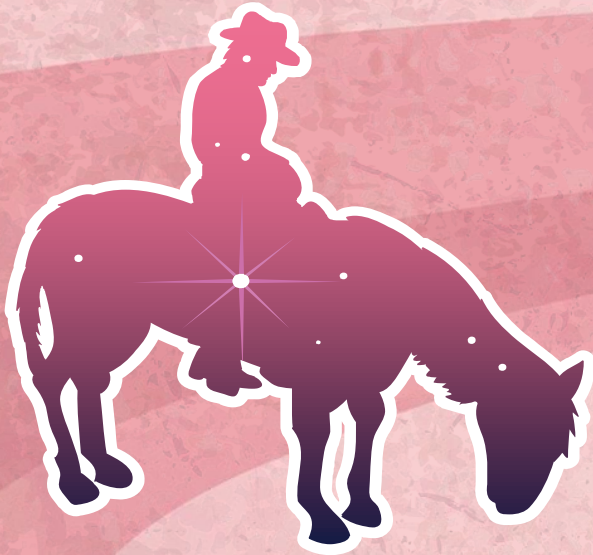




Imaging Young Stellar Objects with the CHARA Array

Noura Ibrahim, John Monnier, MIRC-X/MYSTIC
Collaboration

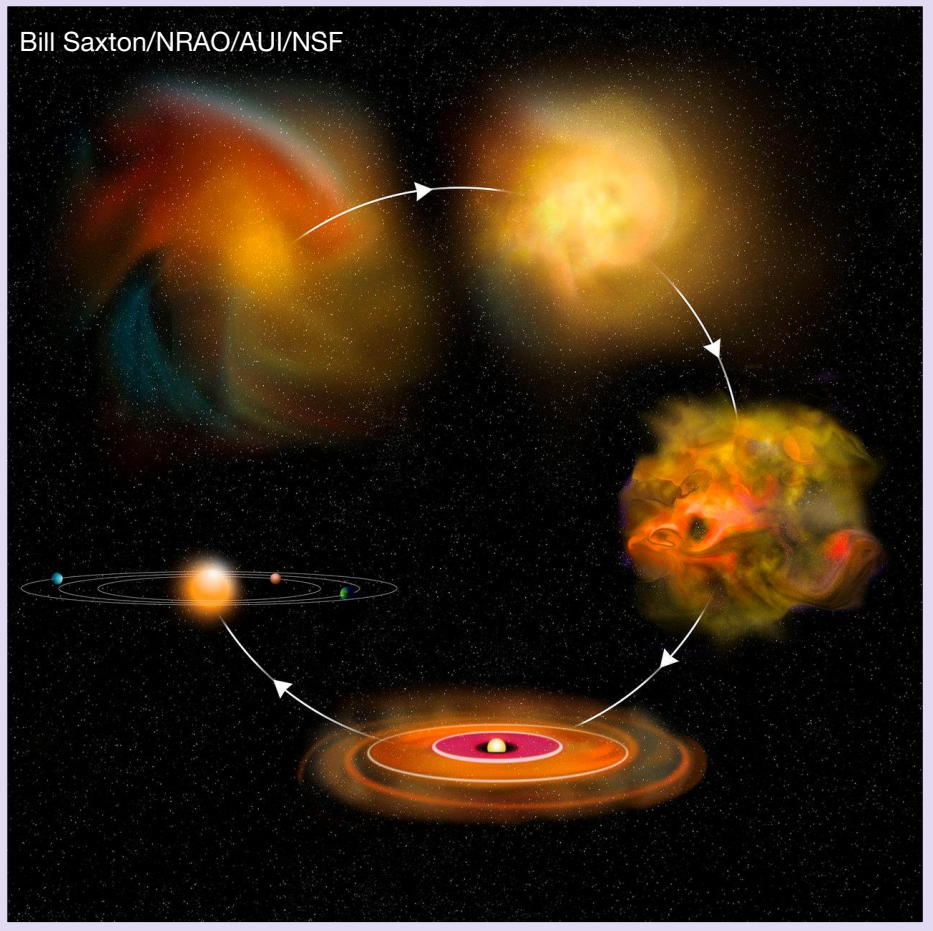




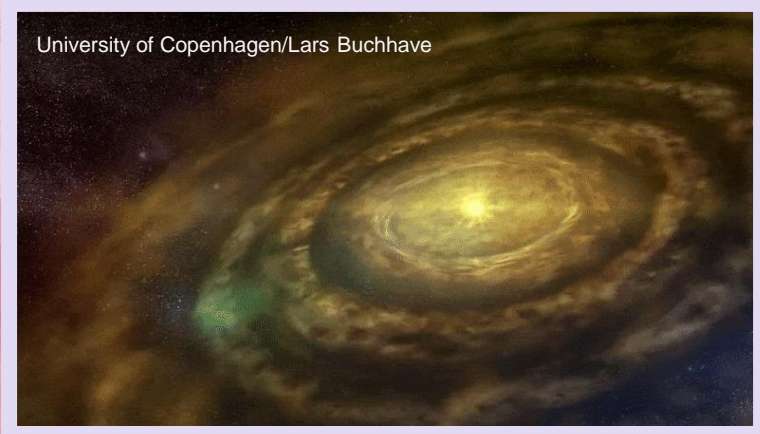
Young Stellar Objects (YSOs)



Bill Saxton/NRAO/AUI/NSF



University of Copenhagen/Lars Buchhave

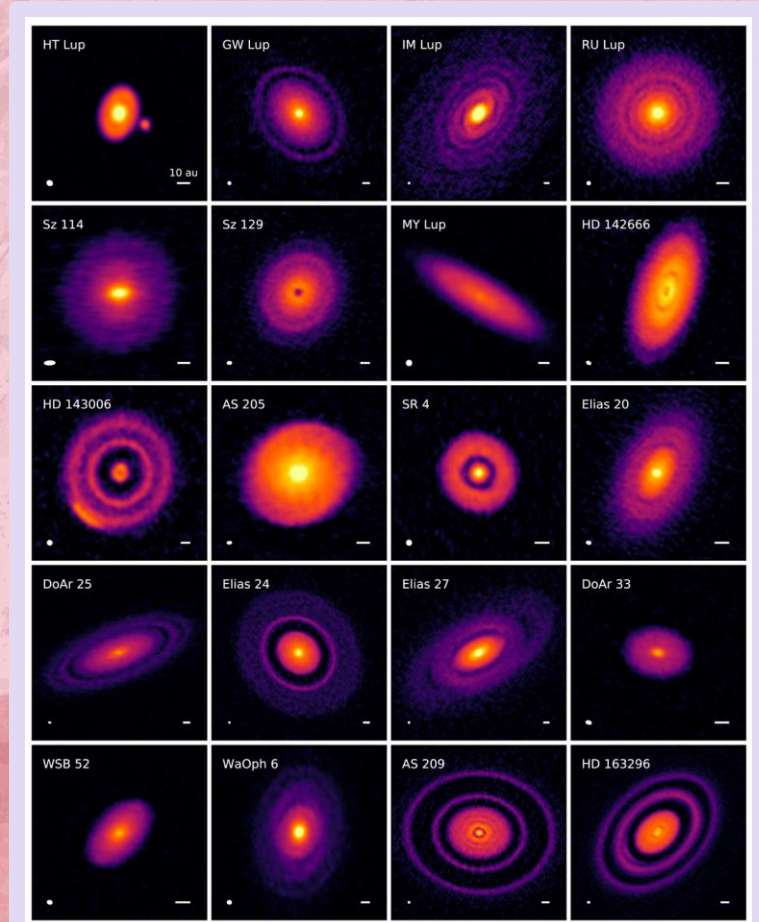


Young Stellar Objects (YSOs)

Sub-Millimeter imaging of protoplanetary midplanes show a diverse sample with distinct structures

Rings, gaps, asymmetries, vortices, and spiral arms

Could be evidence of ongoing planet formation!



