

Exploring asymmetries in the dusty shell of the semi-regular variable V CVn with CHARA

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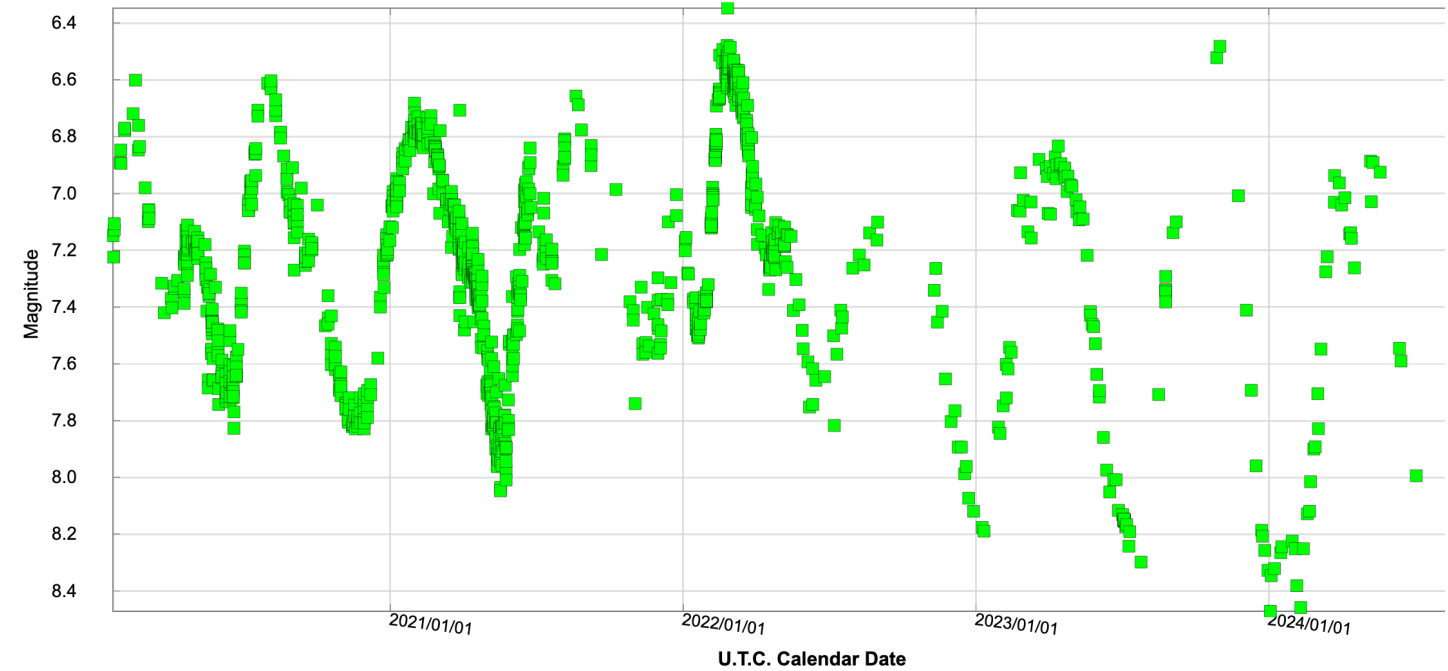
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V Canum Venaticorum - V CVn - HD 115898

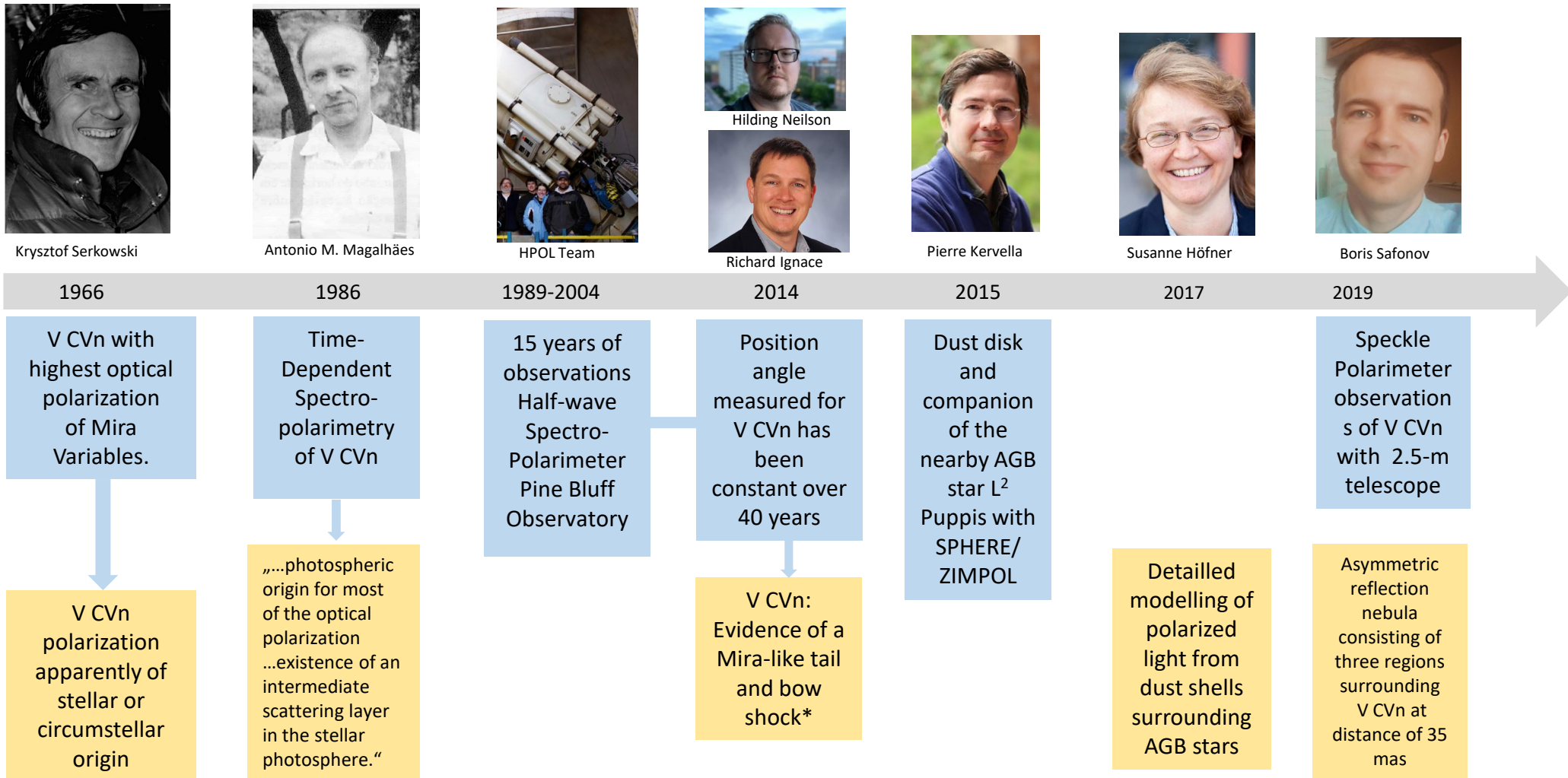
Atmospheric model of AGB-star B. Freytag, S. Lijjgren, and S. Höfner, A&A, 2017



