Millimeter compact sources within the OMC1 filaments

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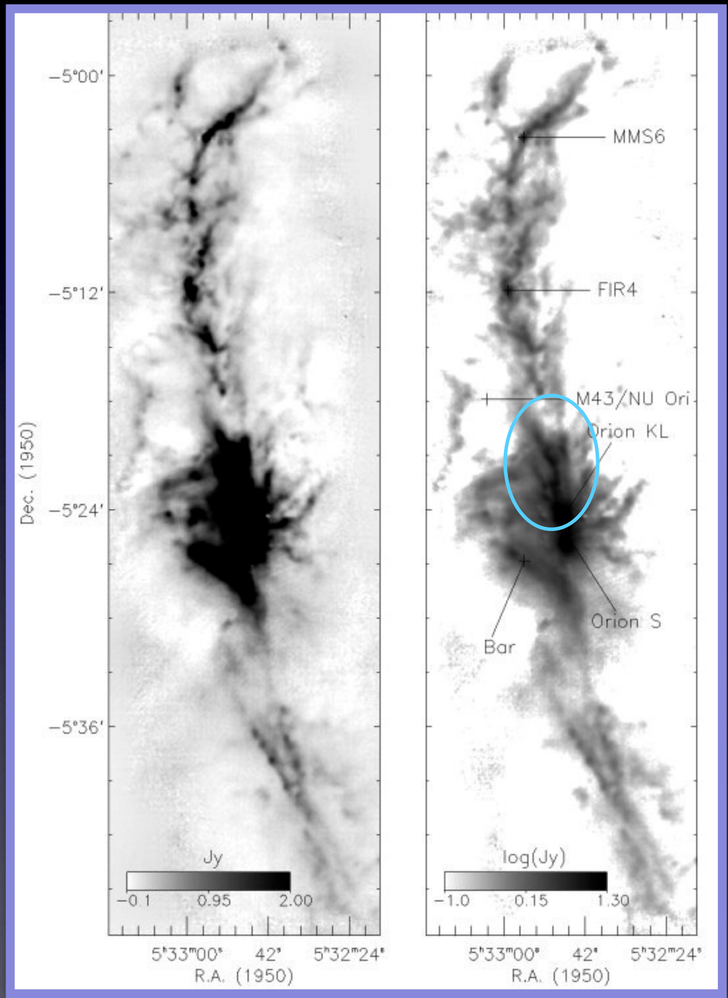
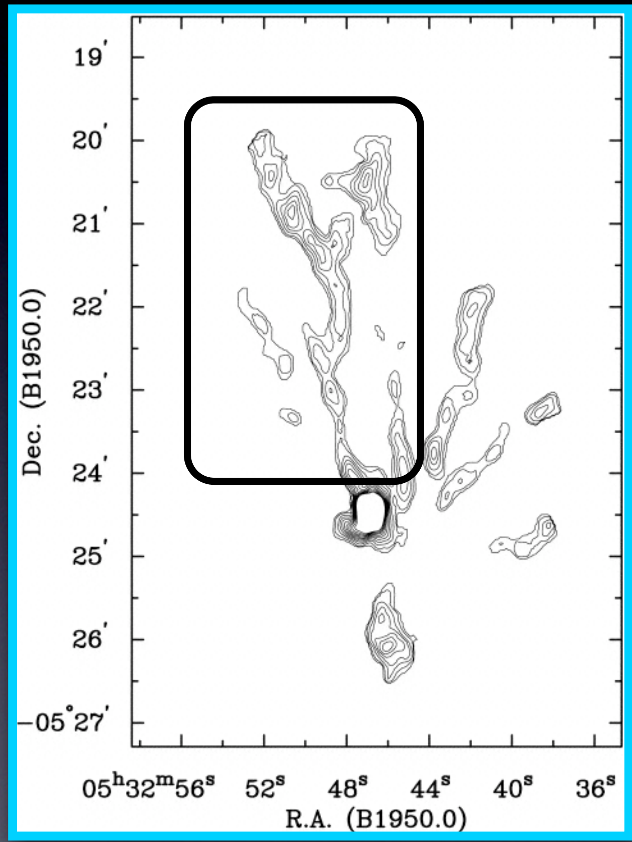
SCUBA/JCMT 850μm

(Johnstone & Bally, 1998)



VLA NH3 (1-1)

(Wiseman & Ho, 1998)

