The Star Formation Newsletter #301, 22-28

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#22 The evolution of young Hii regions
I. Continuum emission and internal dynamics

http://arxiv.org/pdf/1712.04735

(< 0.01 pc)

ALMAで 9つの hyper- and ultra-compact HII regionsを観測

-> 質量降着による大質量原始星進化の最終段階　を調べる

(もしくは大質量星の pre-main-sequence 段階)

Red MSX Source (RMS) Survey が見つけた600個のHii regionのうち

- ATCA & VLA でcompact (r<5”)
- bolometric luminositiesが10^4 Lsun より大きいもの
- 距離が3 ~ 5.5 kpc 以内に位置しているもの

(expanding / rotating / infalling)

Hii regionでガス (ionised & molecular gas) の動きがどうなっているか？

-> high-resolution(~0.5”)で観測 (ALMA Band 6)

- radio recombination line H29α
- molecular emission (CS, CH3CCH)
- 256GHz continuum emission

Table 2: Summary of radio properties of the H II regions and their host molecular clumps. The luminosity in Column 7 is that of the H II region, and the final column gives the radio derived spectral index. For the targets which were not detected in all of the ATCA and VLA wavebands in Urquhart et al. (2007, 2009), no spectral index (α) was determined.

Source Name	RA (J2000)	Dec. (J2000)	Distance (kpc)	Log[M_{clump}] ($M_\odot$)	Log[L_{Bol}] ($L_\odot$)	Radio Size ($''$)	Flux[a] $_{6\,cm}$ (mJy)	α
G302.02+00.25	12:43:31.49	−62:36:13.7	4.26±0.98	2.76	4.16	2.24	59.5	−0.03
G302.49−00.03	12:47:31.76	−62:53:59.6	3.39±0.40	2.61	3.75	2.07	23.4	0.03
G309.89+00.40	13:50:35.54	−61:40:21.4	5.41±1.27	3.12	4.40	1.79	1.2	···
G330.28+00.49	16:03:43.26	−51:51:45.9	5.45±0.56	2.95	4.13	2.00	44.9	−0.08
G332.77−00.01	16:17:31.13	−50:32:35.7	5.67±0.57	3.22	4.16	1.14	24.6	···
G337.63−00.08	16:38:19.02	−47:04:51.0	3.82±0.43	2.88	4.01	2.20	31	0.01
G337.84−00.37	16:40:26.68	−47:07:13.1	2.98±0.47	2.55	4.59	3.32	11.1	0.63
G336.98−00.18	16:36:12.43	−47:37:58.0	4.67±0.41	2.51	4.43	1.47	18	0.52
G339.11+00.15	16:42:59.58	−45:49:43.6	4.96±0.40	2.93	4.24	1.98	42.9	−0.04

