Imaging Young Stellar Objects

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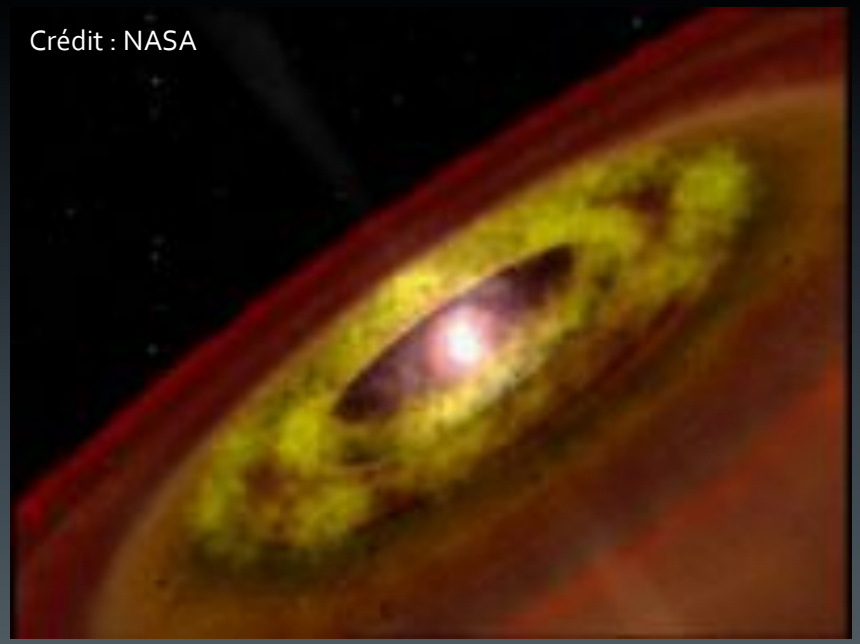
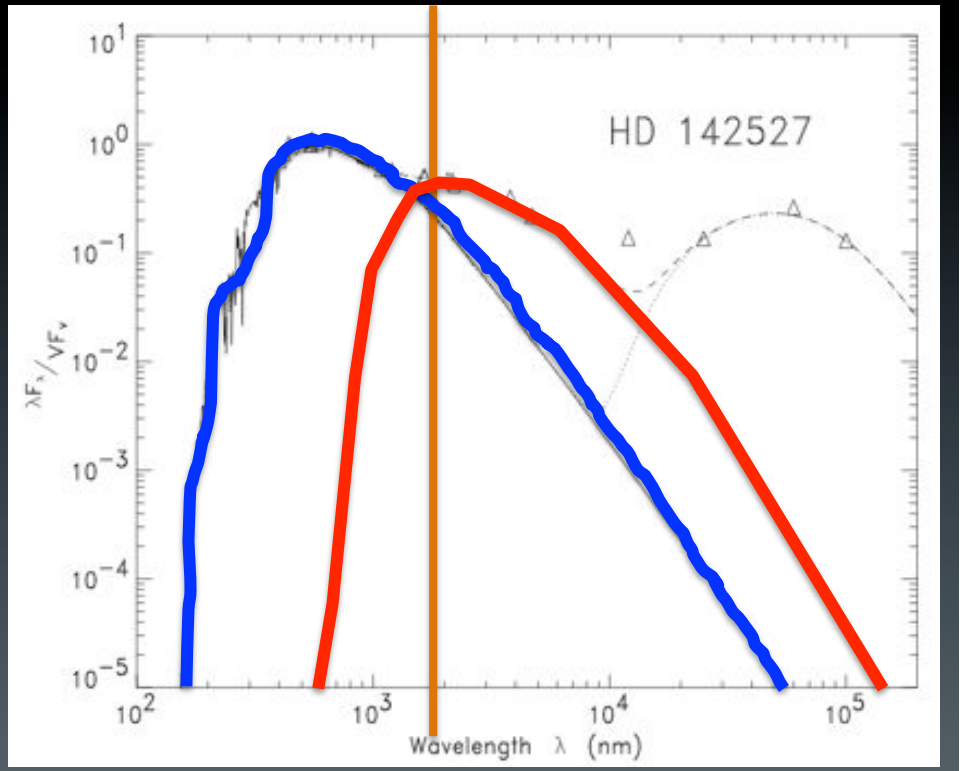
What are we imaging ?

- YSO :
  - Complex environment
  - Model independent
  - $H > 6$
- PIONER :
  - 4 Telescopes / 3 config.
  - Sensitive enough..



What are we imaging ?

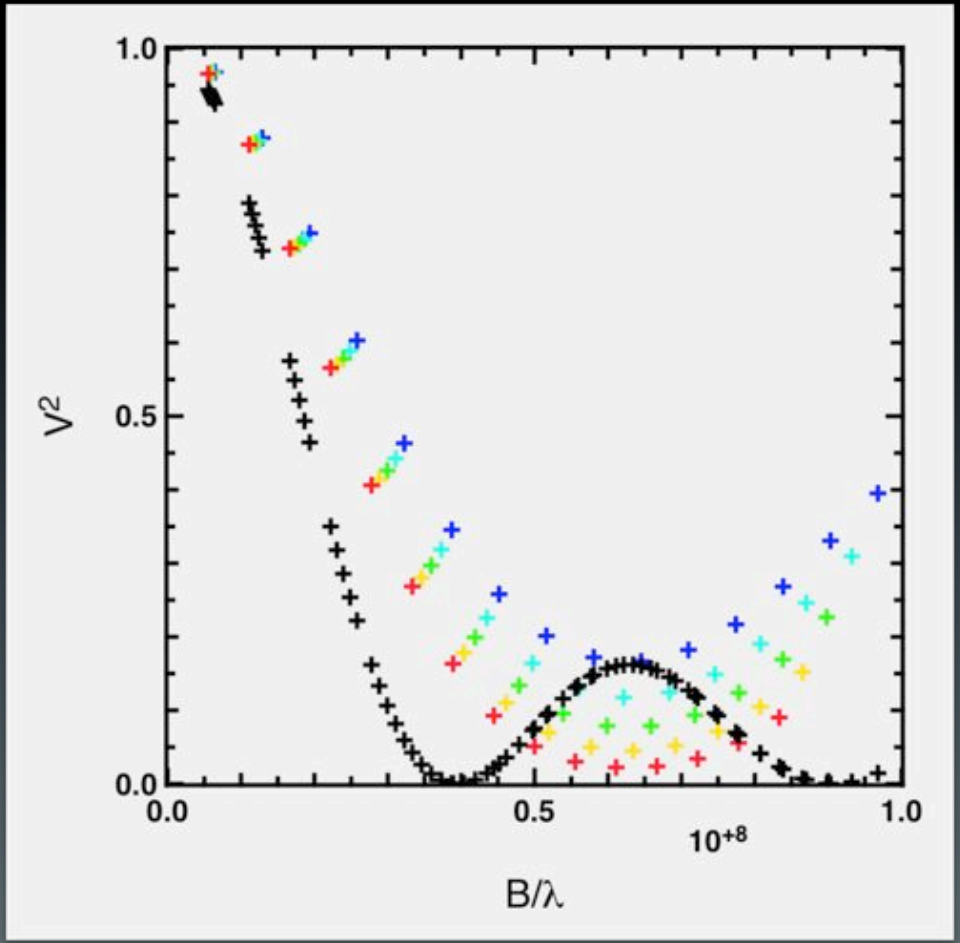
- YSO
- Near infrared
- At least 2 components
  - The star
  - Its environment (~1500K)



