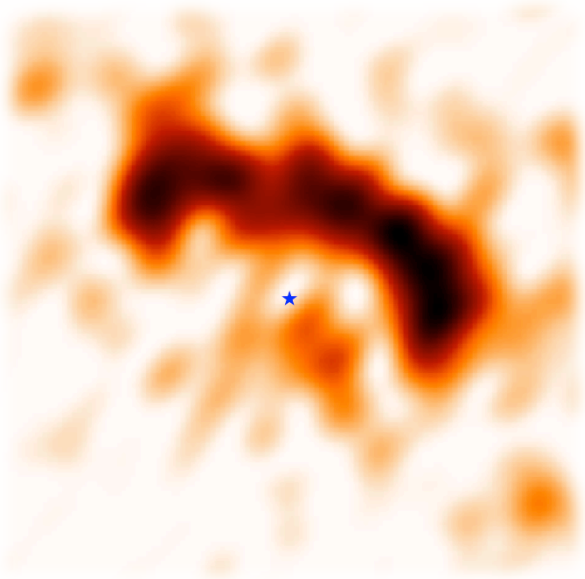
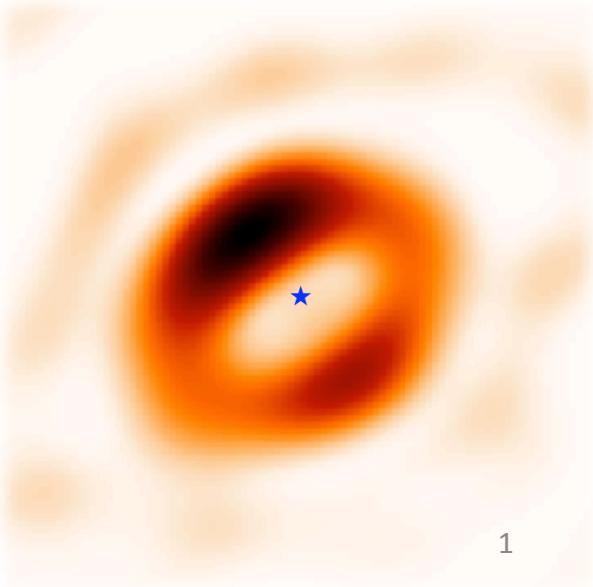
POLCA ANR-10-BLAN-0511

VLTI/PIONIER images of the brightest inner disk rims: Are they all clumpy?