[a] Integrated Flux at 6 cm

256GHz continuum

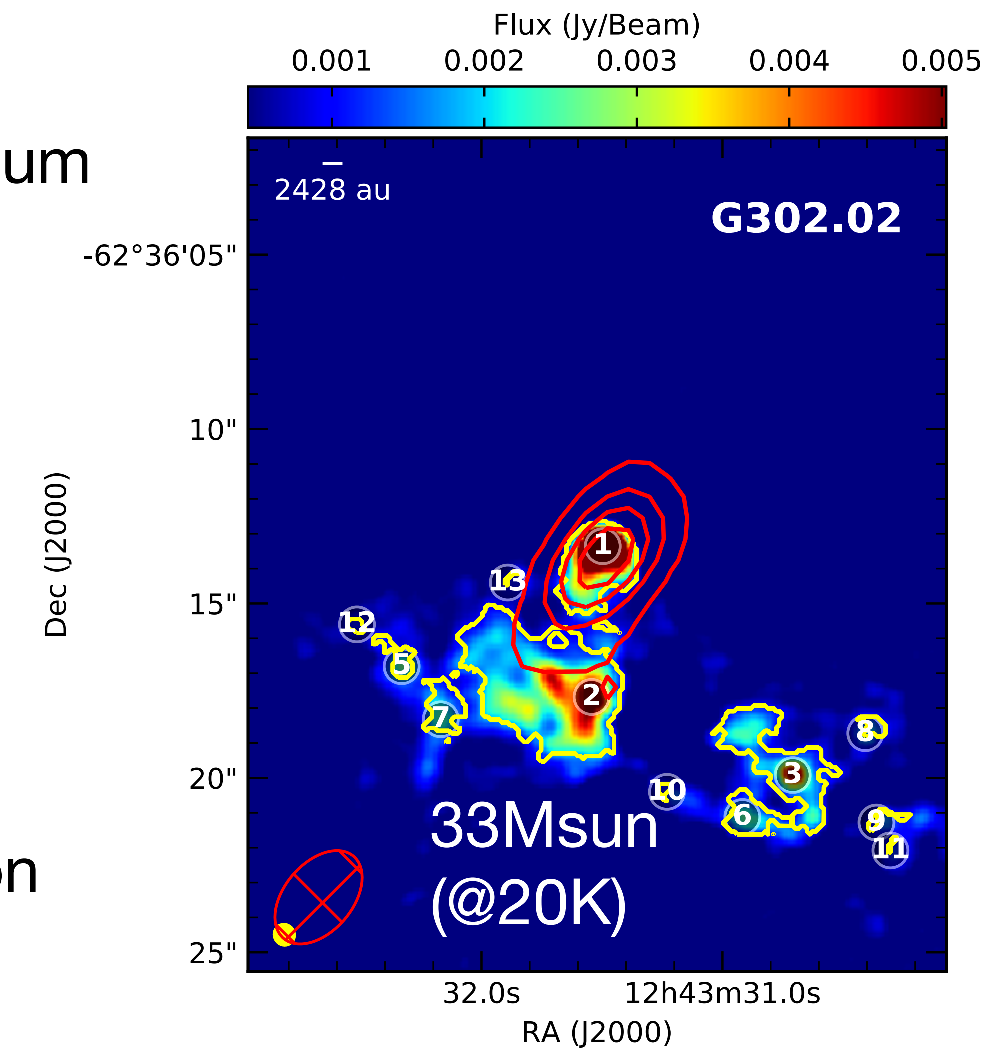
red: 5GHz

core: yellow

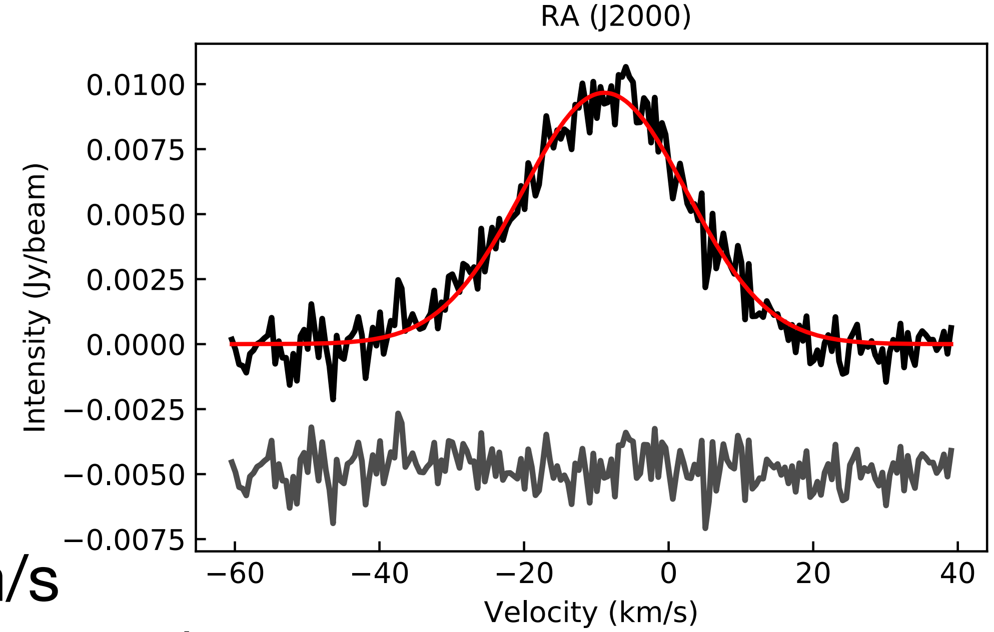
clumpiness

Jenas Length
~2000 AU
(100K, 10^7/cc)

