Observations of “Disks” Associated with High-Mass Young Stars

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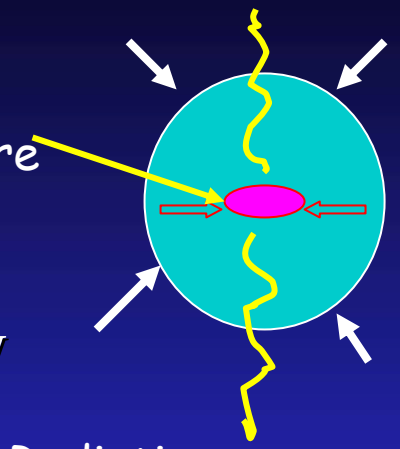
Why Massive Disks



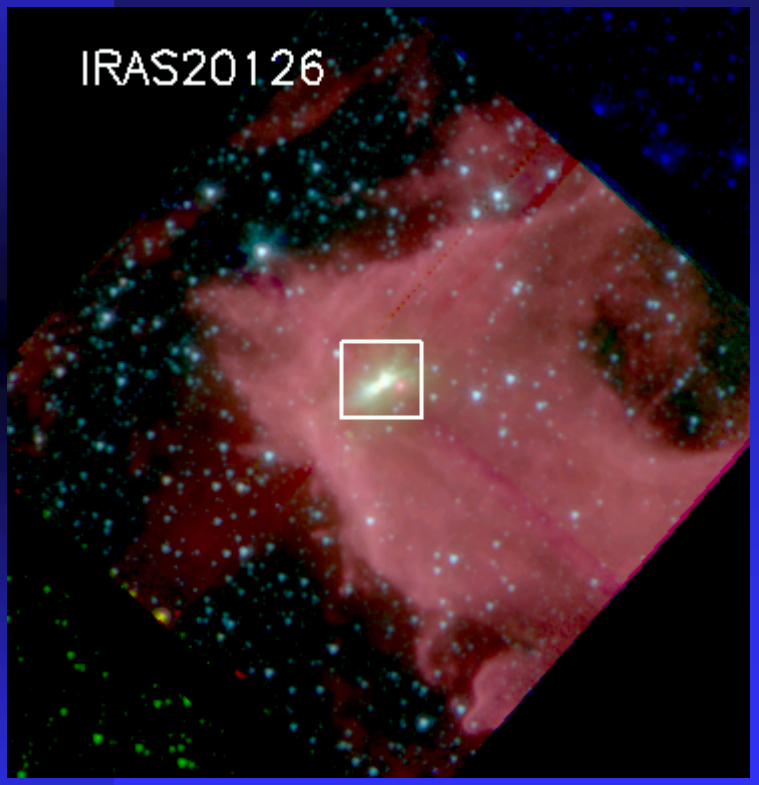
- Disks are the central part of theories for star formation, have imptortant implications to how massive stars are formed.
- Current instruments lack of sensitvity/resolution to resolve the kinematics in disks in massive young stars (ALMA);

  $T_{KH} < T_{ff}$: Disks embedded in envelopes, difficult to separate them morphologically and kinematically.
- Obervers' Definition:

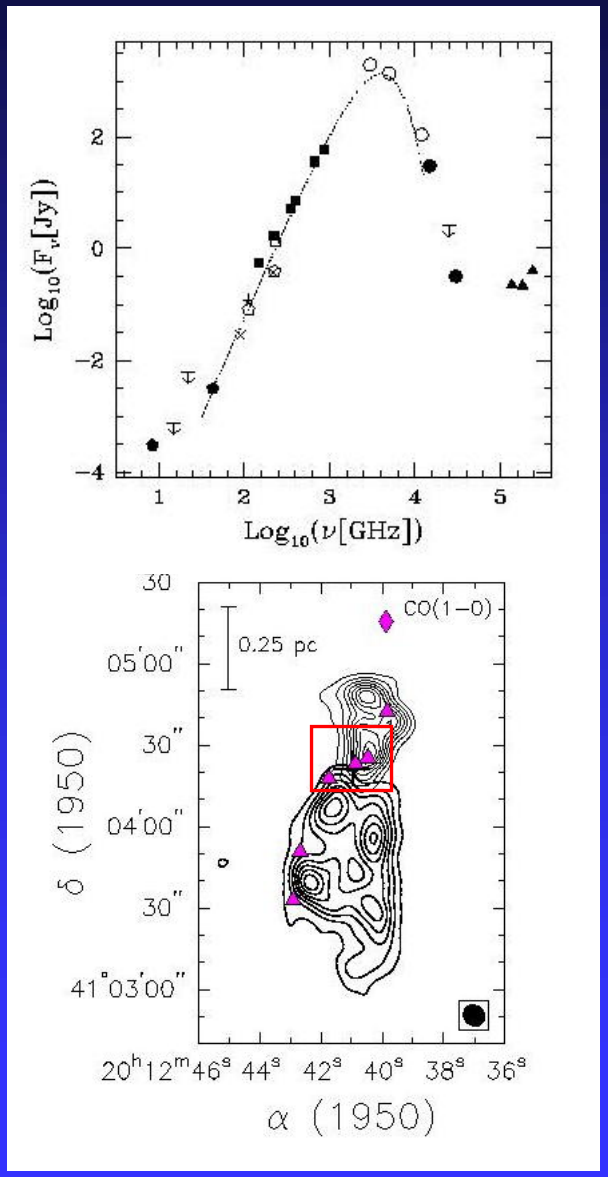
  Inner envelope + accretion disk

IRAS20126+4104

SED: 1.3x10^4 Lsun



Spitzer 3.6/4.5/8.0um
Qiu et al. 2007

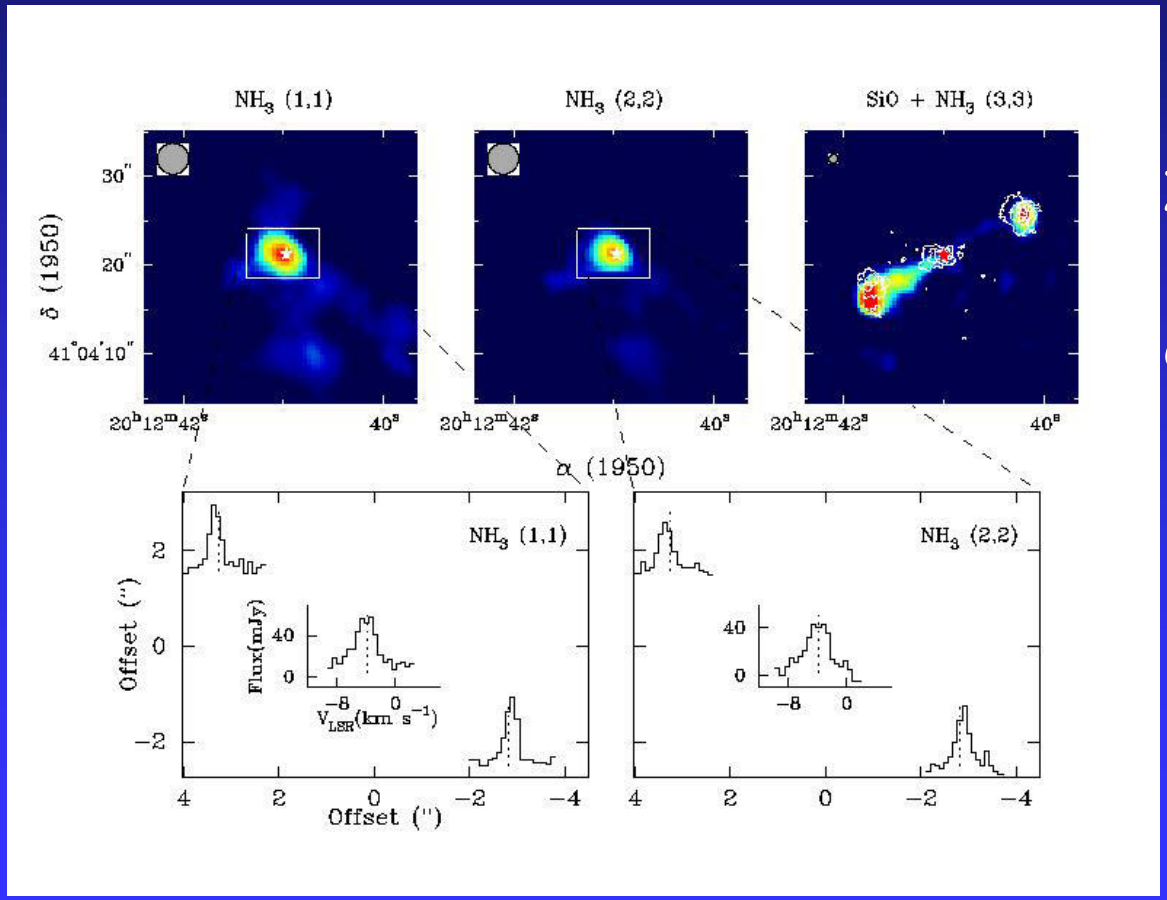