Jacques Kluska



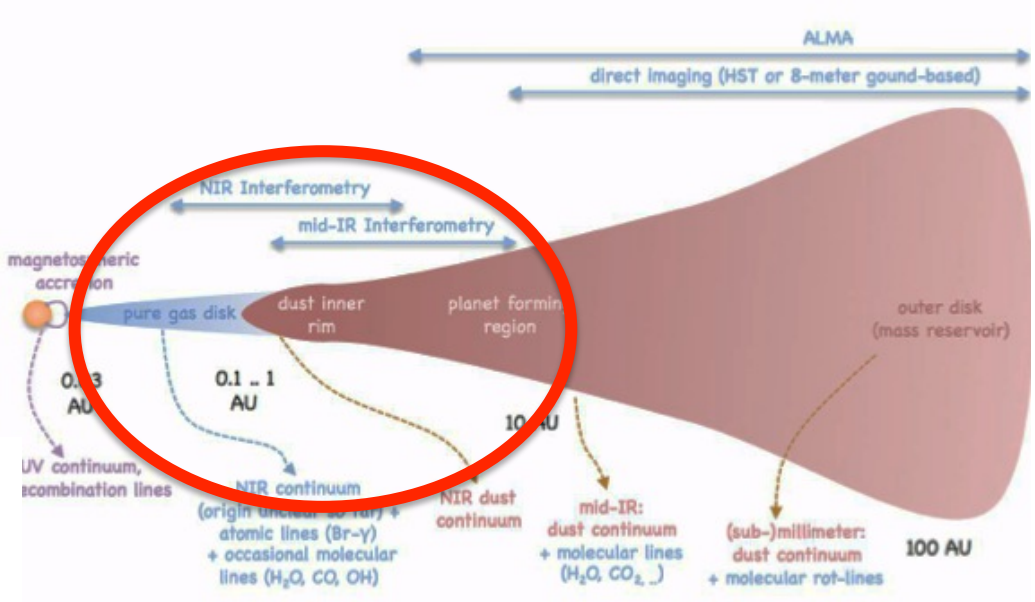


The consortium

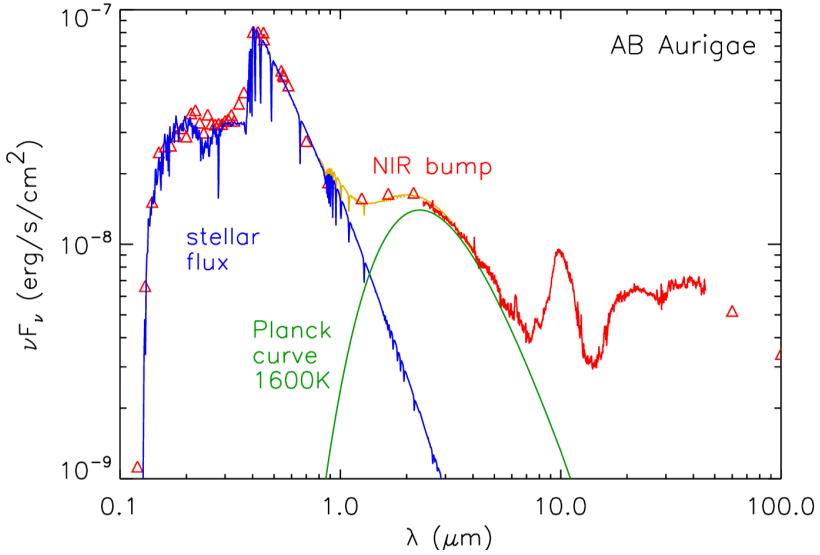
ESO/IPAG: J.-P.Berger
Exeter University: **J. Kluska,** S. Kraus
IPAG: B. Lazareff, M. Benisty, J.-B. Le Bouquin, F. Malbet
MPIE Garching: W.-F. Thi,
UMI-FCA : C. Pinte, F. Ménard
Michigan State University: J. Monnier
Georgia State University : F. Baron
University of Cambridge: A. Juhasz
Caltech: R. Millan-Gabet, A. Isella
CRAL, Lyon : E. Thiébaut
EPFL: F. Soulez
University of Amsterdam: C. Dominik
Universidad Catolica de Chile: R. Lachaume

Inner regions of PP disks: Theory

- Focus on Herbig Ae/Be stars $2M_{\odot}<M_{\star}<8M_{\odot}$
- Near infrared bump

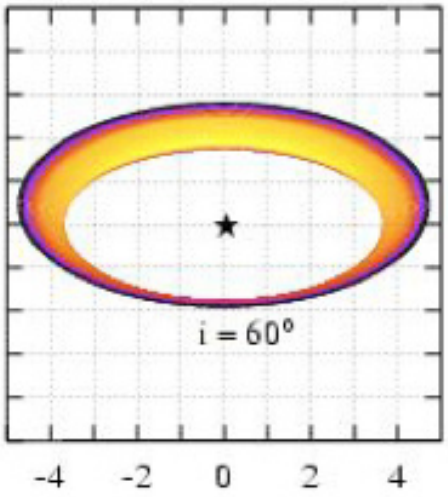


Dullemond & Monnier 2010

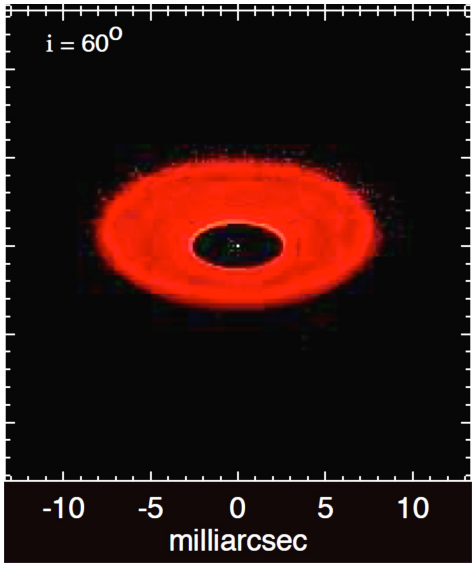


Inner regions of PP disks: Theory

- Focus on Herbig stars
- Near infrared bump
- Several interpretations
  - Puffed-up inner rim *(Dullemond et al. 2001, Isella & Natta 2005)*
  - Halo *(Vinkovic et al. 2002)*
  - Disk wind (*Bans & Königl 2012)*
  - MRI atmosphere *(Turner et al. 2014)*
  - Dust segregation *(Tannirkulam et al 2008, Kama et al. 2009)*
  - …*See also Vinkovic et al. 2014*
- All are axisymmetric