(Andrews et al. 2018)

Scales of YSOs

C.P. Dullemond and J.D. Monnier, 2010

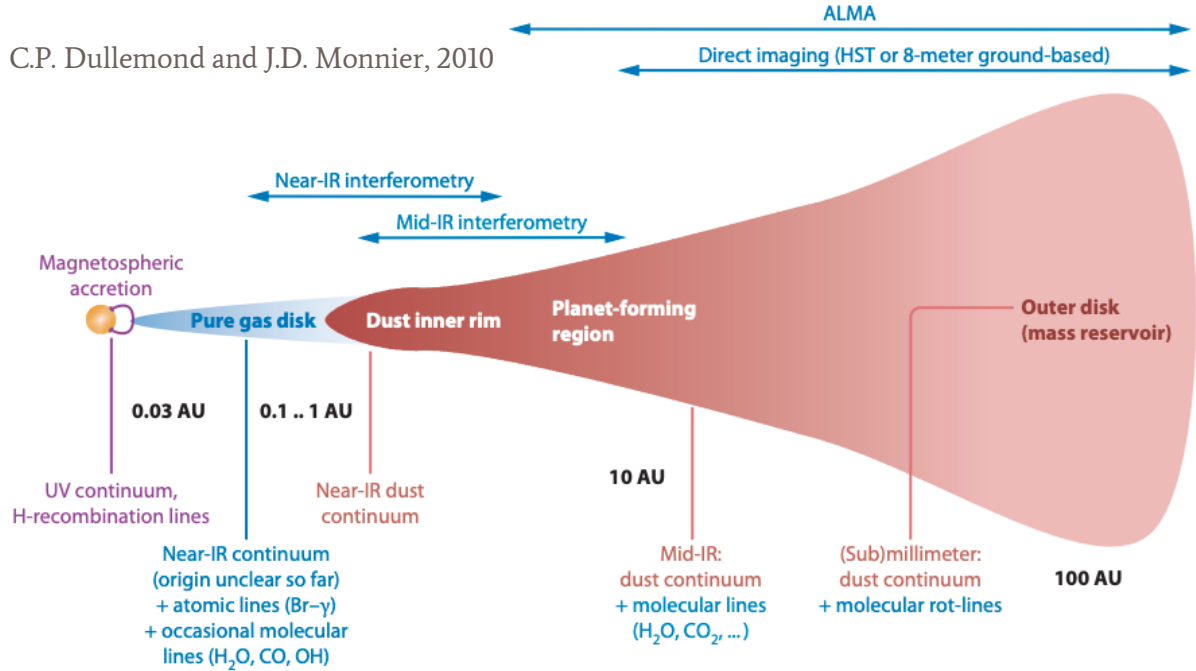


Figure 1

Pictogram of the structure and spatial scales of a protoplanetary disk. Note that the radial scale on the x-axis is not linear. Above the pictogram shows which techniques can spatially resolve which scales. Below shows which kind of emission arises from which parts of the disk.



Probing the inner disk of a Herbig Be star

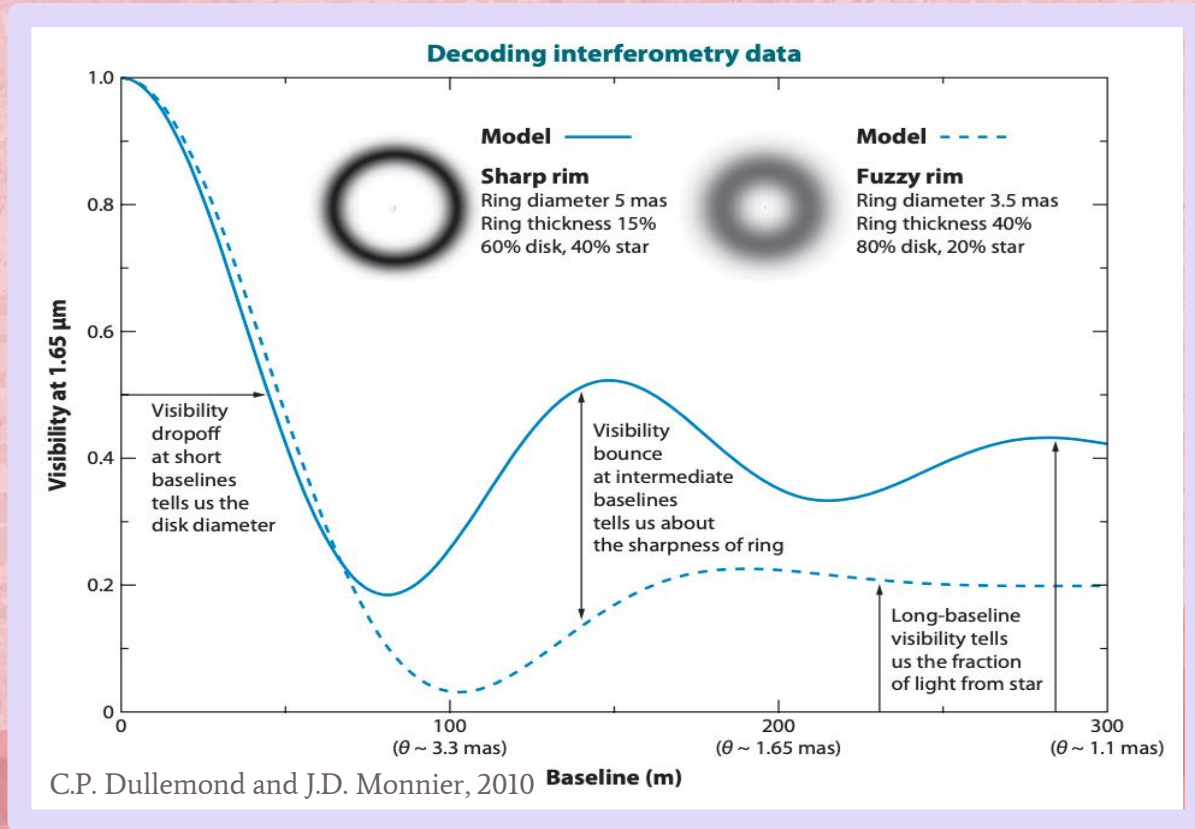
V1295 Aquila (HD 190073) – Really “cool” star :)

- Herbig Be star (spectral type B9)
- 847 pc away
- $780 L_{\odot}$
- $6 M_{\odot}$
- Narrow emission line feature
- Weak detected magnetic field
- Almost face on!