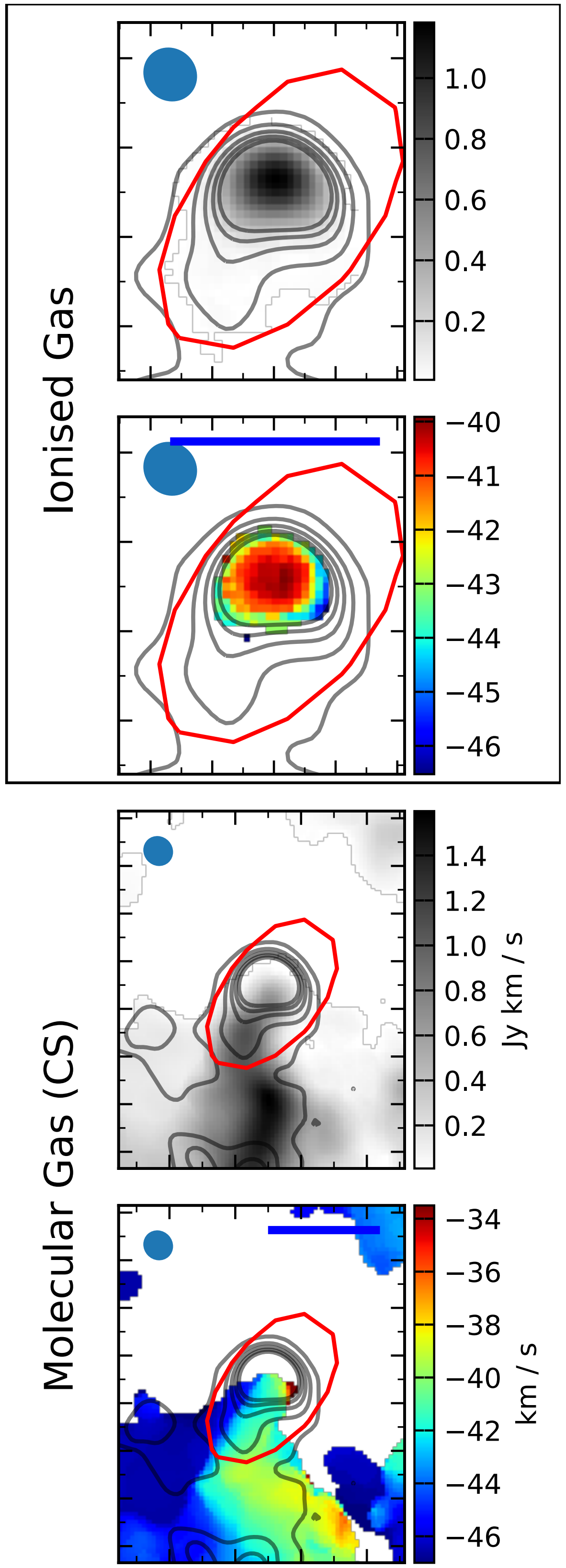
< core separation



RRLs
H29α spectra
fit by Gaussian
(no Lorentzian)



V_{LSR} = -37.1 km/s
Line Width = 11.4 km/s
-> n_e < 5x10^7 /cc
(upper limit)



H29α

integrated intensity
(moment zero)

intensity weighted
velocity
(moment one)
"bulls-eye"
-> infalling

CS

no emission
-> destroyed

Table A.2: Clump positions, Areas, Derived Fluxes, Masses, and Column Densities

ID Number	Peak RA	Peak DEC	Area	Flux	Clump Mass ($M_\odot$)			Log(Column Density)		
	(h:m:s)	(d:m:s)	(arcsec^2)	(mJy)	(20 K)	(50 K)	(100 K)	(20 K)	(50 K)	(100 K)
G302.02 (1.00e+07 cm^{-3}, 70.0 K)										
1	12:43:31.50	-62:36:13.36	4.63	62.08	25.37	8.37	3.94	24.41	23.93	23.6
2	12:43:31.54	-62:36:17.68	13.45	81.48	33.29	10.99	5.17	23.79	23.31	22.98
3	12:43:30.71	-62:36:19.92	5.22	23.92	9.77	3.23	1.52	23.77	23.29	22.96
4	12:43:29.87	-62:36:22.00	0.94	4.57	1.87	0.62	0.29	23.62	23.14	22.81
5	12:43:32.33	-62:36:16.80	0.75	3.01	1.23	0.41	0.19	23.45	22.97	22.64
6	12:43:30.92	-62:36:21.12	1.5	6.01	2.46	0.81	0.38	23.43	22.95	22.62
7	12:43:32.17	-62:36:18.32	1.39	5.57	2.28	0.75	0.35	23.41	22.92	22.6
8	12:43:30.41	-62:36:18.72	0.38	1.29	0.53	0.17	0.08	23.32	22.84	22.51
9	12:43:30.36	-62:36:21.28	0.3	0.83	0.34	0.11	0.05	23.18	22.7	22.37
10	12:43:31.23	-62:36:20.40	0.16	0.43	0.17	0.06	0.03	23.12	22.64	22.31
11	12:43:30.30	-62:36:22.08	0.09	0.23	0.09	0.03	0.01	23.09	22.61	22.28
12	12:43:32.52	-62:36:15.60	0.2	0.52	0.21	0.07	0.03	23.07	22.59	22.26
13	12:43:31.89	-62:36:14.40	0.11	0.27	0.11	0.04	0.02	23.04	22.56	22.23