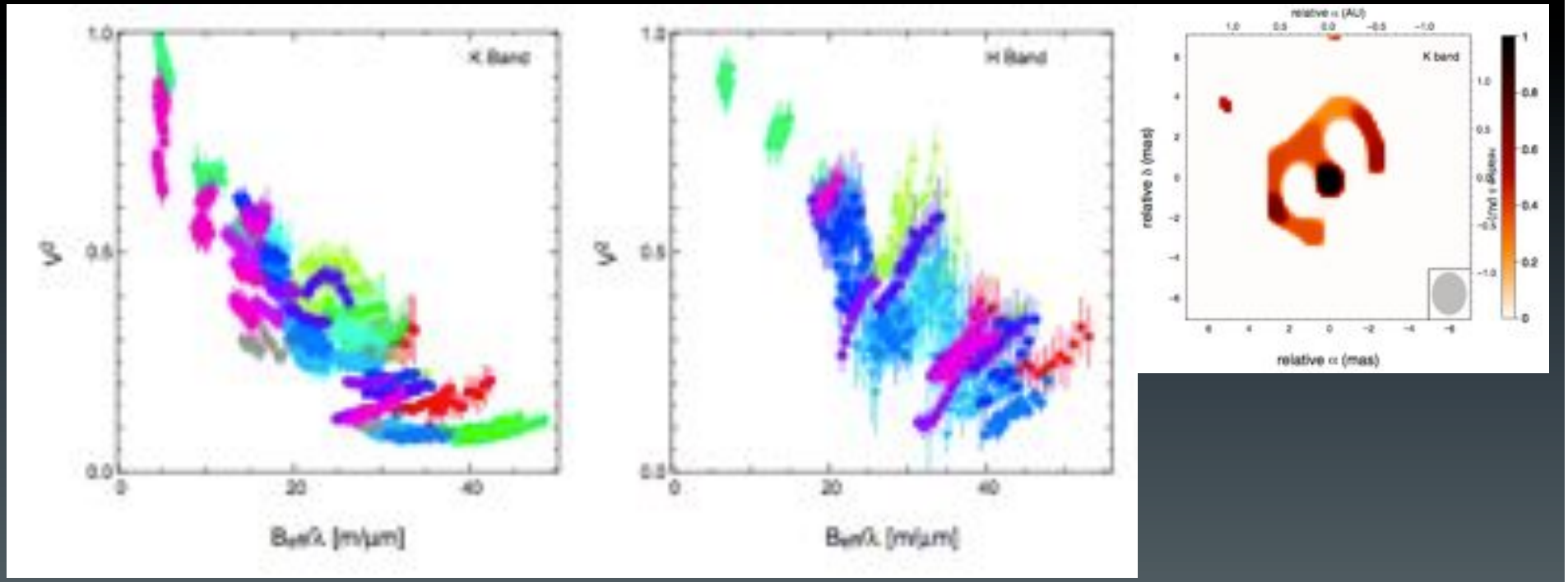
Malfait et al. 1998

Interferogram

- The effect on the interferogram will be :
- Monochromatic approach is not appropriate



