Massive accretions disks as viewed with ALMA & ELT

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Emmy Noether-Programm
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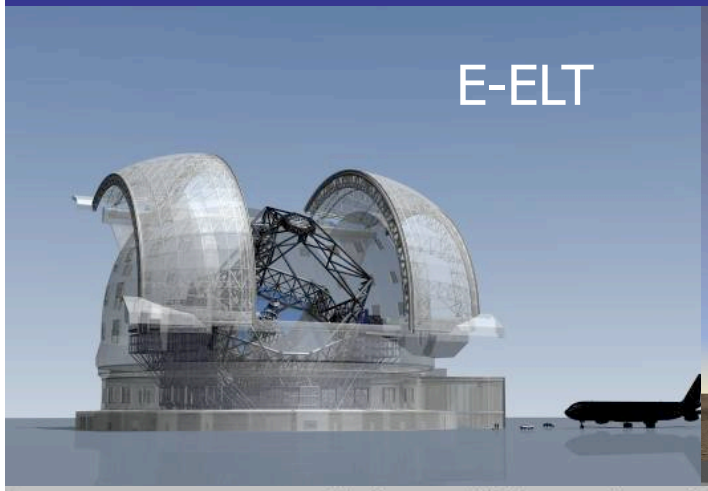
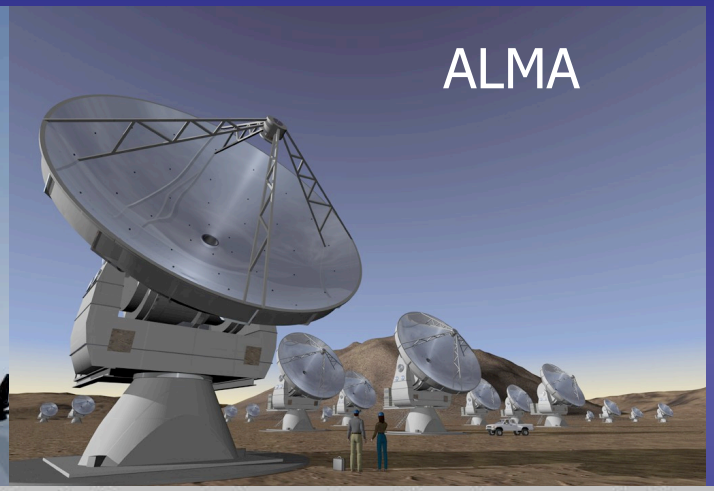
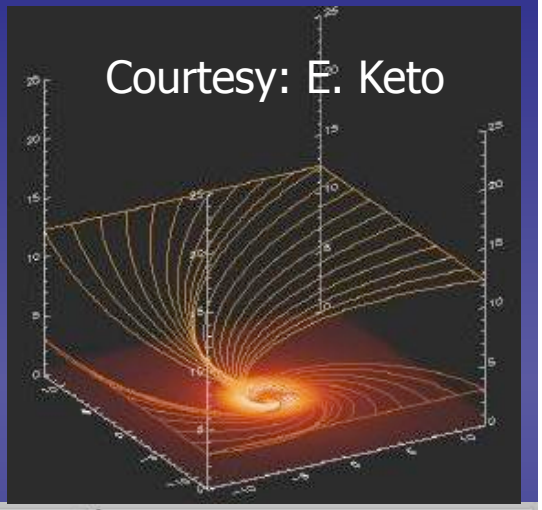
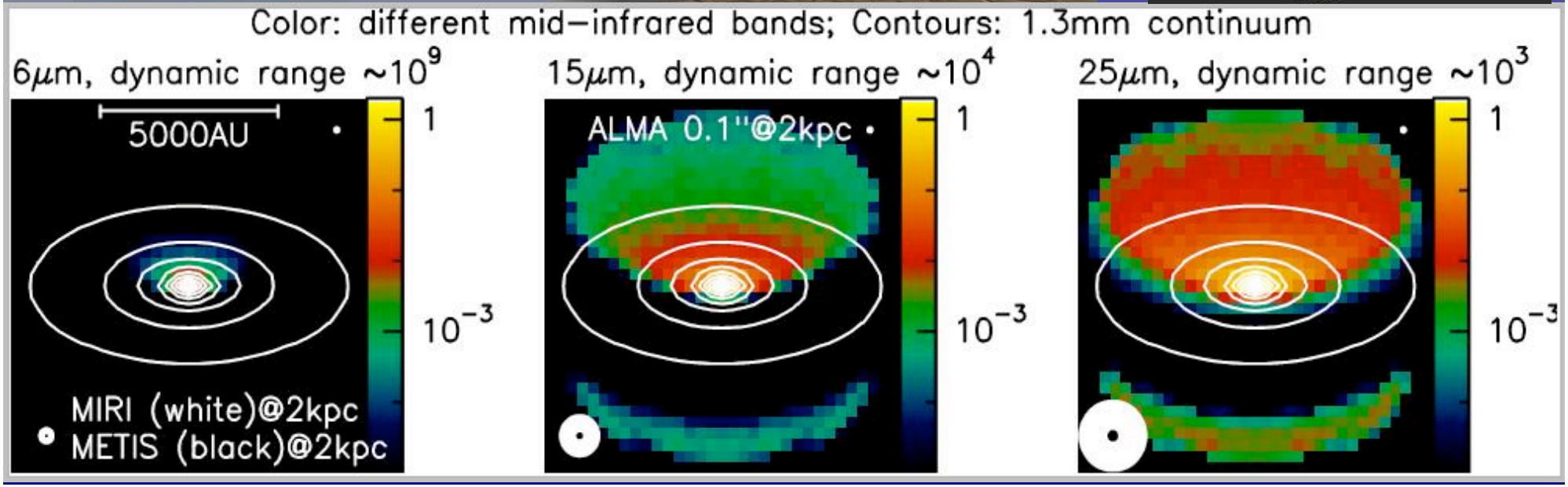
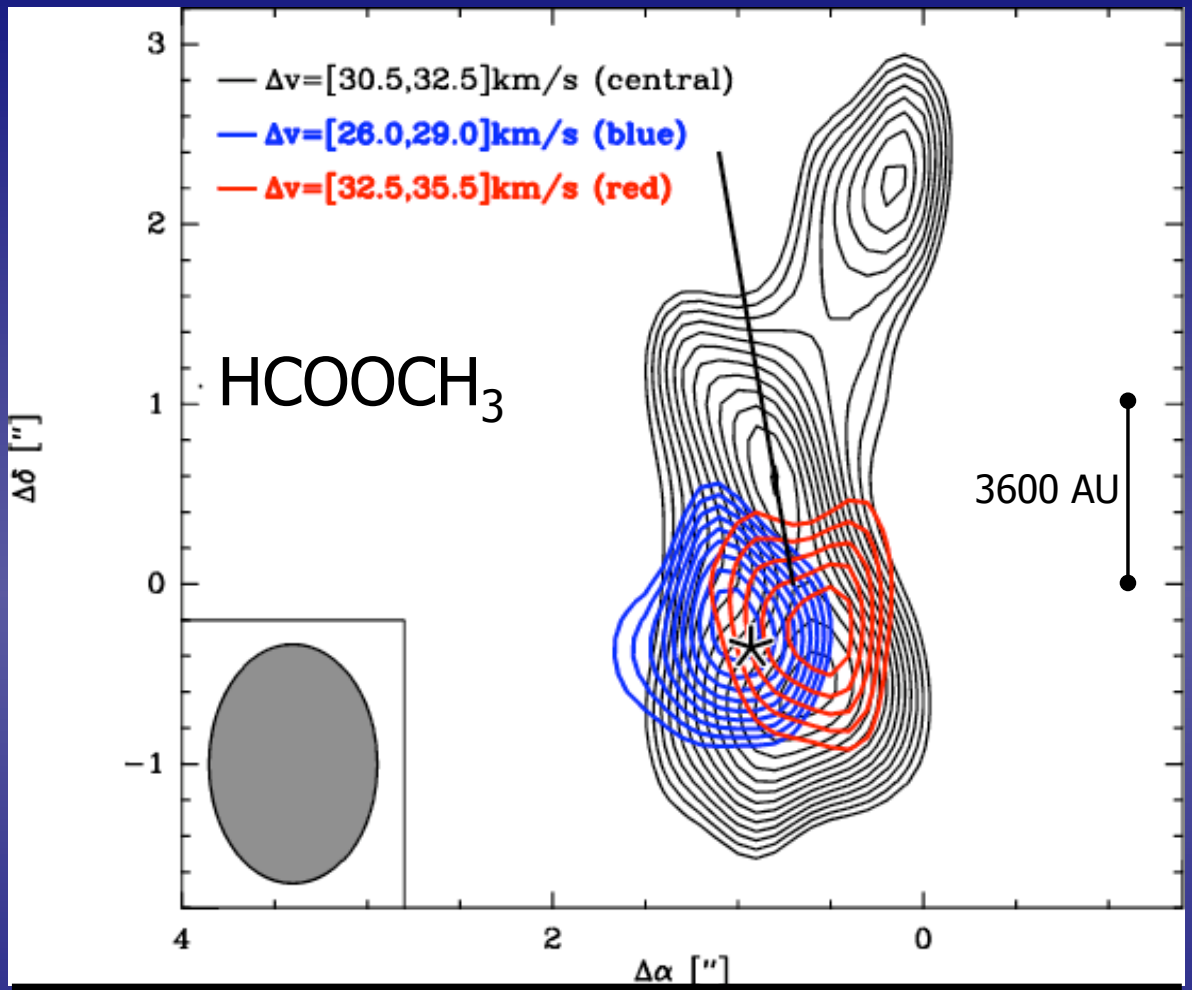








