L1641-N: feedback in cluster formation and a large Class 0 protostar disk (?)

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(Jonathan Williams, Jonathan Tan, Sebastian Wolf)

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Feedback from protostellar outflows…

- Are energetic: a mechanism to keep clouds turbulent?
- Are collimated: transfer of energy is inefficient
- … but in a cluster there may be plenty! …so: what could they do to cluster and massive star formation?

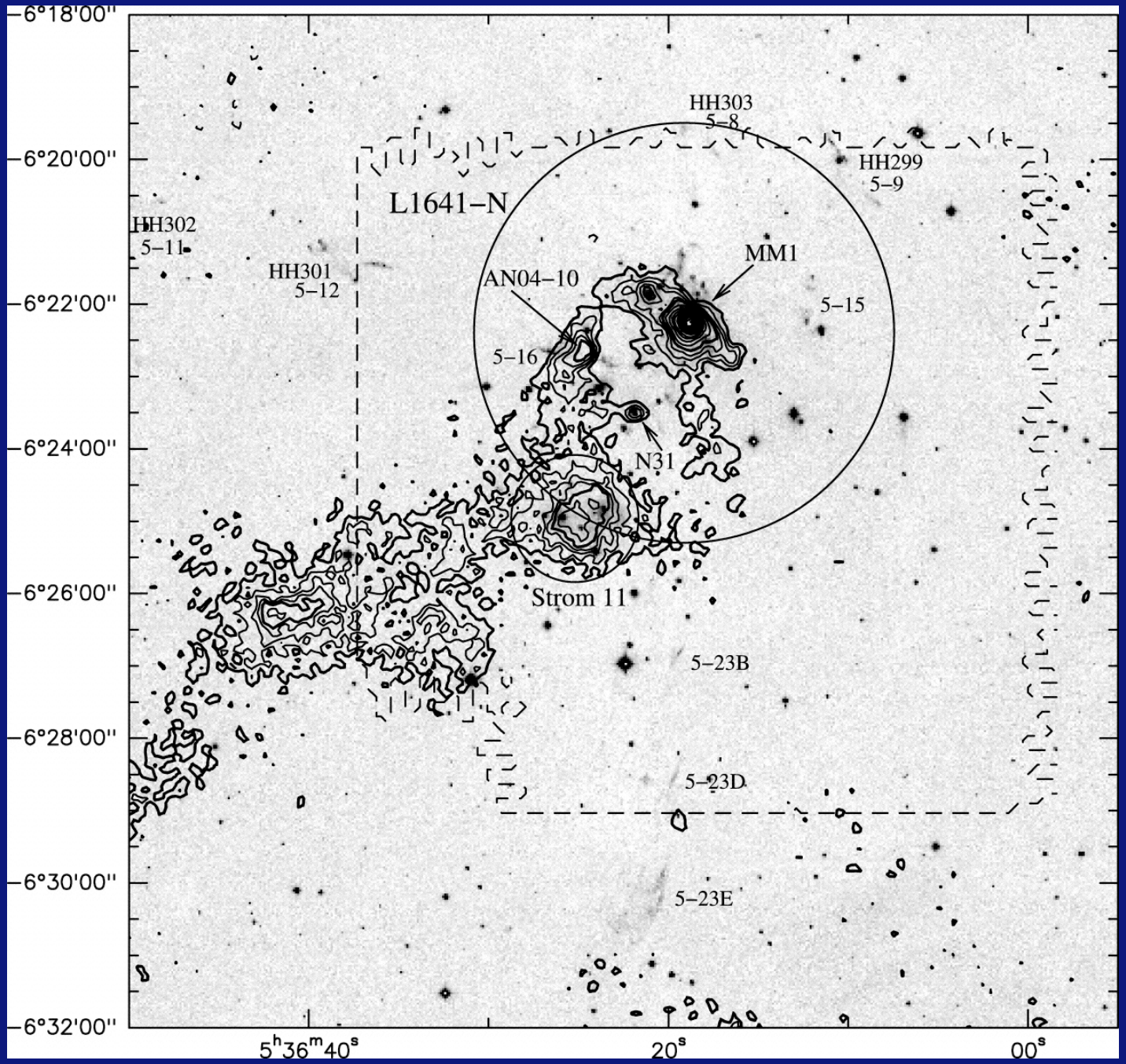
Early disks…

- Are predicted to be small, as low angular momentum material comes in first (e.g., Terebey etal 1984, ApJ 286, 529)
- Observations are sparse (highly obscured sources, confusion with envelope emission at mm wavelenghts) (e.g., Rodriguez etal 2005, ApJ 621, 133: IRAS16293B; Looney etal 2000, ApJ 529, 477)