Real data HR5999



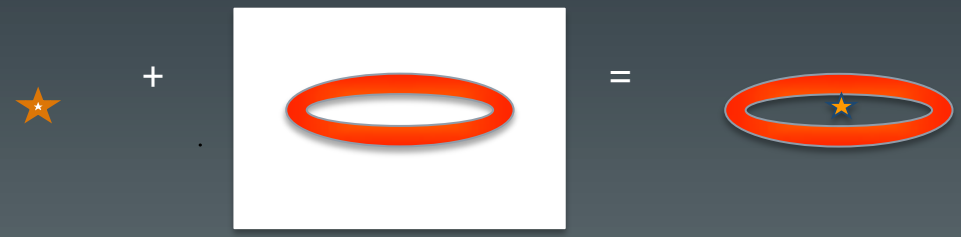
Benisty et al. 2011

Chromatic image reconstruction

- Parametric and image reconstruction part
- Modeling the fluxes

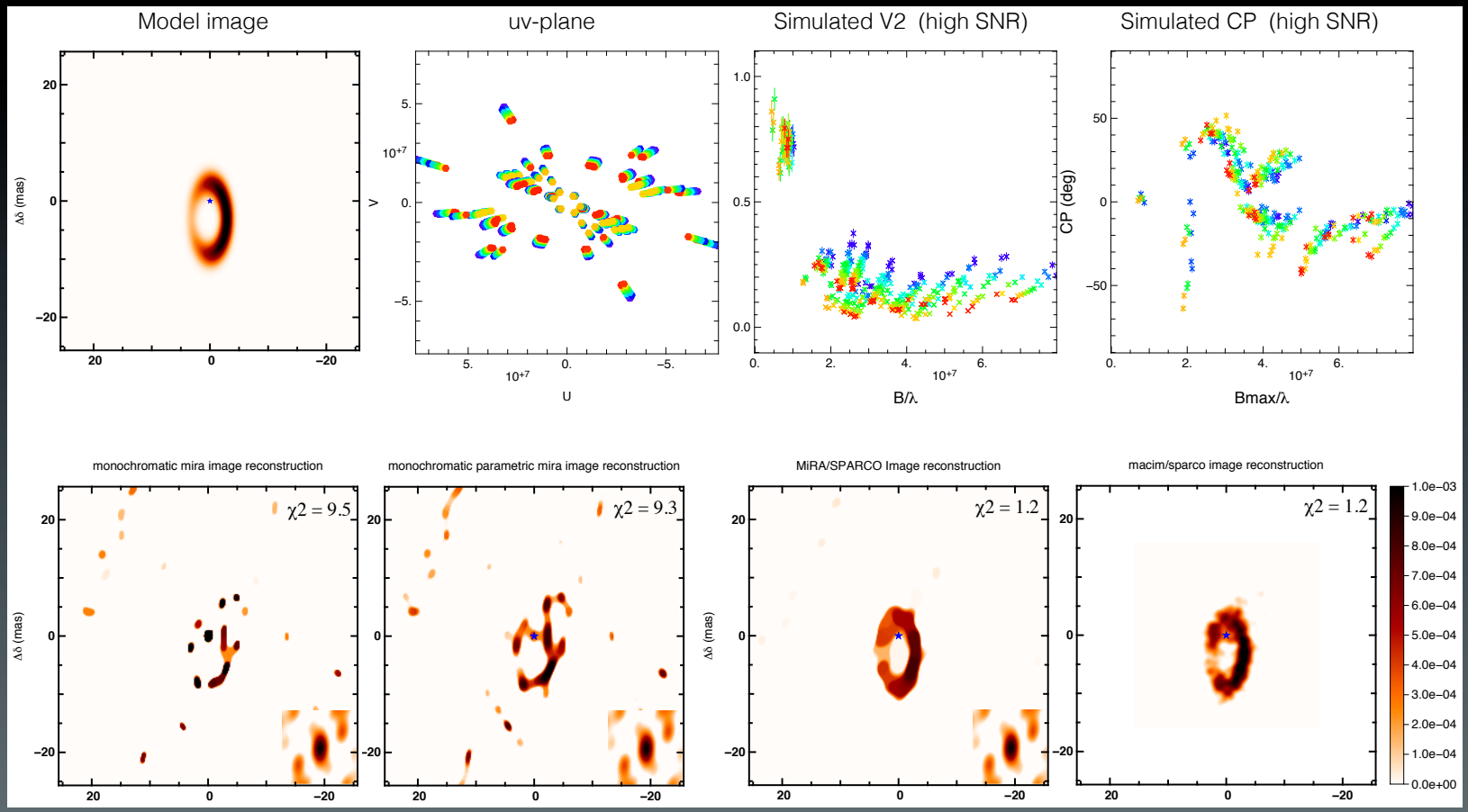
$$f_{\rm tot}(\lambda)\widetilde{V}_{\rm tot}\left(\frac{B}{\lambda},\lambda\right) = f_*(\lambda)\widetilde{V}_*\left(\frac{B}{\lambda}\right) + f_{\rm env}(\lambda)\widetilde{V}_{\rm env}\left(\frac{B}{\lambda}\right)$$

$$\widetilde{V}_{\rm tot}\left(\frac{B}{\lambda},\lambda\right) = \frac{f_*(\lambda) + f_{\rm env}(\lambda)\widetilde{V}_{\rm env}\left(\frac{B}{\lambda}\right)}{f_*(\lambda) + f_{\rm env}(\lambda)}$$