#23 Stellar mass spectrum within massive collapsing clumps I. Influence of the initial conditions

https://arxiv.org/pdf/1711.00316

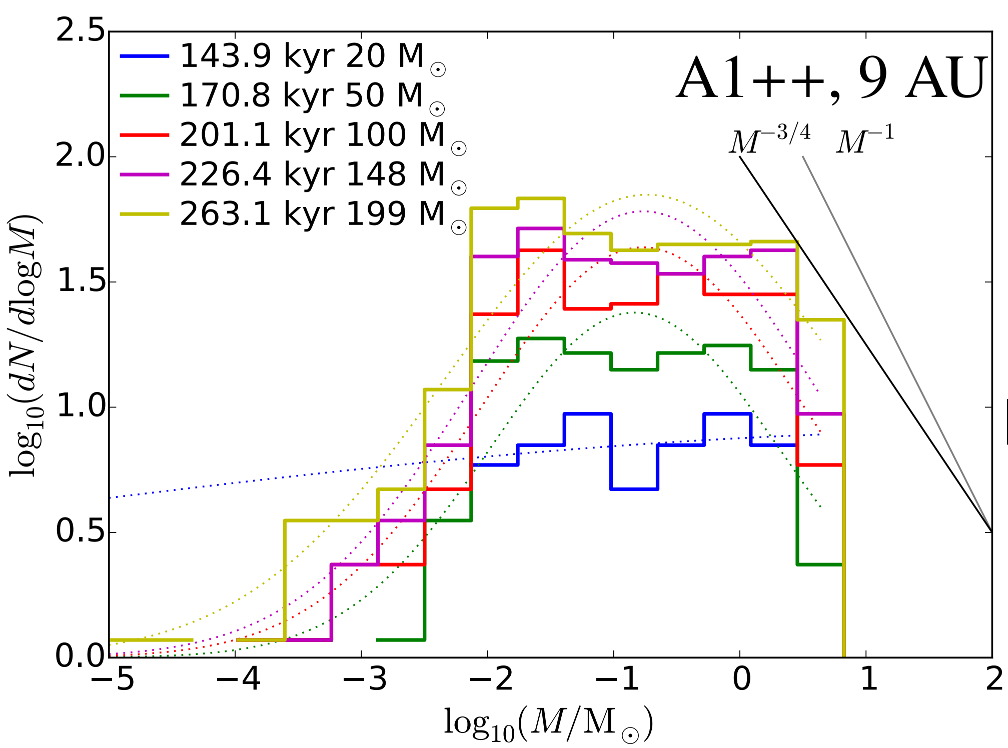
IMF の傾きは何が決めるか

-> density と turbulence を変化させてシミュレーションした (RAMSES + sink)

