab · l'Observatoire de Paris · LESIA · University of Michigan · ISSP · Interferometric Survey of Stellar Parameters · erc · The University of Sydney · Australian National University · Kyoto Sangyo University · University of Exeter

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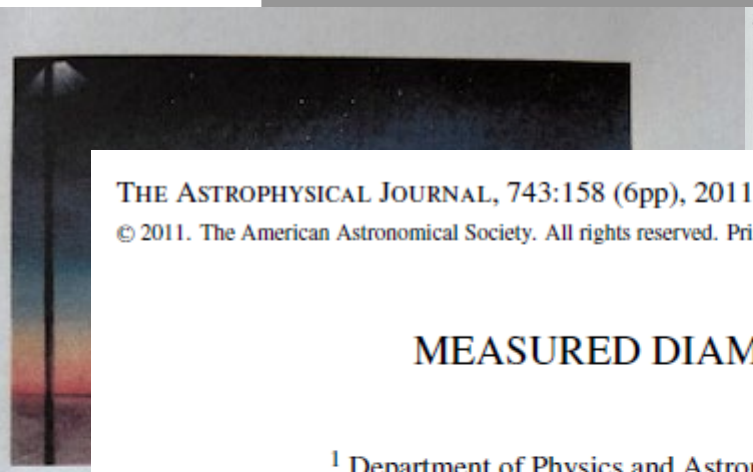

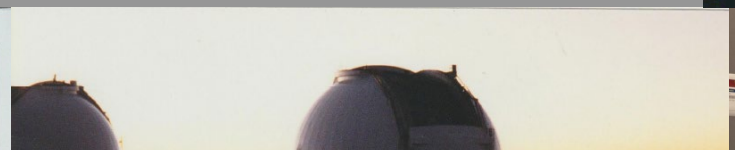

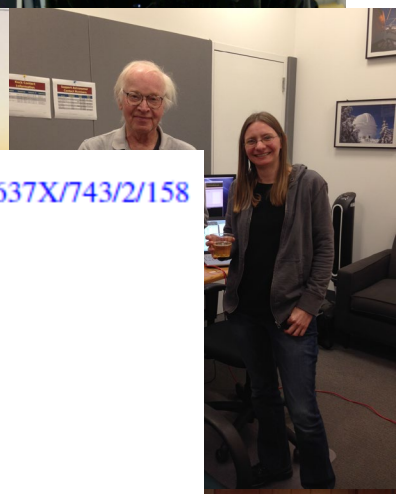

THE ASTROPHYSICAL JOURNAL, 743:158 (6pp), 2011 December 20 doi:10.1088/0004-637X/743/2/158

MEASURED DIAMETERS OF TWO F STARS IN THE β PIC MOVING GROUP

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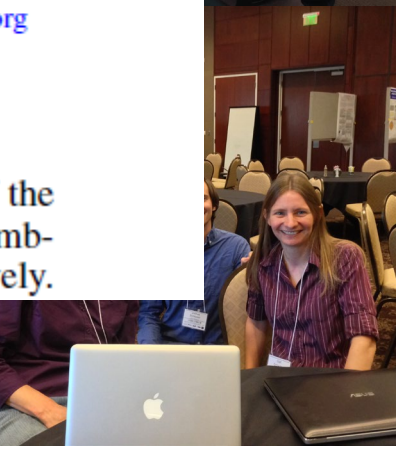
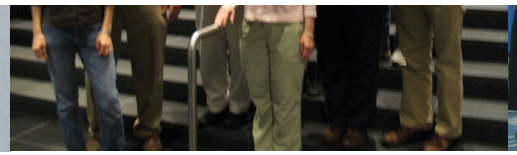
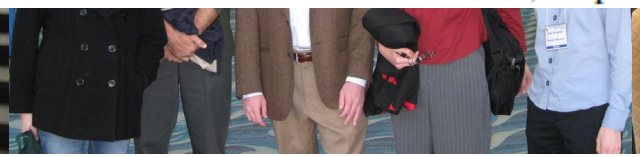
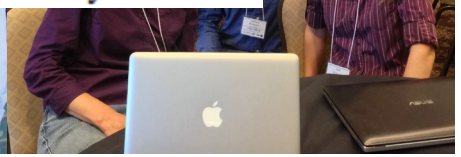
ABSTRACT

We report angular diameters of HIP 560 and HIP 21547, two F spectral-type pre-main-sequence members of the β Pic Moving Group. We used the east–west 314 m long baseline of the CHARA Array. The measured limb-darkened angular diameters of HIP 560 and HIP 21547 are 0.492 ± 0.032 and 0.518 ± 0.009 mas, respectively.