Stellar model Image YSO

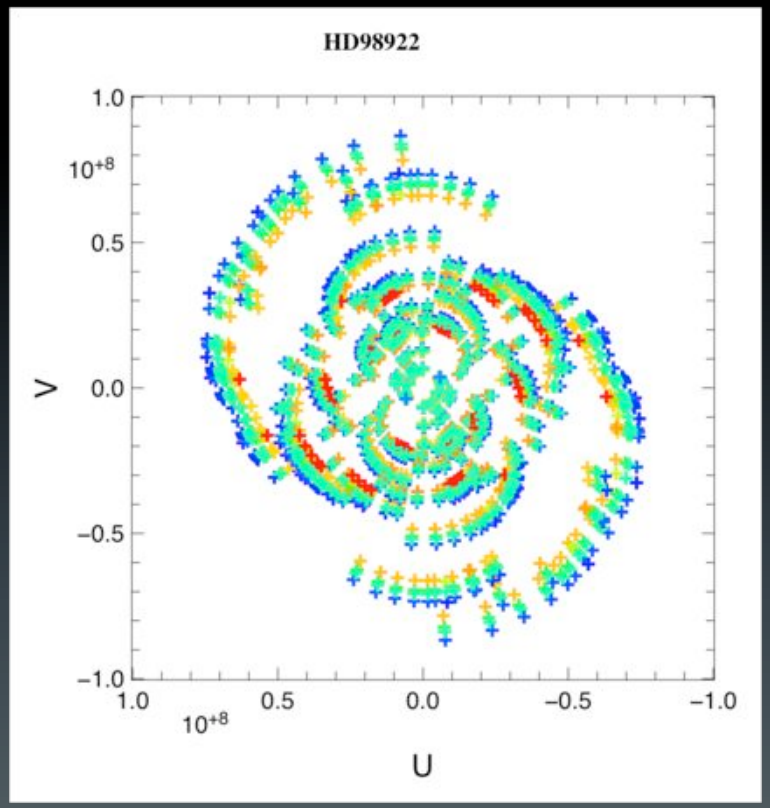
Chromatic image reconstruction



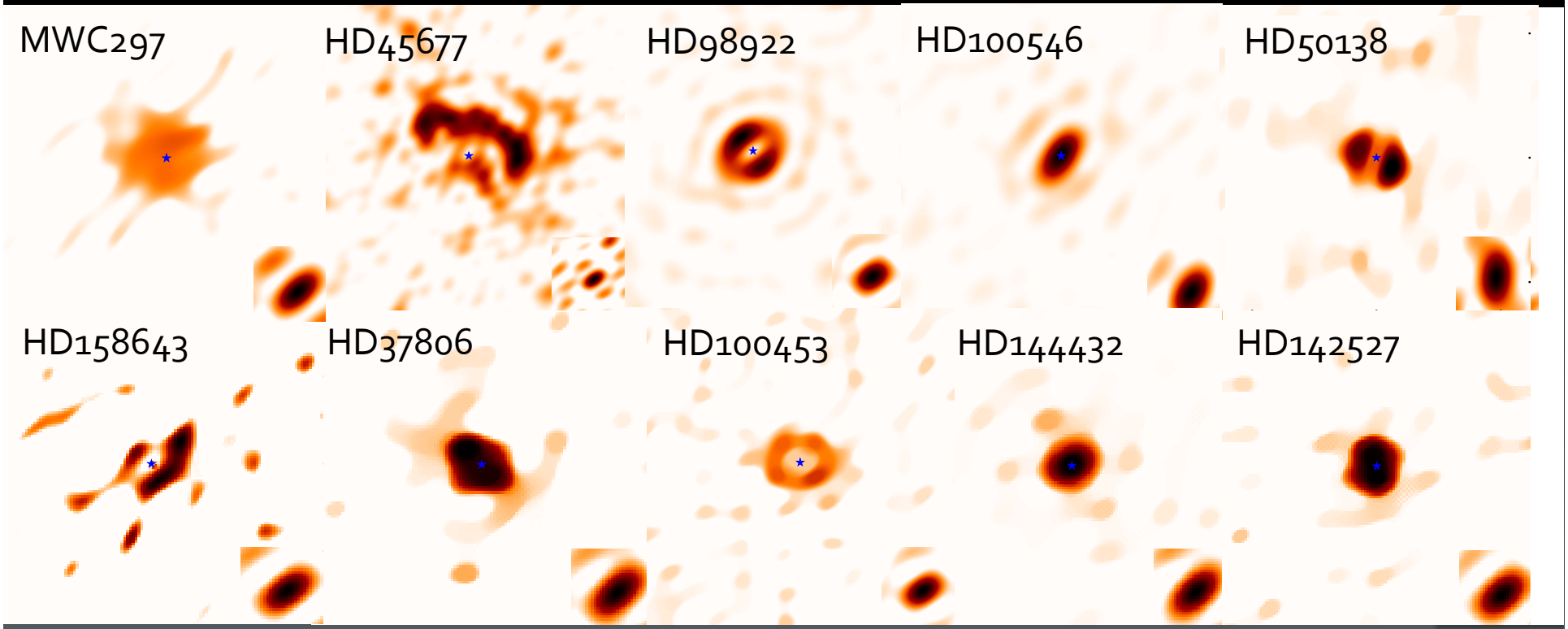
Kluska et al. (subm.)

Images from PIONIER

- PIONIER survey of Herbig Ae/Be stars
- 31 nights of observation
- 55 stars observed
- ~12 imaging targets