1000 Msun のコア

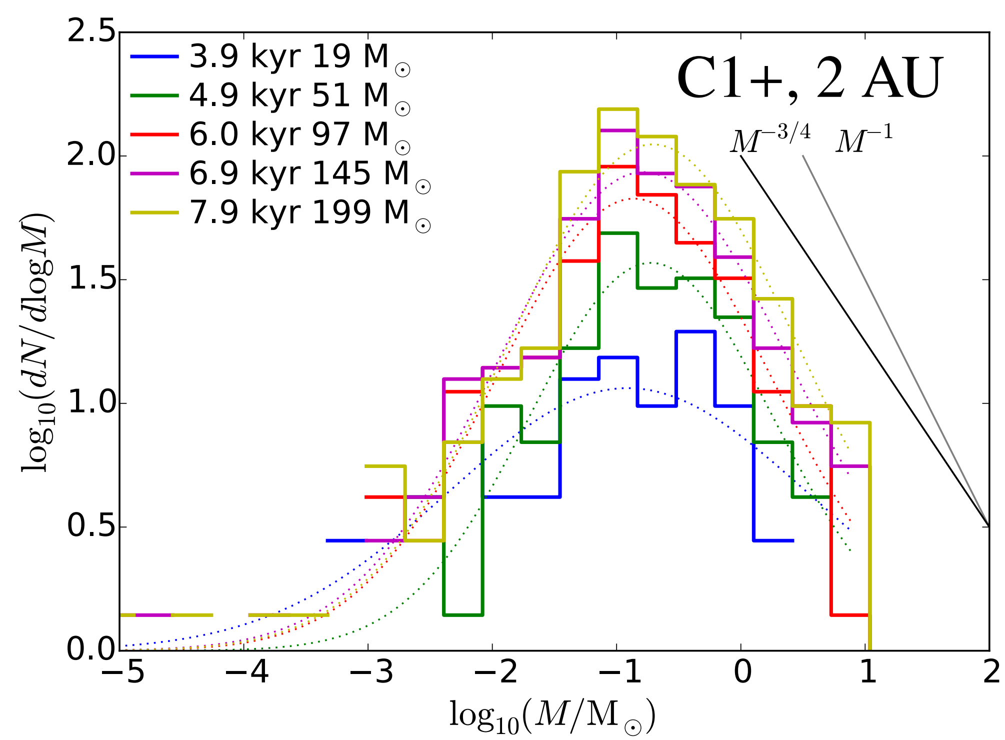
0.75 pc (~10^4 /cc)
M = 7

0.084 pc (~10^7 /cc)
M = 22



Γ ~ 0

thermal support dominant



Γ ~ -3/4

turbulent dispersion dominant

#24 THE TOP-SCOPE SURVEY OF PLANCK GALACTIC COLD CLUMPS: SURVEY OVERVIEW AND RESULTS OF AN EXEMPLAR SOURCE, PGCC G26.53+0.17

http://adsabs.harvard.edu/pdf/2017arXiv171104382L

(< 14K)

TOP-SCOPE: Plank Galactic Cloud Clumps (PGCCs) の low temperature dust を観測

-> 星形成の初期段階

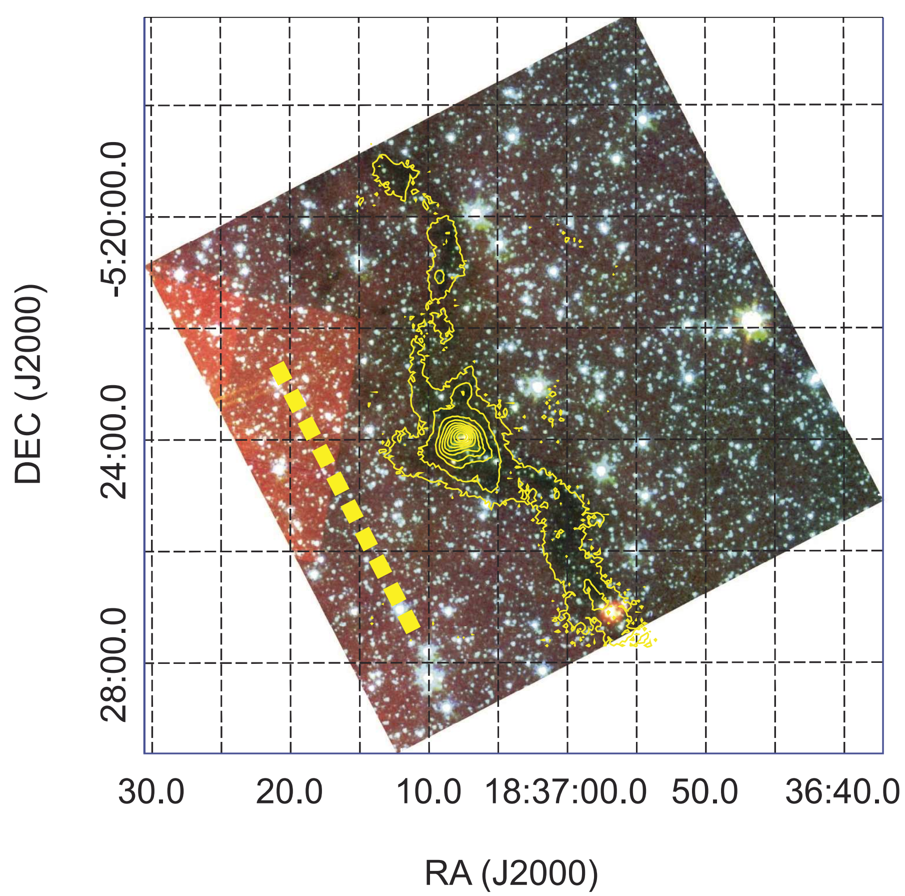
~2000 clumps with 12CO(1-0) & 13CO(1-0)