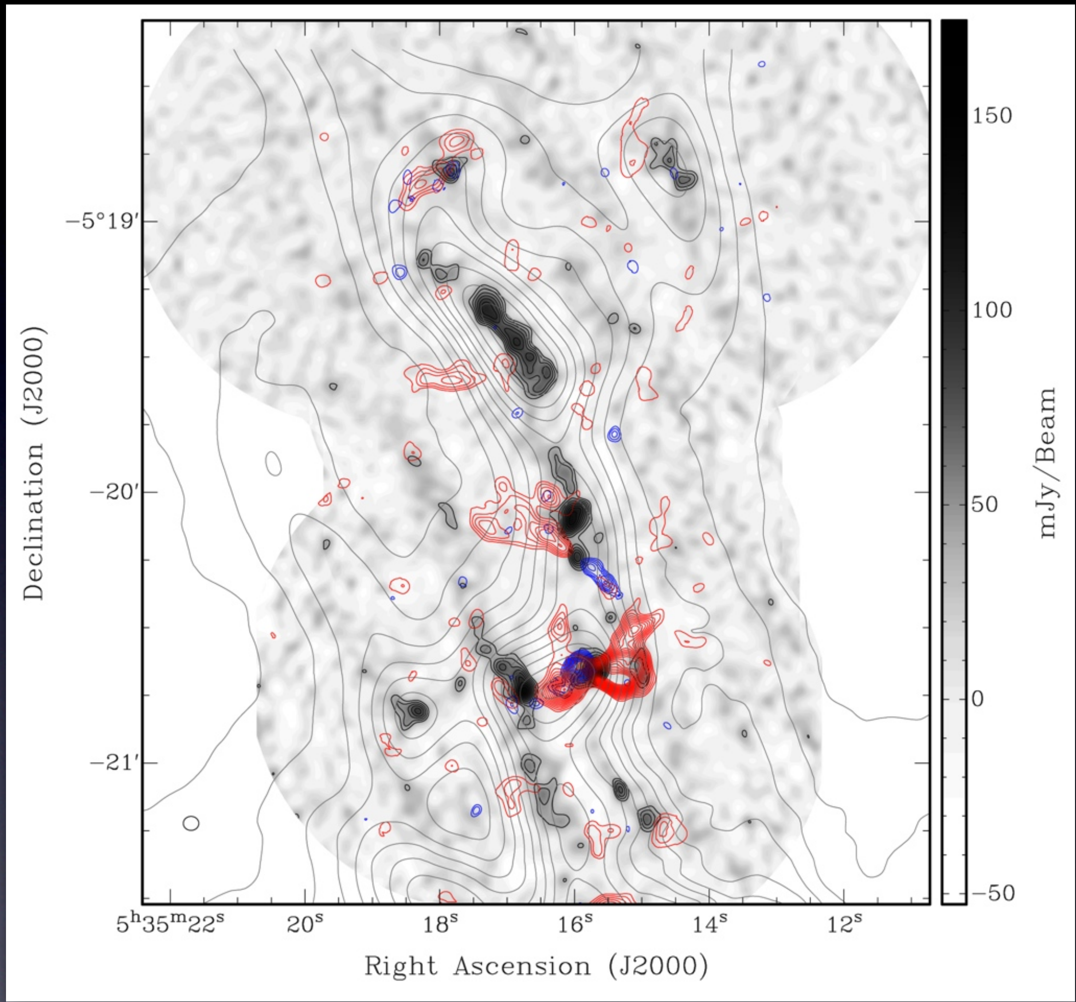


Submillimeter Array observations

8 antennas (6m)