The L1641-N cluster

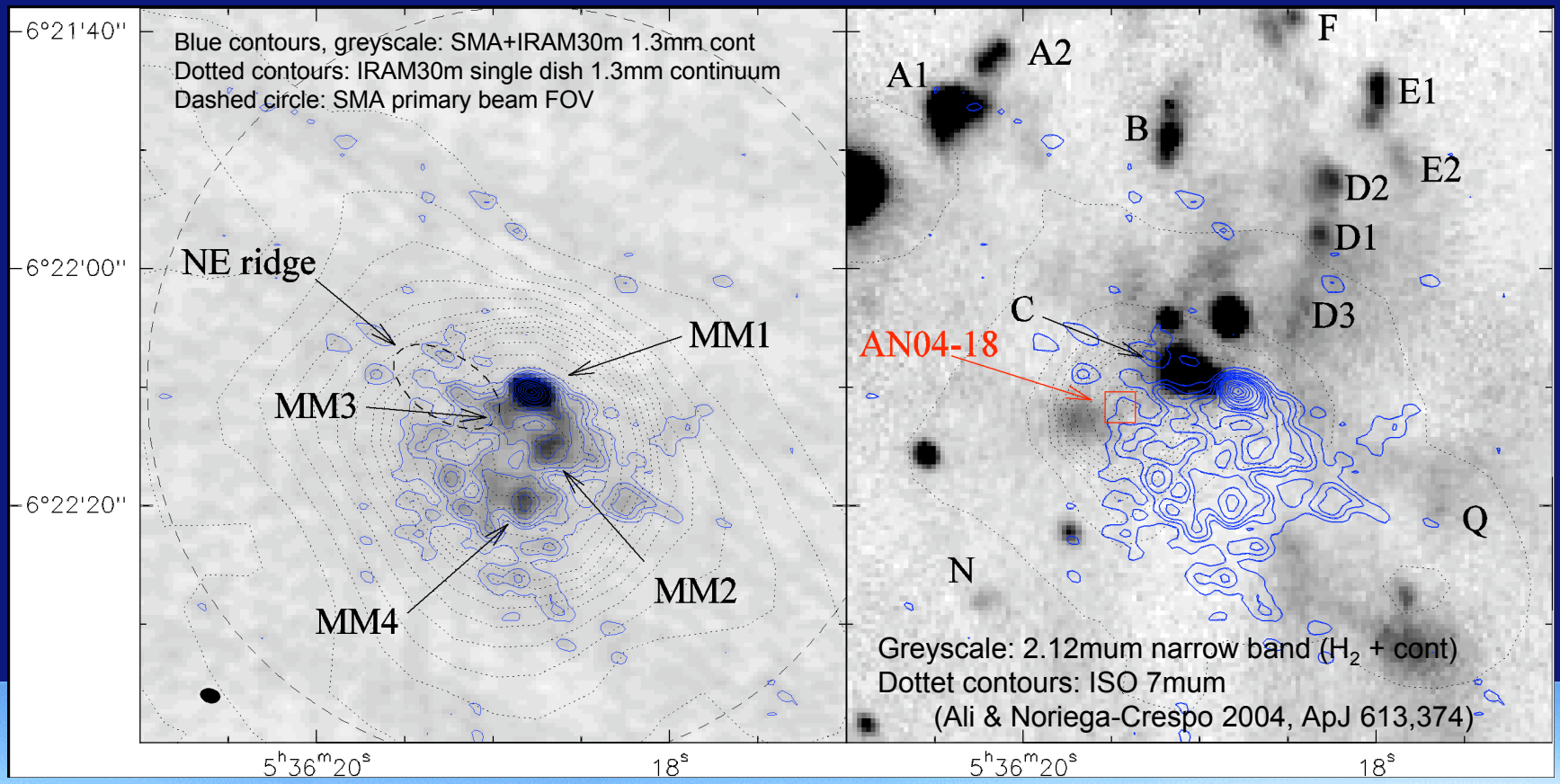
- About 1 degree south of Orion Nebula
- 20-30 NIR members (Hodapp & Deane 1993, ApJS 88, 199)
- Class 0 to Class II

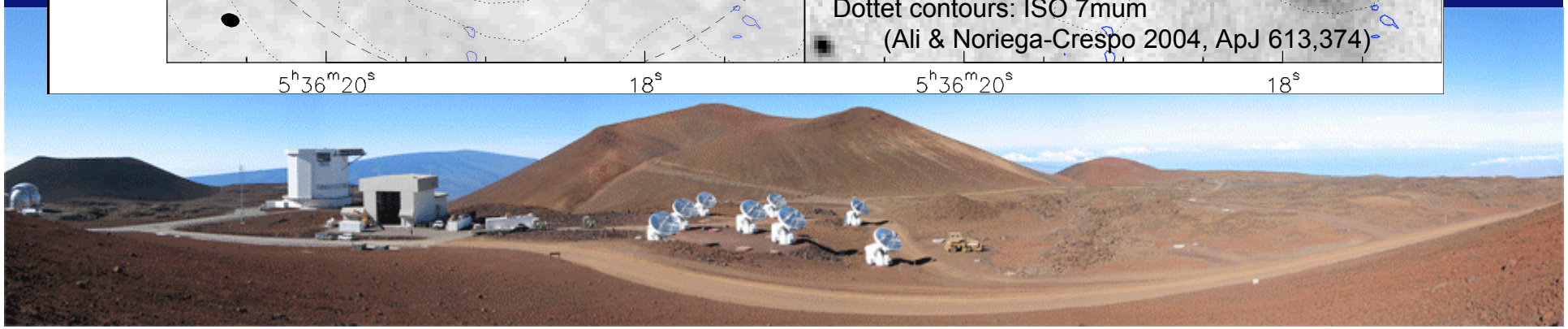
2.12mum narrow band (greyscale) + 1.3mm dust continuum (contours)