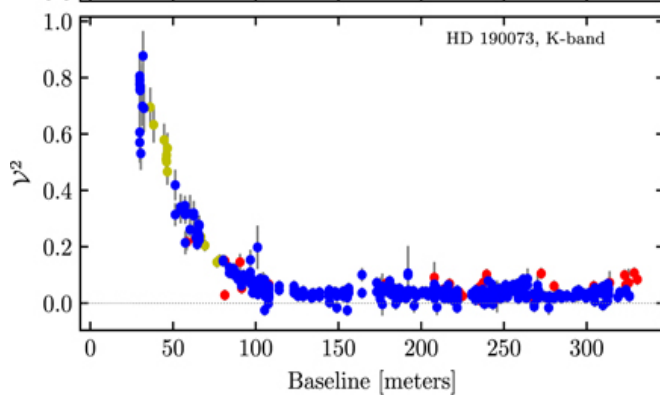
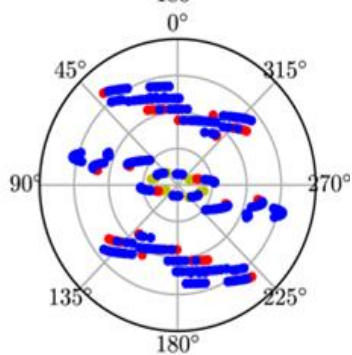
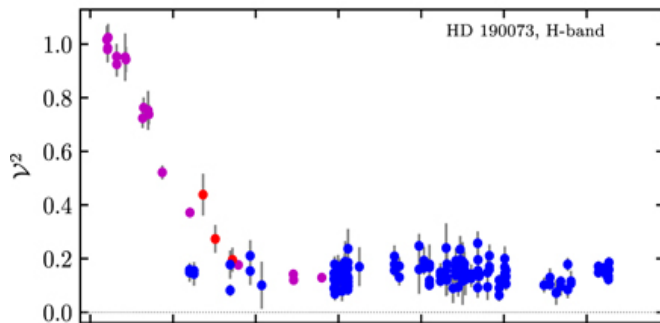
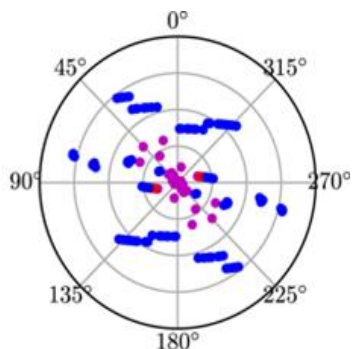
Simbad

In Theory

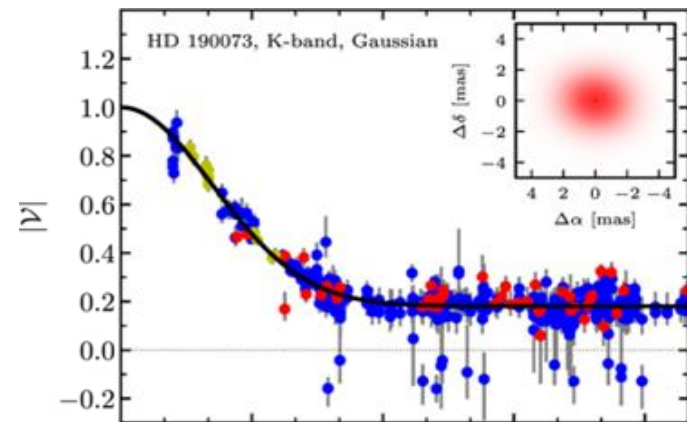
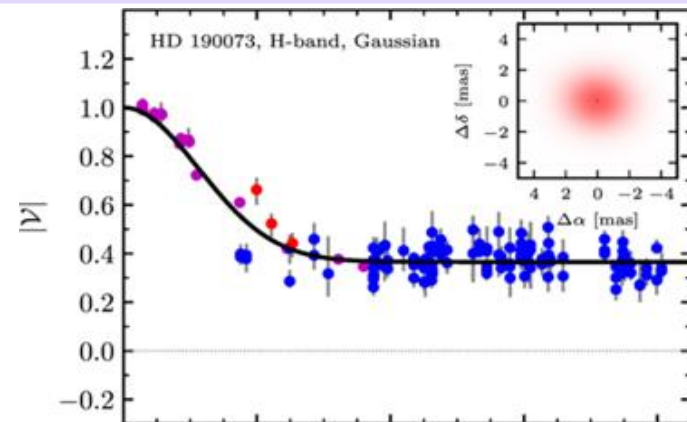


Previous work

(Setterholm et al 2018)