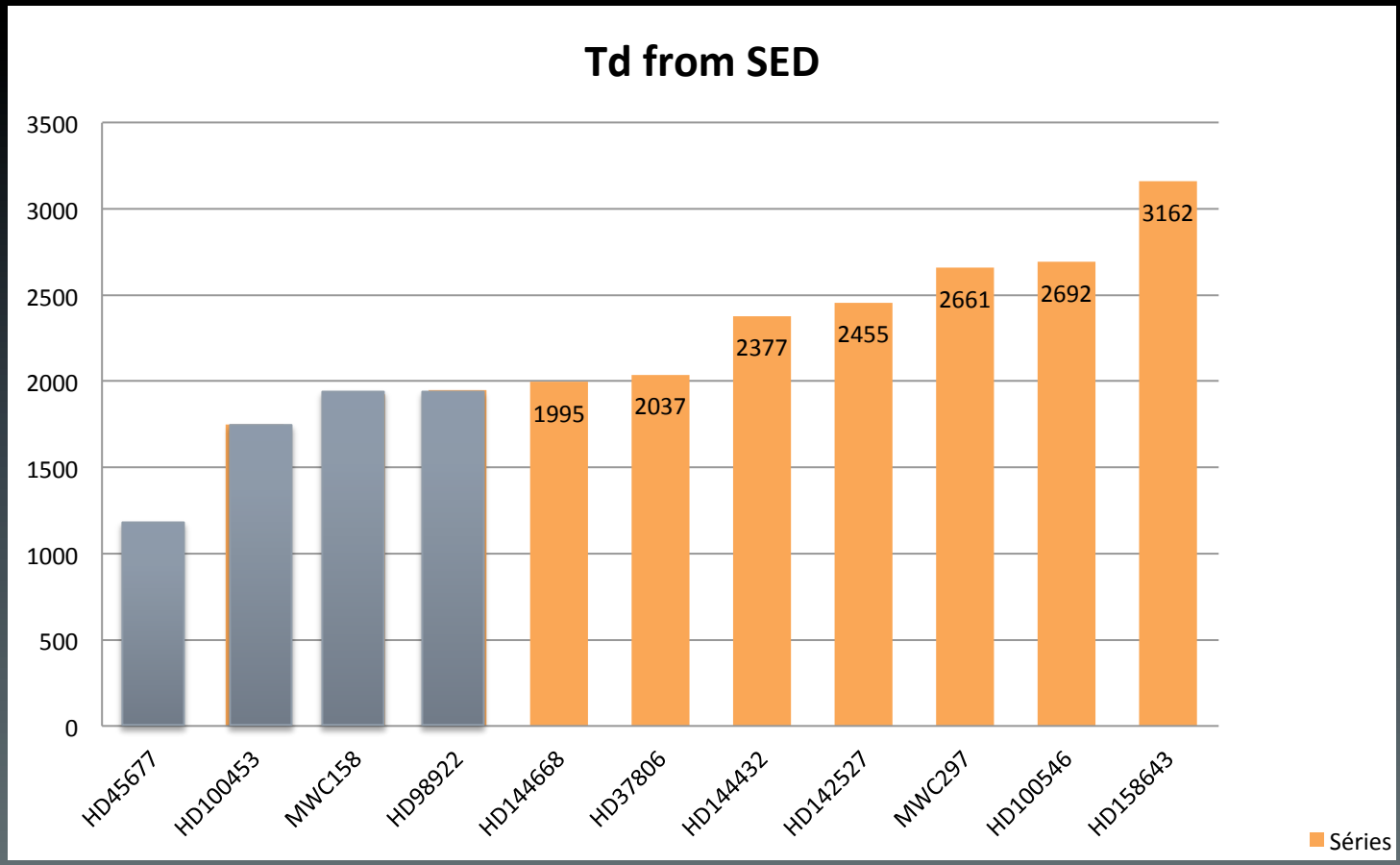
Images from PIONIER



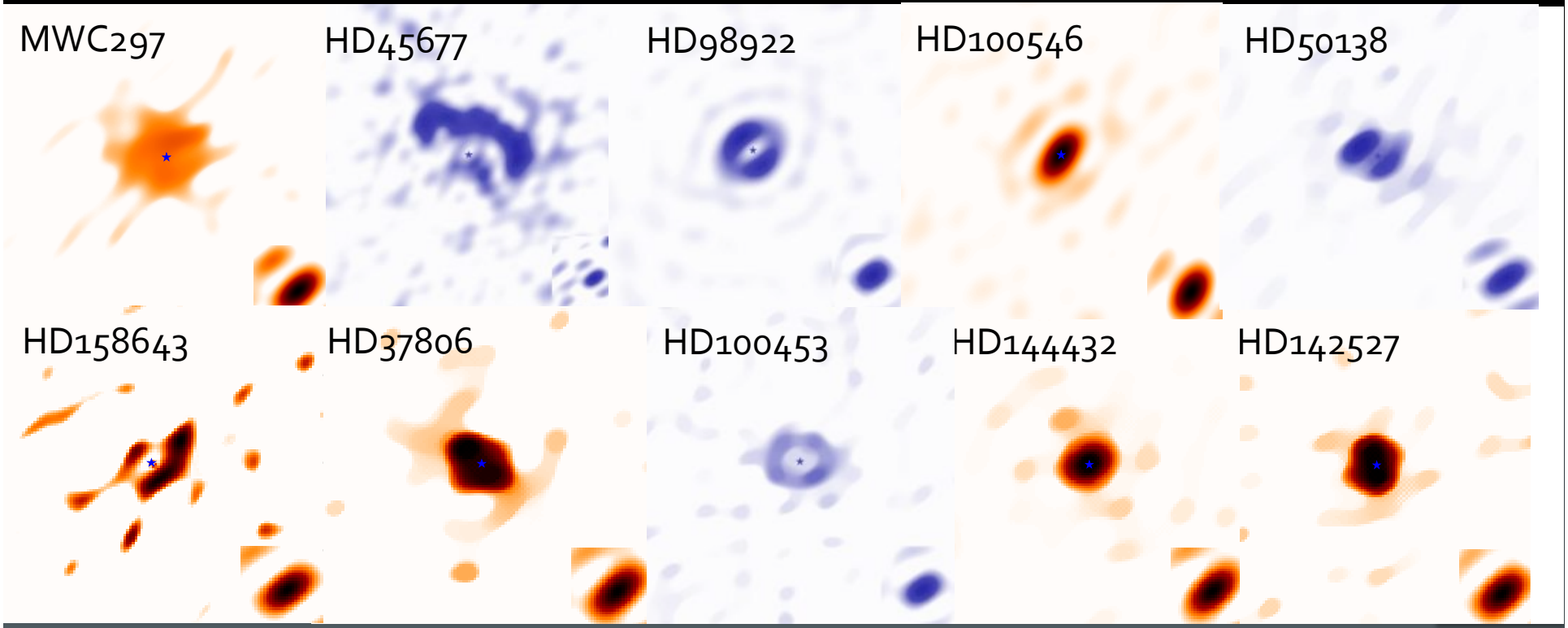
Link with spectral type ? With age ? Distance ?

Herbig Survey

- Only dust seen in H band ?