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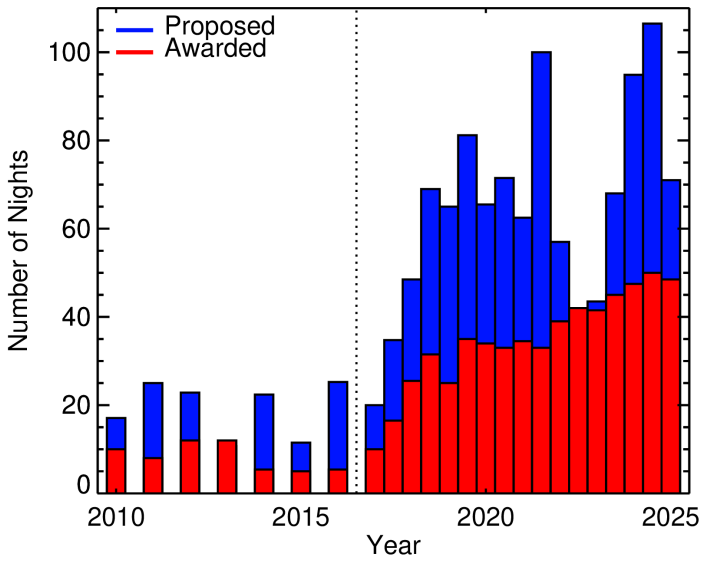
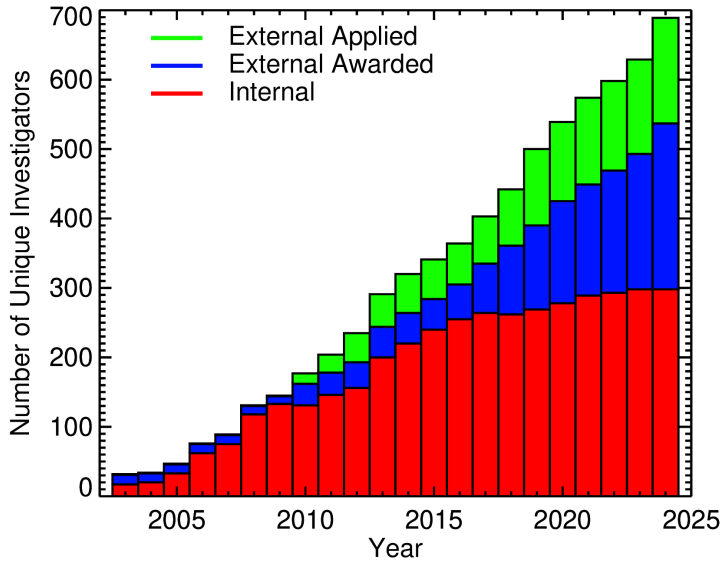
Open Access Program

Supported through NSF AAG Program through 2027 ($3.5M)

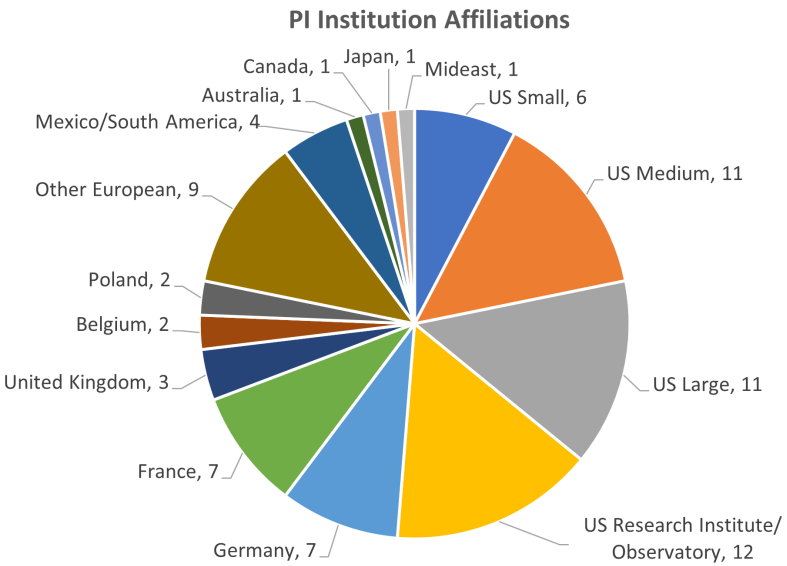
Average Oversubscription ~ 2



Over 400 astronomers have applied for open access time (PI + CoI)