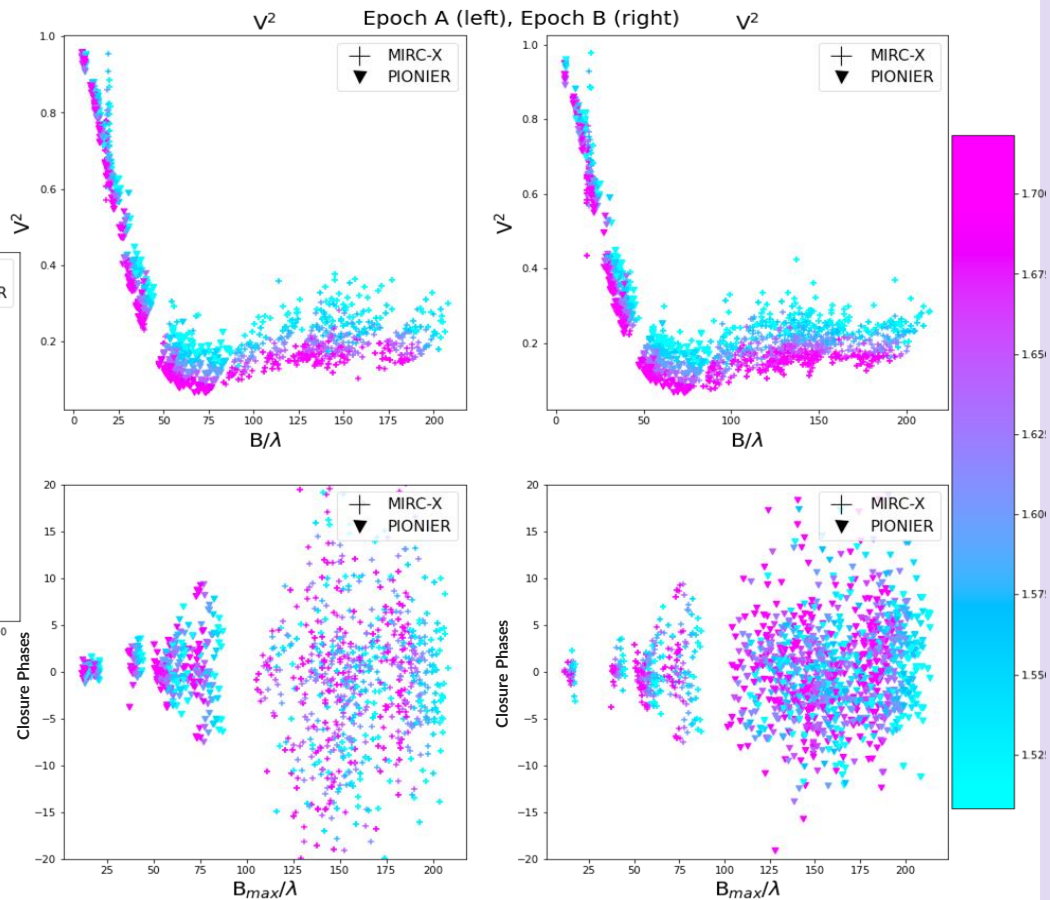
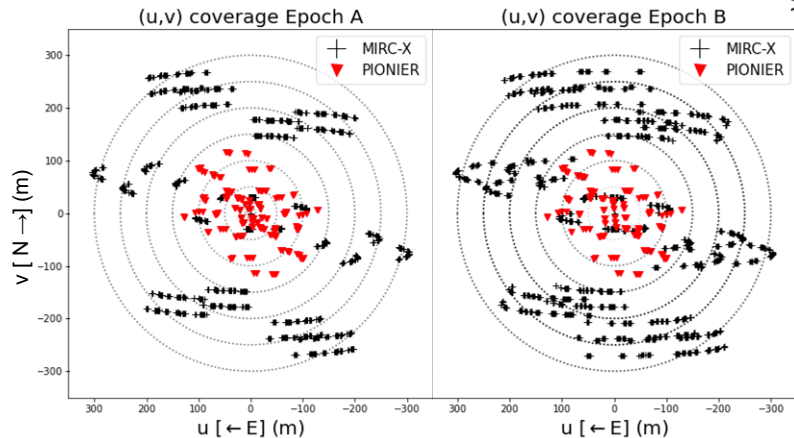