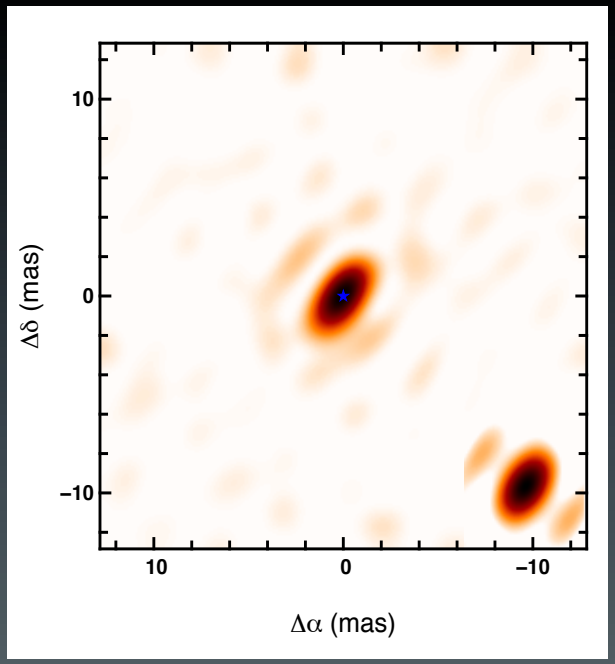


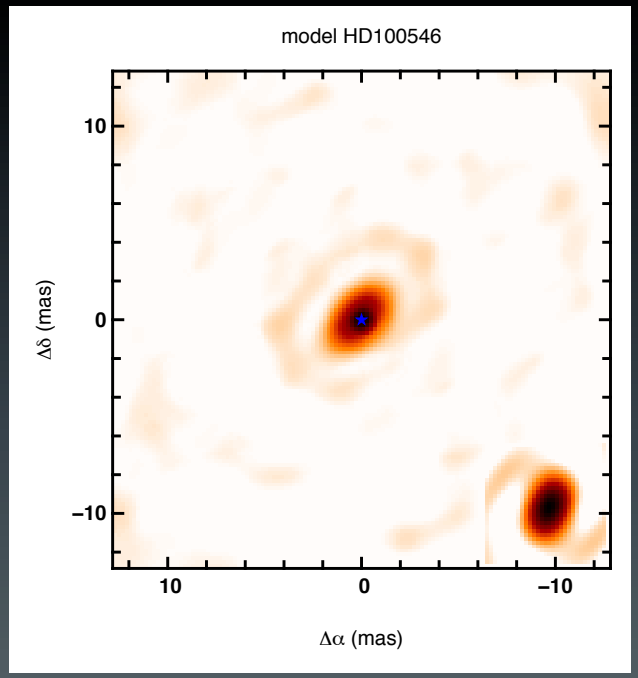
Images from PIONIER



Herbig Survey

- HD100546

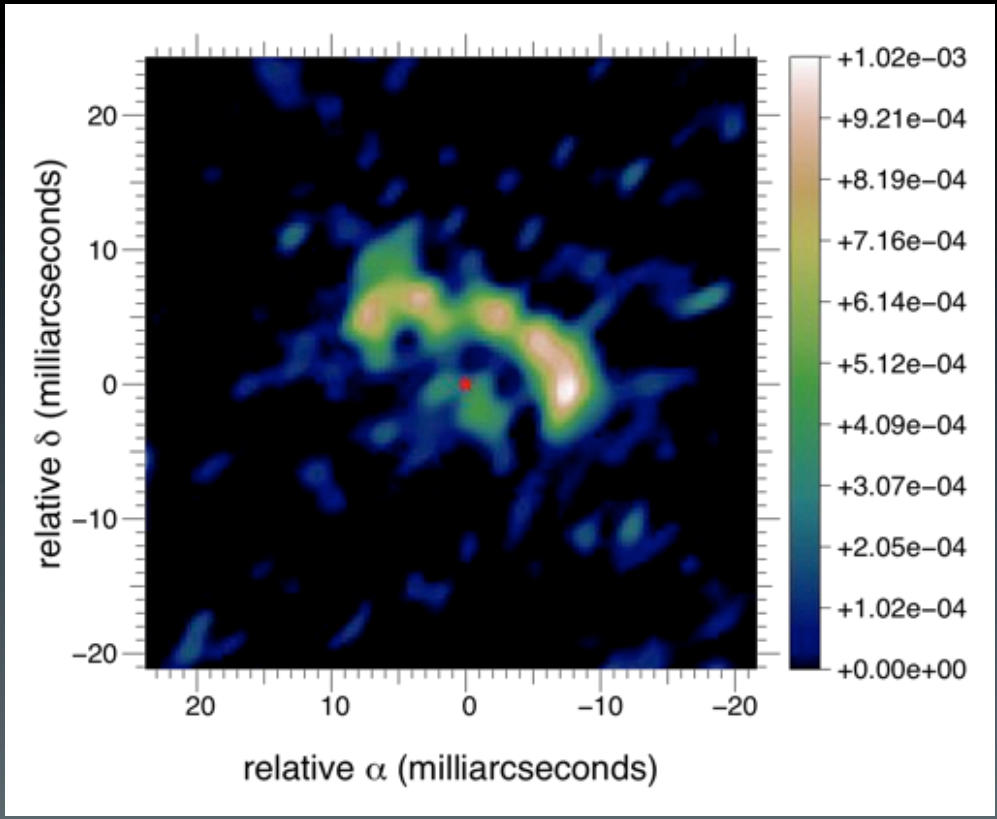


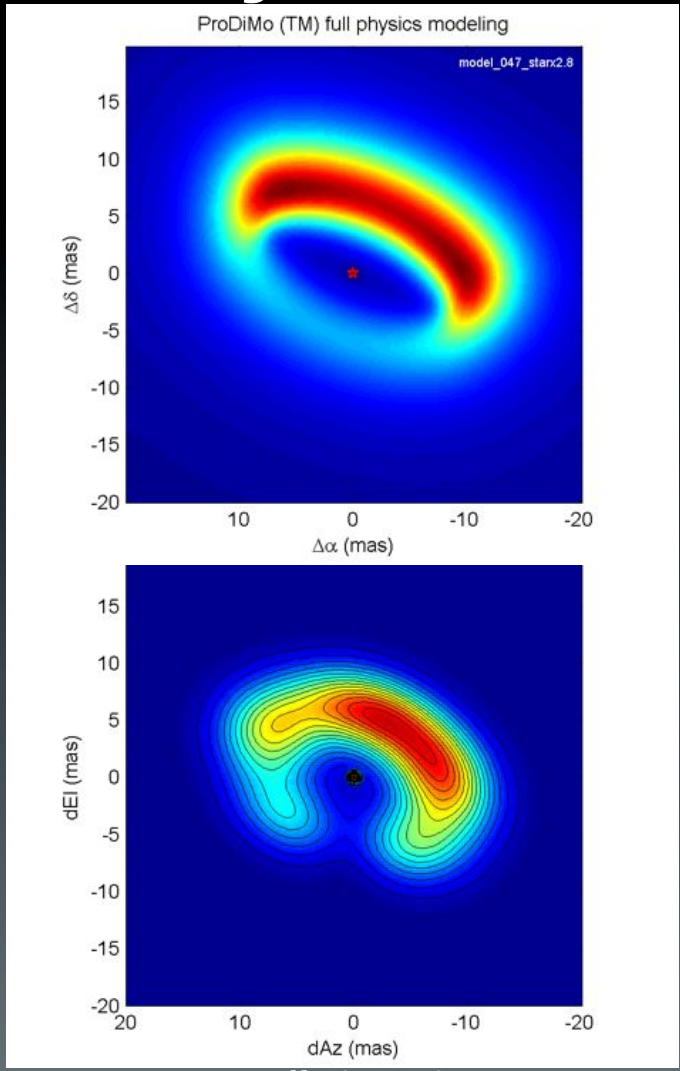