230 GHz

compact configuration: ~ 3” resolution

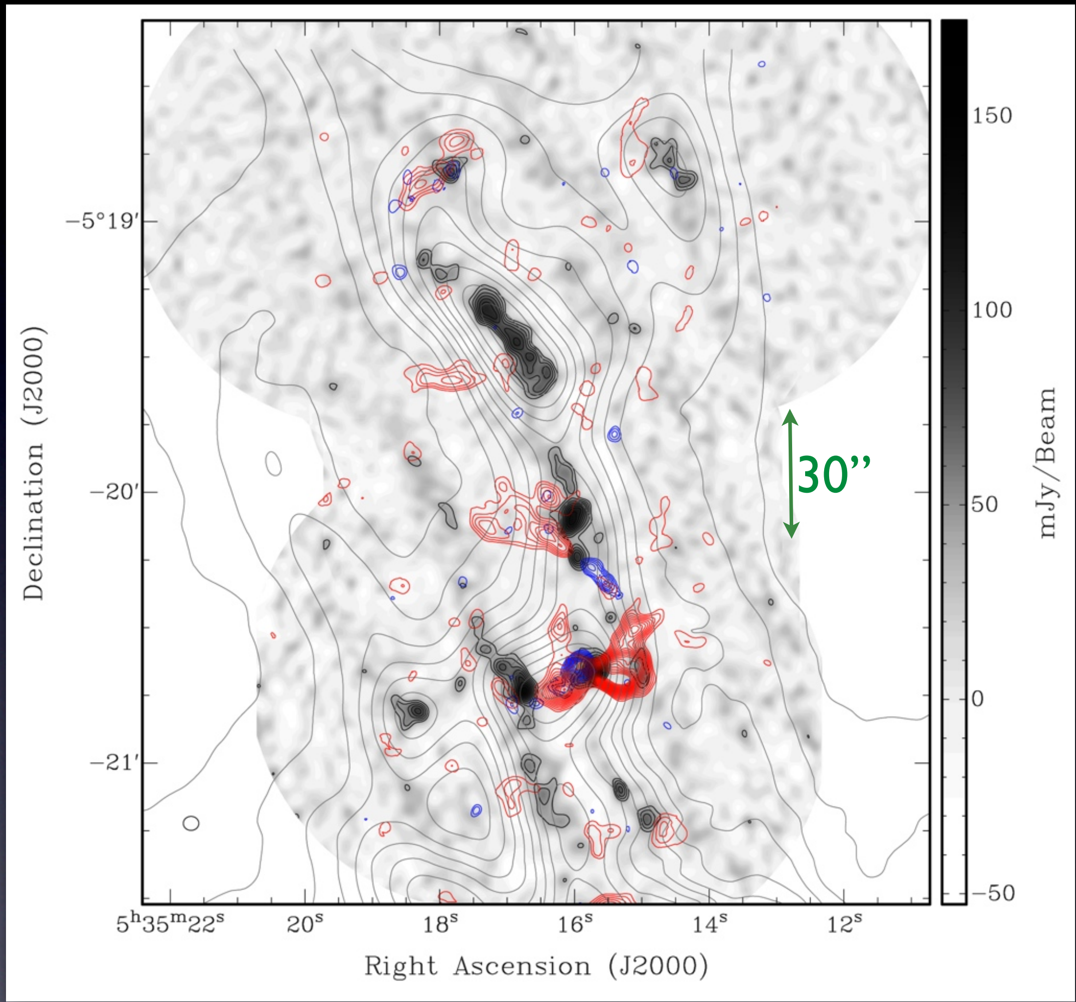


SCUBA 850μm cont.
(grey contours)

SMA 1.3mm cont.
(grey scale image)

SMA CO (2-1)
(red & blue contours)

16 compact sources
4 outflows



Thermal fragmentation?

$\lambda_{Jeans} = 31''$

T=17K

n=1.9x10^5 cm^{-3}

Source properties

ID	Flux (mJy)	R (AU)	M (M_{sun})	density (10^7 cm^{-3})
1	182	626	0,9	13,7
2	160	987	0.8	3.1
3	173	715	0,9	8,7
4	367	763	1,9	15,3
5	220	480	1,1	36,7
6	249	624	1,3	18,9
7	200	767	1,0	8,2
8	180	587	0,9	16,4
9	191	698	1,0	10,4
10	330	534	1,7	40.0
11	335	704	1,7	17,7
12	197	621	1,0	15,2
13	544	709	2.8	28,2
14	252	619	1,3	19,6
15	347	682	1,8	20,2
16	353	682	1,8	20,5