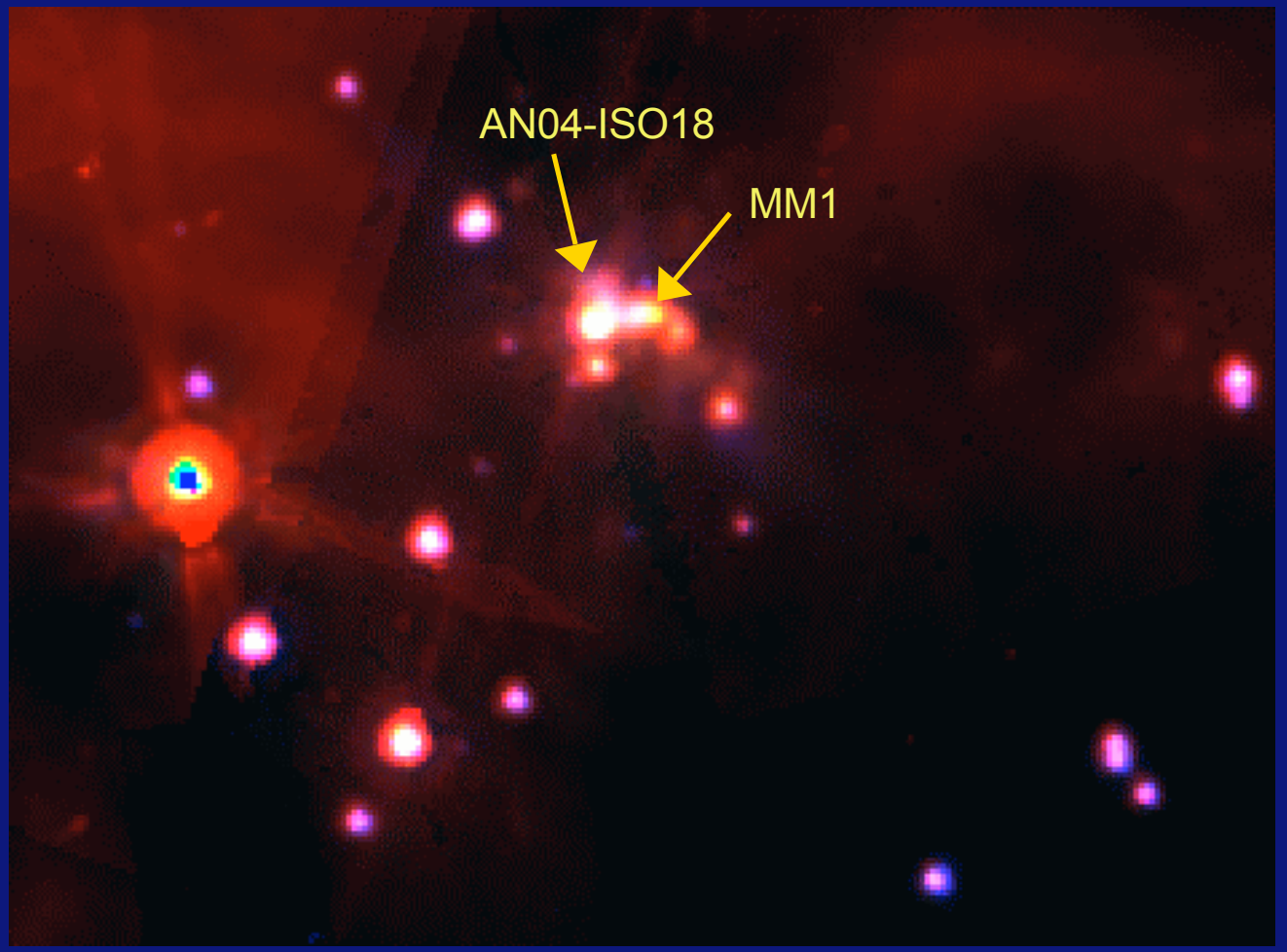
L1641-N @ SMA: 1.3 mm dust continuum

Stanke & Williams 2007, AJ 133, 1307