Cesaroni et al. 1999

CO 1-0
Shepherd et al. 1999

IRAS20126+4104

NH3 (1,1), (2,2), (3,3) + SiO



Zhang et al. 1998; 1999

Cesaroni et al. 1999

Signatures of NH_3 Disks

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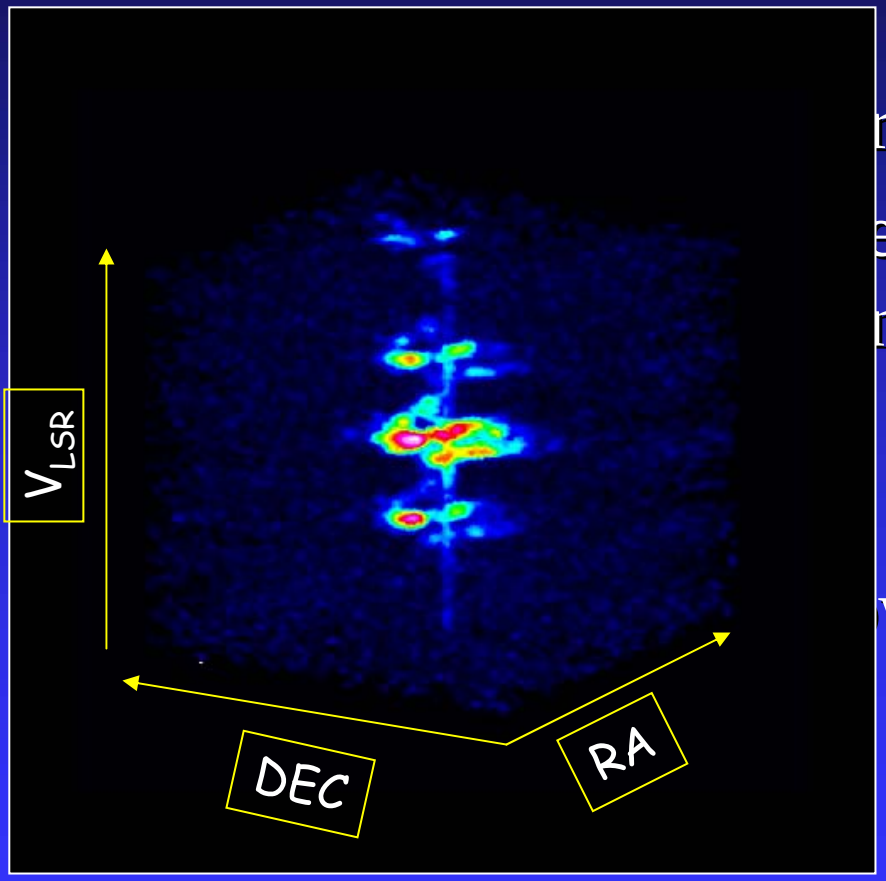
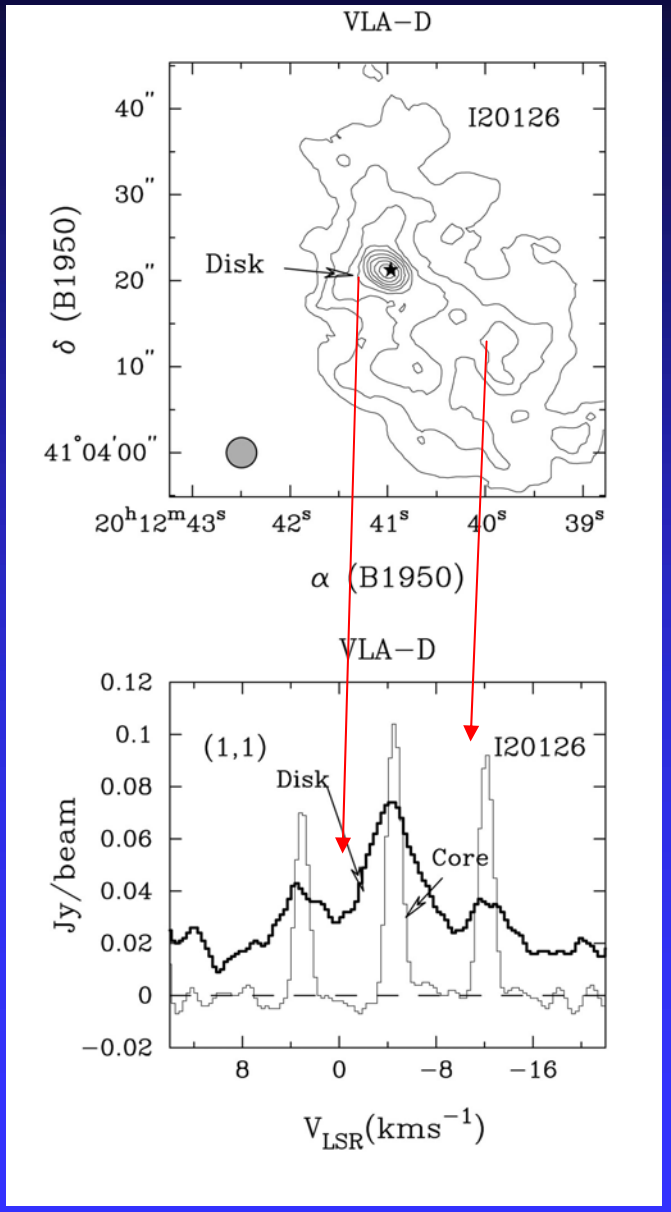
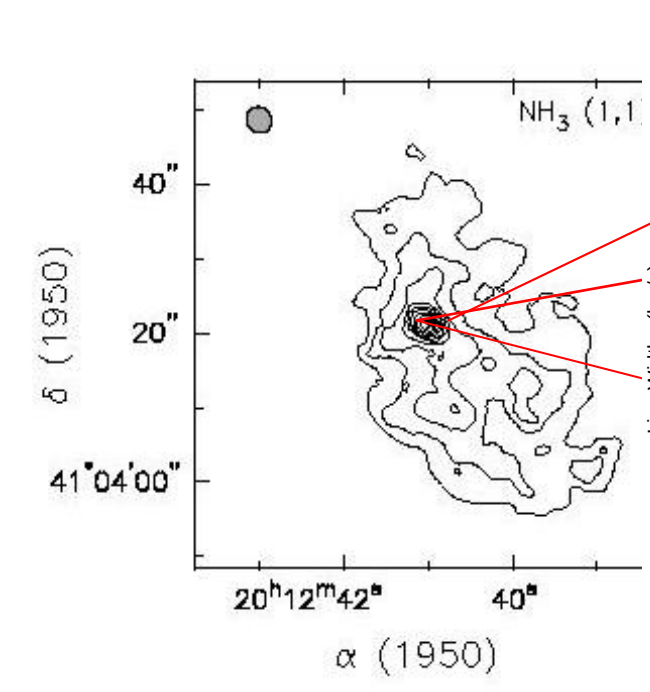
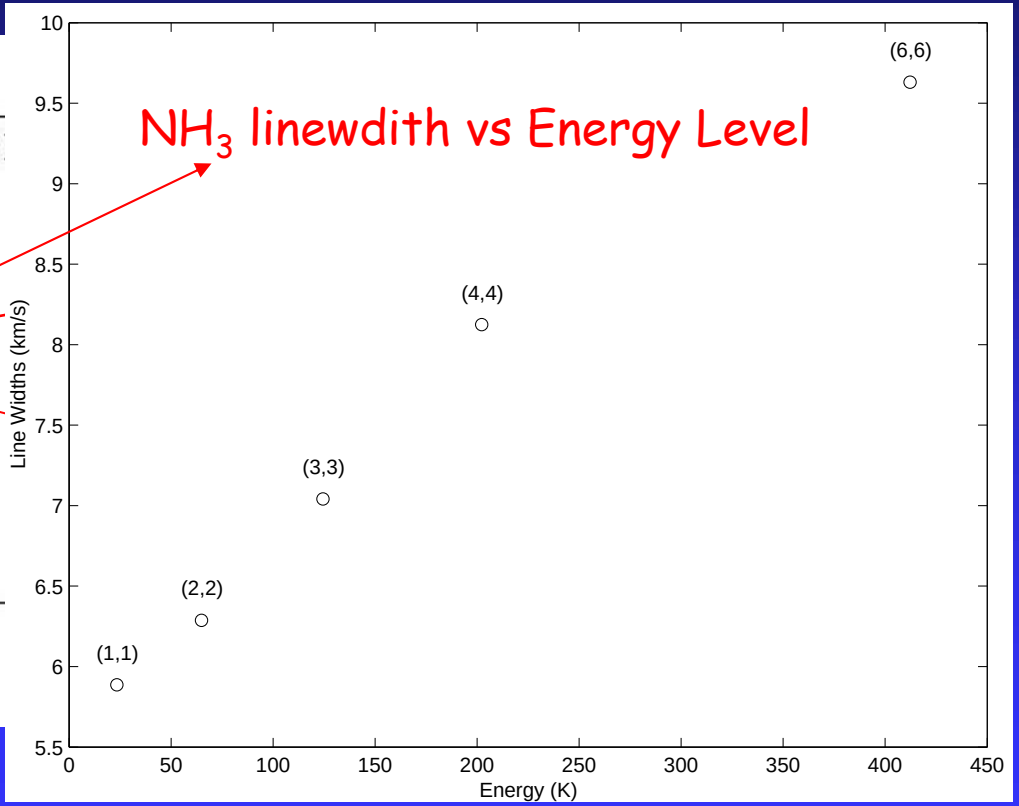