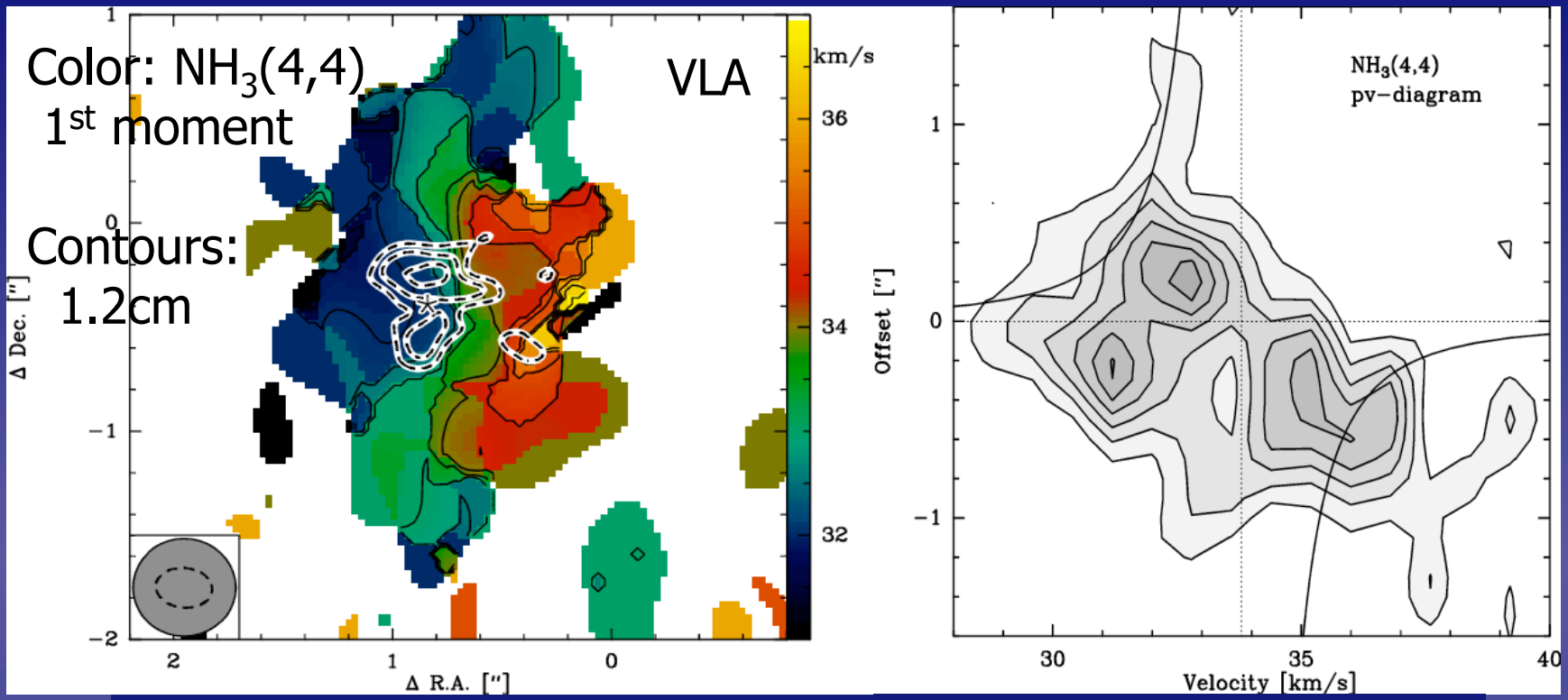
The Disk candidate in IRAS 18089-1732



$10^{4.5}$ L_{sun} source, size~2000AU, T~350K

Beuther et al. 2005

The Disk candidate in IRAS 18089-1732



New high-excitation ammonia $NH_3(4,4)/(5,5)$ data

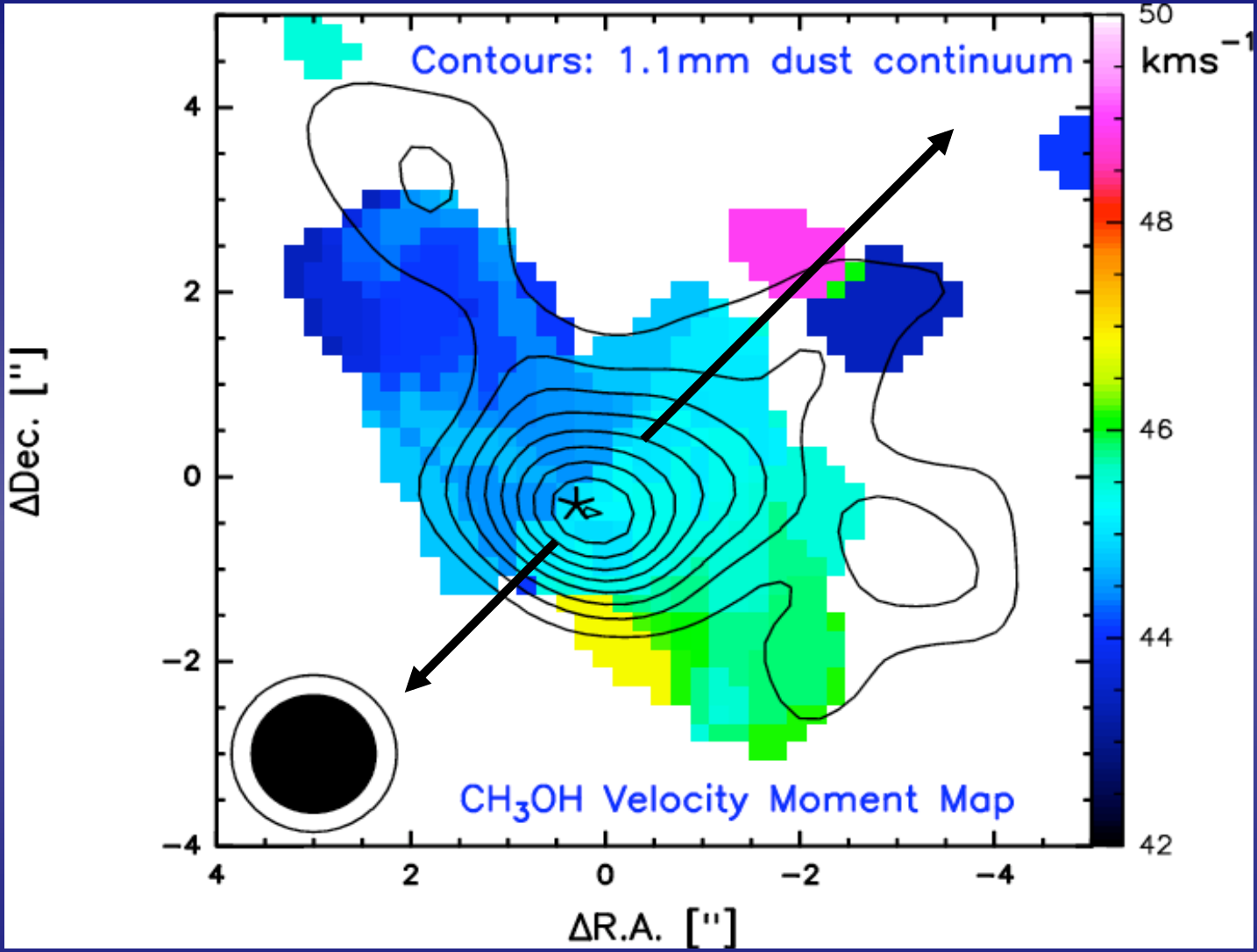
- Clear east-west velocity gradient.

- Non-Keplerian motions.

- T > 100K in rotating structure.

Beuther & Walsh 2008

Modeling infall in an Infrared Dark Cloud (IRDC)



- Velocity spread ~ 2.5 km/s
- Structure size ~ 25000 AU
- Model line emission of inspiraling gas.

Fallscheer et al. in prep.