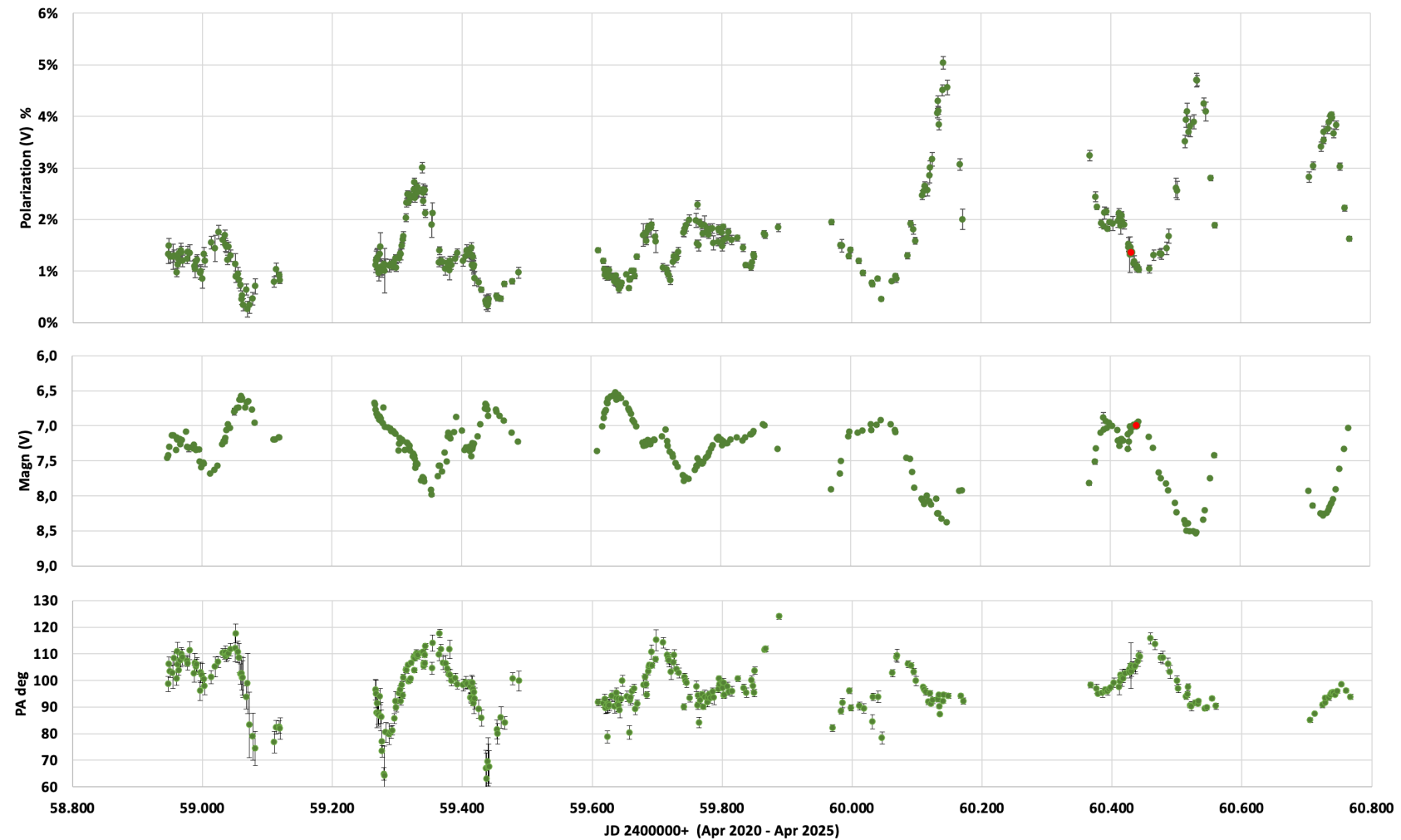
AASVO, V CVn V-band Magnitudes CCD

- M4e - M6e late AGB star
- 500 pc*
- High tangential velocity of 97 km/sec*
- High galactic latitude (70 deg.)
- Semi-Regular Mira Variable (SRVb)
- Radial pulsations with period of about 192 days
- Complex pulsating behavior not yet fully understood
-> Secondary and/or extra long secondary period?