~1000 clumps with 850μm continuum emissions

G26.53+0.17 (G26)

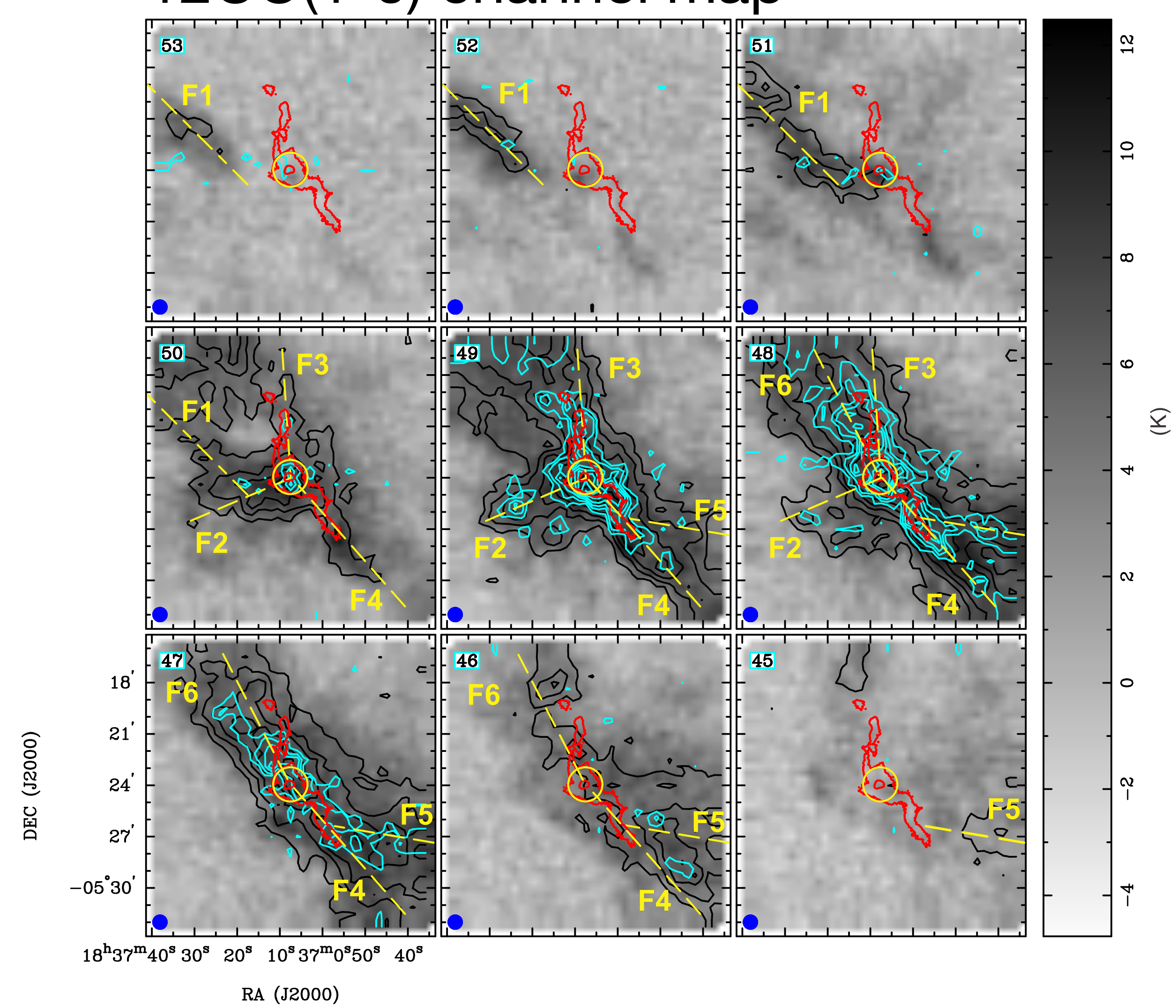
a filamentary infrared dark cloud