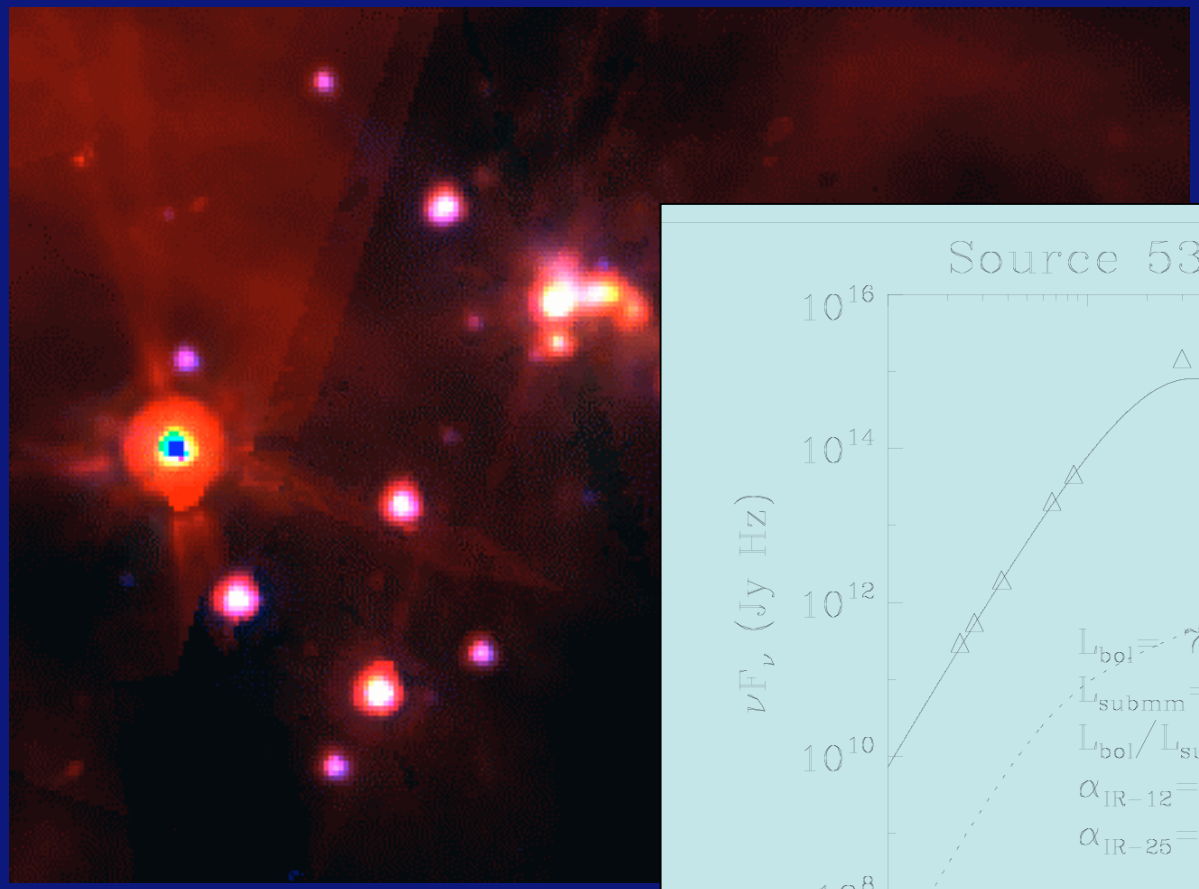


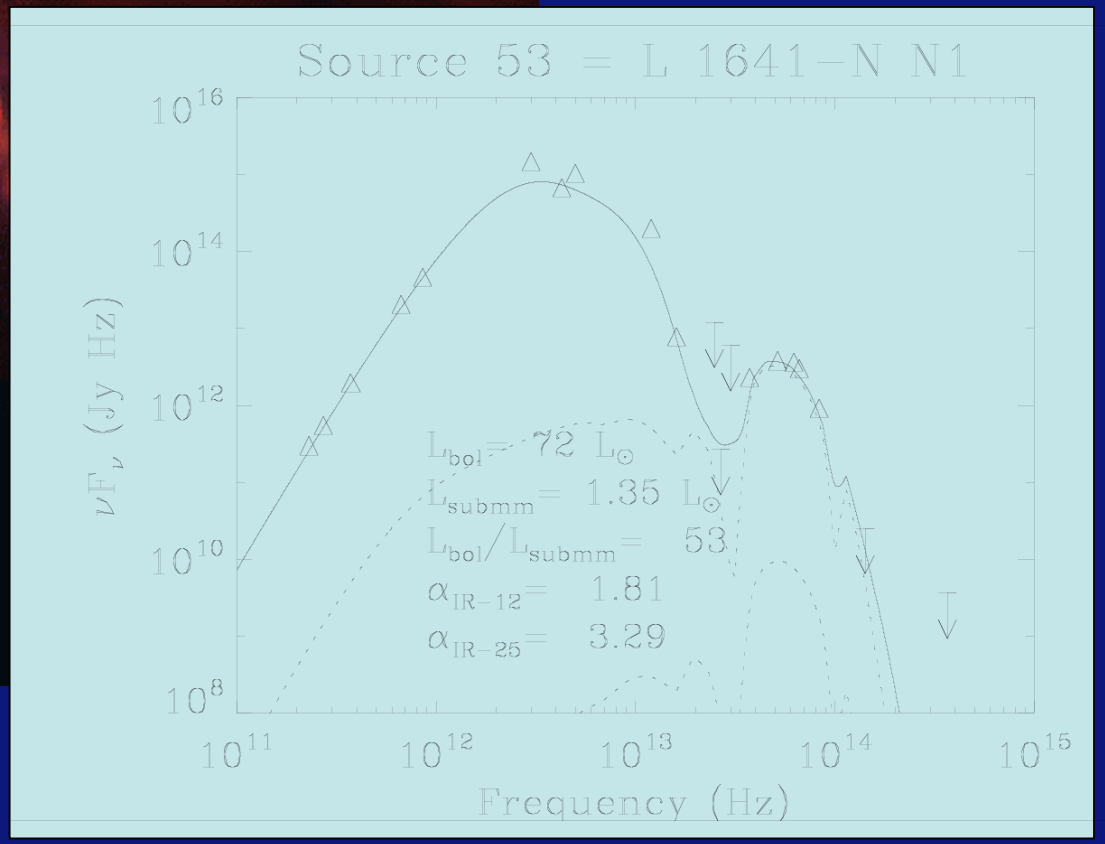


L1641-N @ Spitzer IRAC: hot dust? H_2?