Isella & Natta 2005

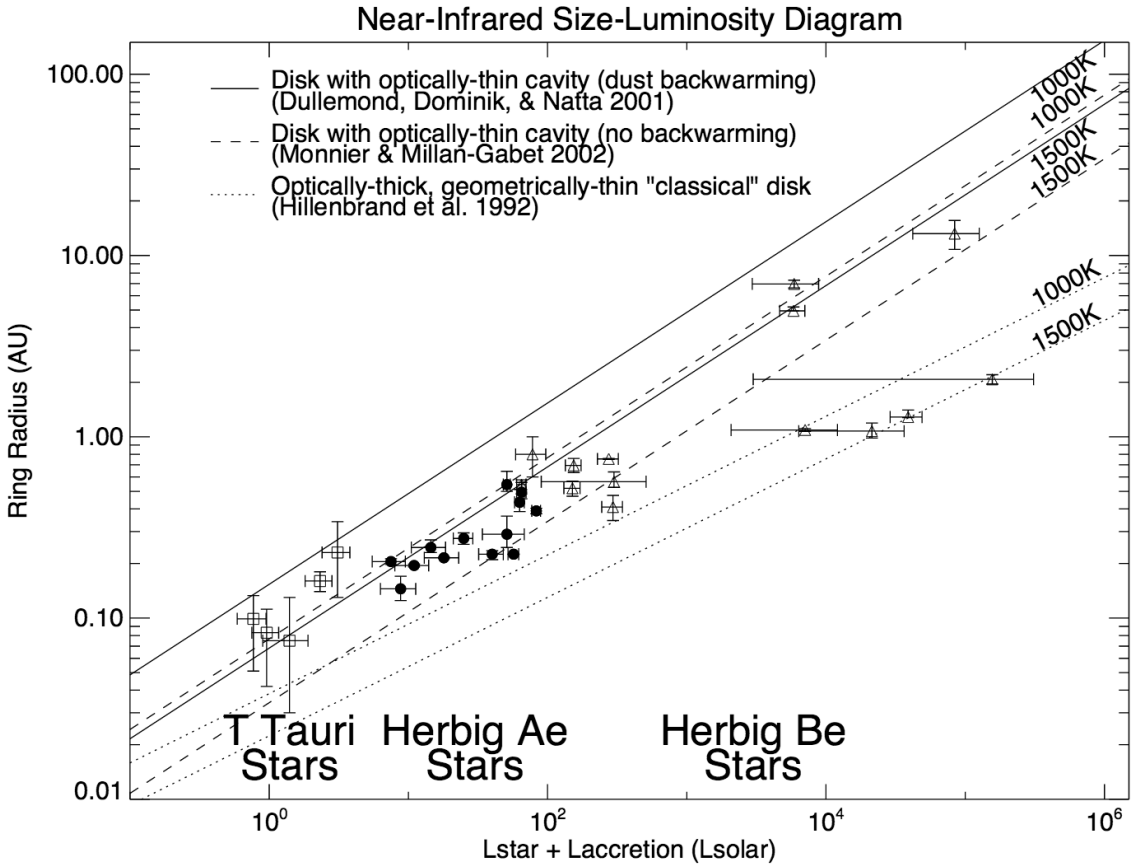


Tannirkulam et al 2008

Inner regions of PP disks: Observations

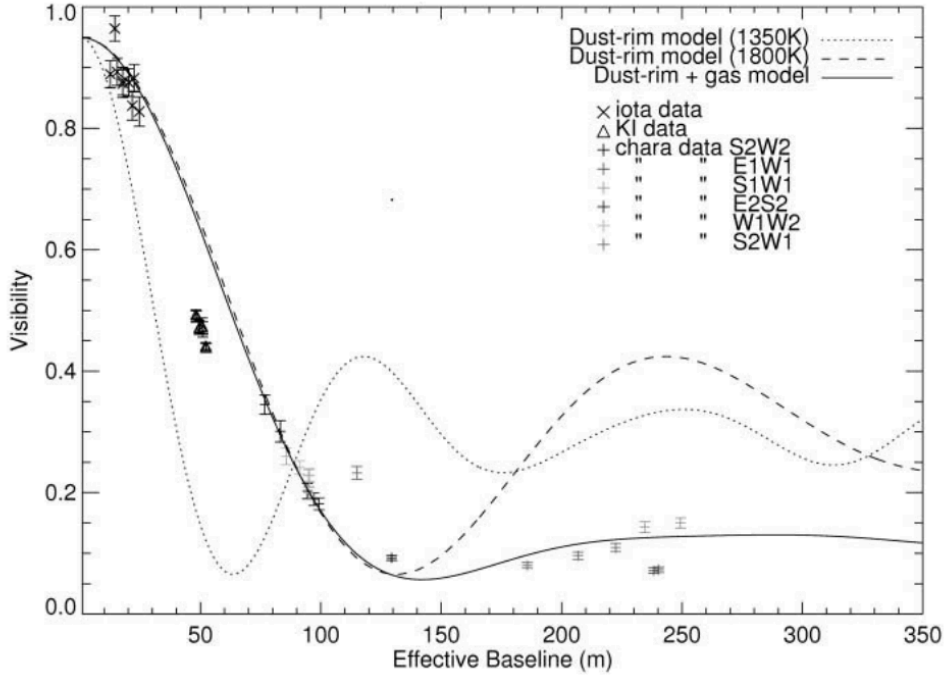
- Size-Luminosity relation

Monnier et al. 2005, Millan-Gabet et al. 2007, Dullemond & Monnier 2011

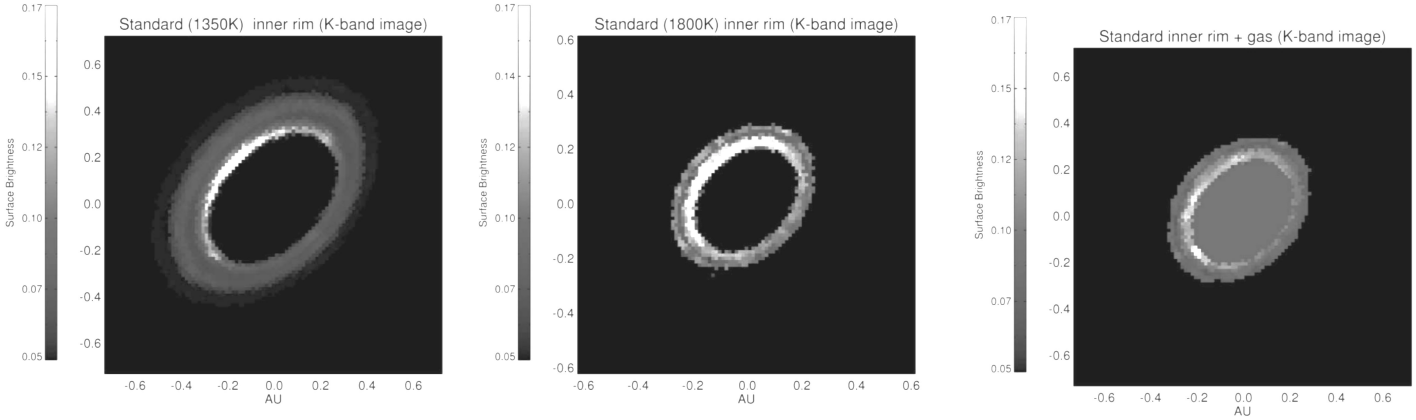


Inner regions of PP disks: Observations

- Size-Lum relation
- Inner disk?