IRAS20126+4104



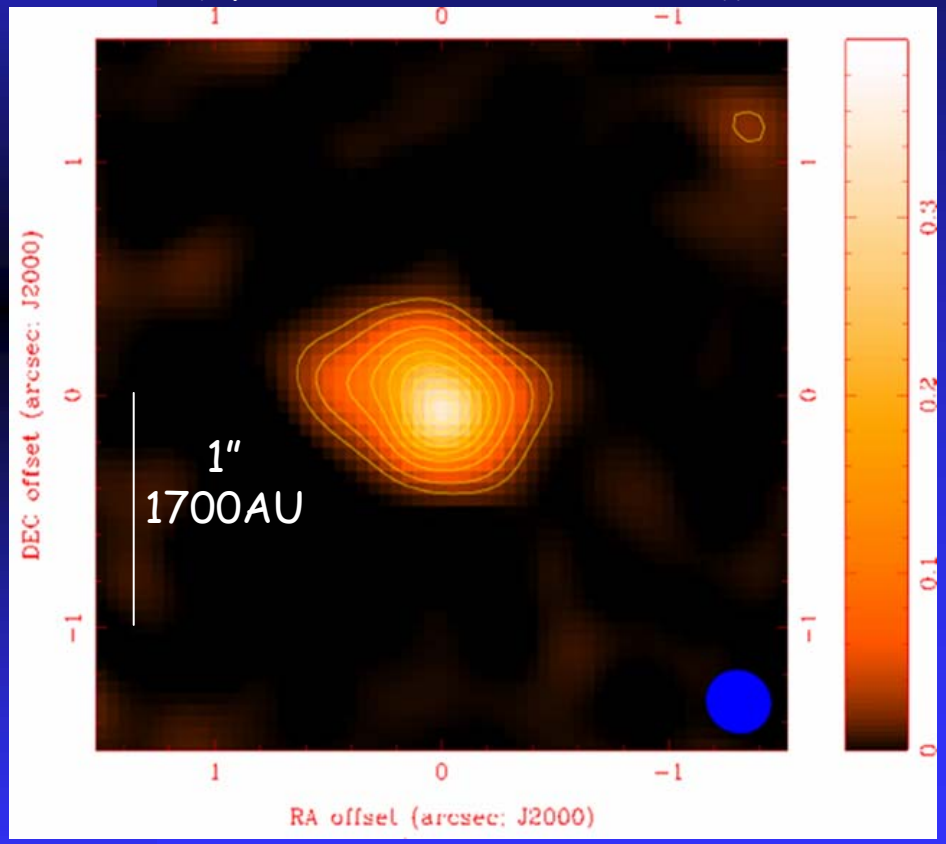


Zhang et al. 1998
Cesaroni et al. 1999

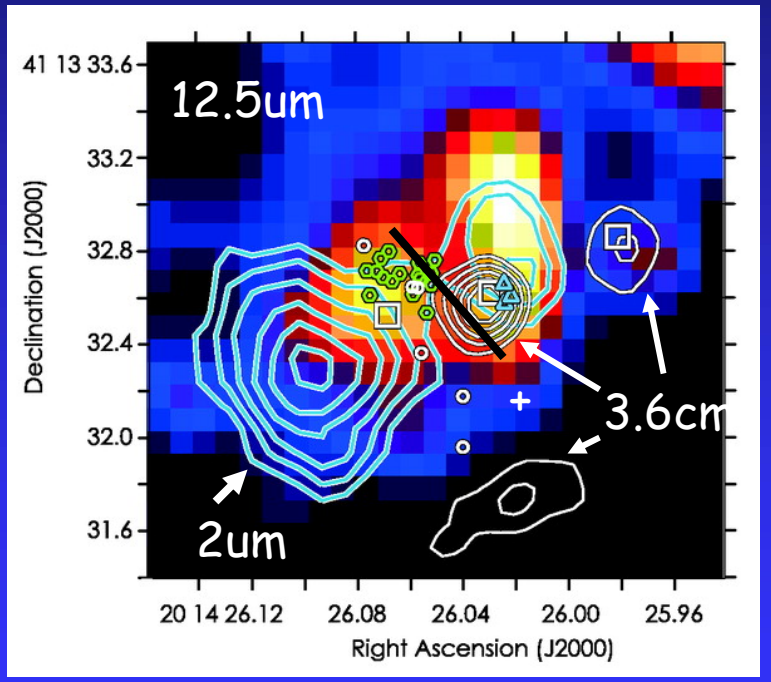
Chen, Zhang et al. 2007

IRAS20126+4104: Multiplicity?