V CVn polarimetry milestones 1966 - 2019

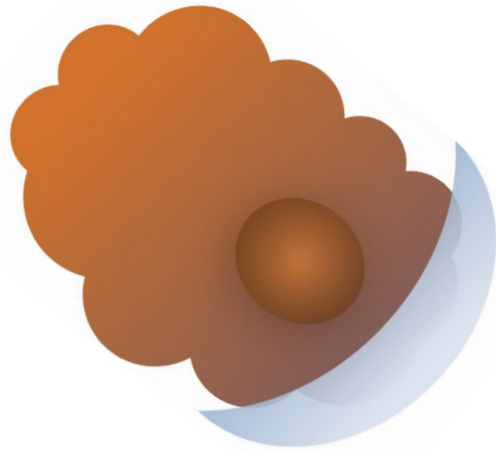


A multiyear photopolarimetric study of the semi-regular variable V CVn



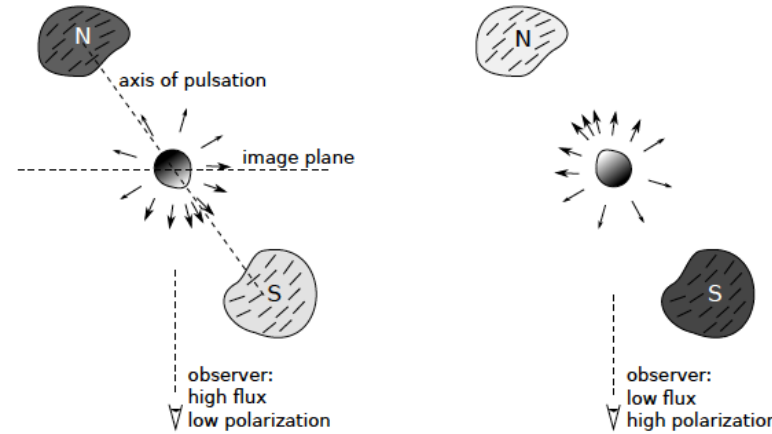
Reference: H. Neilson, N. Steenken, J. Simpson R. Ignace, M. Shrestha, C. Erba and G. Henson. A&A Volume 677, September 2023

After sixty years of research no consensus model for dusty shell



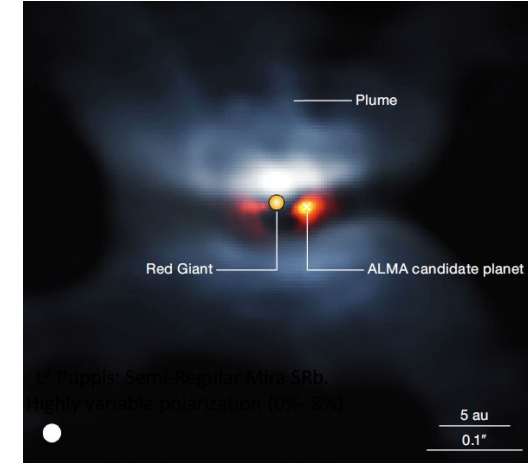
Neilson (2014)

Bow shock?



Safonov (2019)

Bipolar clouds?



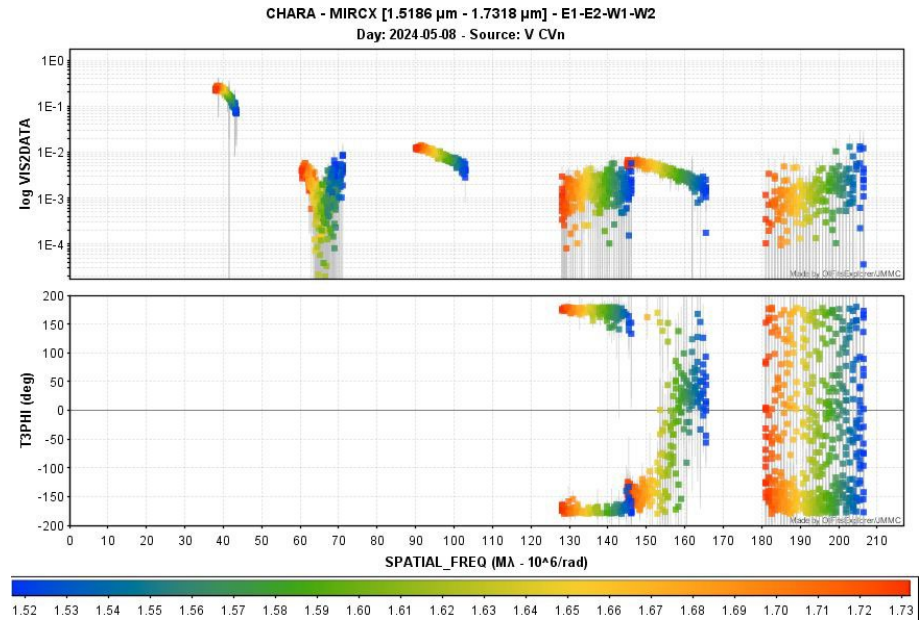
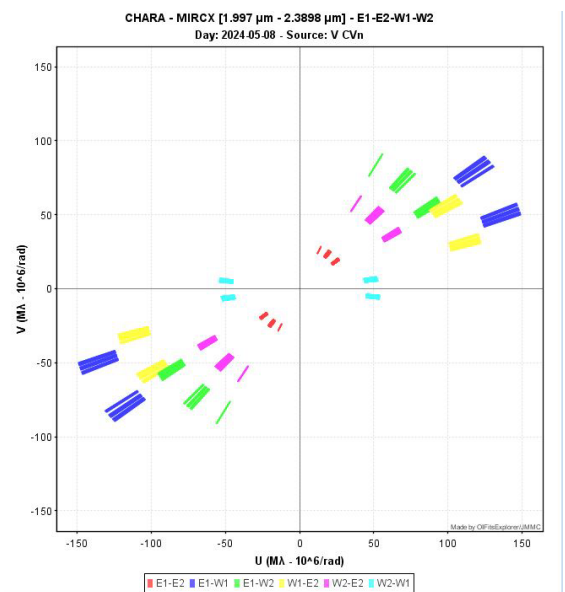
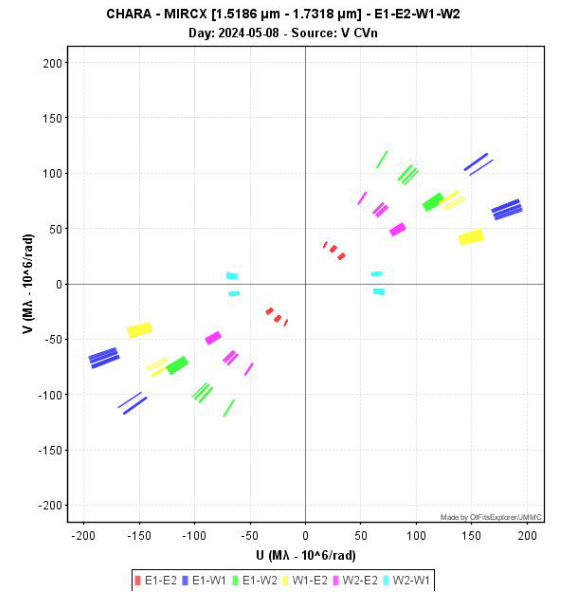
Dusty disk?