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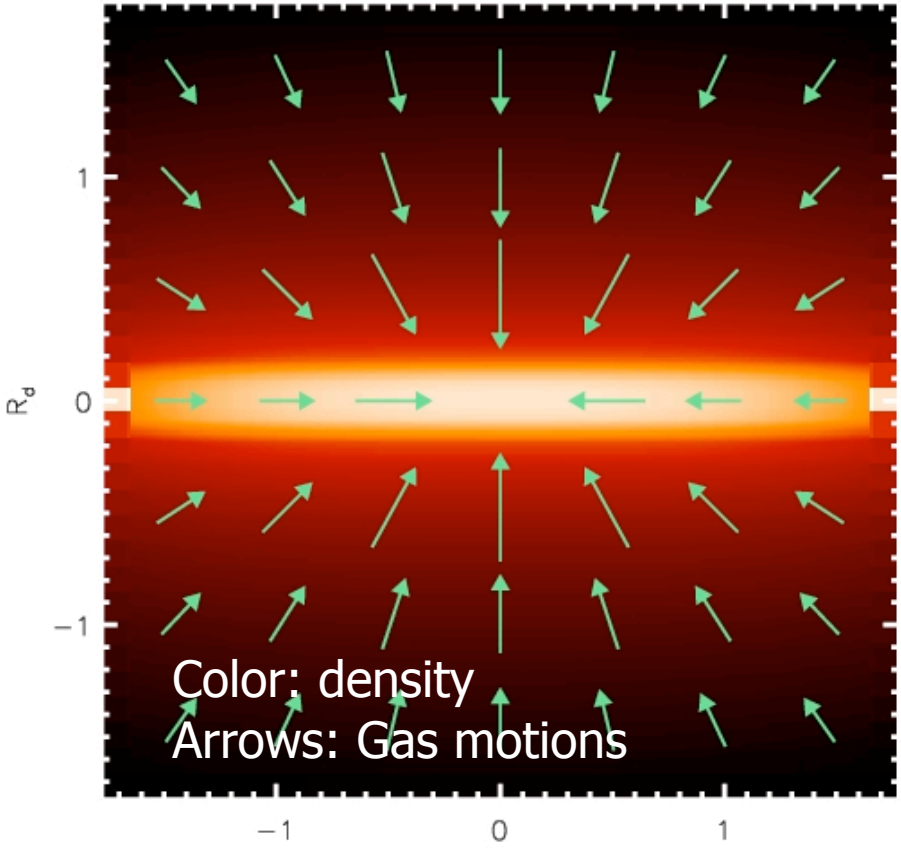

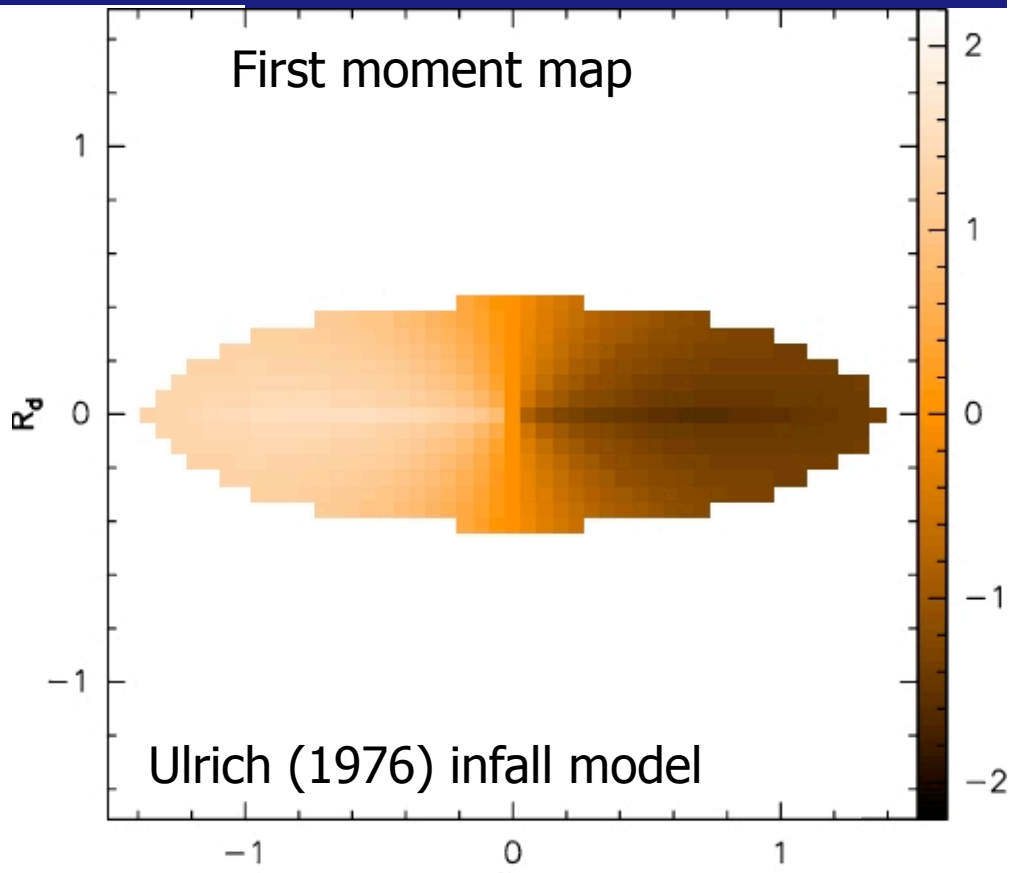

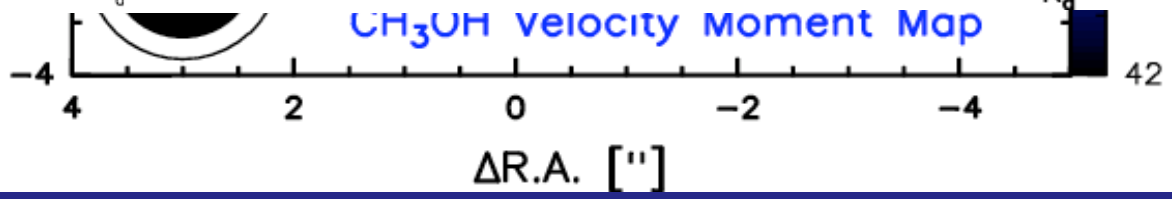

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Massive disk candidates with VLT/CRIRES

CRIRES@VLT
Δv between 3 and 5 km/s

+0408, black and red are two spectral setups

OCN- ice

CO and H_2O ices

^{13}CO R(19) R(18) R(17) R(16) R(15) R(14) R(13) R(12) R(11) R(10) R(9) R(8) R(7) R(6)

^{12}CO R(9) R(8) R(7) R(6) R(5) R(4) R(3) R(2) R(1) R(0) P(1) P(2) P(3) P(4) P(5)

0.04
0.02
0

4600 4650 4700

Wavelength [nm]

Beuther et al. in prep.