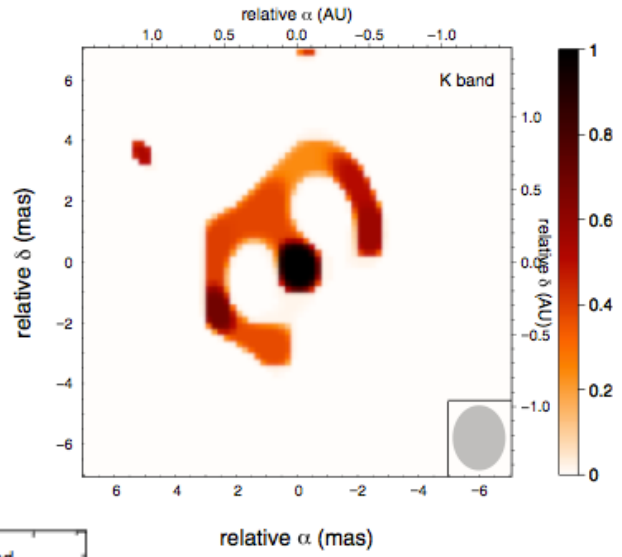


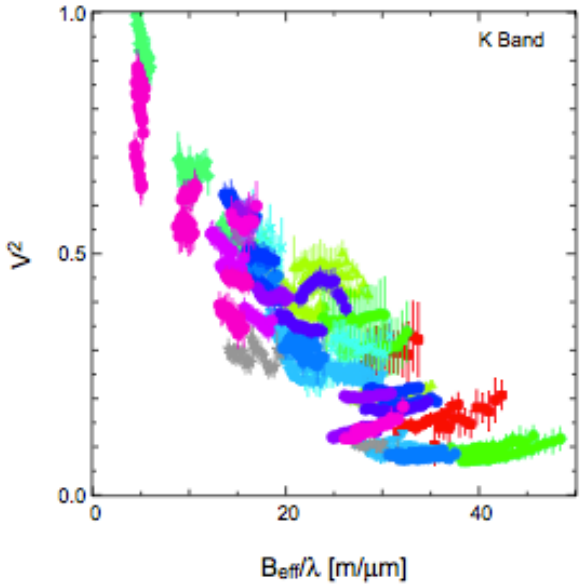
Akeson et al. 2005, Tannirkulam et al. 2008, Kama et al. 2009, Benisty et al. 2010, Vinkovic et al. 2006