Nature of the compact sources

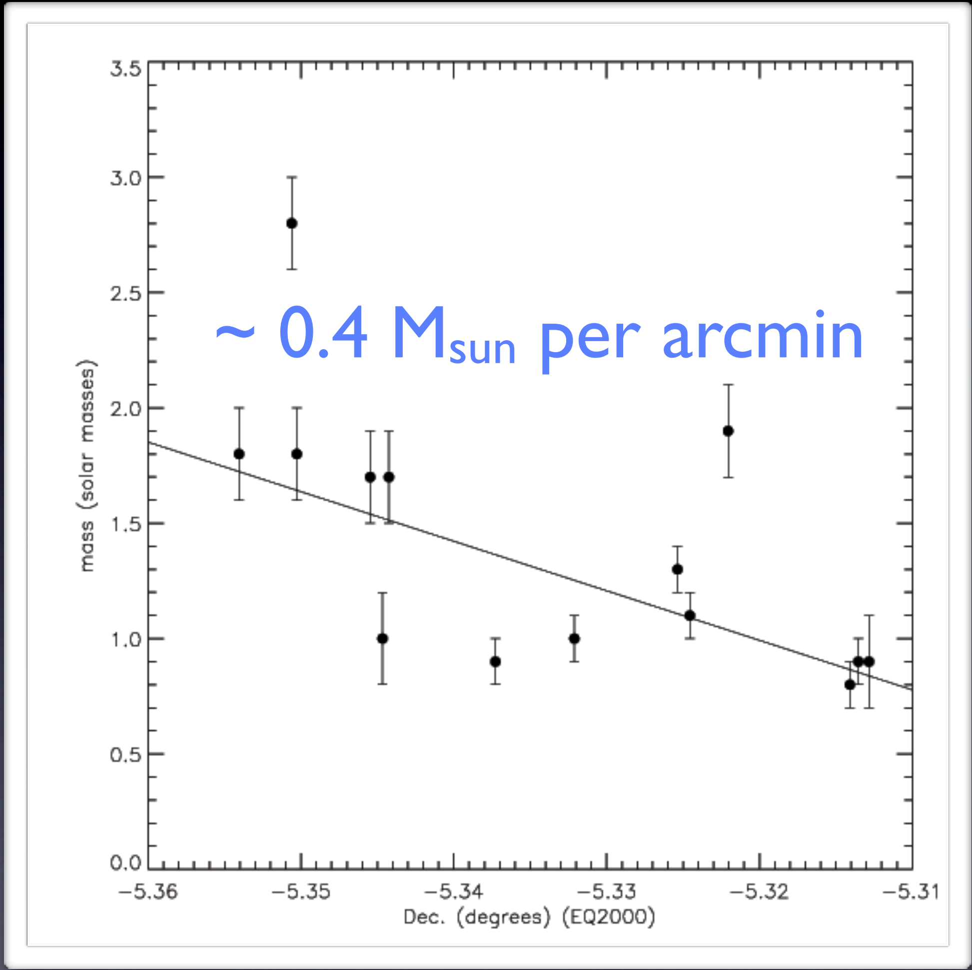
- no infrared counterparts were found

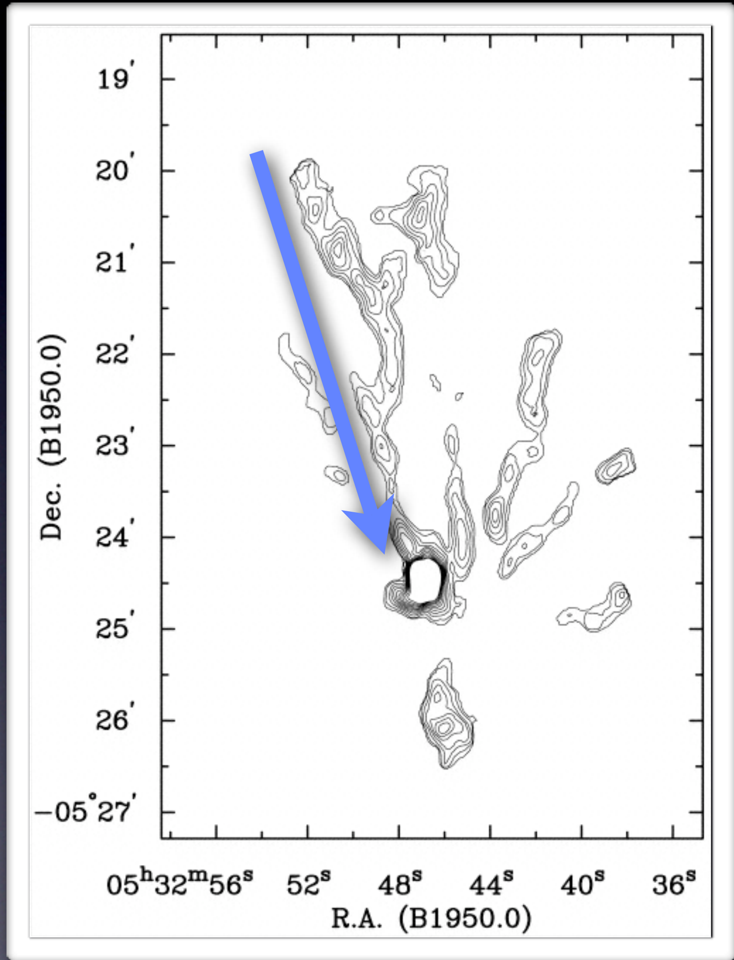
- densities and sizes are consistent with those of disks and inner part of envelopes