Massive disk candidates with VLT/CRIRES

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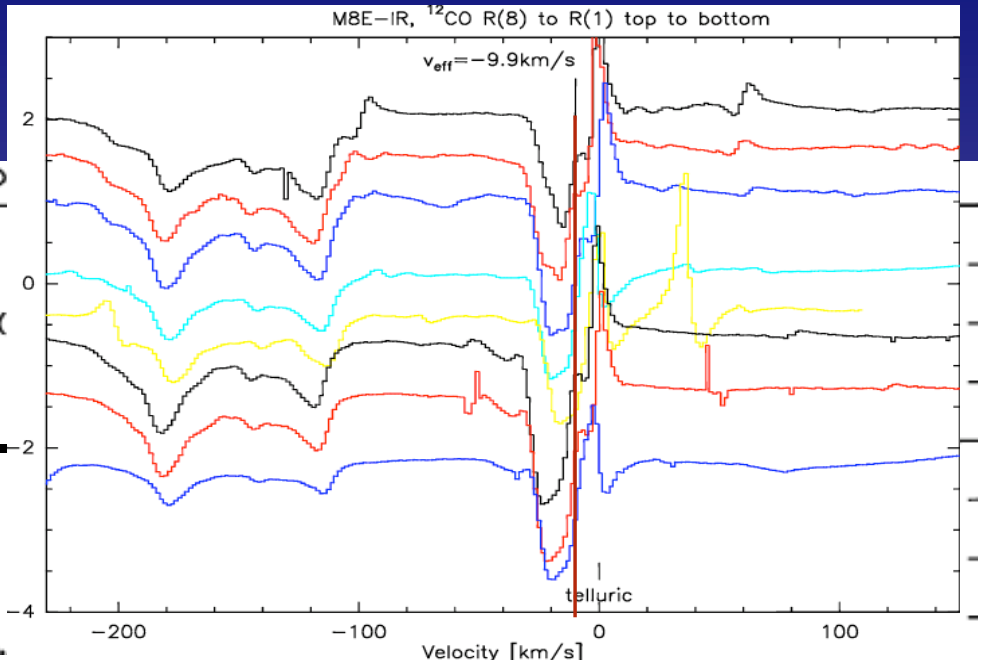