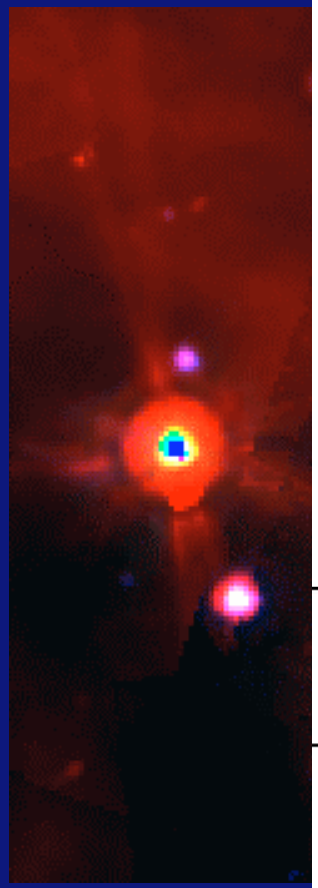


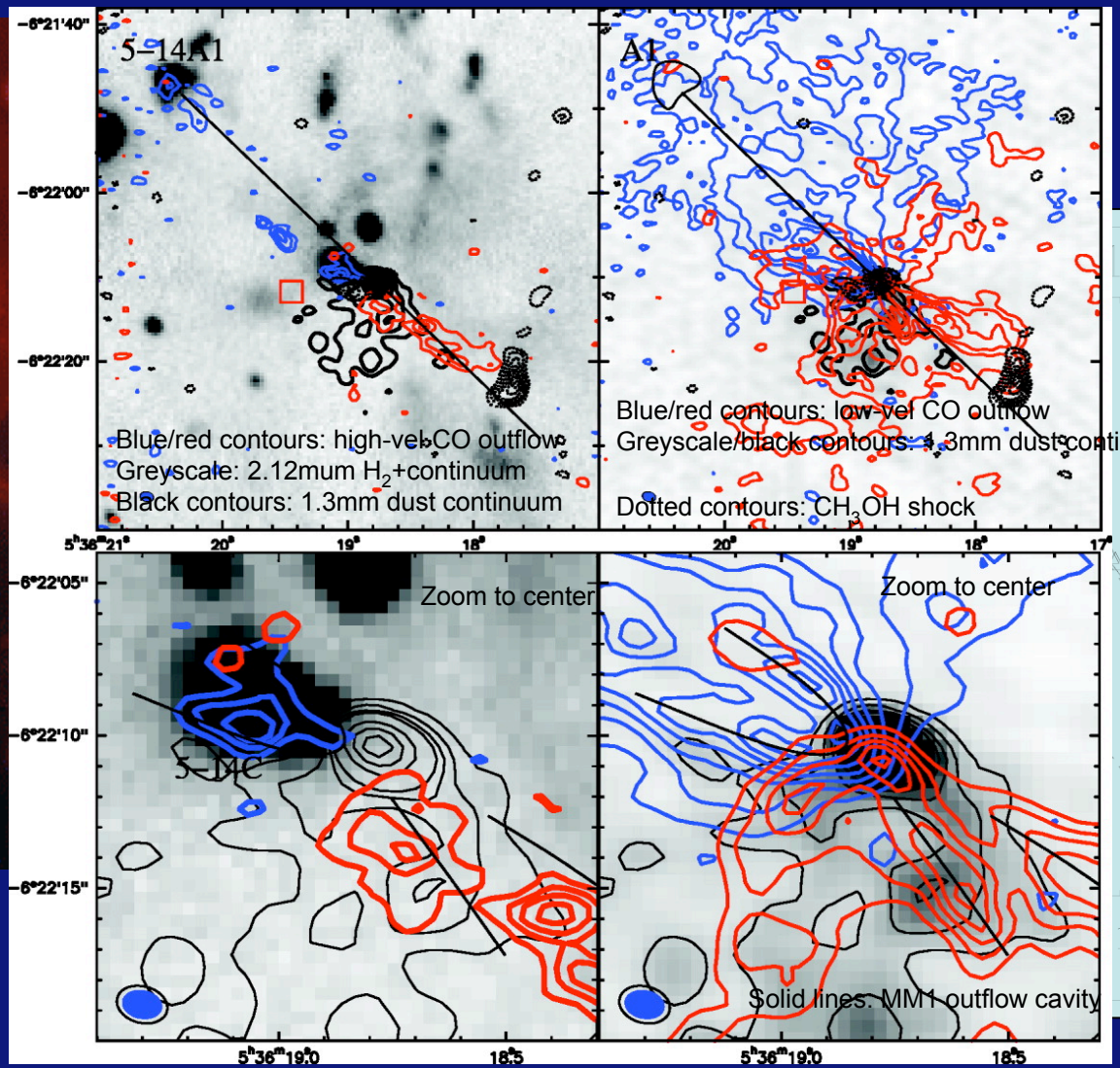
L1641-N mm-NIR SED:
Class 0 protostar

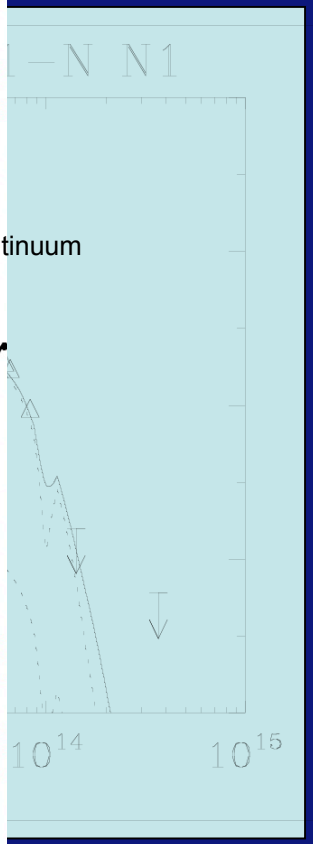




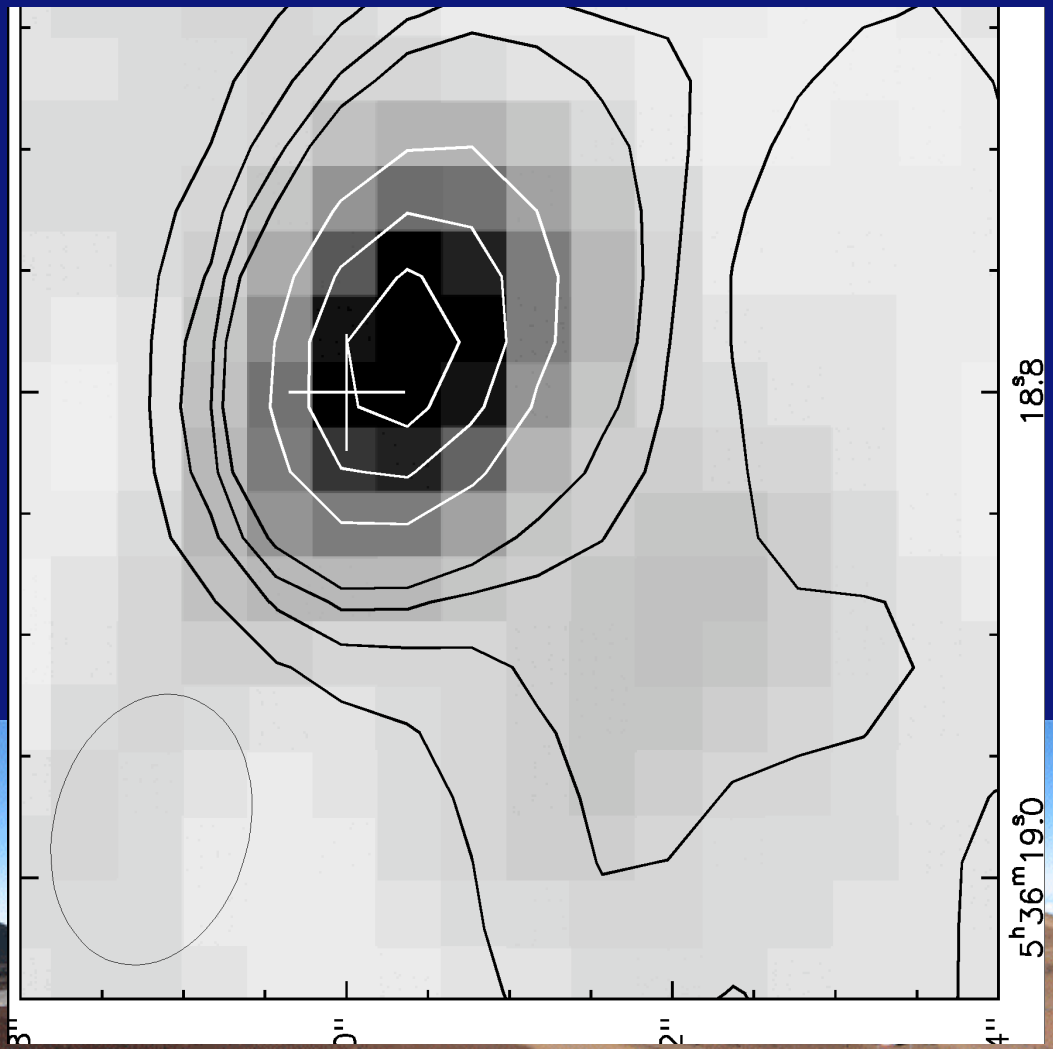
L1641-N: CO outflows: early Class 0 protostar







L1641-N @ SMA-CH_3CN: a disk?