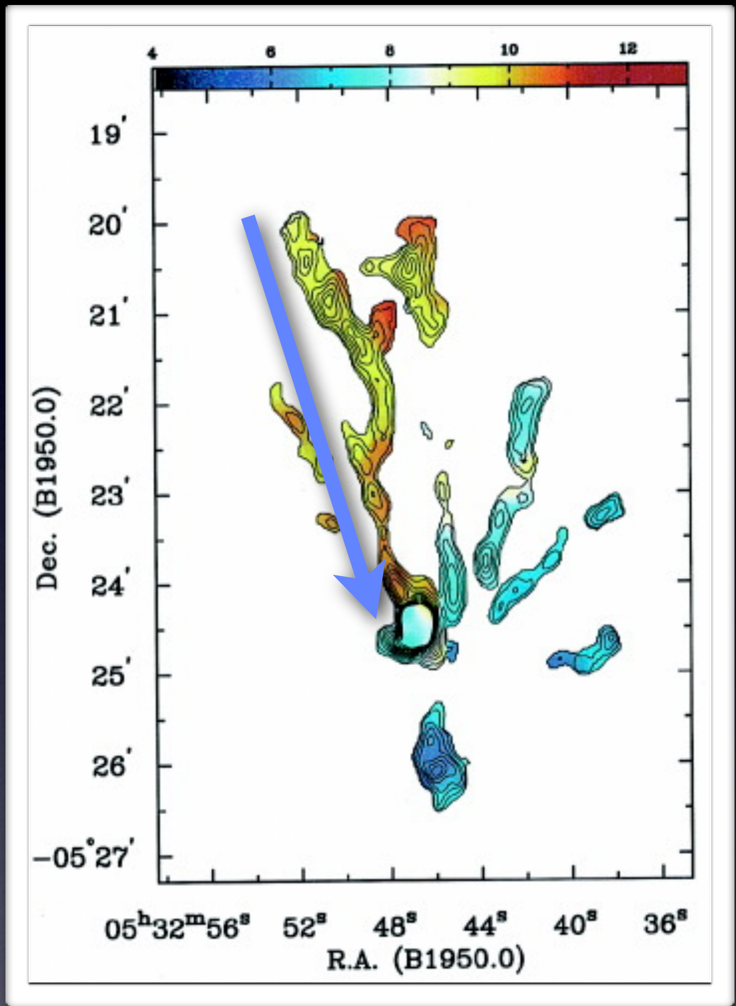
Likely Class 0 (or early Class I) sources.

still tracing the fragmentation process

Mass gradient of the sources







mass gradient coincides with the velocity gradient along the filament

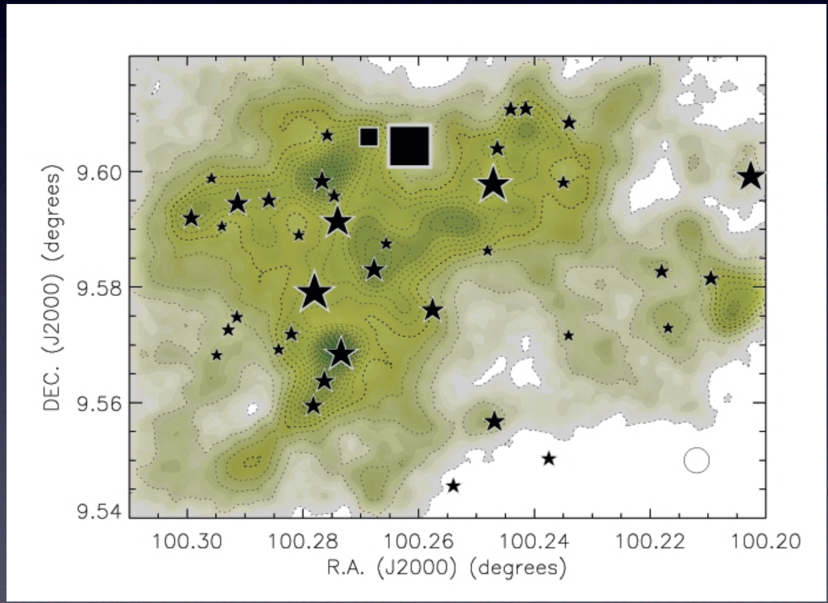
what are the theoretical predictions...?