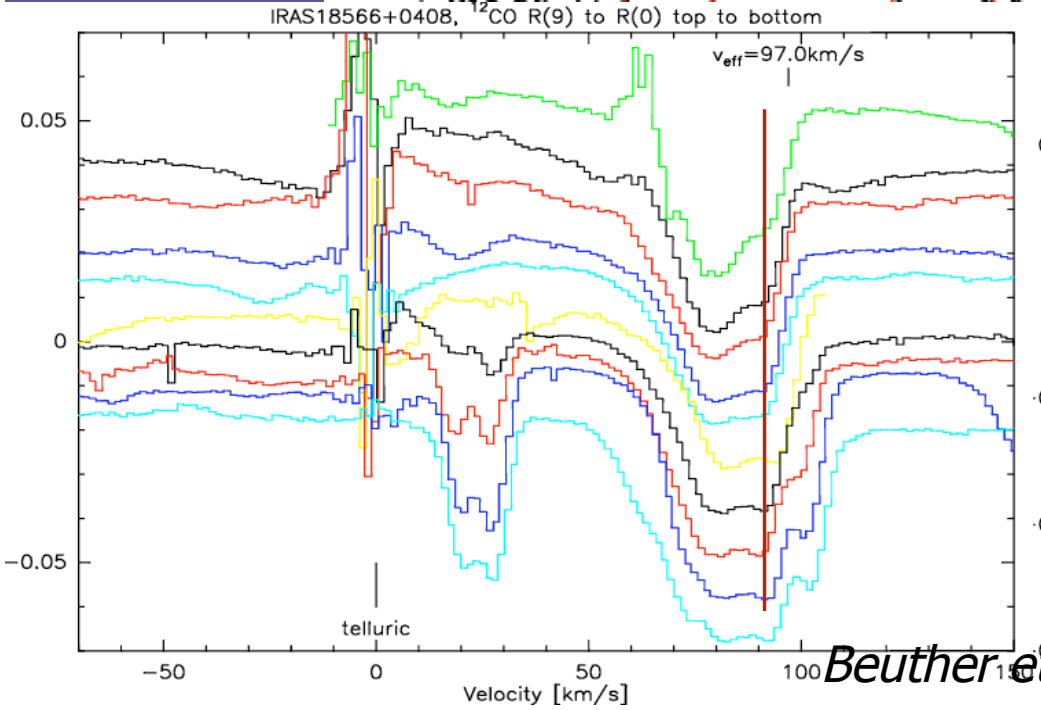
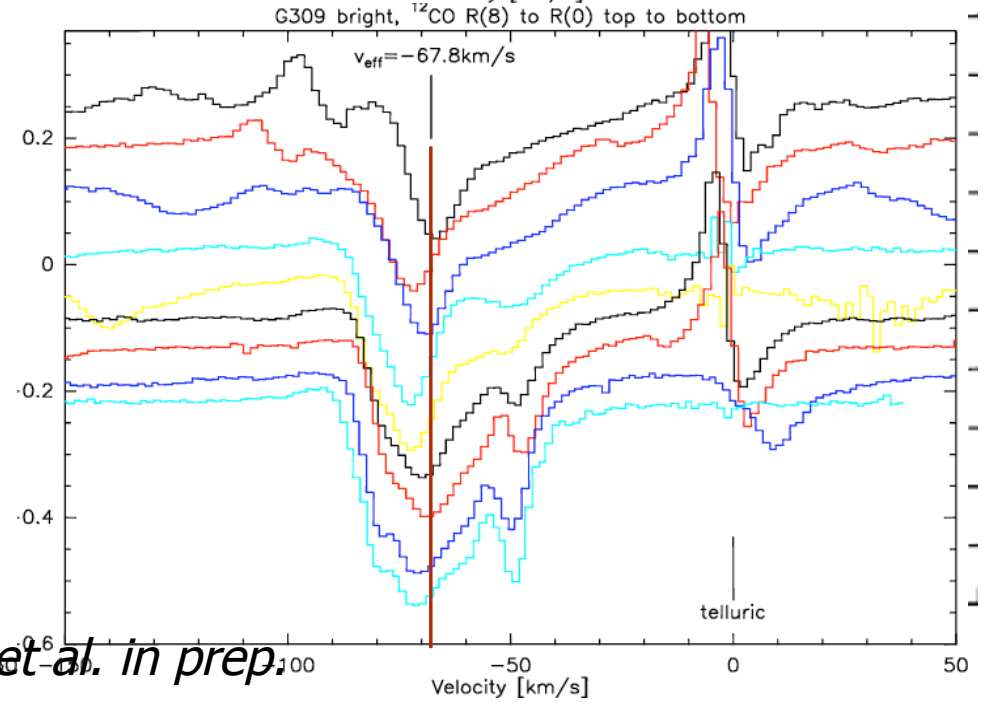
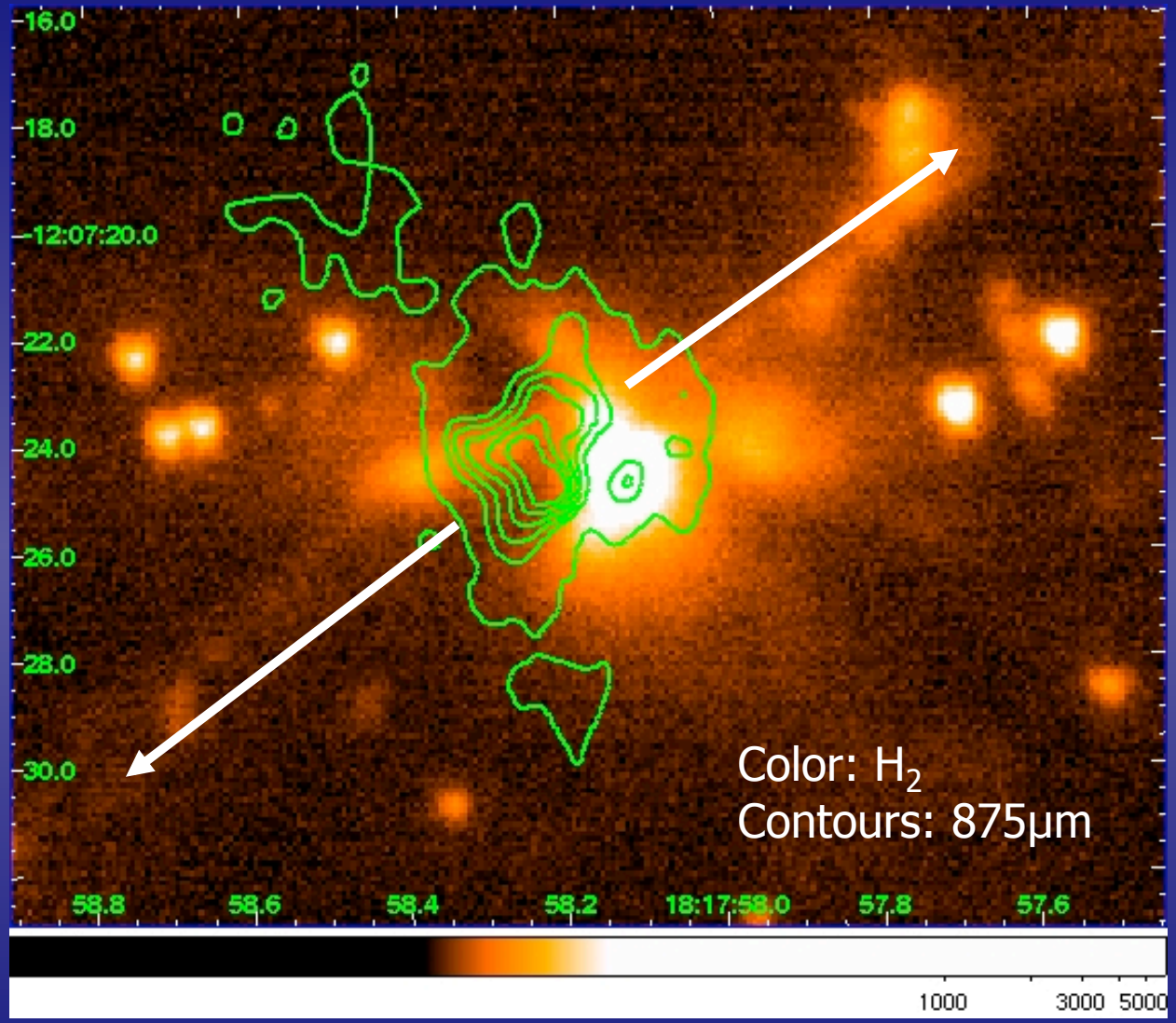