Greyscale:
CH_3CN
(integrated intensity)

Contours:
1.3mm continuum

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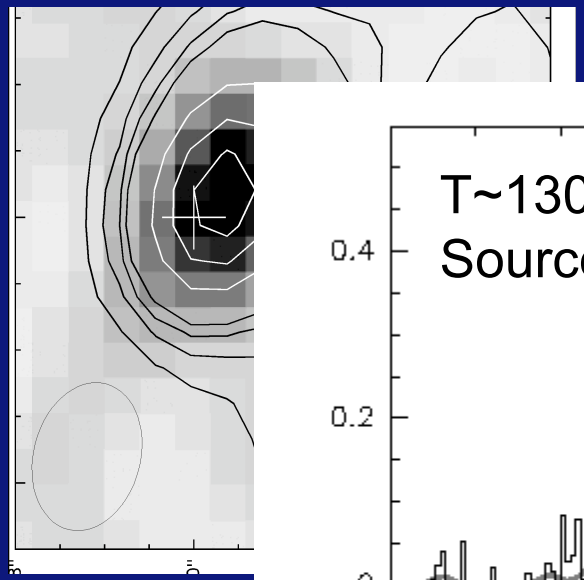

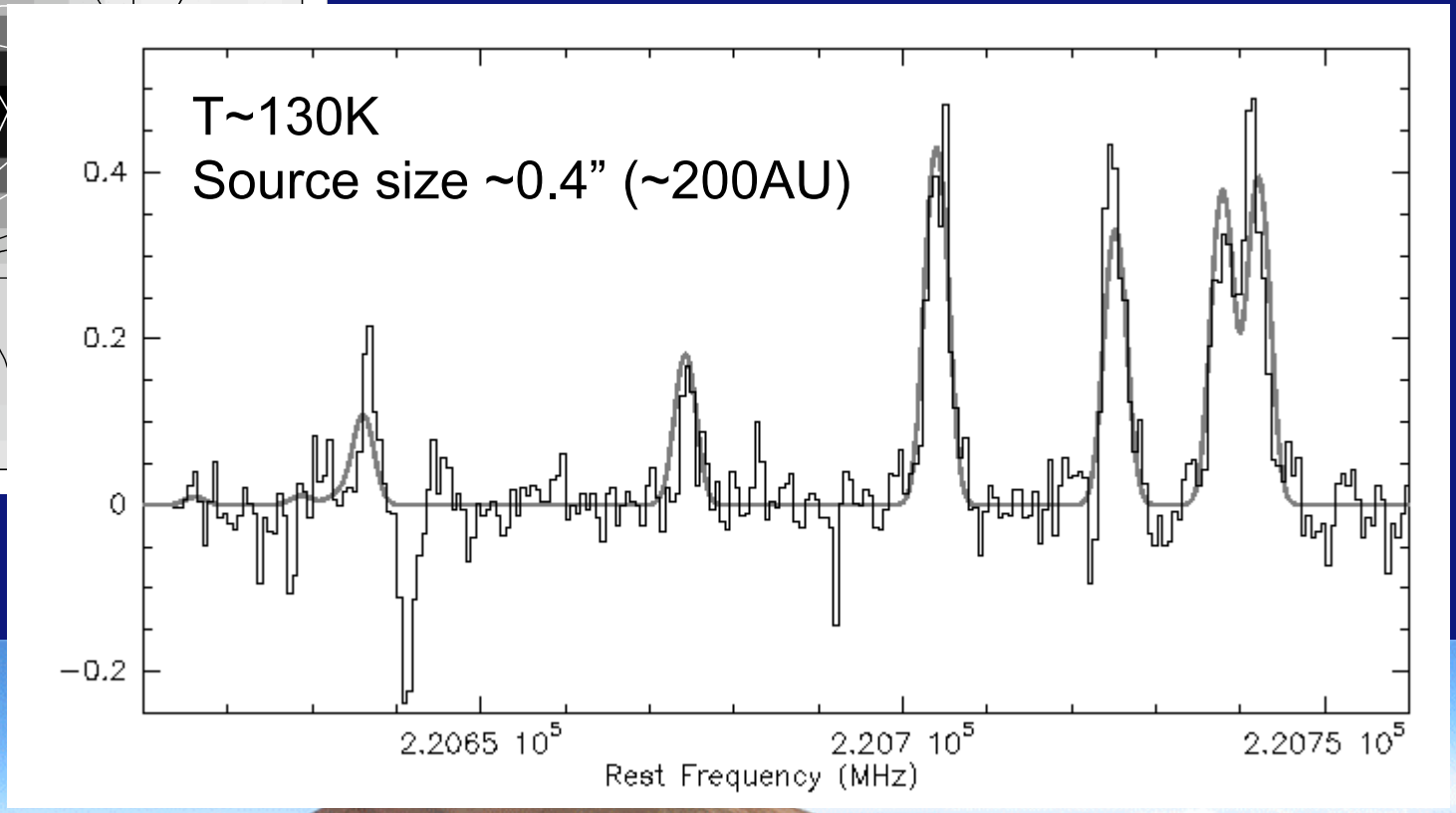

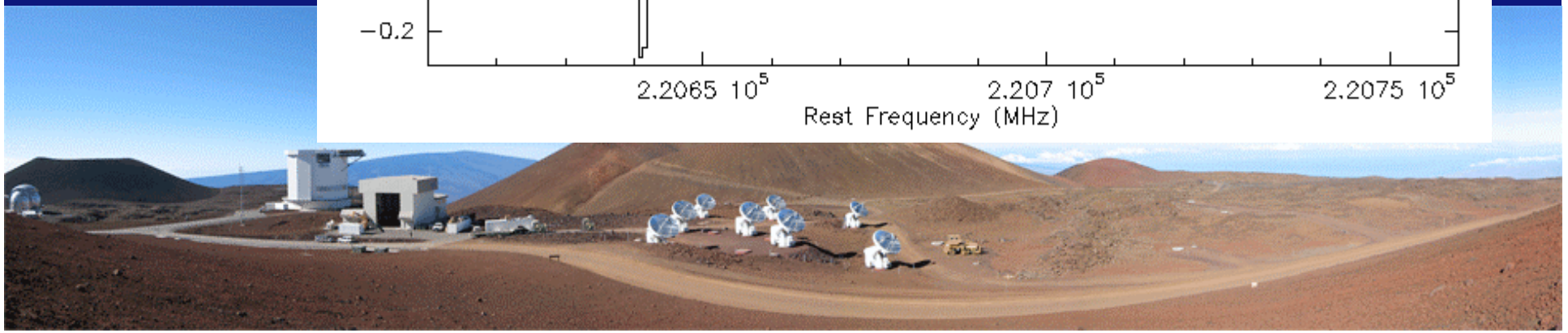