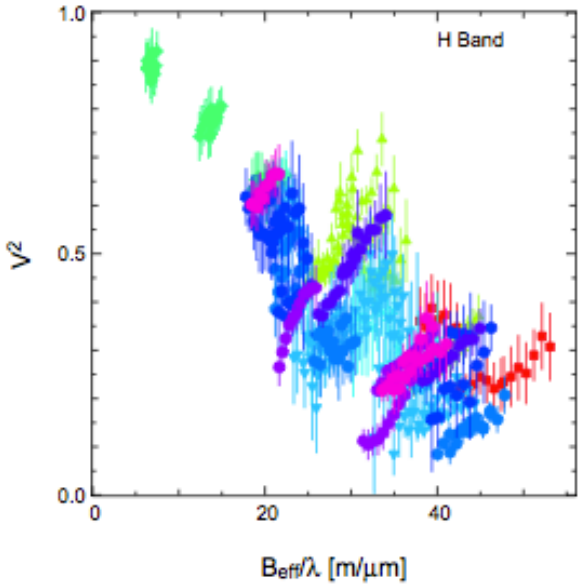


Inner regions of PP disks: Observations

- Size-Lum relation
- Inner disk?
- First images





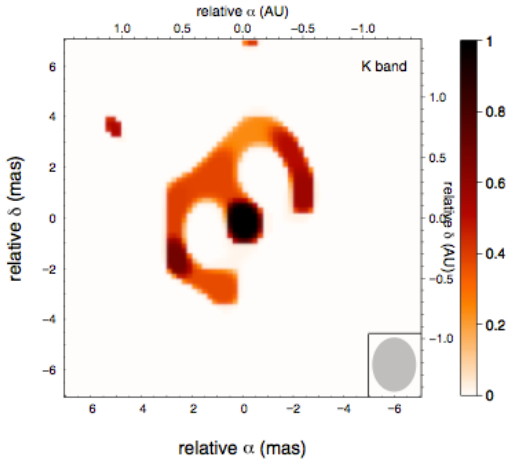


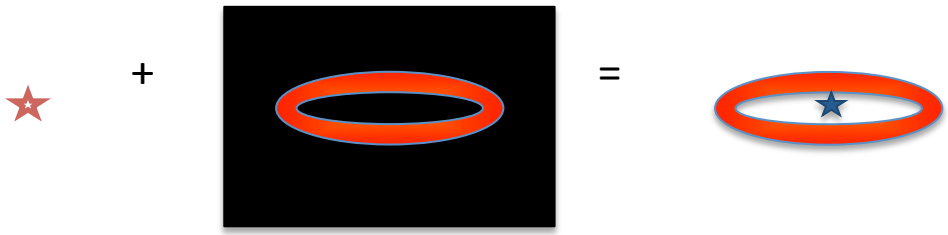
HR5999
Benisty et al. 2011

See also Renard et al. 2010, Kraus et al. 2012

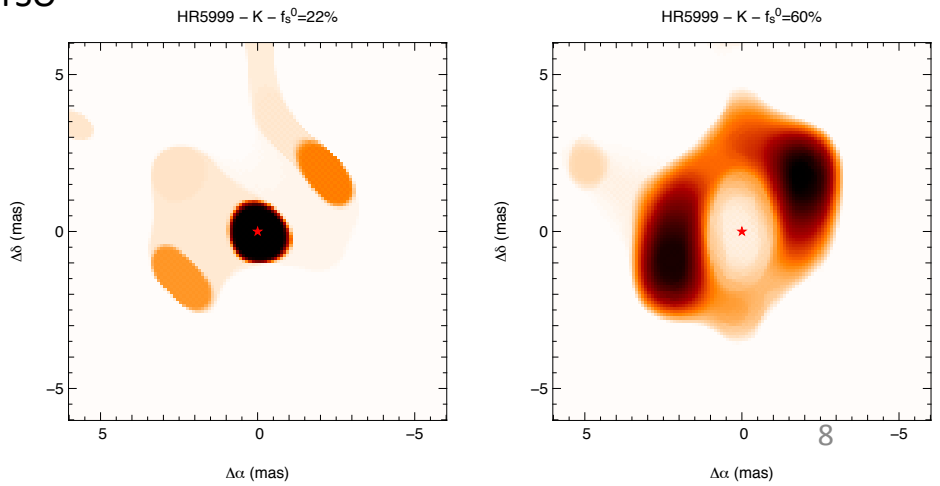
Inner regions of PP disks: Observations

- Size-Lum relation
- Inner disk?
- First images





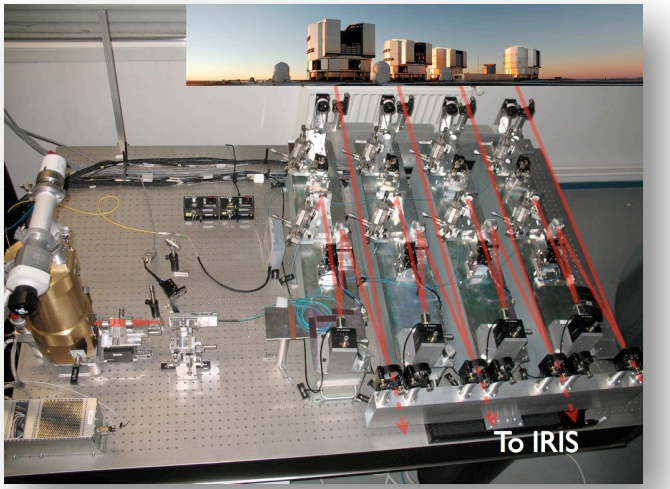
Stellar model + Image = YSO

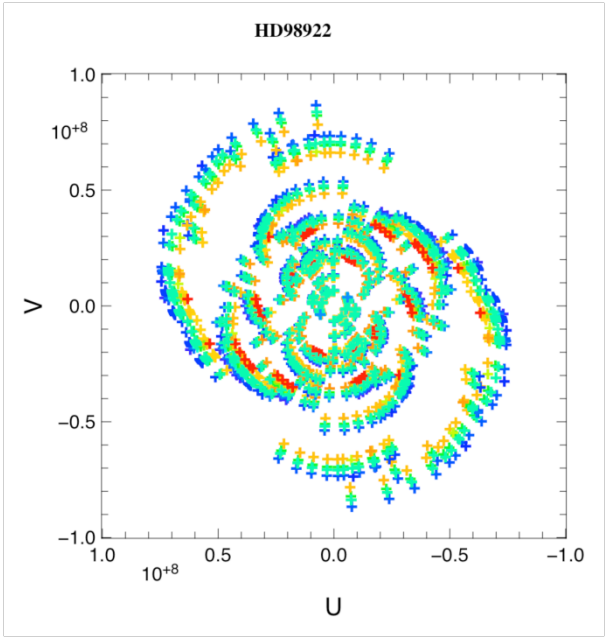


Kluska et al. 2014, A&A, 564A, 80.

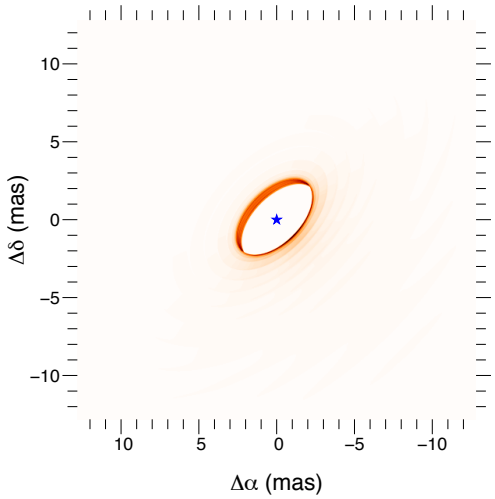
PIONIER Large Program Survey

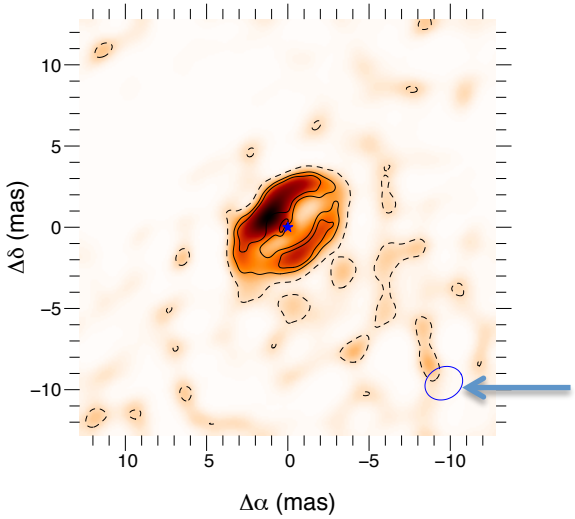
- PIONIER/VLTI Large Program (PI:Berger)
- 30 nights
- 55 objects observed
- 14 images of the continuum
- Aims:
  - Statistics on morphology
  - A panel of model-independent images