Beuther et al. in prep.

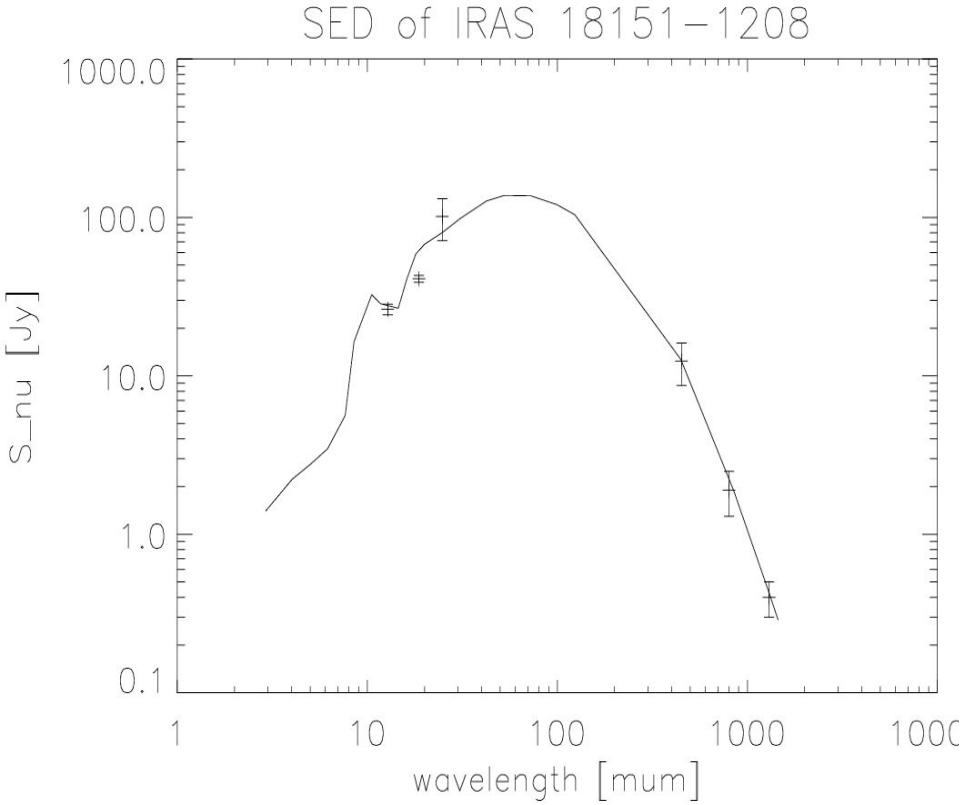
Modeling disk line and continuum emission

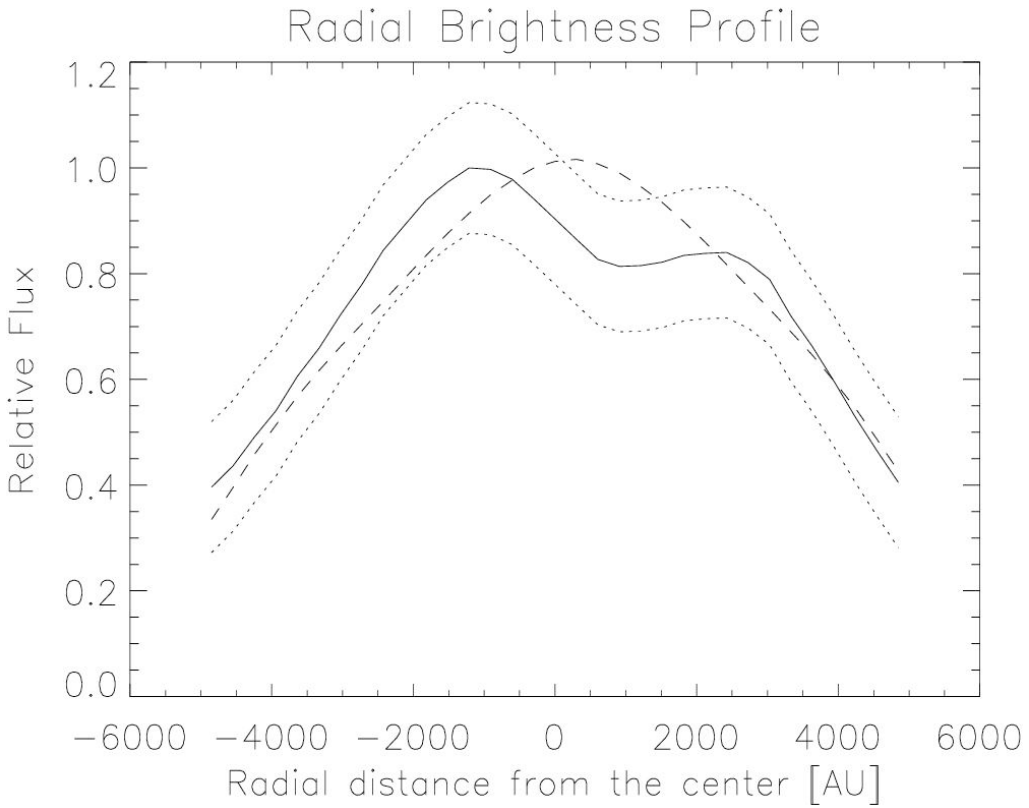


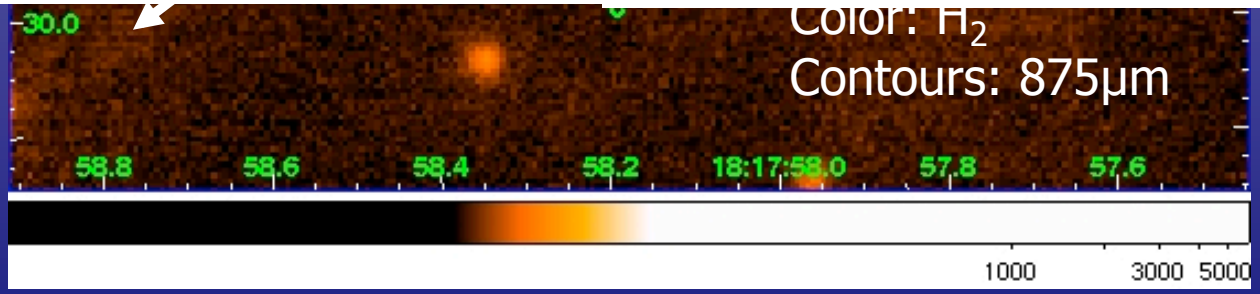
- Dust lane perpendicular to outflow.
- Diameter roughly 6000 AU.
- Model comparison with low-mass disks.

Fallscheer et al. in prep.