Model of an accretion disk + inner rim

Herbig Survey

- HD45677

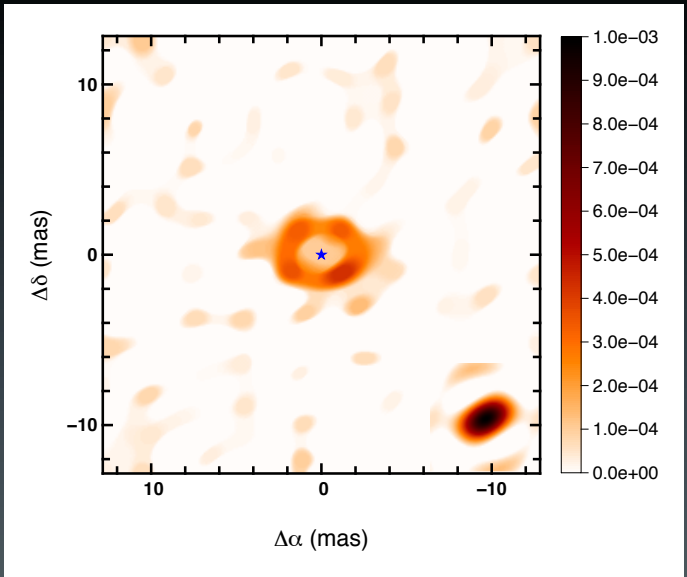


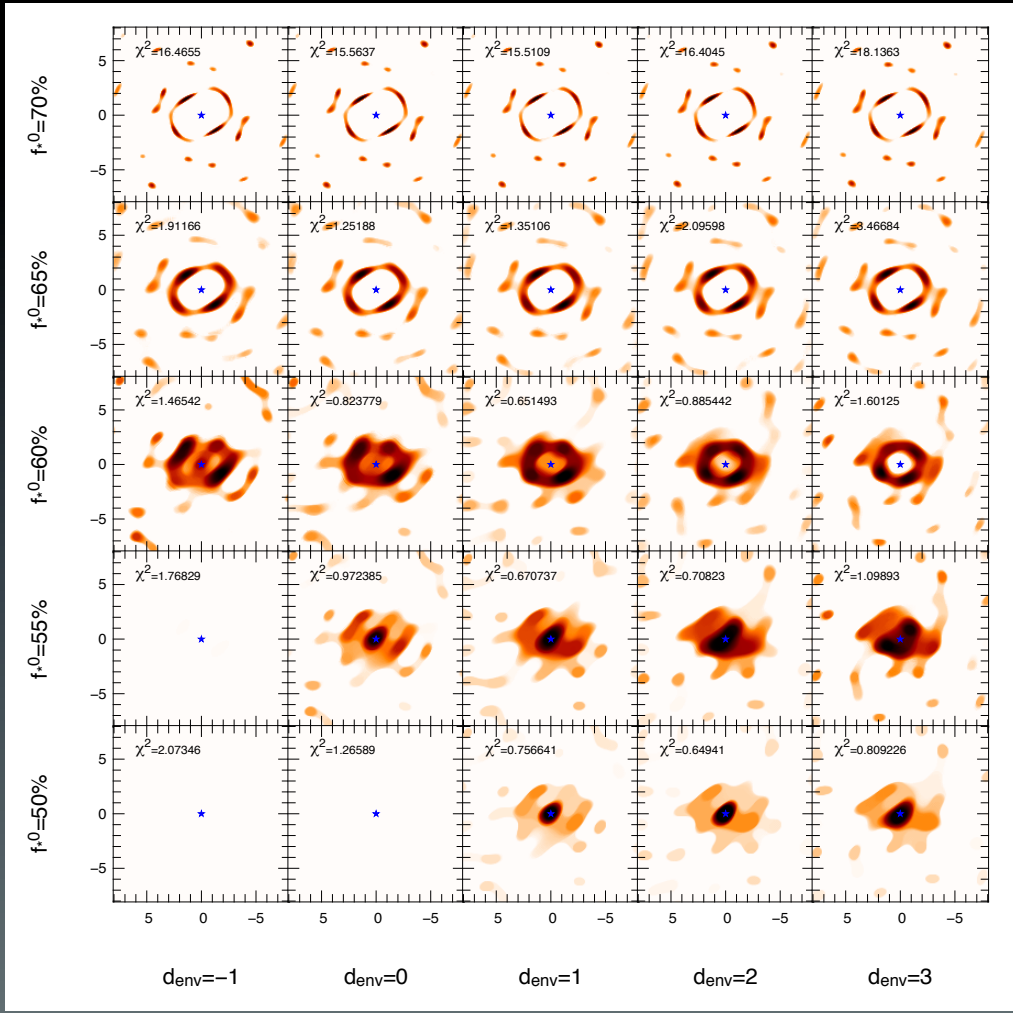


Lazareff, Thi et al. in prep.