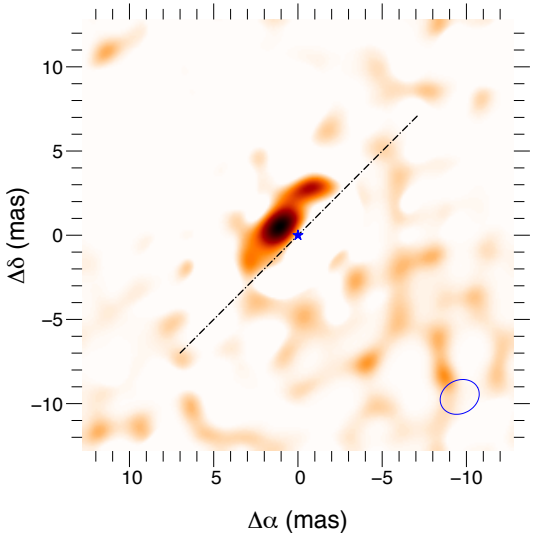


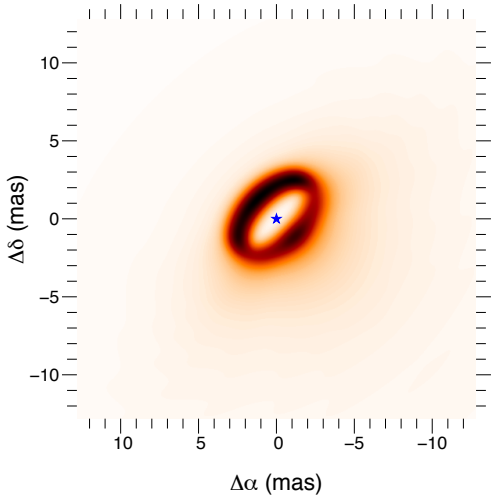
PIONIER Large Program Images

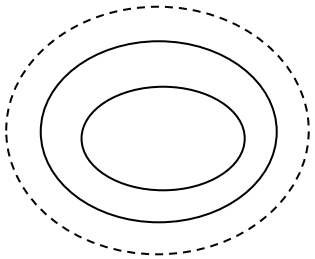




beam





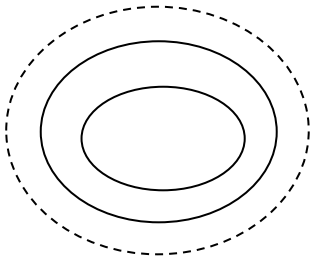


1, 3, 5 σ contours
Estimations from baseline bootstrapping

PIONIER Large Program Images

beam

Kluska et al. in prep.



1, 3, 5 σ contours
Estimations from baseline bootstrapping

PIONIER Large Program Images

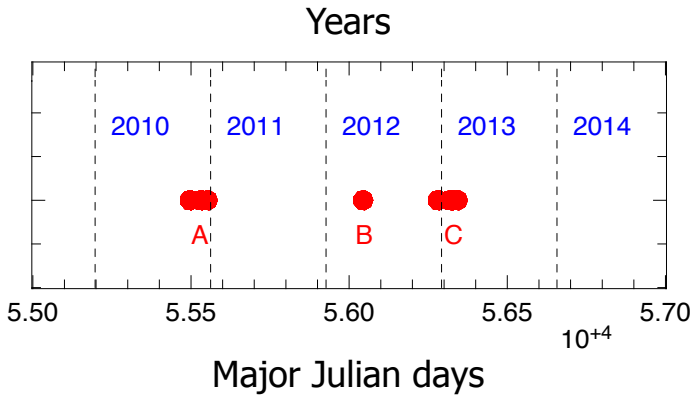
Kluska et al. in prep.