SMA: 345 GHz Continuum

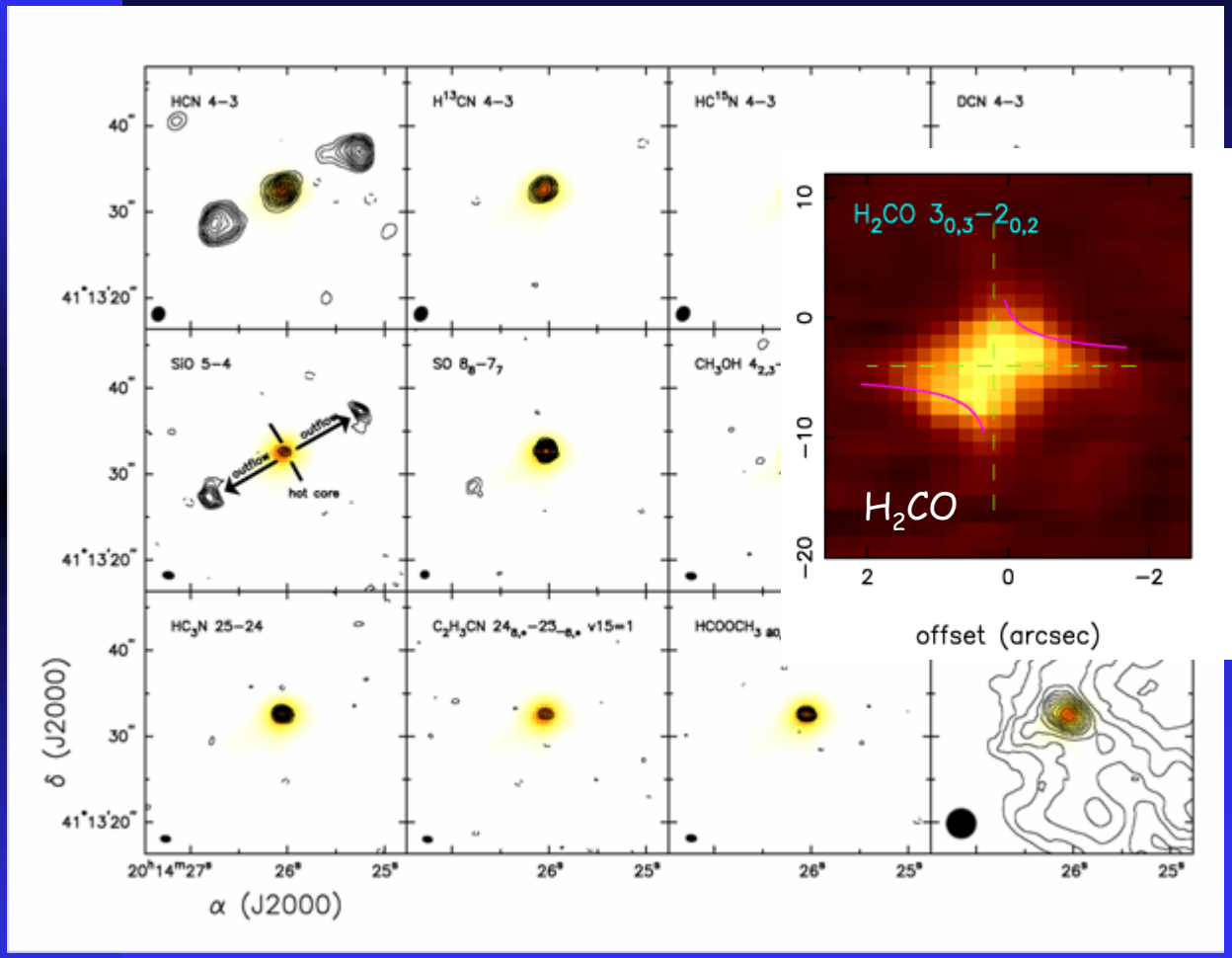


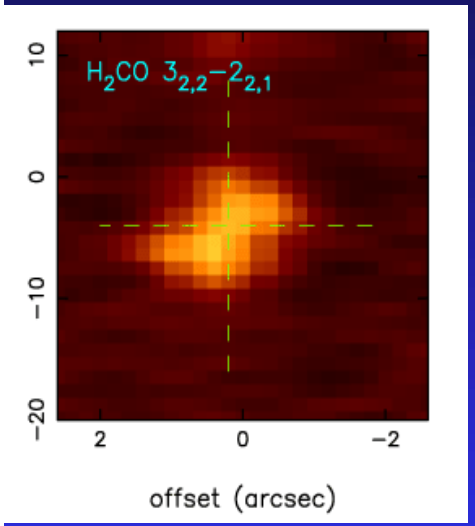
T. K. Sridharan/V. Chen



De Buizer 2007
Sridharan et al. 2005

IRAS20126+4104 (SMA View)