2023/11/03

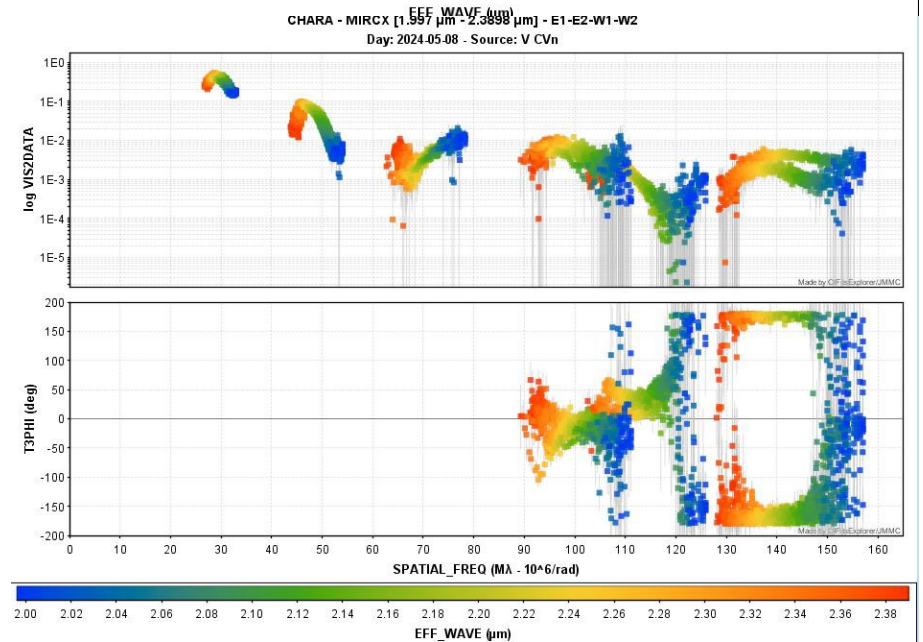
Positive reaction from CHARA Team on proposal for test observation!



CHARA
Snapshot
May 8



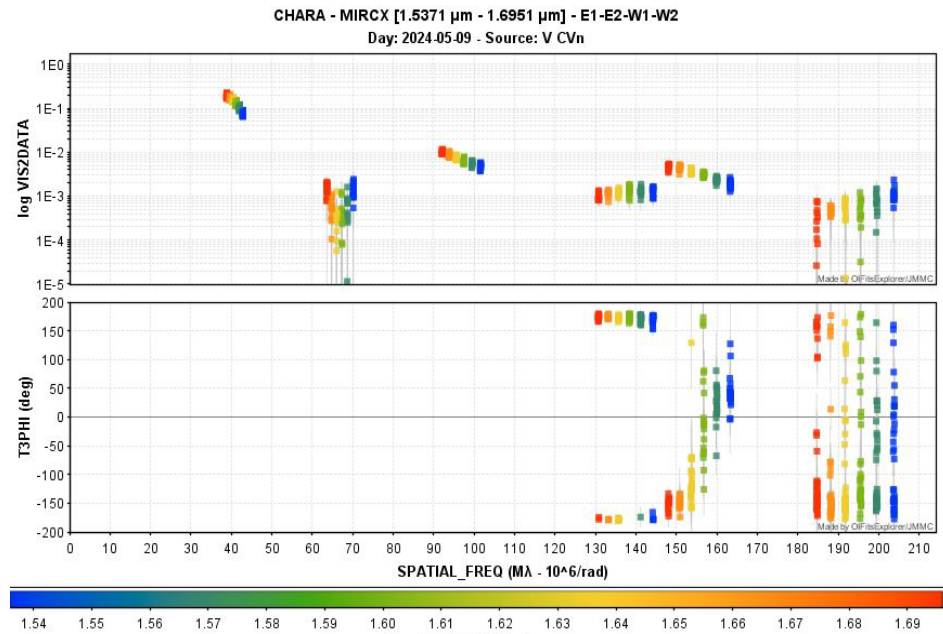
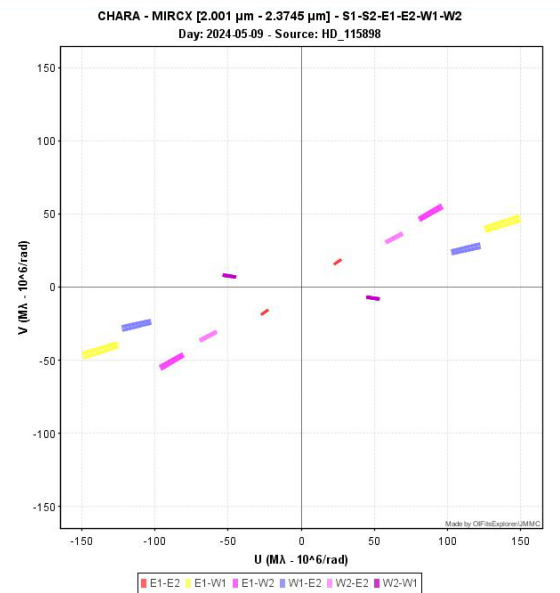
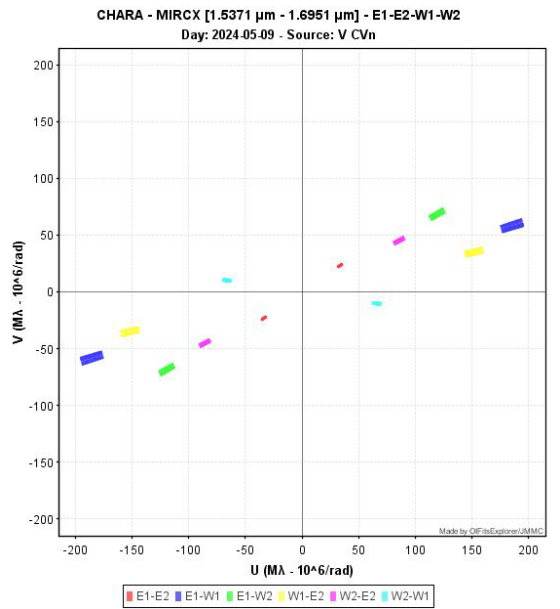
H band