Open Access PI

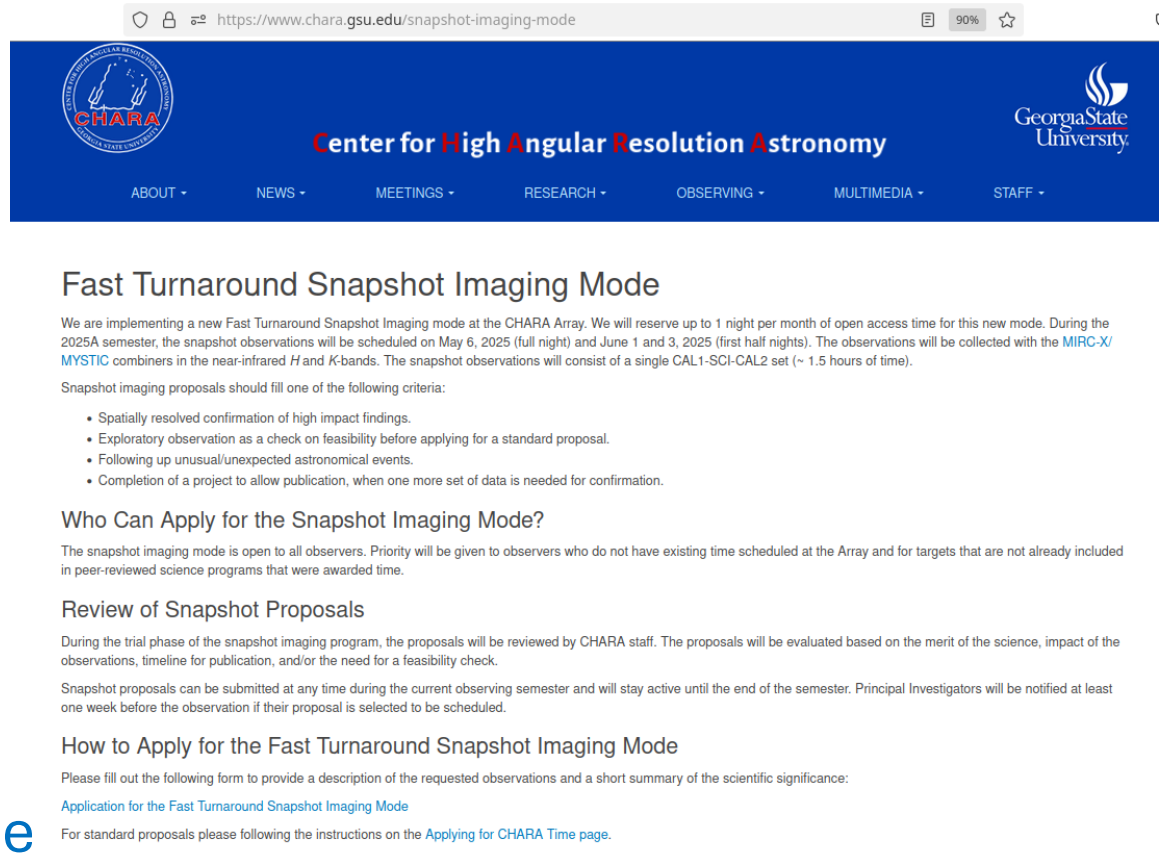


50 nights per semester open to broader community
Time allocated through NOIRLab

- 422 open access proposals submitted since 2010
- Open access PIs from over 80 distinct institutions

Fast Turn Around Snapshot Imaging Mode

- New in 2025A!
- Reserve up to 5 nights per semester
- Science Motivation
  - High impact findings
  - Exploratory epoch for larger proposal
  - Completion of project
  - Unusual/unexpected events
- Who can apply?
  - Priority for those without time scheduled
  - Targets not already in approved programs
- www.chara.gsu.edu/snapshot-imaging-mode



https://www.chara.gsu.edu/snapshot-imaging-mode

Center for High Angular Resolution Astronomy

ABOUT NEWS MEETINGS RESEARCH OBSERVING MULTIMEDIA STAFF

Fast Turnaround Snapshot Imaging Mode

We are implementing a new Fast Turnaround Snapshot Imaging mode at the CHARA Array. We will reserve up to 1 night per month of open access time for this new mode. During the 2025A semester, the snapshot observations will be scheduled on May 6, 2025 (full night) and June 1 and 3, 2025 (first half nights). The observations will be collected with the MIRC-X/MYSTIC combiners in the near-infrared *H* and *K*-bands. The snapshot observations will consist of a single CAL1-SCI-CAL2 set (~ 1.5 hours of time).

Snapshot imaging proposals should fill one of the following criteria:

- Spatially resolved confirmation of high impact findings.
- Exploratory observation as a check on feasibility before applying for a standard proposal.
- Following up unusual/unexpected astronomical events.
- Completion of a project to allow publication, when one more set of data is needed for confirmation.

Who Can Apply for the Snapshot Imaging Mode?

The snapshot imaging mode is open to all observers. Priority will be given to observers who do not have existing time scheduled at the Array and for targets that are not already included in peer-reviewed science programs that were awarded time.

Review of Snapshot Proposals

During the trial phase of the snapshot imaging program, the proposals will be reviewed by CHARA staff. The proposals will be evaluated based on the merit of the science, impact of the observations, timeline for publication, and/or the need for a feasibility check.

Snapshot proposals can be submitted at any time during the current observing semester and will stay active until the end of the semester. Principal Investigators will be notified at least one week before the observation if their proposal is selected to be scheduled.

How to Apply for the Fast Turnaround Snapshot Imaging Mode

Please fill out the following form to provide a description of the requested observations and a short summary of the scientific significance:

Application for the Fast Turnaround Snapshot Imaging Mode

For standard proposals please following the instructions on the Applying for CHARA Time page.

CHARA – AAVSO Collaboration Update

Brian Kloppenborg – Executive Director
American Association of Variable Star Observers (AAVSO)

What AAVSO can do for you

Photometric data collection

- Visual
  - Covers 0 - 16th mag
- Johnson-Cousins UBVRI
  - Photoelectric from -1 to +8
  - CCD / CMOS from 5 to 19 mag
- Sloan ugriz
  - CCD/CMOS from 5 to 19
- MKO-like JH
  - Photoelectric from -4 to +4 mag

Spectroscopic data collection

- R < 200
  - V limit of 10-14 mag
- 600 < R < 5000
  - V limit of 10-12th mag
- 10,000 < R < 30,000
  - V limit ~8th mag

Data mining through the Variable Star Index (VSX)

- Metadata on more than 10.2M variable stars

See details at https://www.aavso.org/observing-campaigns

Acquired data in support of CHARA 2024B programs

	Photometry		Spectroscopy		
PI	**Objects**	**Total Obs**	**Objects**	**Total Obs**	**Note**
Jonak	4	830	11	188	Counting R > 5,000 spectra only
Anugu	2	1,901	1	10	VY Cma, mu Cep
Norris	1	340,431	1	411	T CrB
Monnier	75	2,250	N/A	N/A	Non-variable stars
Richardson	1	1,886	1	152	WR 140
Total	83	347,298	14	761	