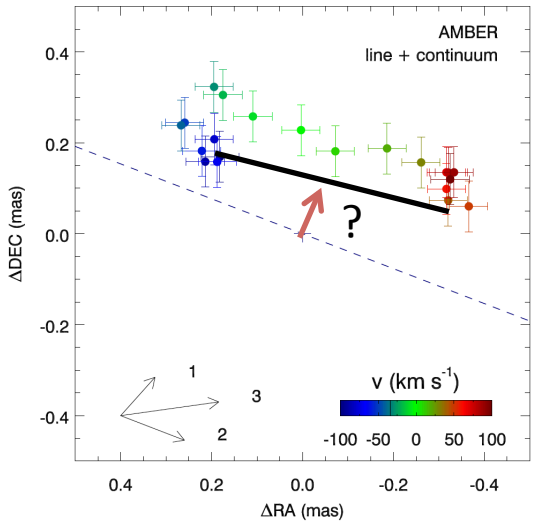
red axis : Major axis from Litterature

black axis : Major axis from fit to LP data

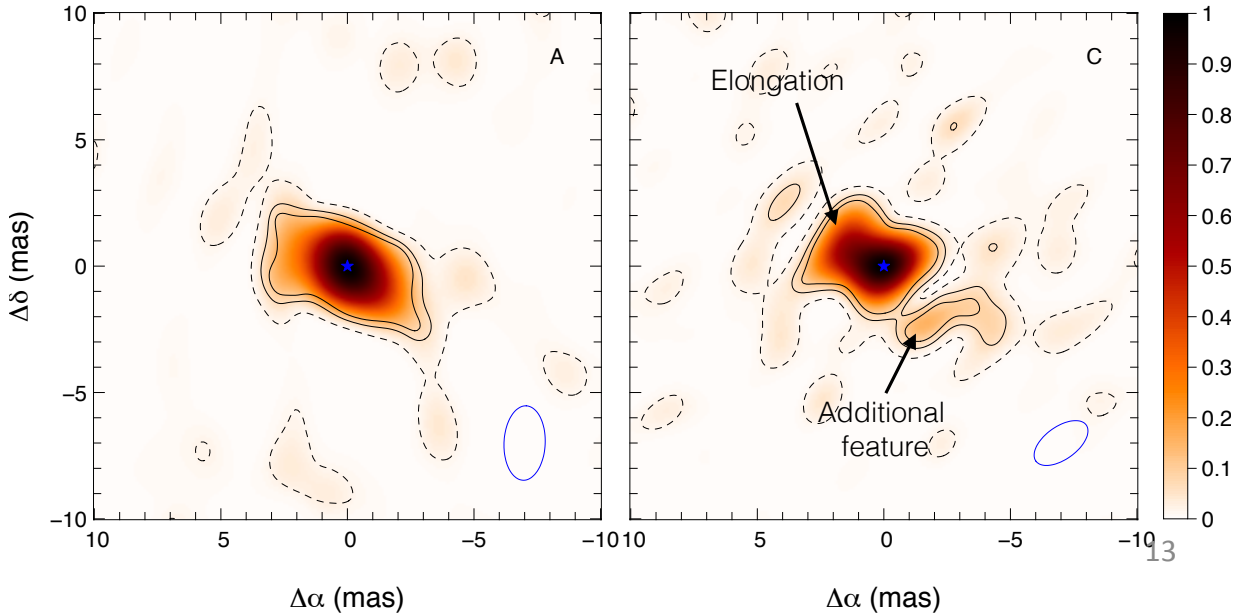
PIONIER Large Program
Peculiar objects

- MWC158 (HD50138)
  - B[e] star with a disk
  - observed in a 2yrs interval
  - Period of ~90days