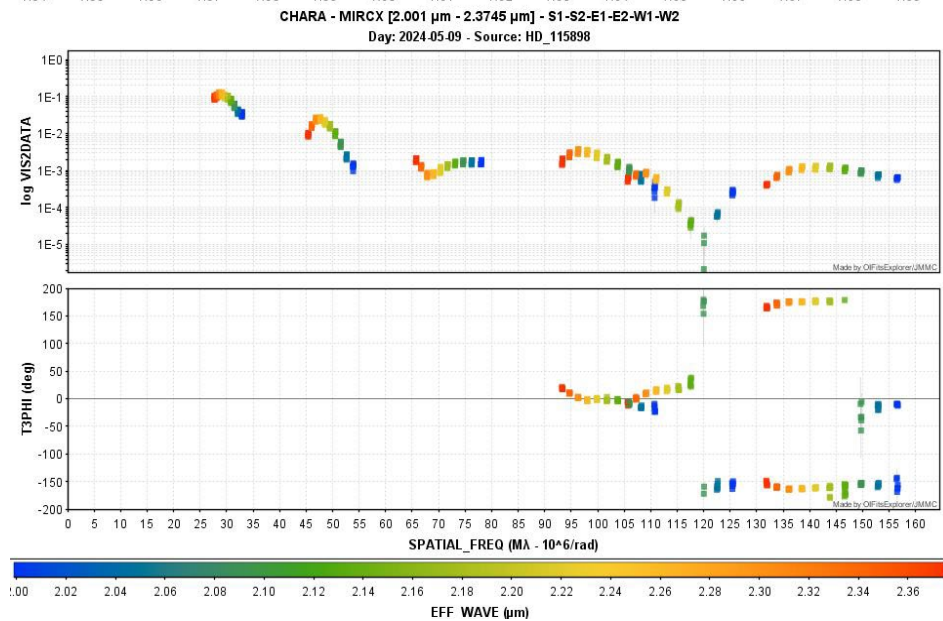
K band



CHARA
Snapshot
May 9



H band



K band

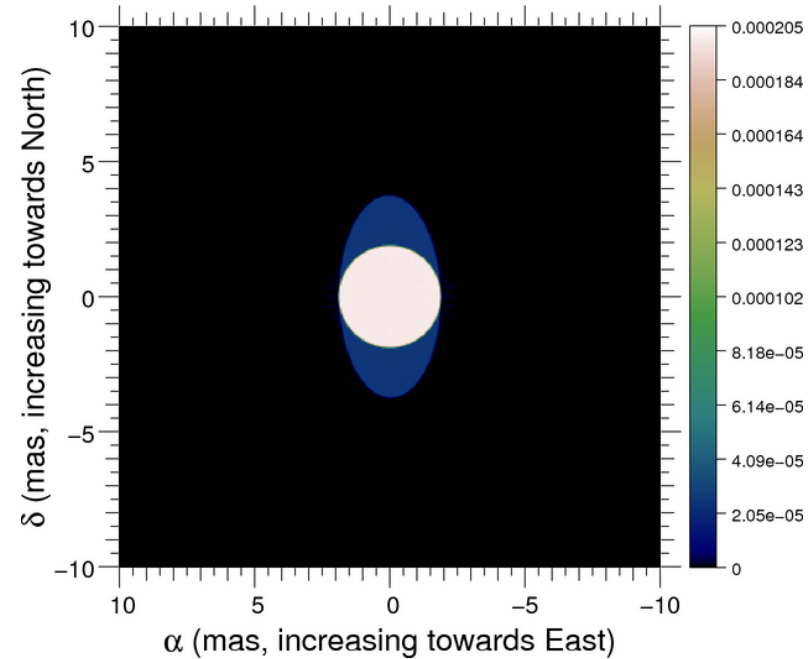
LitPro best fit model: 3.8 mas disk + elongated disk

Model:

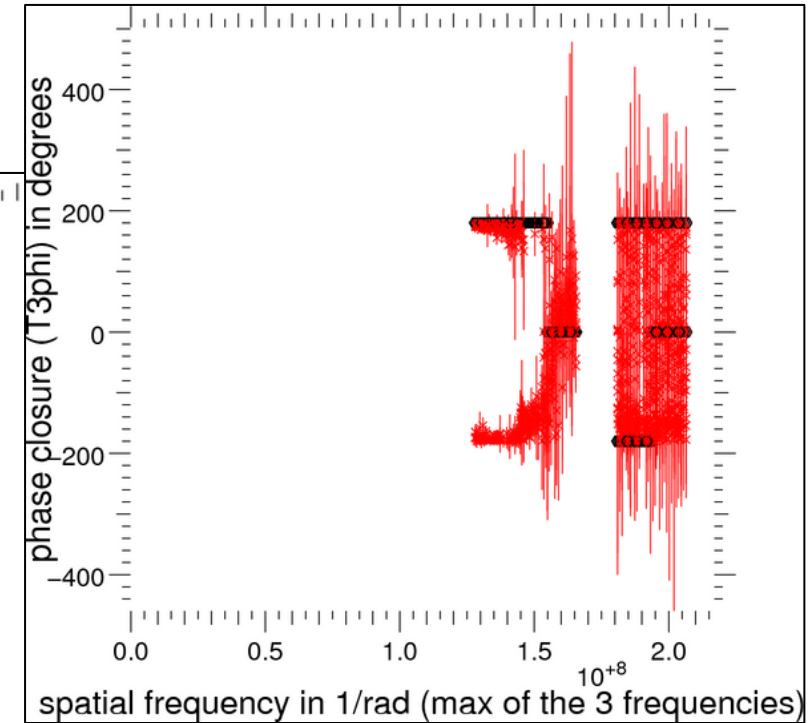
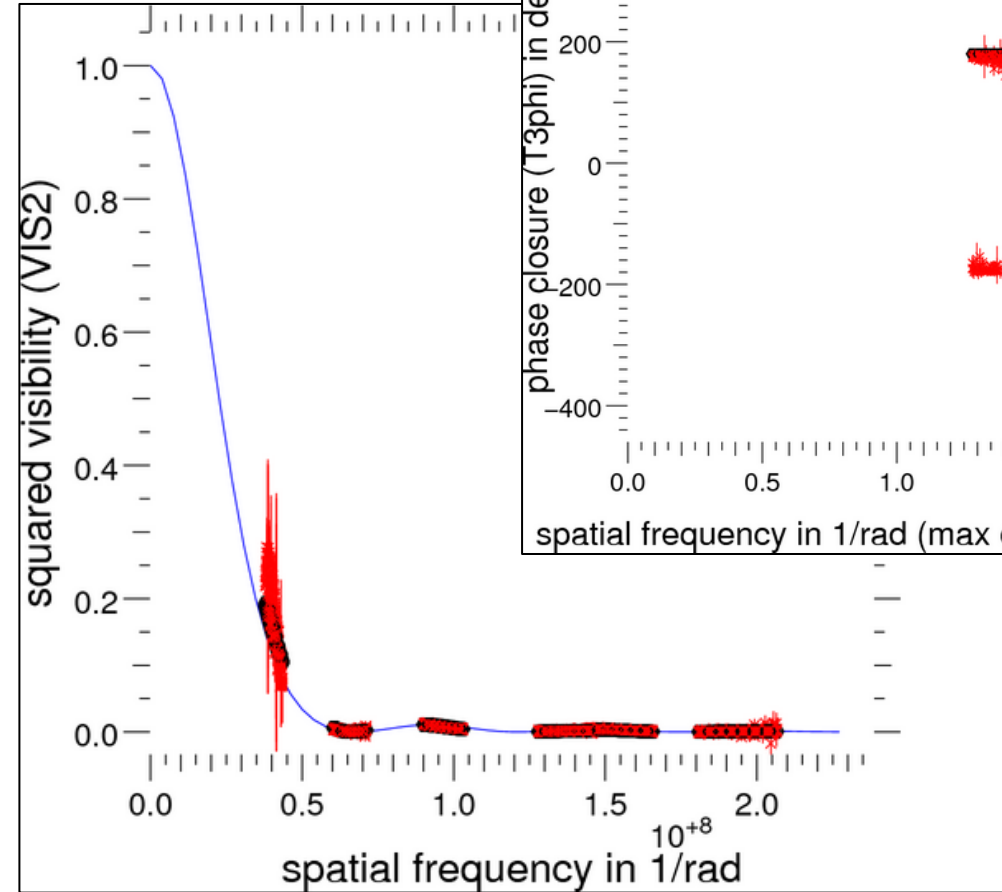
Diameter disk 1 3.8 mas
Flux weight disk 1 78.5%

Minor axis disk 2 3.7 mas
Elong_ratio 2.1
Flux weight disk 2 21.5%

H band
May 8+9



Fit analysis Model vs. data
Reduced Chi2: 2.8



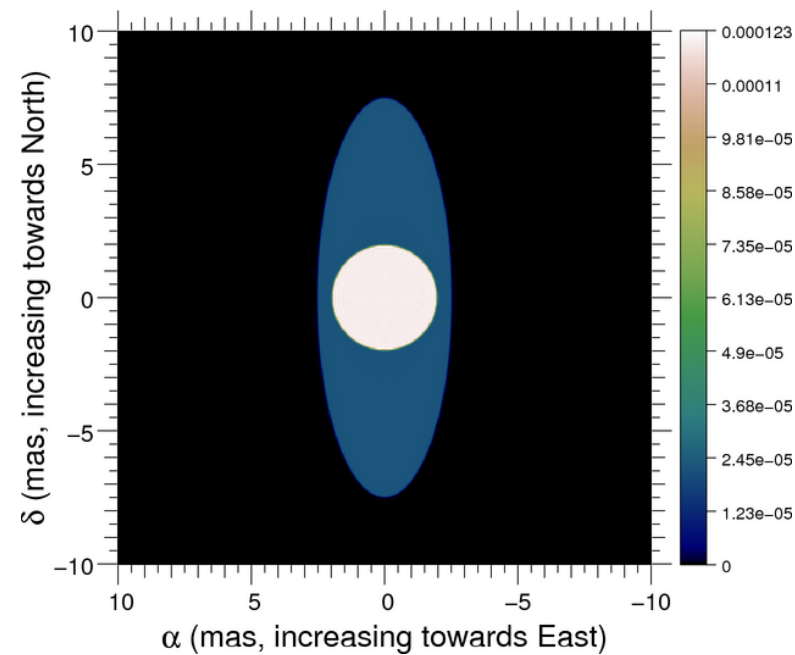
LitPro best fit model: 3.9 mas disk + elongated disk

Model:

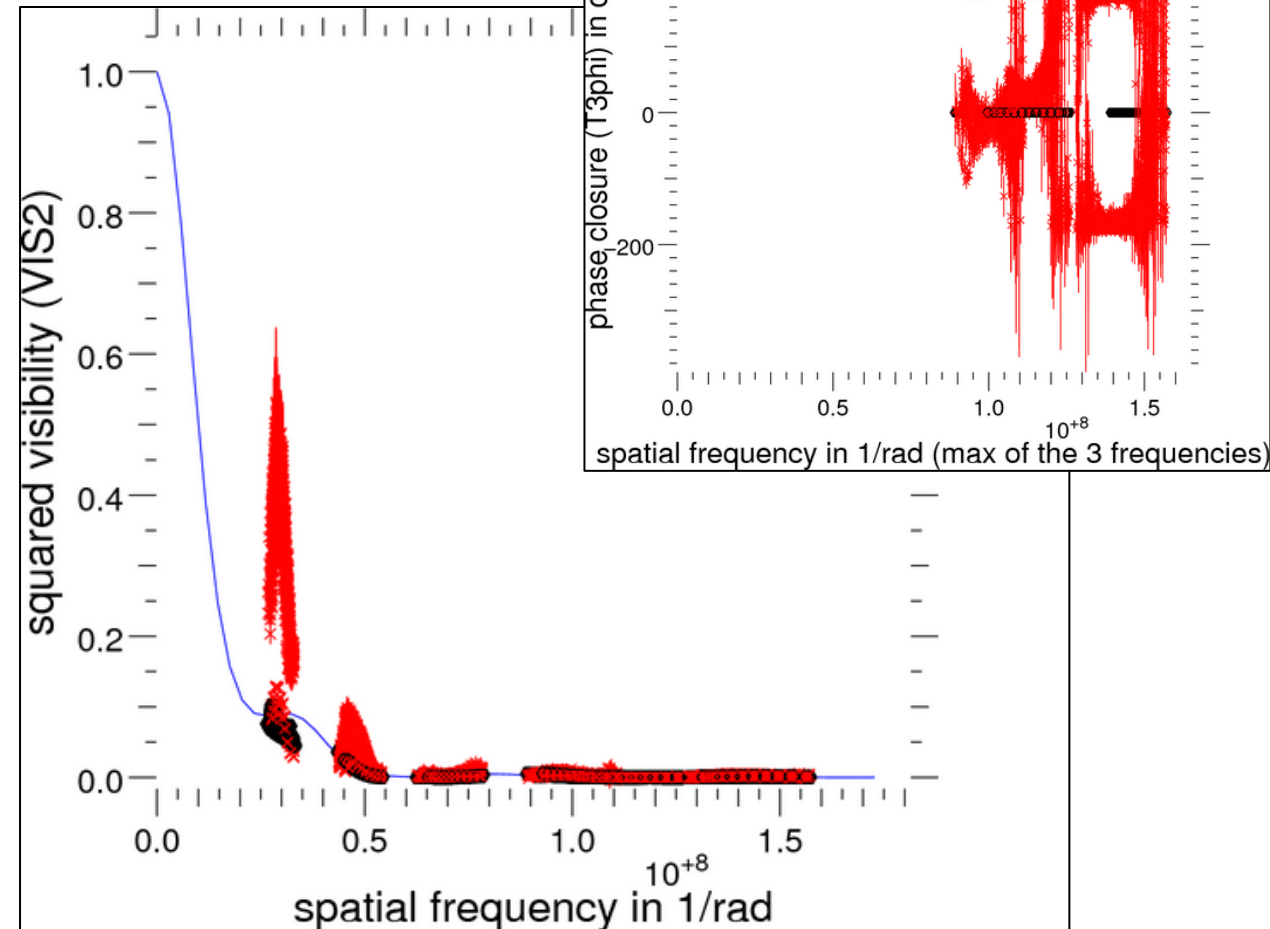
Diameter disk 1 3.9 mas
Flux weight disk 1 47.7%

Minor axis disk 2 5mas
Elong_ratio 2.9
Flux weight disk 2 52.3%

K band
8+9 May

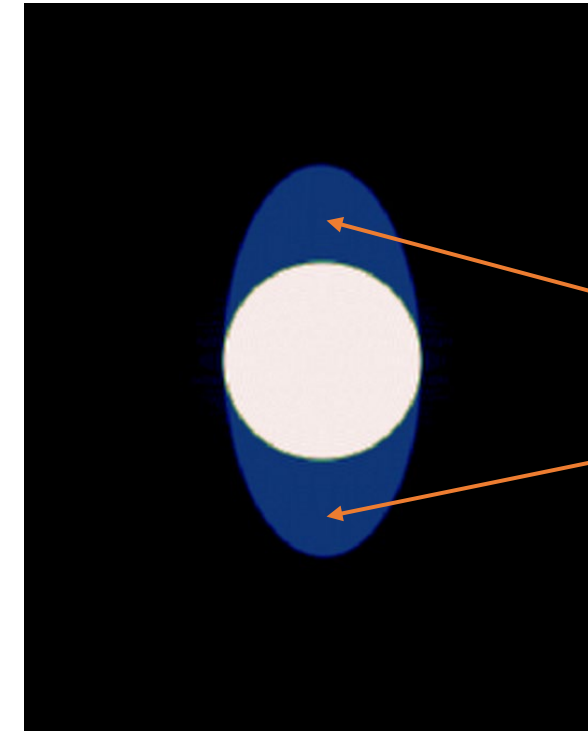
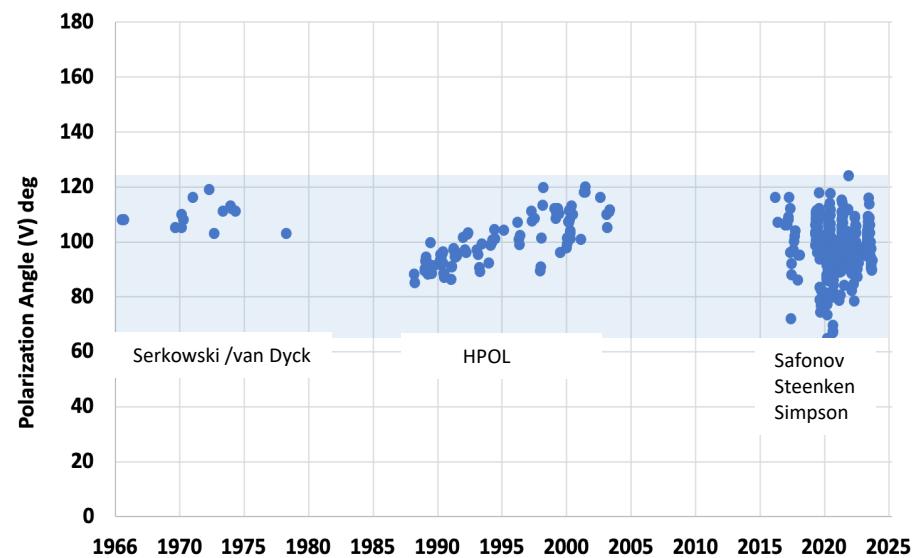