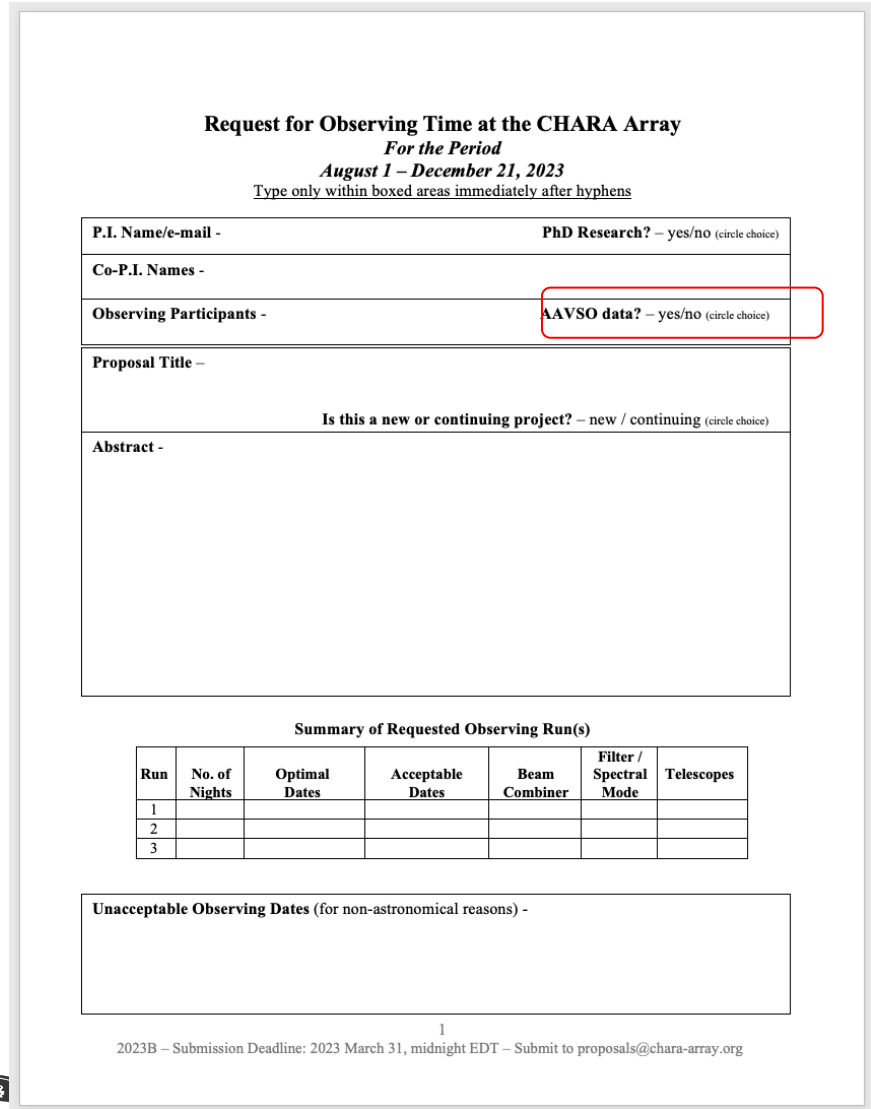
How to request AAVSO observing time

From the CHARA (internal) proposal form

- Check the box!

If you get CHARA time, we'll reach out to you!

Observing Campaign Manager
Elizabeth Waagen
eowaagen@aavso.org



Request for Observing Time at the CHARA Array
For the Period
August 1 – December 21, 2023
Type only within boxed areas immediately after hyphens

P.I. Name/e-mail - **PhD Research?** – yes/no (circle choice)

Co-P.I. Names -

Observing Participants - **AAVSO data?** – yes/no (circle choice)

Proposal Title –

Is this a new or continuing project? – new / continuing (circle choice)

Abstract -

Summary of Requested Observing Run(s)