● Classic ● CLIMB ● PIONIER ● AMBER

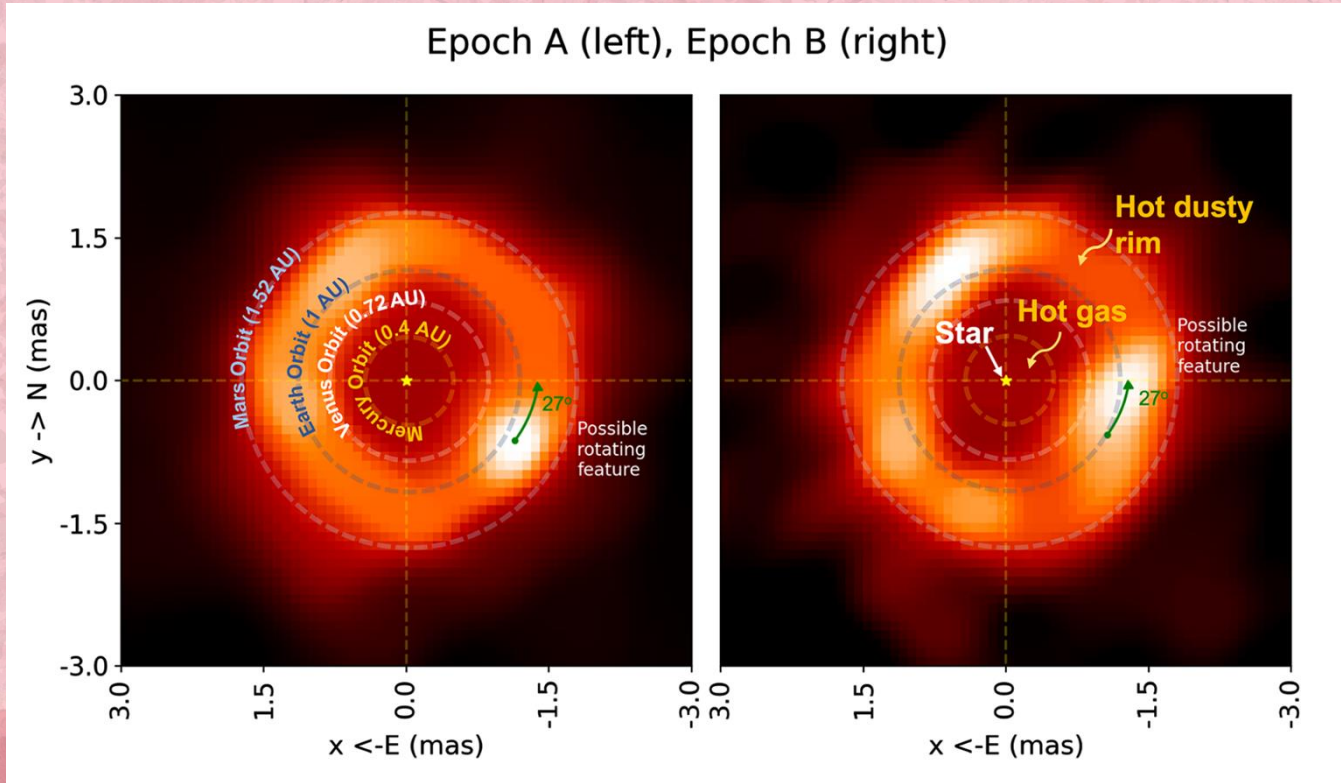


This work

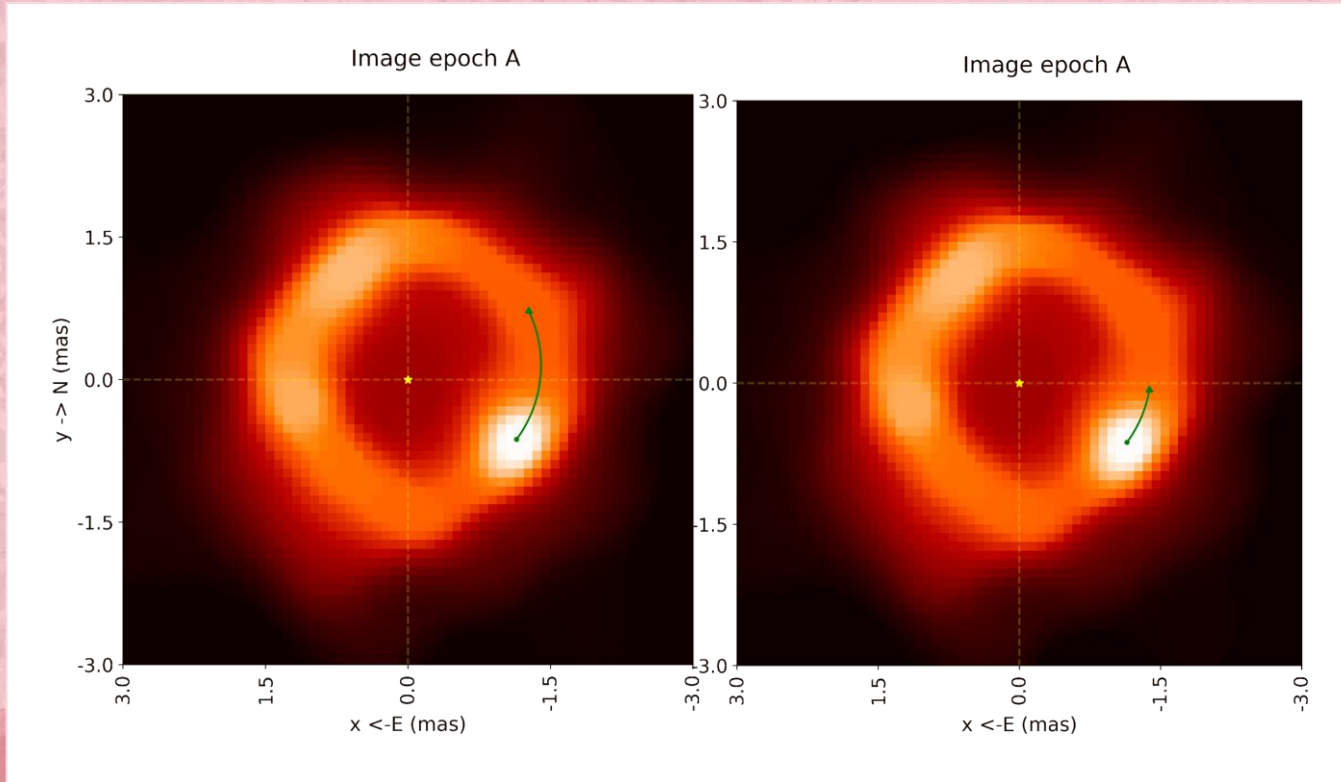
(Ibrahim et al 2023)



Imaging HD 190073 (V1295 Aq1)



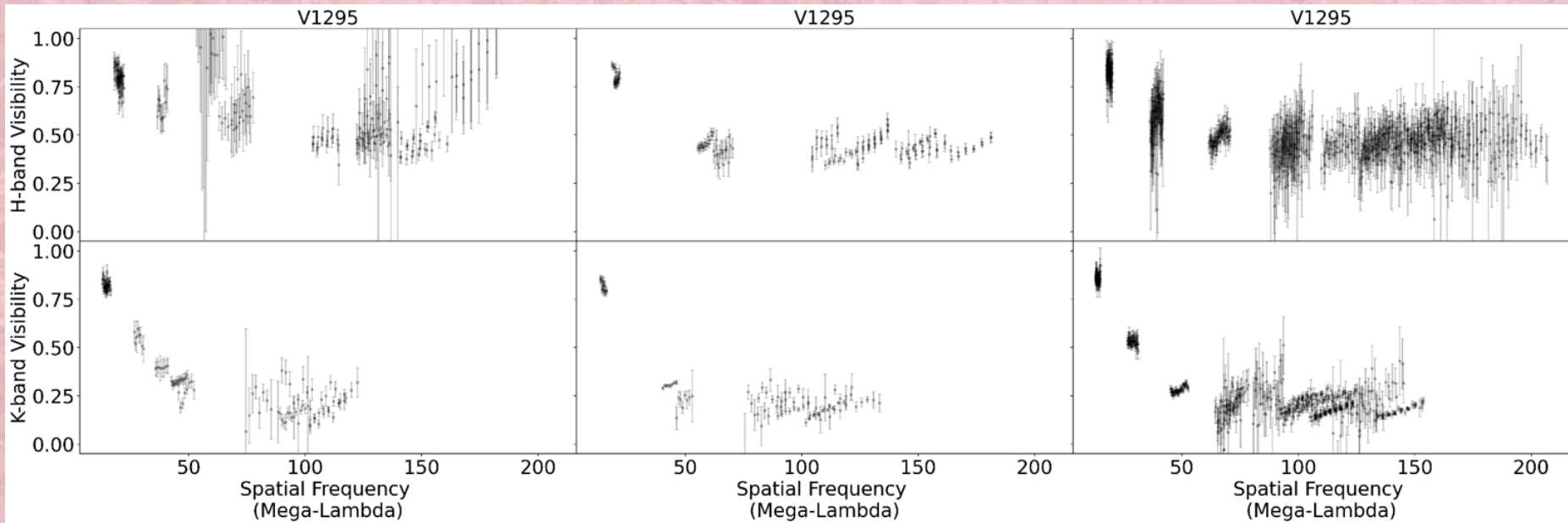
Imaging HD 190073 (V1295 Aq1)