Fit analysis Model vs. data
Reduced Chi2: 93



Elliptical structure could explain the long-term stable PA of optical polarization

- 3.8 mas = radius disk of 200 $R_{\odot}$ at a distance of 500 pc
- Elliptical structure/dusty shell semi-major axis of about 400 $R_{\odot}$
- PA long axis of elliptical structure seems to be orthogonal to the longterm polarization position angle (PA) range

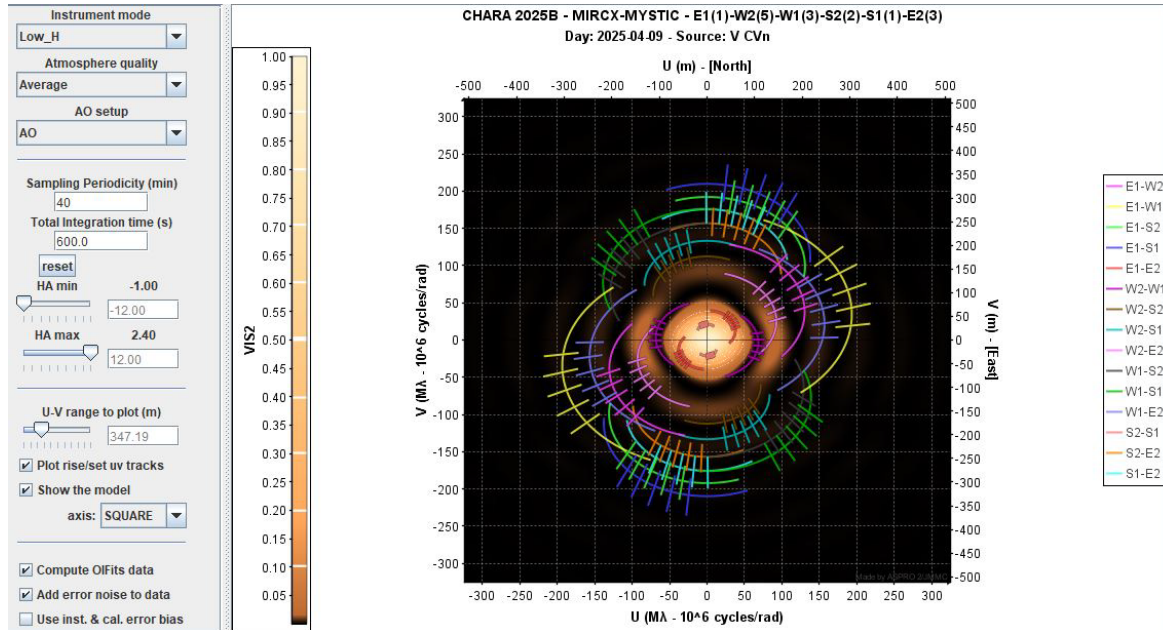


Preliminary hypothesis:

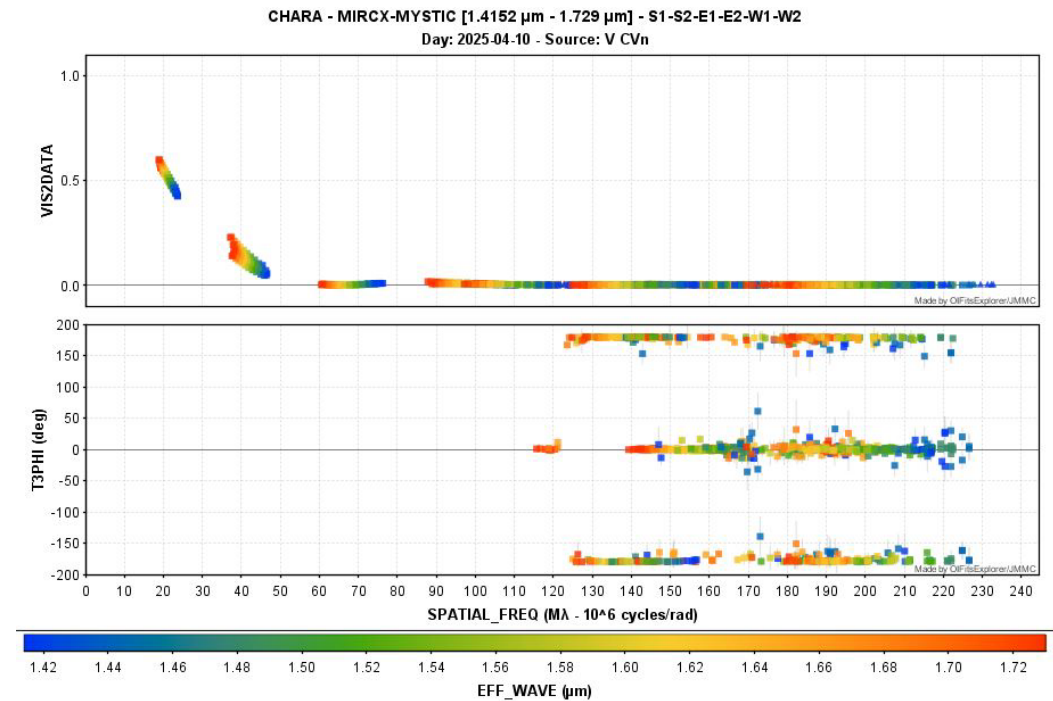
Main dust scattering in polarigenic areas of elliptical structure

Request for guest observing time at the CHARA Array March 1 – July 31, 2026

Simulation of full observation with ASPRO2



Expected results for Model with 3.8 mas disk + 2 x elongated disk



V CVn minimum around mid of March 2026
Visibilty period of V CVn for CHARA starts in January
Proposal deadline 9/2025

New CHARA Polarimetry mode available?