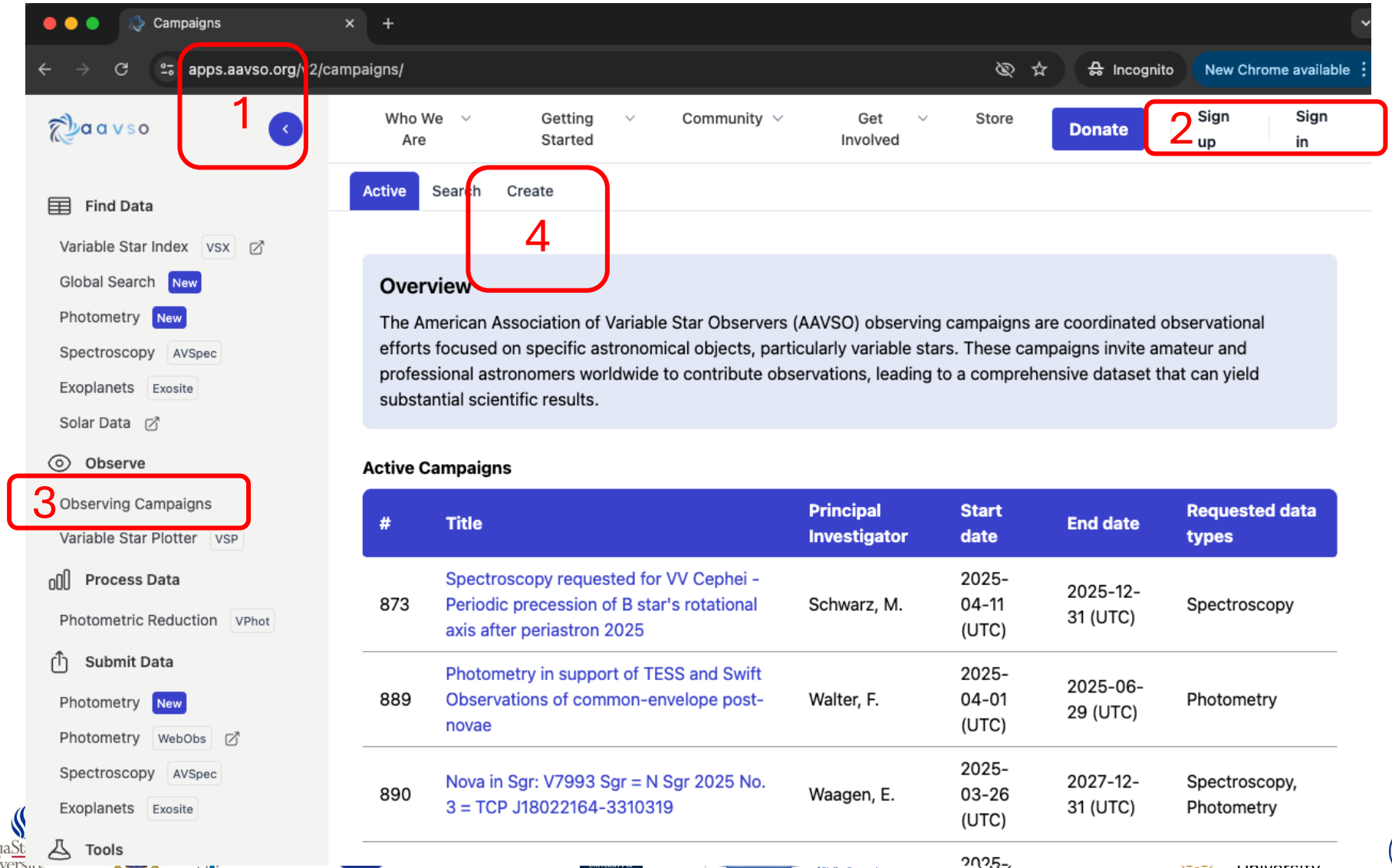
Run	No. of Nights	Optimal Dates	Acceptable Dates	Beam Combiner	Filter / Spectral Mode	Telescopes
1						
2						
3						

Unacceptable Observing Dates (for non-astronomical reasons) -

1

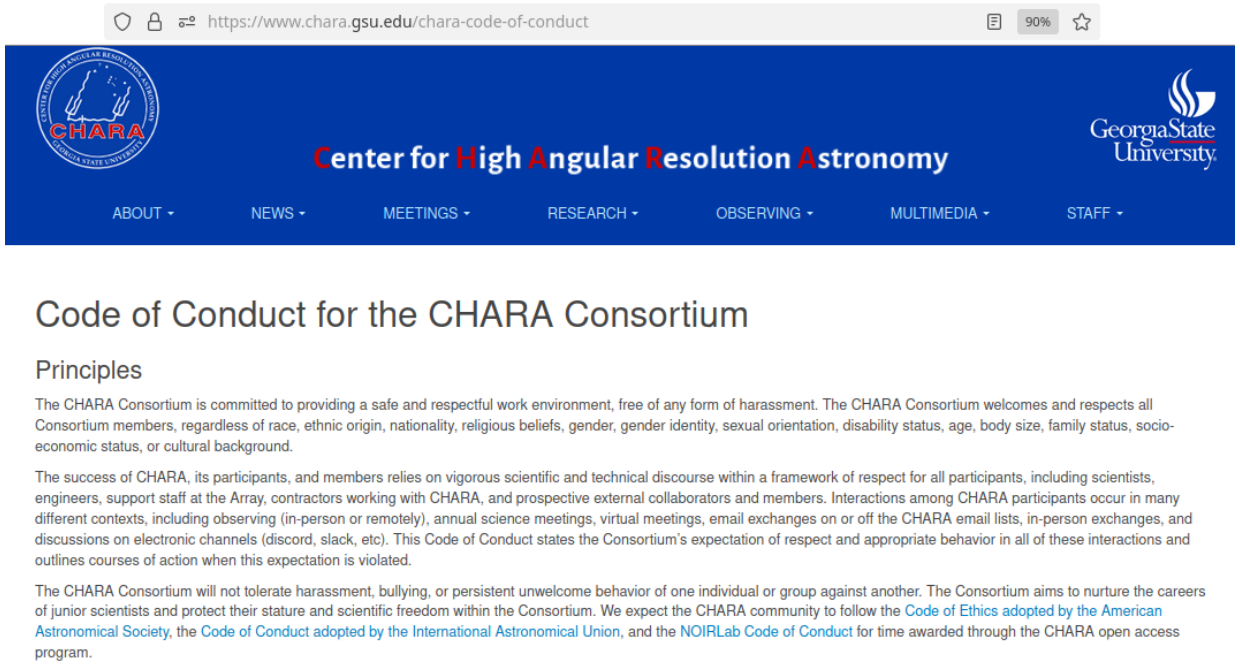
2023B – Submission Deadline: 2023 March 31, midnight EDT – Submit to proposals@chara-array.org