Filaments are common in star forming clusters...

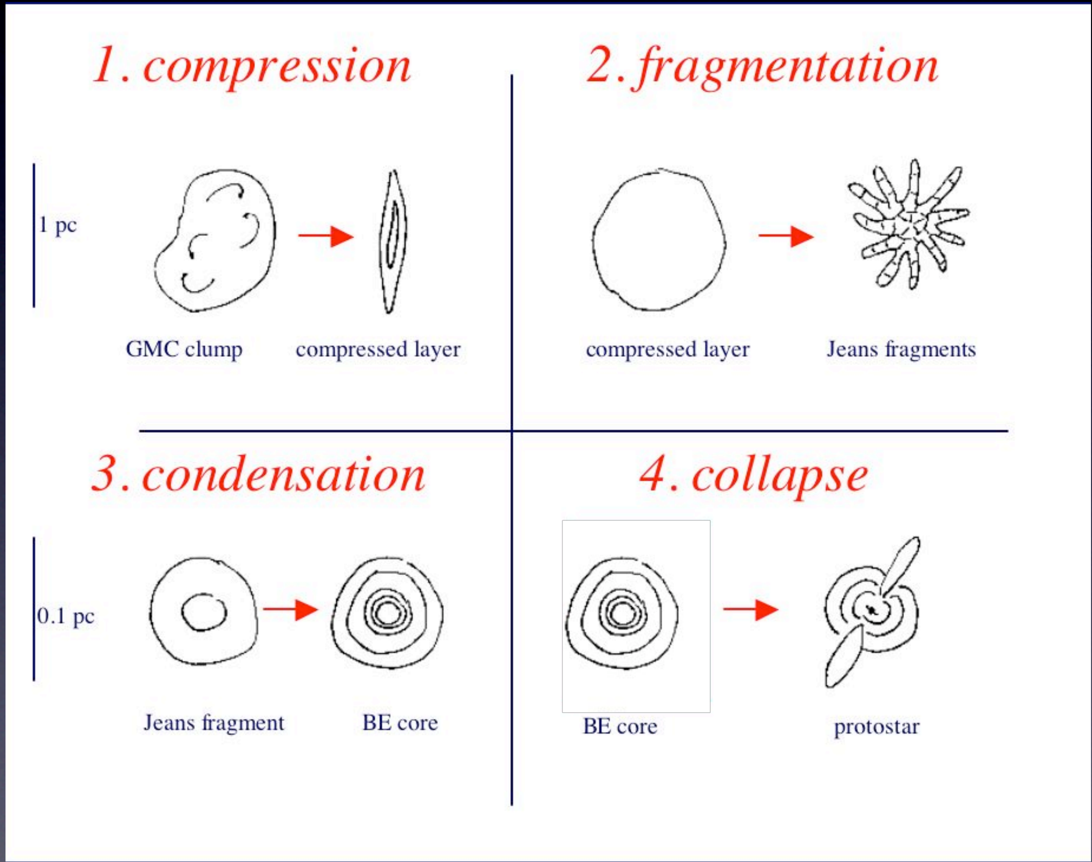
Ophiucus

Corona Australis

Spokes in NGC2264



Model
proposed by Phil Myers



predicts that core masses decrease outwards

reproduces the IMF

Summary

- identified 16 protostars and 4 outflows

- spacing consistent with thermal fragmentation

- measured protostellar mass gradient that is consistent with velocity gradient along the filament

- need ALMA to fully understand the process of collapse and fragmentation of filamentary clouds!

With ALMA...

... the high angular resolution will allow us to:

- probe if these sources are multiple
  - to study fragmentation of low mass cores
- identify what sources are driving the outflows
- spatially resolve the disk from the envelope

... the high spectral resolution will allow us to:

- measure the velocity dispersion of the sources
- accurately measure infall and accretion rates
  - test theoretical models for star formation within filamentary clouds.