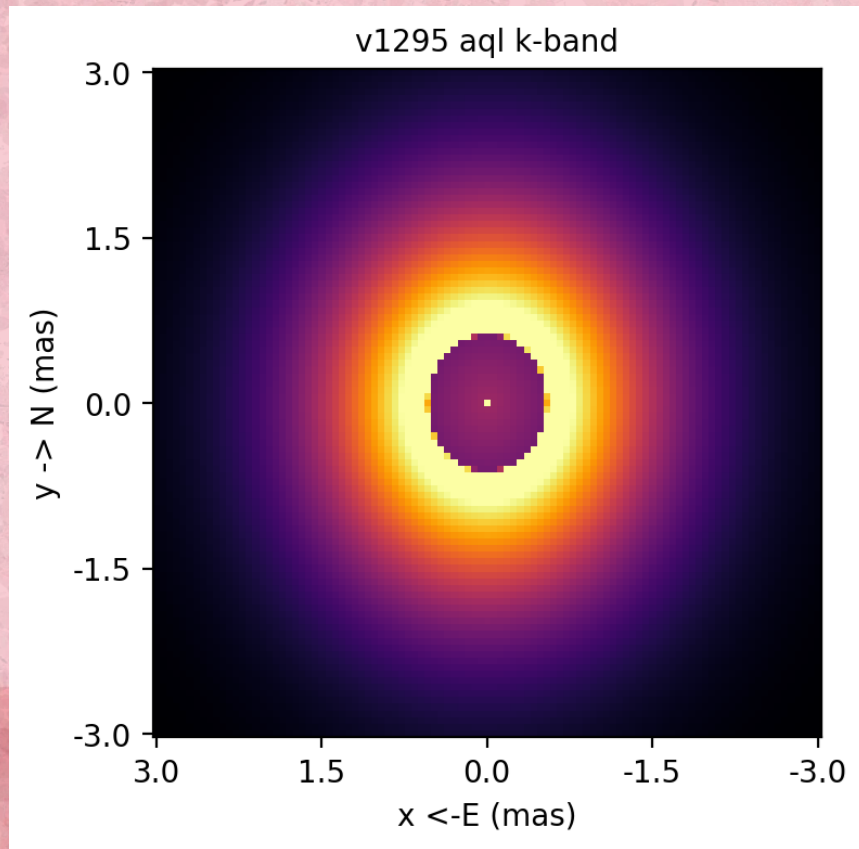
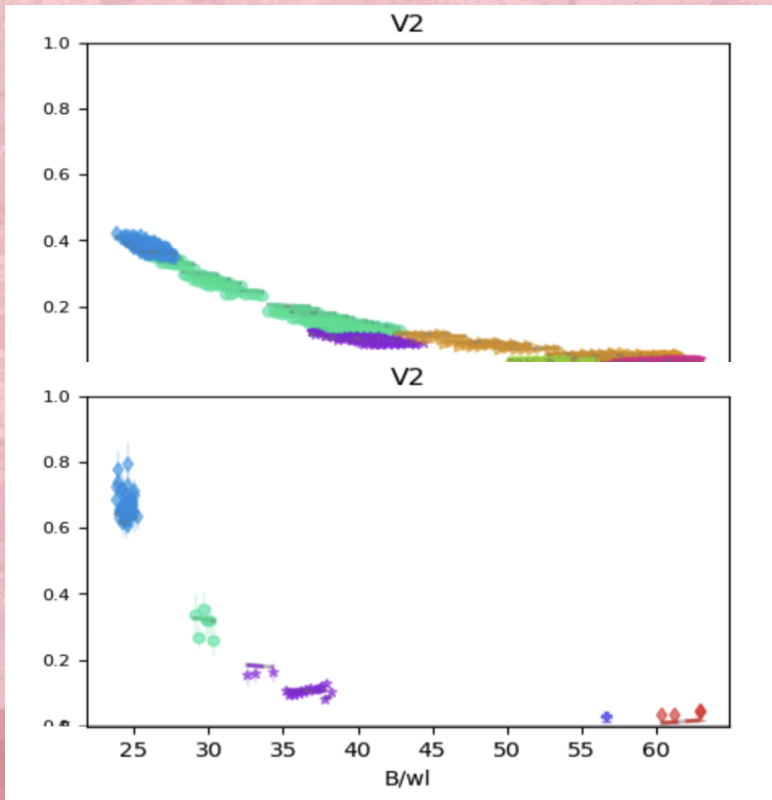
Expect a rotation of 63°