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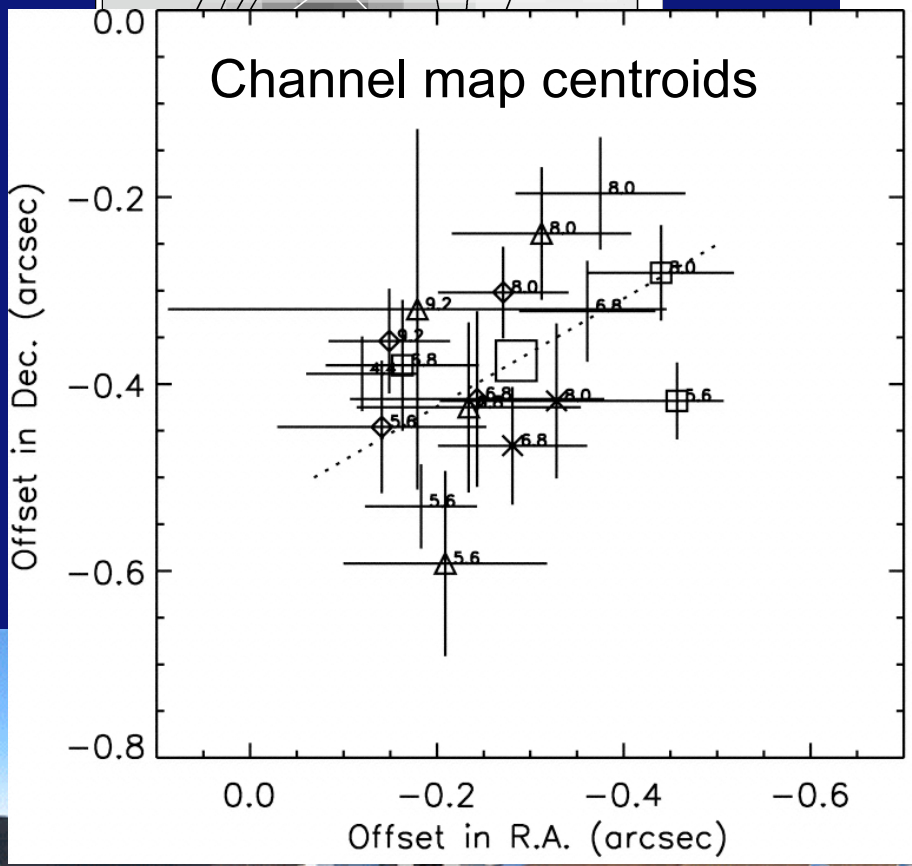
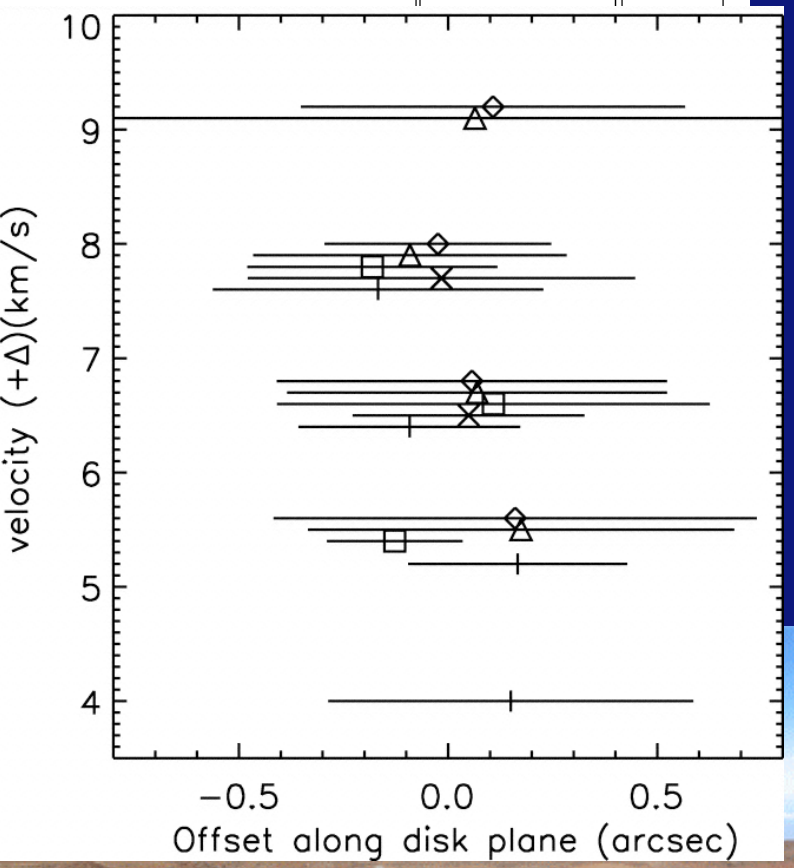
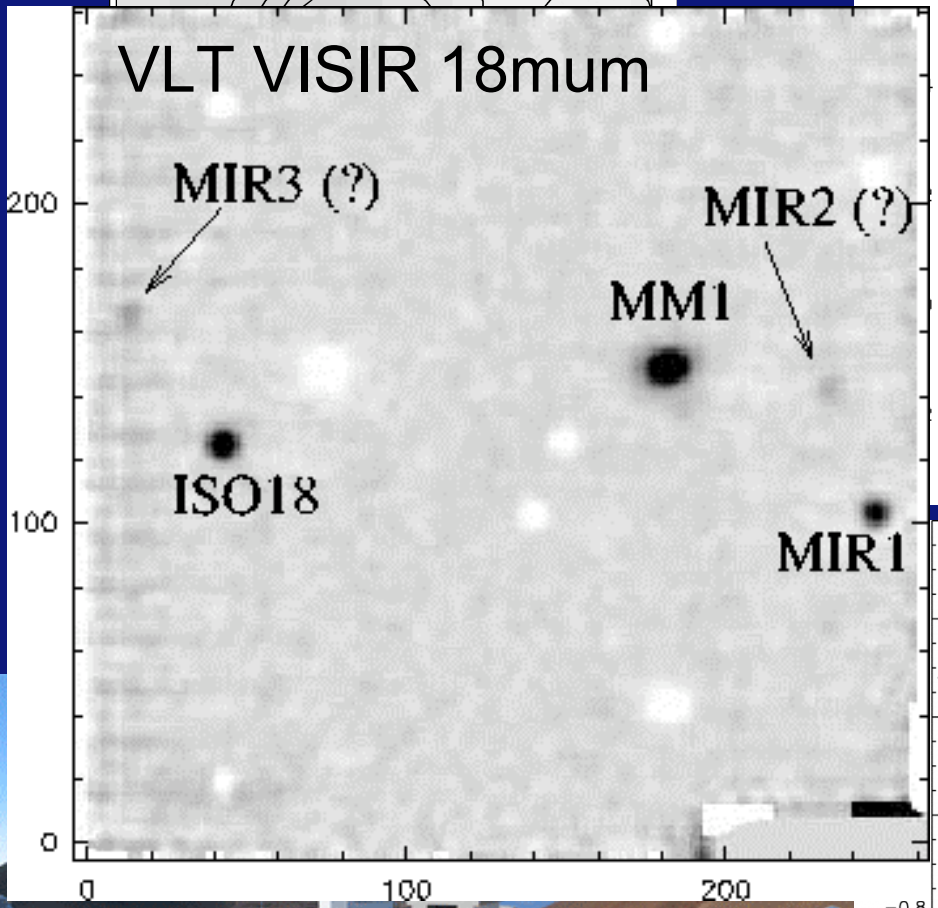
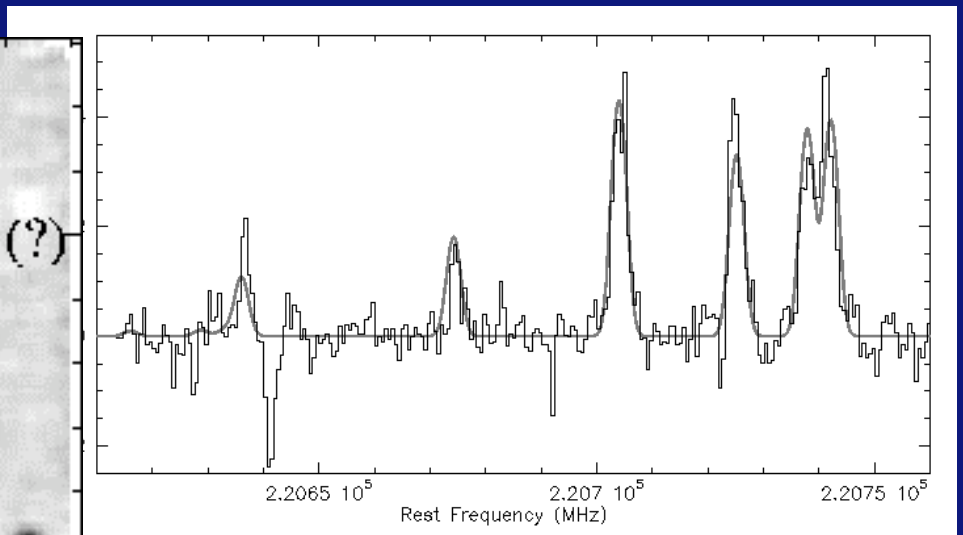
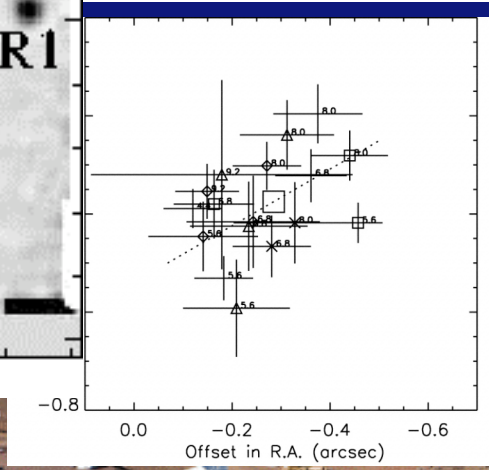