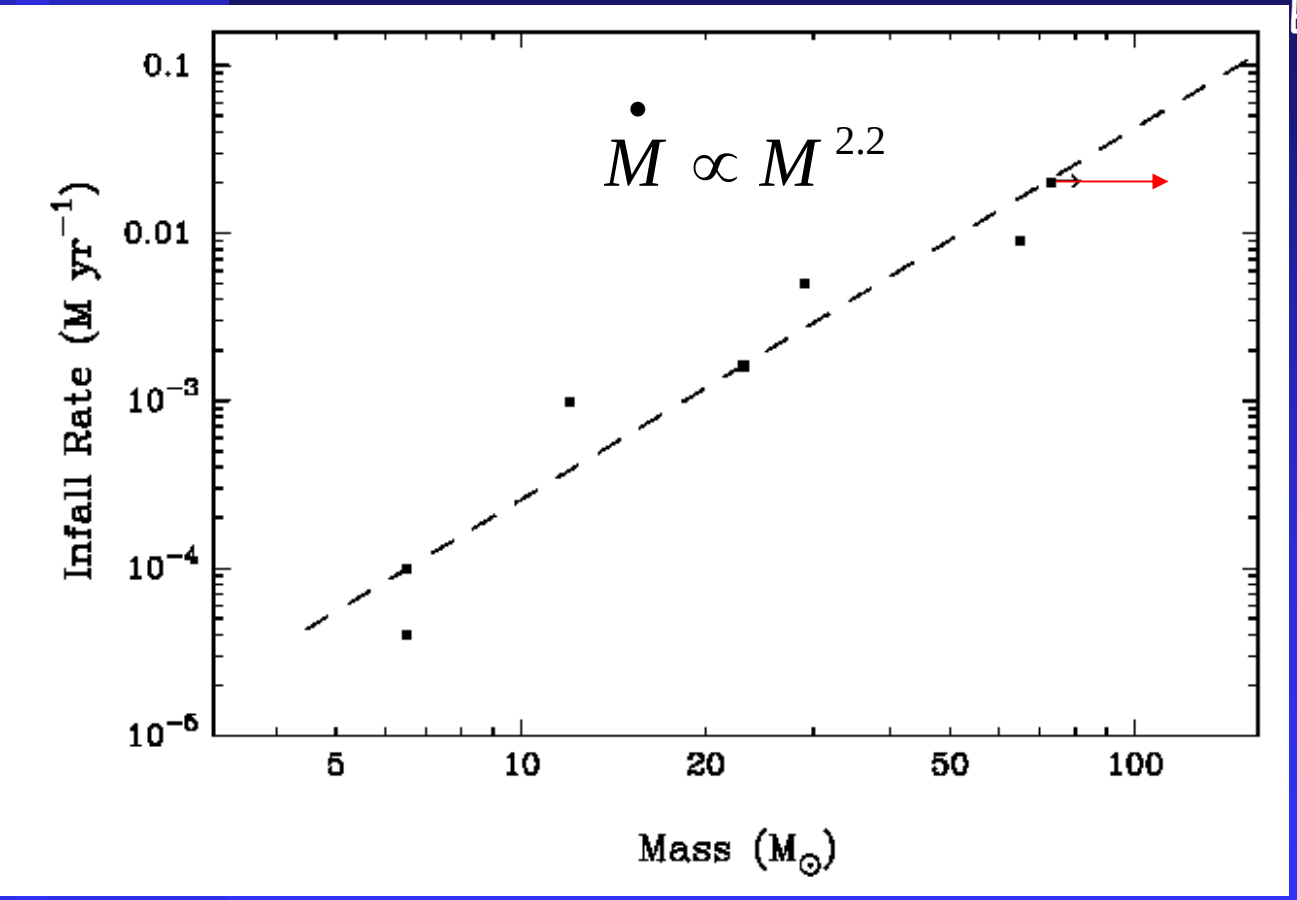




Liu et al. 2007

Modeling Infall/Accretion Rates

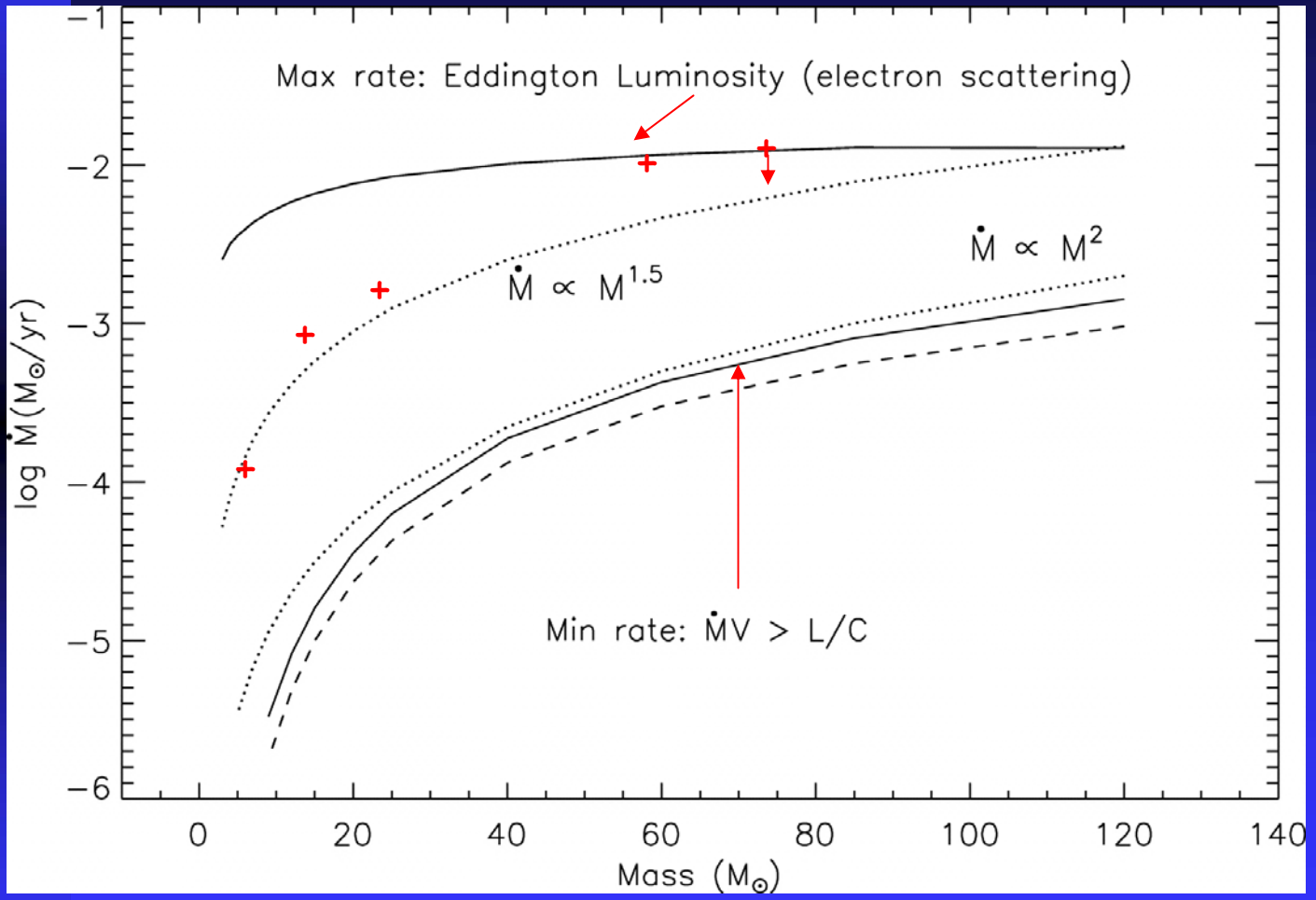
Luminosity -> Stellar Mass of a single star
Beech & Mihalas 1994



Similar relation seen in low-mass stars
Natta et al. 04;
Muzerolle et al. 05

Physical?
Monolithic Collapse
vs.
Competitive Accretion

NO Problem with Radiation Pressure



Larson & Starrfield 1971
Kuhn 1974
York & Krugel 1977
Wolfire & Cassinelli 1987
Osorio et al. 1999

Krumholz's talk

Keto 2003

Summary

- Consistent kinematical signatures of infall/rotation are observed in I20126;
- Infall rates are large enough to overcome radiation.

- Following up other NH_3 “disks” with the SMA;
- ALMA will provide much needed sensitivity/resolution for spectral line work.