Measure a rotation of 27°

V1295 Aq1 in K-band



V1295 Aql in K-band

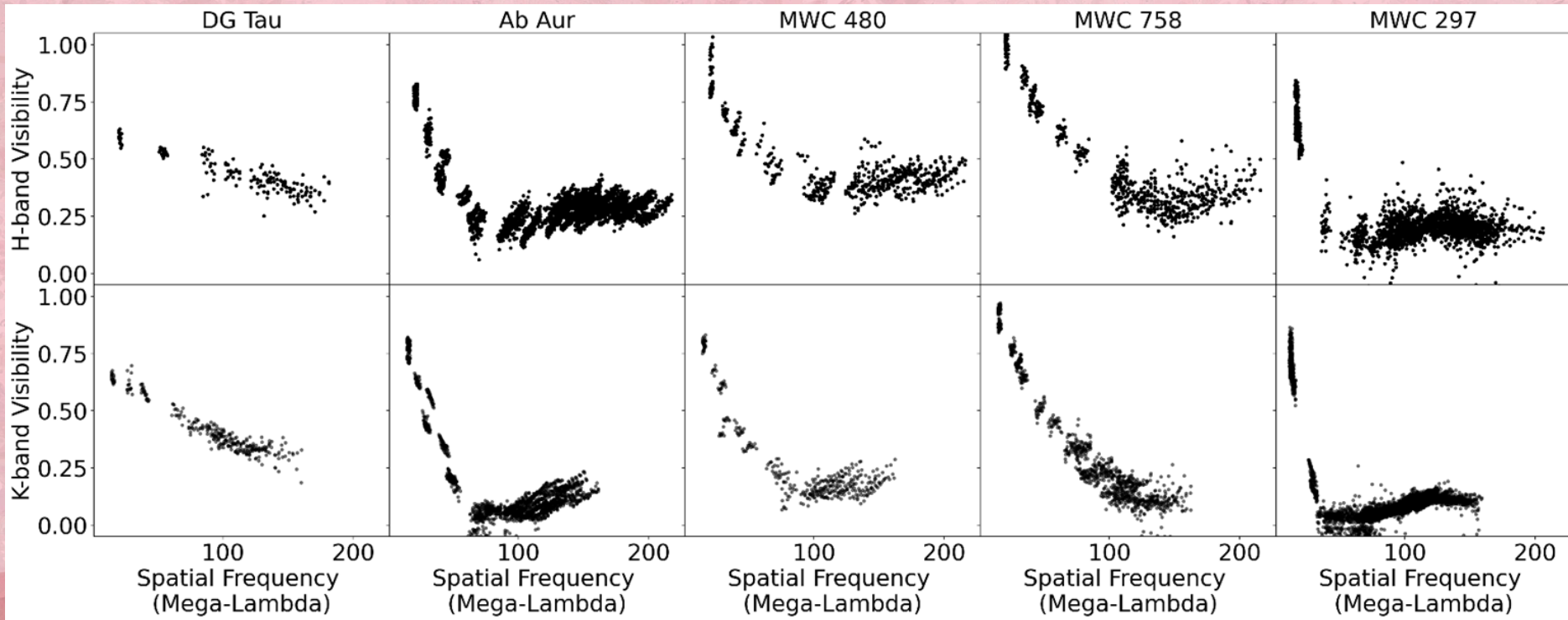


H+K band Herbig Survey

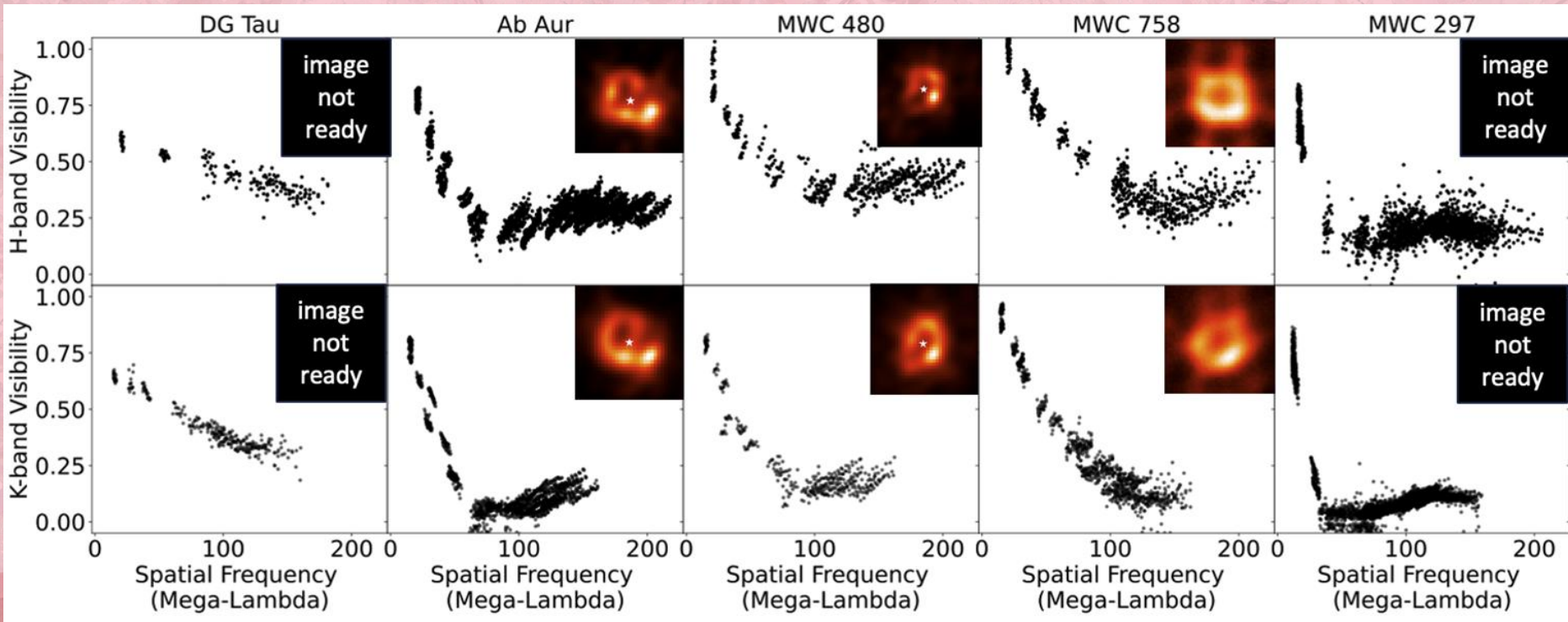
| ID | V | H | K | Spectral Type |
|-----------|-------|------|------|----------------|
| MWC 297 | 12.31 | 4.39 | 3.04 | B1.5Ve |
| Z CMa | 8.80 | 5.22 | 3.61 | B5/8eq+F5/7 |
| HD 50138 | 6.67 | 5.09 | 4.15 | A1Ib/II |
| AB Aur | 7.05 | 5.06 | 4.23 | A0Ve |
| HD 200775 | 7.43 | 5.47 | 4.65 | B2Ve |
| HD 163296 | 6.85 | 5.53 | 4.78 | A1Vep |
| MWC 1080 | 11.85 | 5.98 | 4.83 | B0eq |
| HD 31648 | 7.62 | 6.26 | 5.53 | A5Vep |
| MWC 340 | 10.62 | 6.79 | 5.77 | B2Ve |
| HD 36112 | 8.27 | 6.56 | 5.80 | A8Ve |
| HD 190073 | 7.73 | 6.65 | 5.86 | A2IVe |
| MWC 765 | 10.90 | 6.96 | 5.95 | A1e |
| HD 179218 | 7.39 | 6.65 | 6.00 | A0Ve |
| VV Ser | 11.80 | 7.44 | 6.32 | A5Ve |
| HD 169142 | 8.16 | 6.91 | 6.41 | F1VekA3mA3_IB? |
| HD 250550 | 9.59 | 7.53 | 6.64 | B9e |
| HD 216629 | 9.36 | 7.29 | 7.10 | B3IVe+A3 |