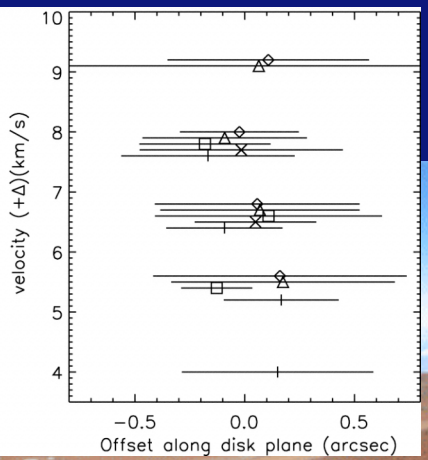


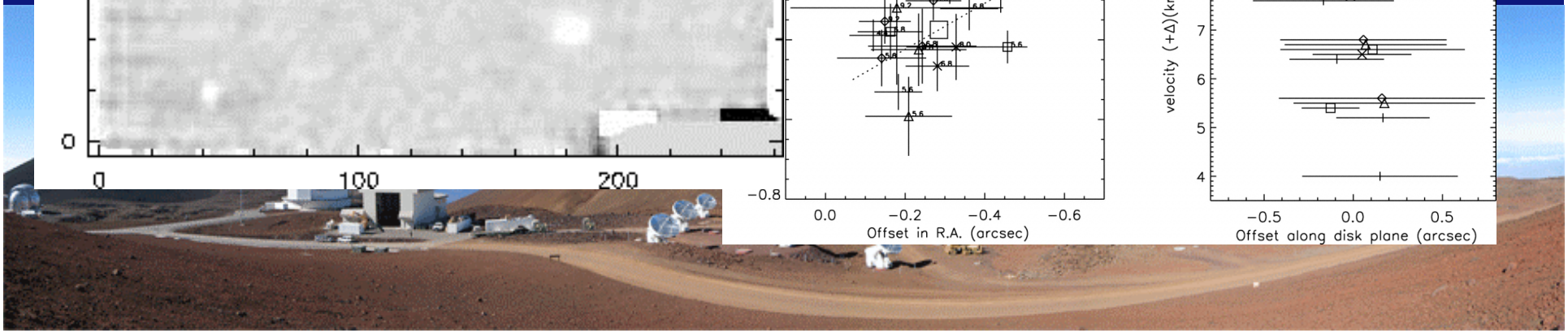
L1641-N @ SMA-CH_3CN and VLT VISIR 18mum: a disk?











Conclusions

- There is evidence for a large (200AU) disk in the Class 0 protostar L1641-N MM1 – disks must form quickly
- There is high velocity CO from outflows everywhere – low mass protostars might have significant impact on cluster formation
- … and waiting for ALMA …