If you didn't get time, we're still happy to collaborate



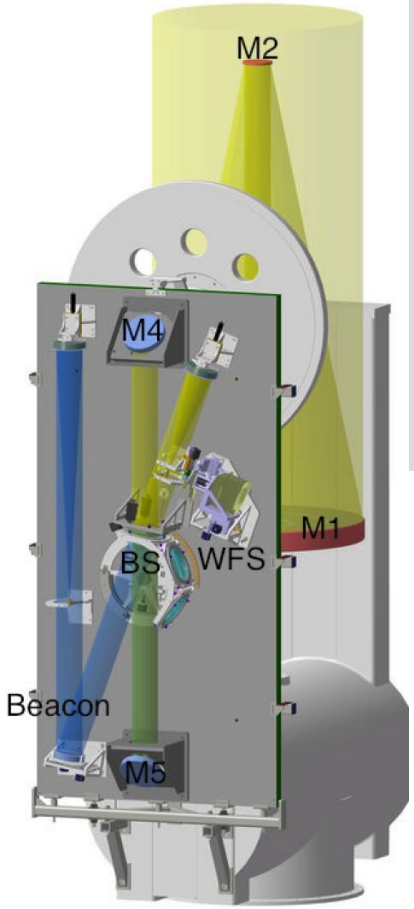
CHARA Code of Conduct

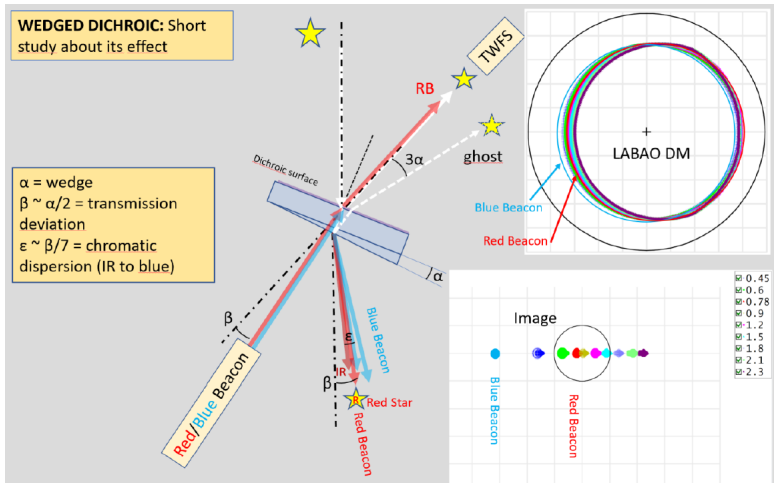
- Draft version available at:
  - www.chara.gsu.edu/chara-code-of-conduct
- Feedback appreciated!
  - gschaefer@gsu.edu

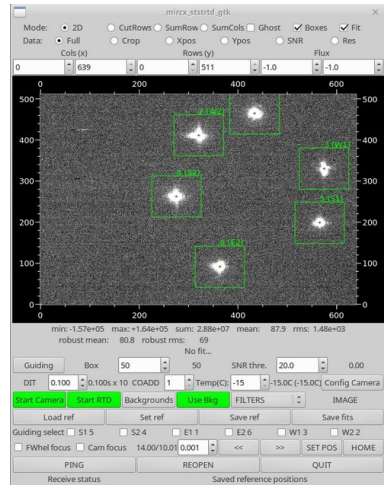


Multi-Spectral Band Advances

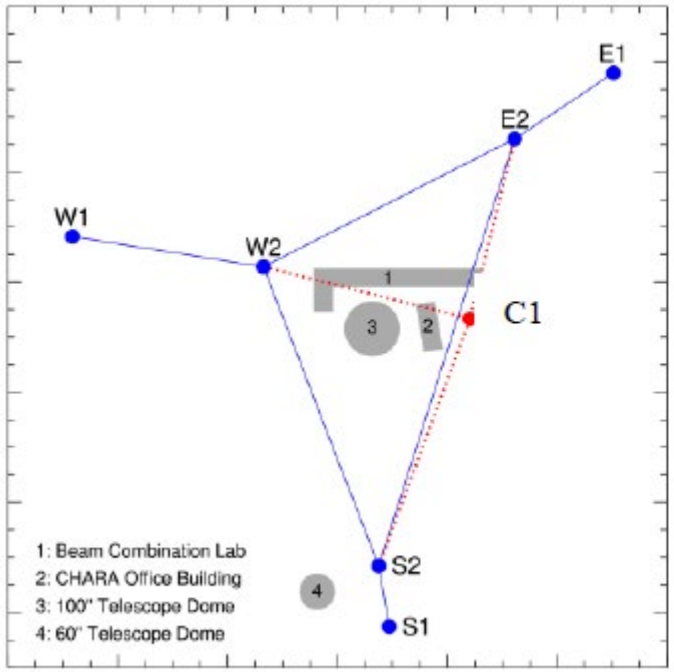
- Submitted – NSF MRI Track 1 (PI Schaefer)
- Upgrade the dichroic beam splitters in AO systems at telescopes
  - Minimize dispersion between visible and IR light transported to lab
- Upgrade detector in the Six Telescope Star Tracker (C-RED One)
  - Extend recent improvements in alignment stability to fainter targets