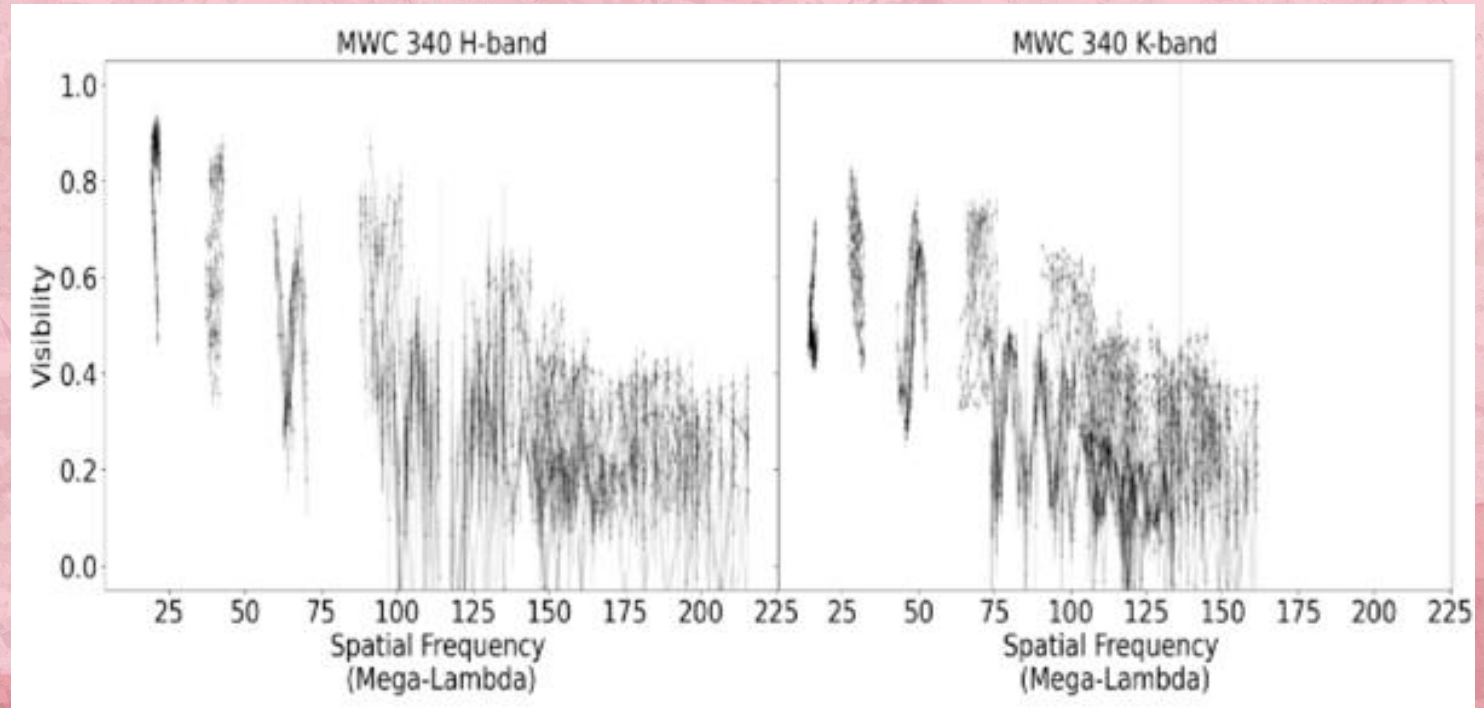
H+K band Herbig Survey



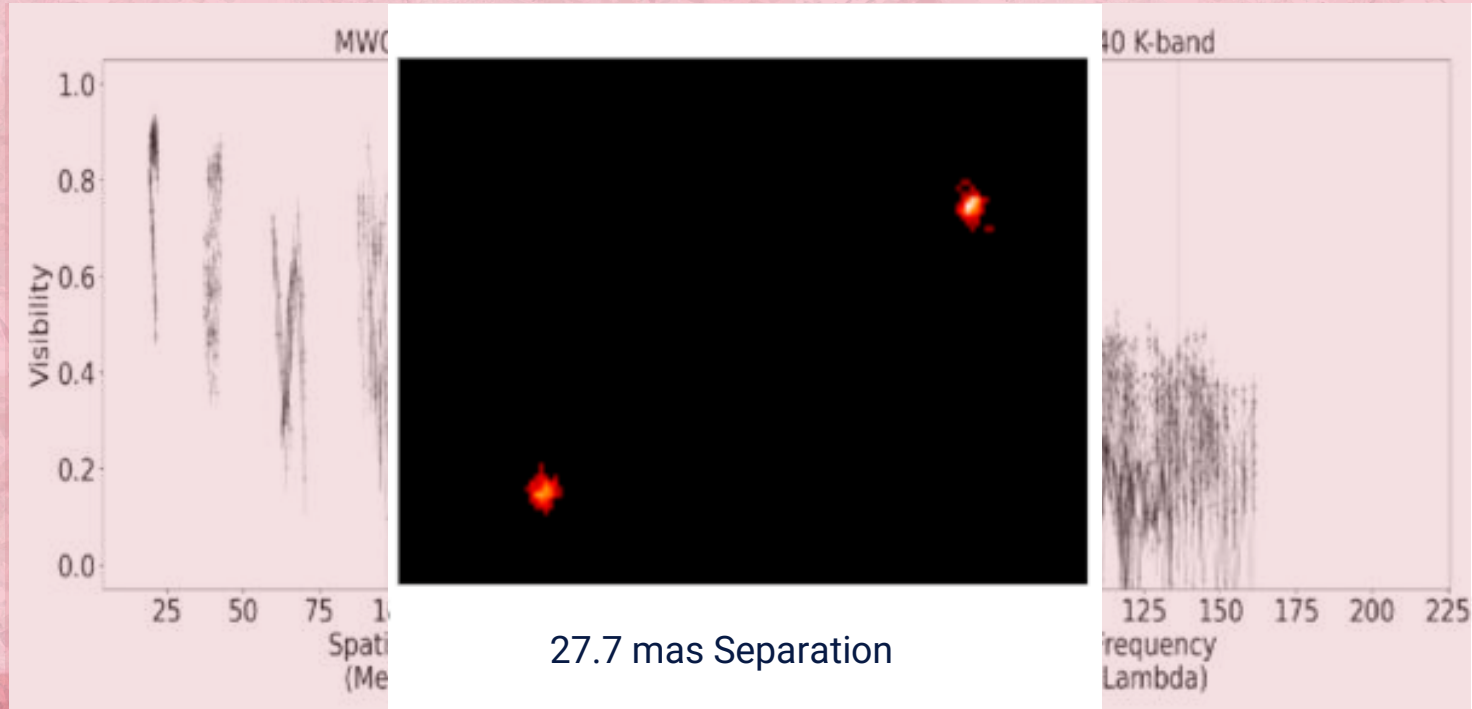
H+K band Herbig Survey



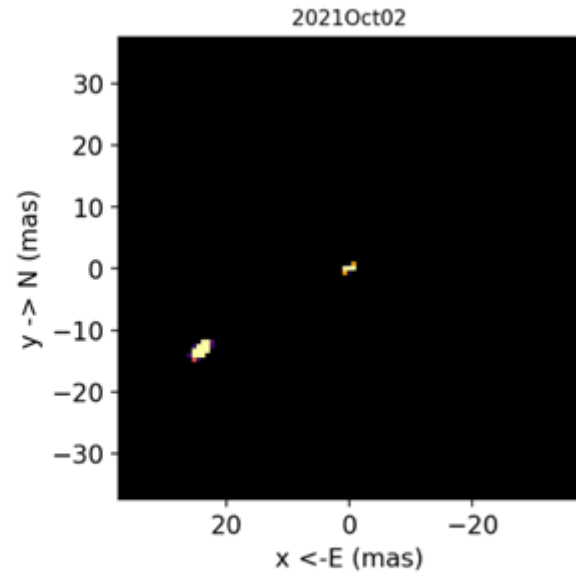
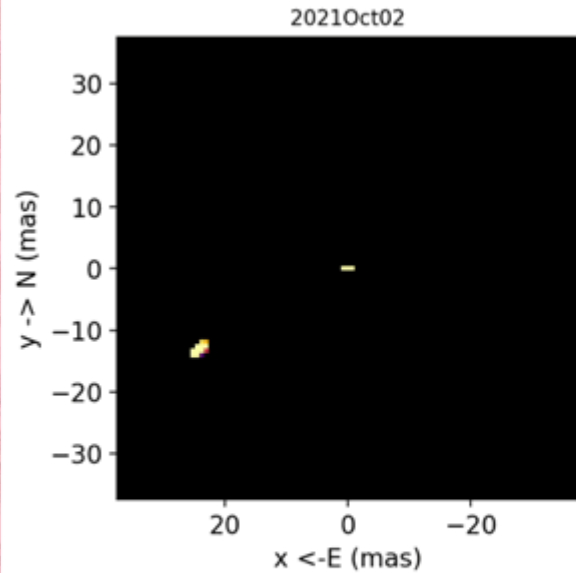
The curious case of MWC340



The curious case of MWC340



The curious case of MWC340



What's next?

Asymmetric multiwavelength modeling and imaging of V1295 Aql through time (+ PIONIER and GRAVITY)

More Herbig snapshot images and models in H+K-band

MWC340– Archival data from Keck and PTI

T Tauri stars!!!!

| Name | K mag | Spectral Type |
|-------------|-------|---------------|
| HD 25457** | 4.18 | F7V |
| RY Tau** | 5.40 | K1IV/Ve |
| HD 98800** | 5.59 | K5V(e) |
| V866 Sco | 5.78 | K0e+K5e |
| SU Aur** | 5.99 | G2IIIne |
| HD 142666 | 6.08 | F0V_sh |
| HD 125340** | 6.13 | G7III |
| HD 283447 | 6.21 | K3Ve |
| LkHA 190 | 6.23 | F7/G3I/Ile |
| TWA 2** | 6.71 | M2Ve |
| DF Tau | 6.73 | M3Ve |
| V2508 Oph** | 6.86 | K6 |
| HD 283572** | 6.87 | G5IVe |
| DR Tau** | 6.87 | K5Ve |
| AS 209** | 6.96 | K4Ve |
| DG Tau | 6.99 | K6Ve |
| RW Aur | 7.02 | K1/5e+K5e |
| LkHA 330 | 7.03 | F7 |
| HD 143006 | 7.05 | G5IVe |
| AS 207** | 7.21 | K5e |
| TWA 8** | 7.43 | M3Ve |

Thanks for listening!

inoura@umich.edu



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