Modeling disk line and continuum emission







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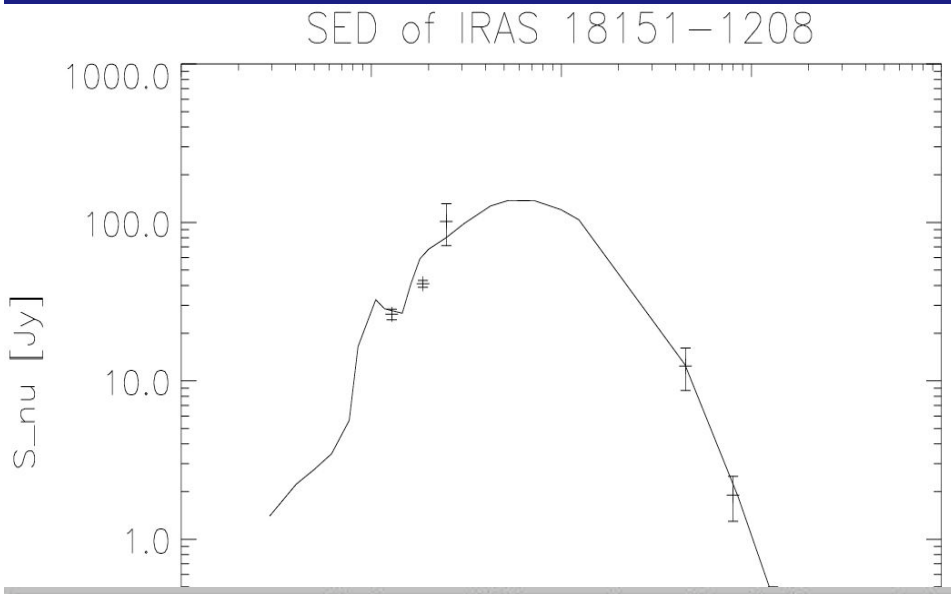

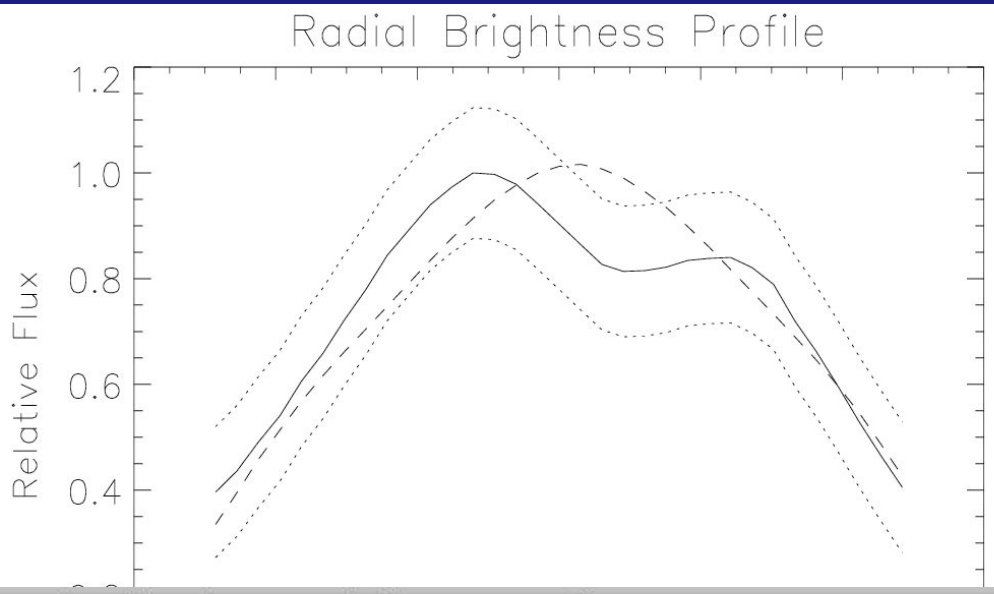

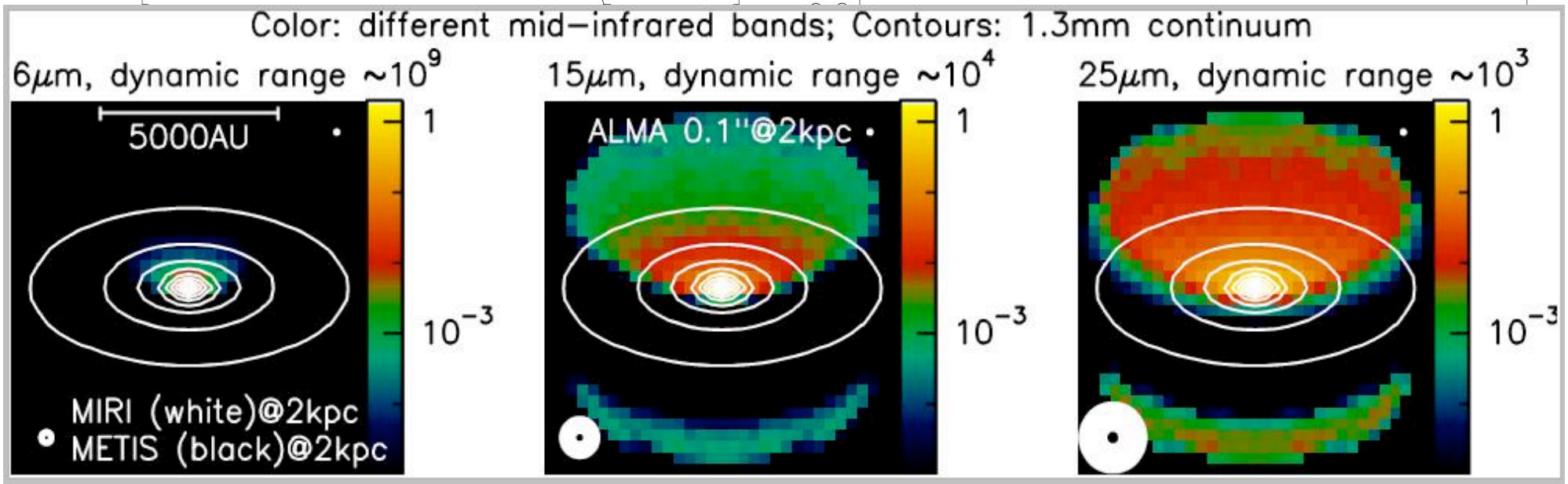

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Summary

- Today we observe large-scale rotating and infalling structures

- Tentative evidence for more disk-like entities at the centers.

ALMA and ELT will revolutionize this field via:

- Resolving the disks/envelopes down to scales of order 100AU.

- Combining and modeling the data we will disentangle the physical processes like density/temperature/spiral structure.