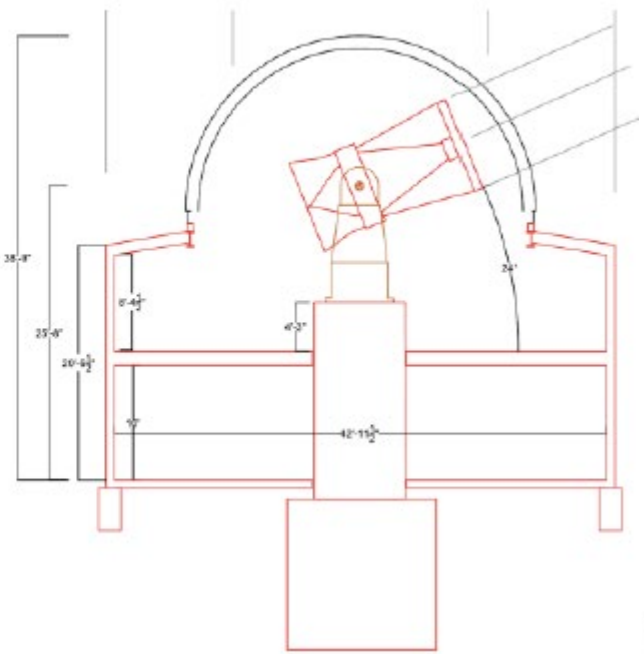


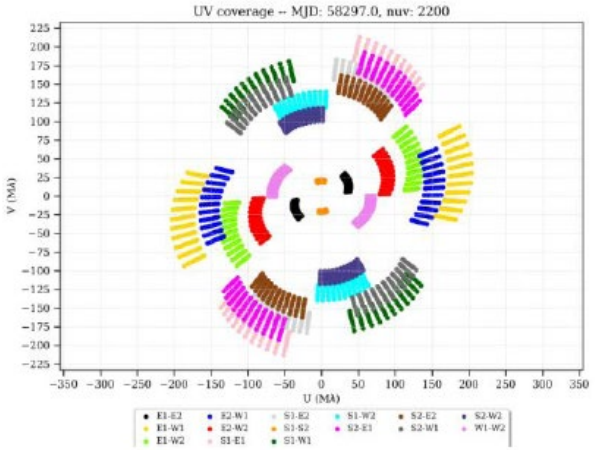


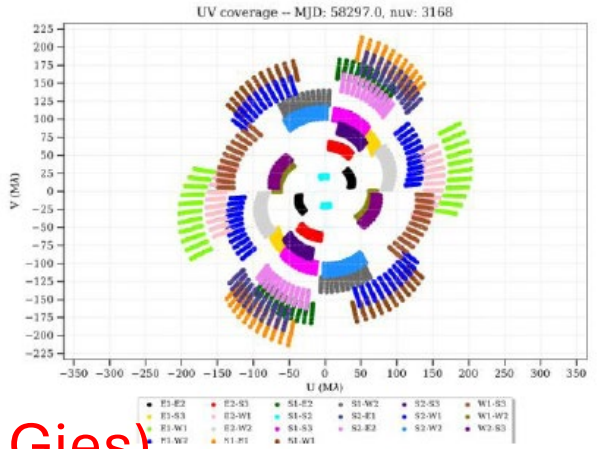


Central 2-Meter Telescope









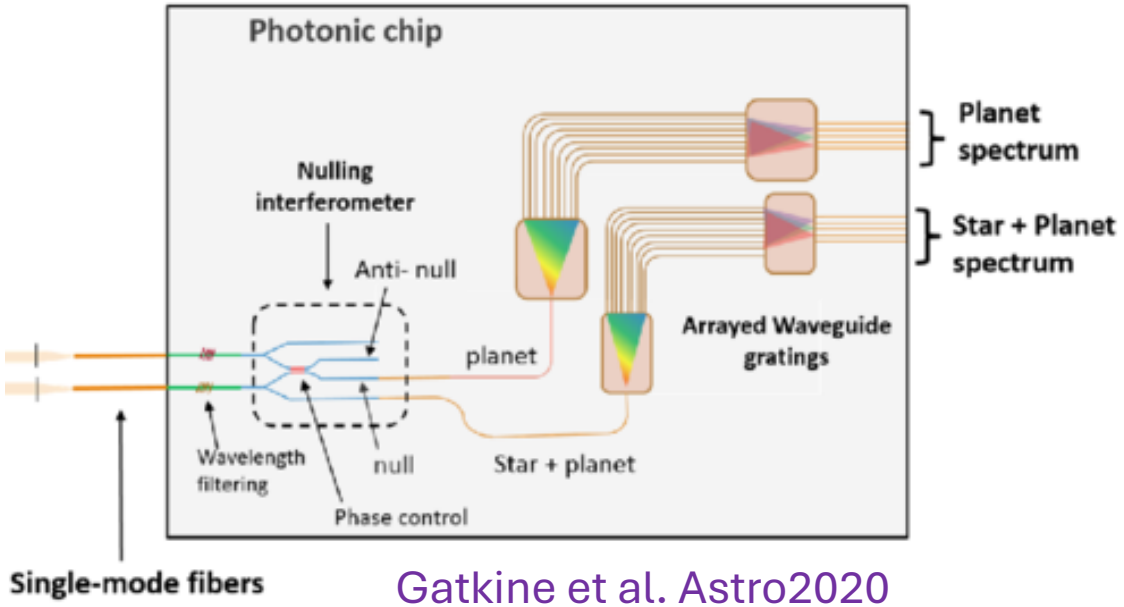
- Baseline Bootstrapping for Imaging
- Improve uv Coverage and Improve Sensitivity
- Prelim. Prop: NSF – Mid-Scale Research Infrastructure (MSRI-1; Gies)