Herbig Survey

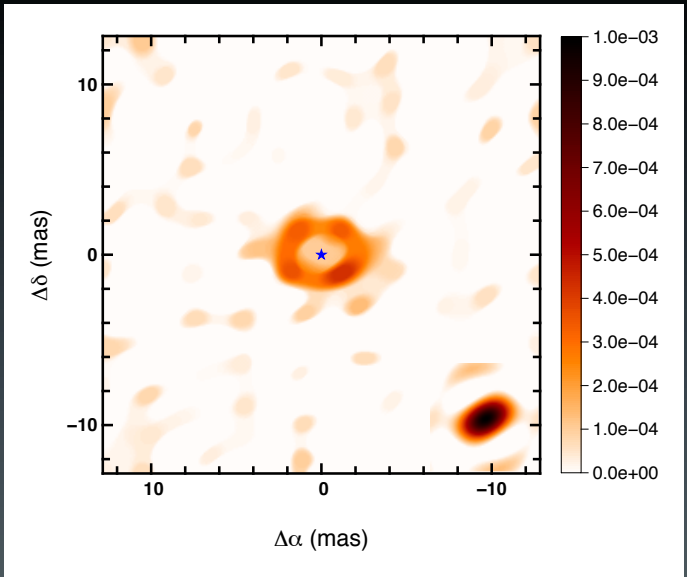
- HD100453

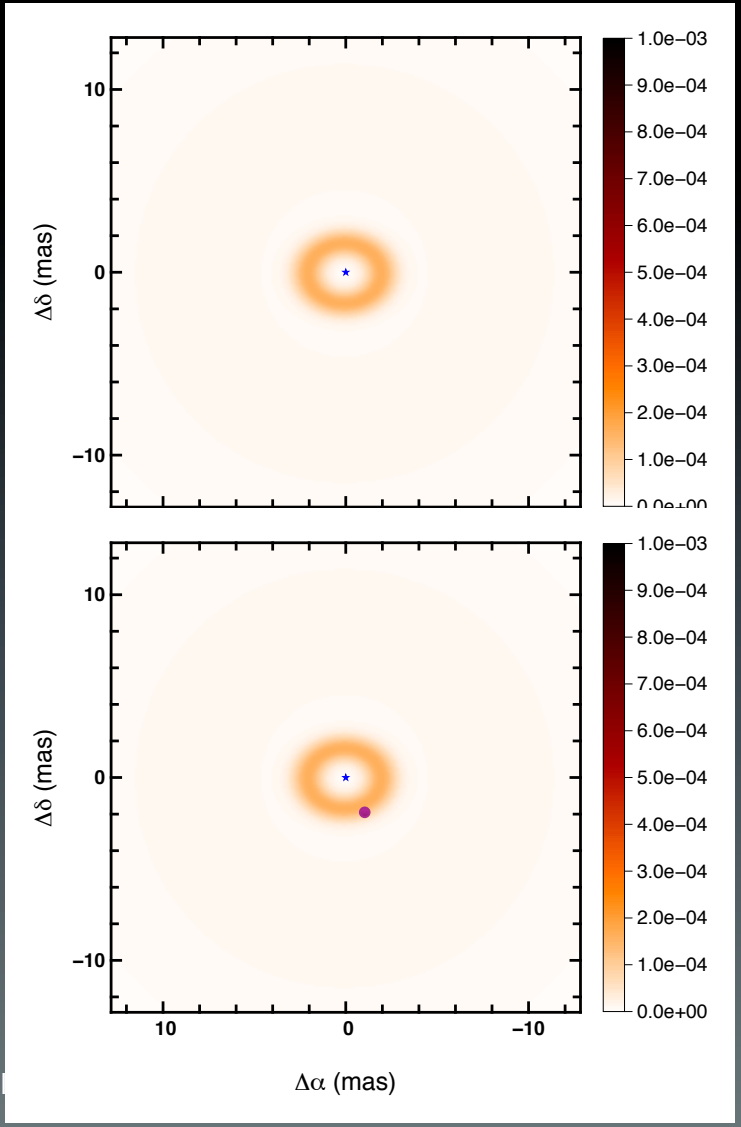




Herbig Survey

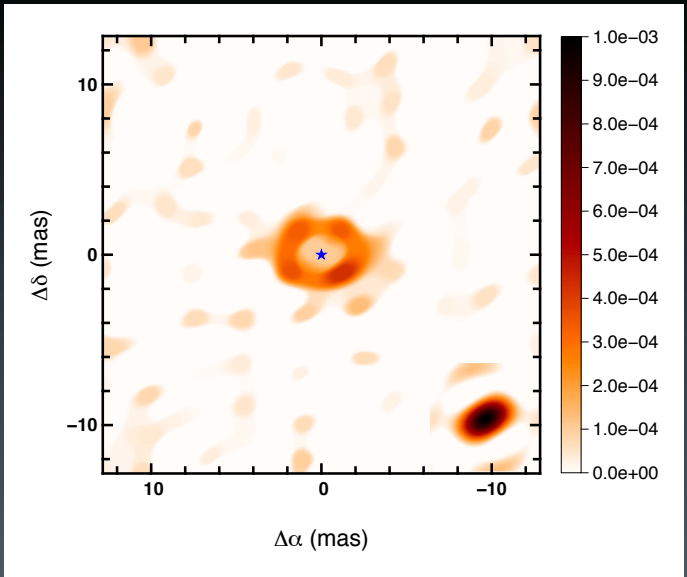
- HD100453

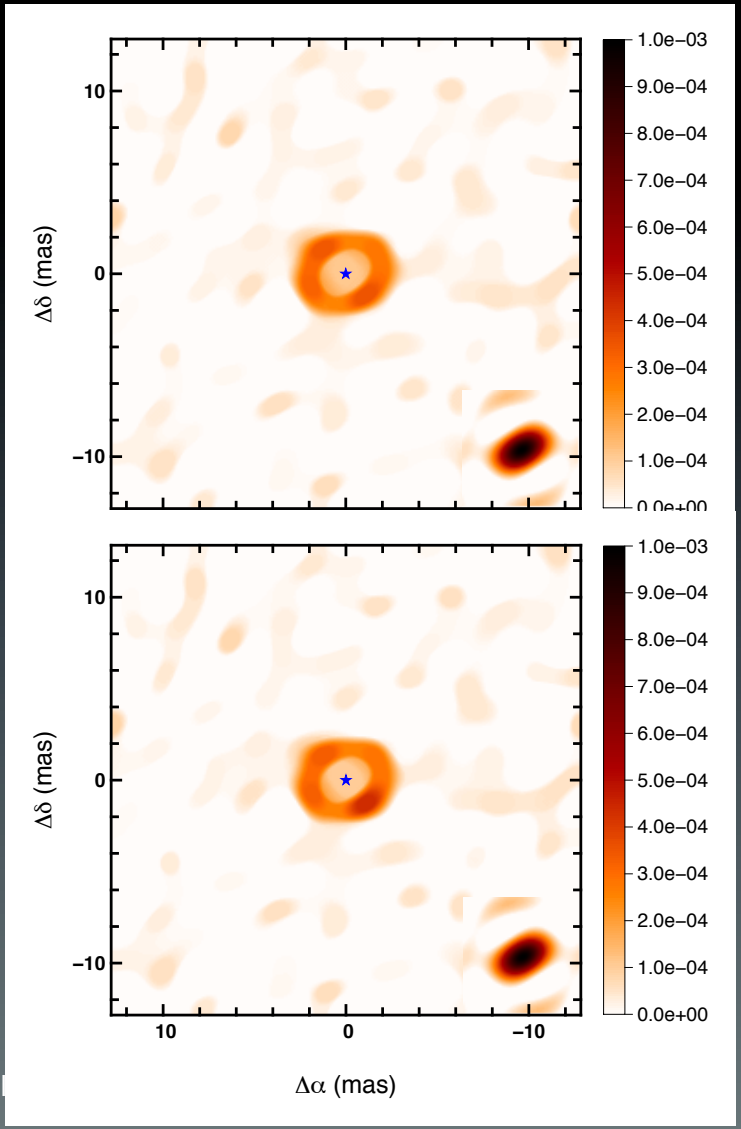




Herbig Survey

- HD100453





To conlude…

- PIONIER
  - Enough sensitivity to explore YSO
  - 4T imaging → 3 x ½ nights over 2 weeks
- Imaging
  - PIONIER inspired new imaging techniques
  - Need to constrain the sellar to total flux ratio
- YSO
  - Optically thick inner accretion disk ?
  - Azimuthal variations in the disk ? Variability ?