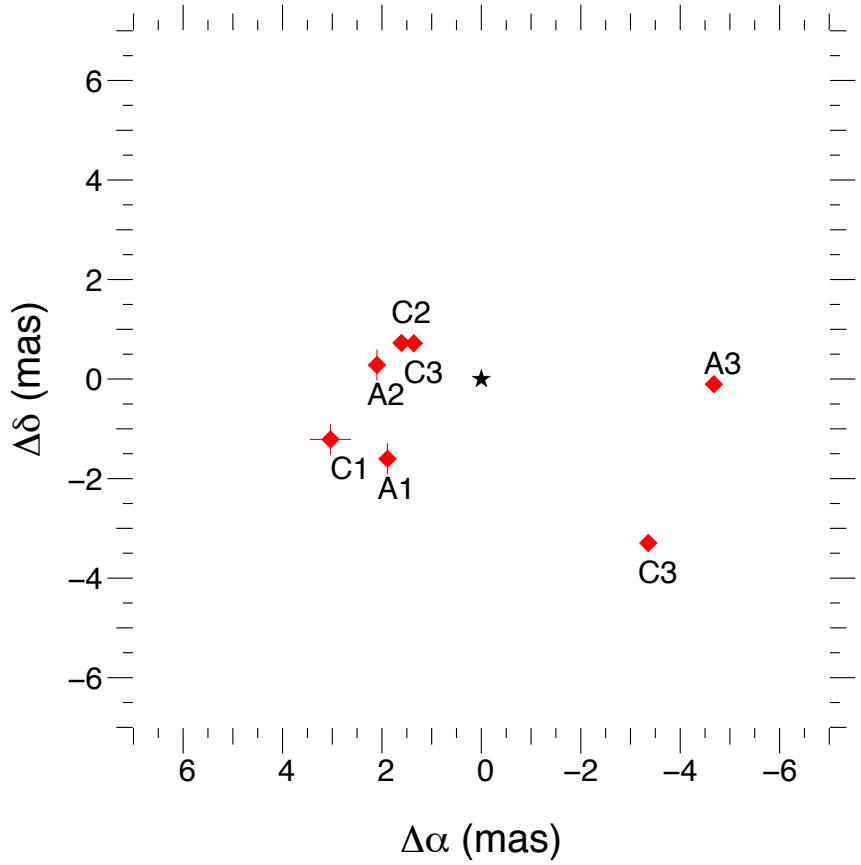


Ellerbroek et al. 2015



PIONIER Large Program
Peculiar objects

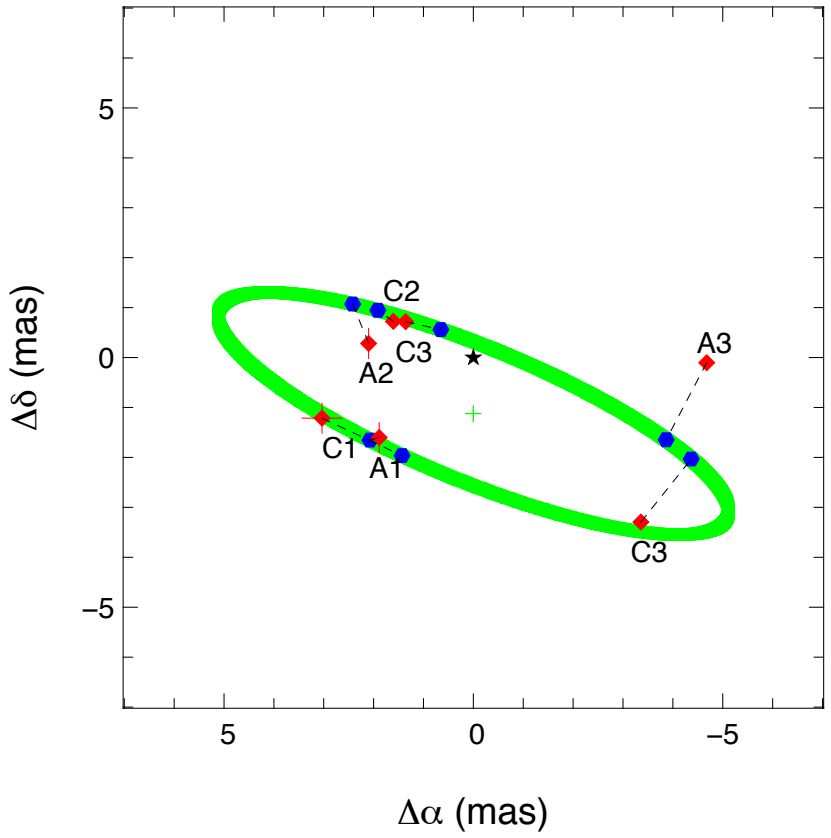
- MWC158 (HD50138)
  - B[e] star with a disk
  - observed in a 2yrs interval
  - Orbit fit from parametric model (star+disk+point source).



Kluska et al. to be submitted

PIONIER Large Program
Peculiar objects

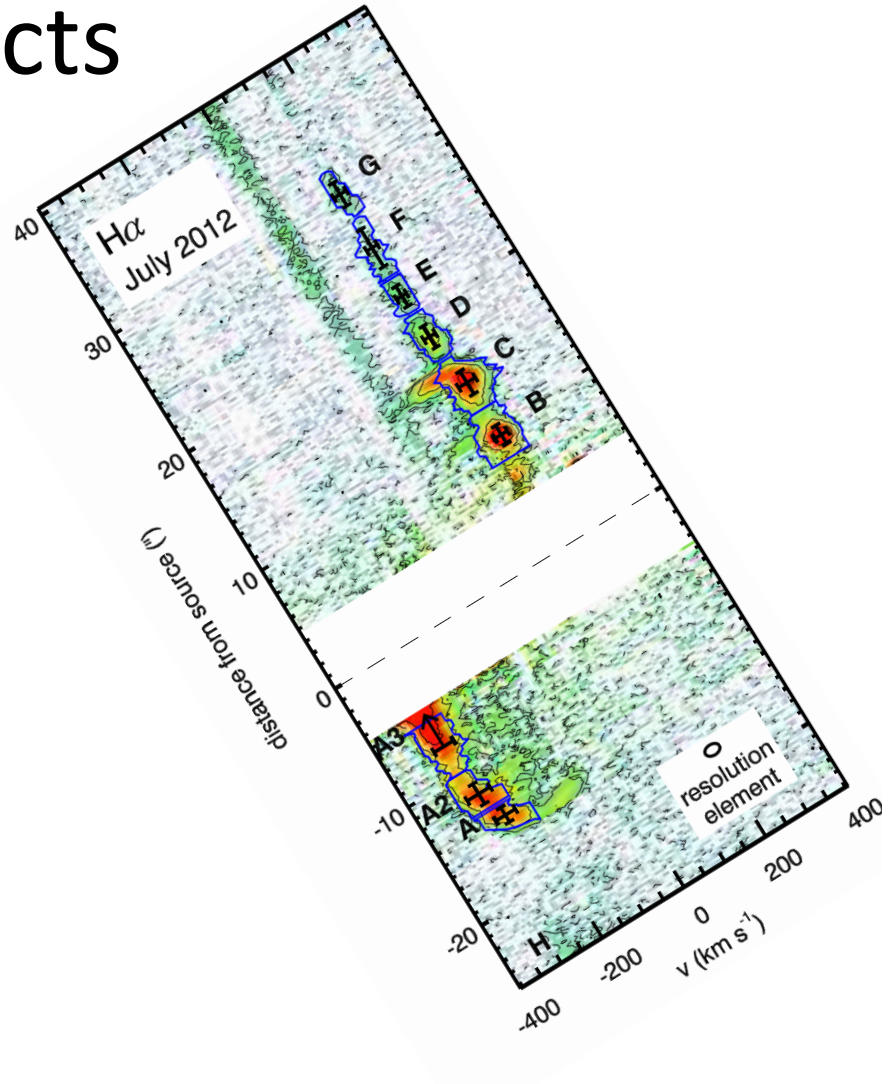
- MWC158 (HD50138)
  - B[e] star with a disk
  - observed in a 2yrs interval
  - Orbit fit from parametric model (star+disk+point source).
  - Same orientation as the disk
  - Not Keplerian, high disk thickness needed



Kluska et al. to be submitted

PIONIER Large Program
Peculiar objects

- HD163296 (MWC275)
- Disk with inner emission
- Jet with knots
- Period 16yrs



Kluska et al. in prep., Ellerbroek et al. 2013, Renard et al. 2010

Conclusion and perspectives

- Continuum emission is complex: no clear single geometry
- Some of the objects display departure from point-symmetry (not always inclination effect)
- Quick evolution, link with accretion/ejection mechanism?
- Gravity will provide both lines and continuum
- 3D chromatic algorithm exist
- Link with different techniques (direct imaging, ALMA)