Possible Upgrades in the Future

- Dual star mode (Narsi's talk)
- Silmaril sensitivity improvements (Cyprien's talk)
- Optimizing AO for performance at visible wavelengths
  - Redesign telescope AO bench (smaller off-the-shelf DM)
  - Redesign labAO system – offload TT/aberrations to telAO
- CMAP – 1 km baseline (Channel 13 site)
  - Improve resolution
- Central 2-meter + upgrade existing telescopes to 2m
  - Improve sensitivity
  - Improve uv coverage

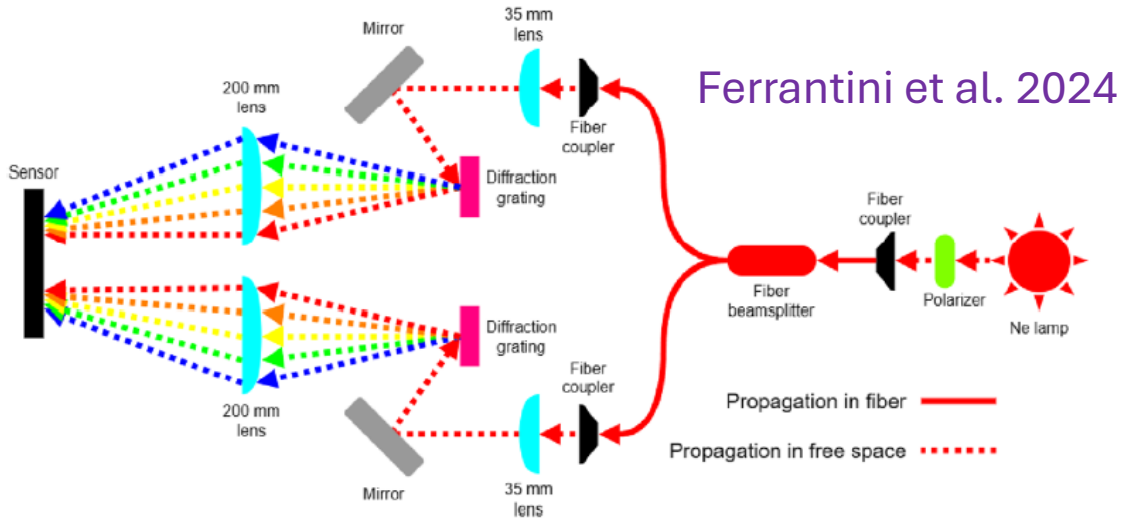
CHARA Array as a Testbed for Testing New Technologies - Potential Collaborations

- CHARIOT (Kevin Barjot's talk)
- UCLA – Pradip Gatkine
  - Nulling on photonic chip



Gatkine et al. Astro2020

- Brookhaven National Lab – Paul Stankus
  - Multifrequency intensity interferometry demonstration using SPAD fast spectrometer



Ferrantini et al. 2024

Much thanks to CHARA staff and colleagues for their patience this last year as we started a new journey in being parents.

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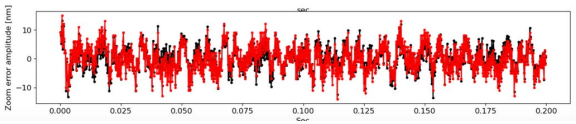
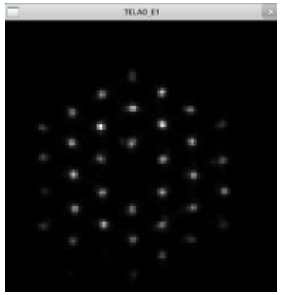
Engineering Updates from the Mountain



Fixed metrology timestamp glitch
Narsi, **Nils**, Brad Hines

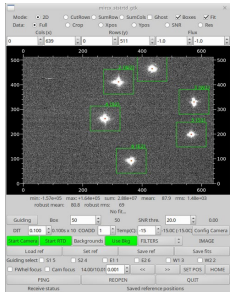
CMAP telescope installation, AOB development, and fiber testing
Rob, **Rainer**, CMAP team



Implementation of new unified AO software for telAO + labAO + obsgtk
Theo, **Karolina**, Rob, Rainer, Narsi

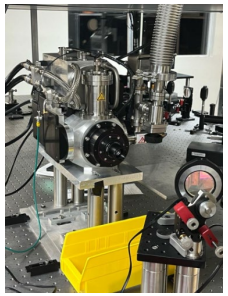
New generator and automatic transfer switch
Chris, JT, Craig

Data archive expansion
Jeremy



Star tracking with STST, SPICA FTT, Strider
Narsi, Denis, Theo

Telescope drives, cylinders, stairs
Nic, Craig, Victor



Silmaril Commissioning
Cyprien, Narsi, Silmaril team