12CO(1-0) channel map



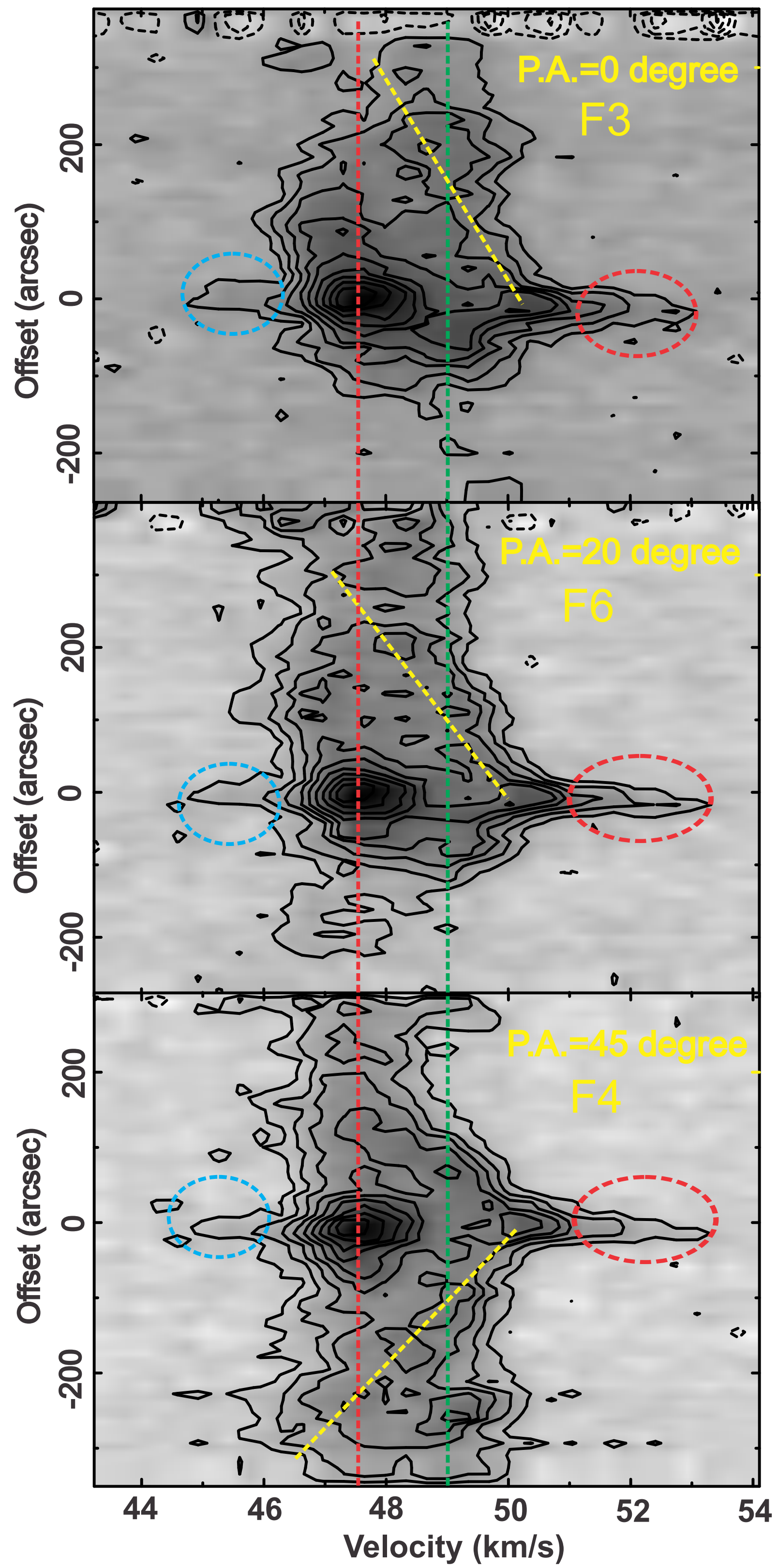
Spizer/IRAC three color

yellow: SCUBA-2 850μm continuum

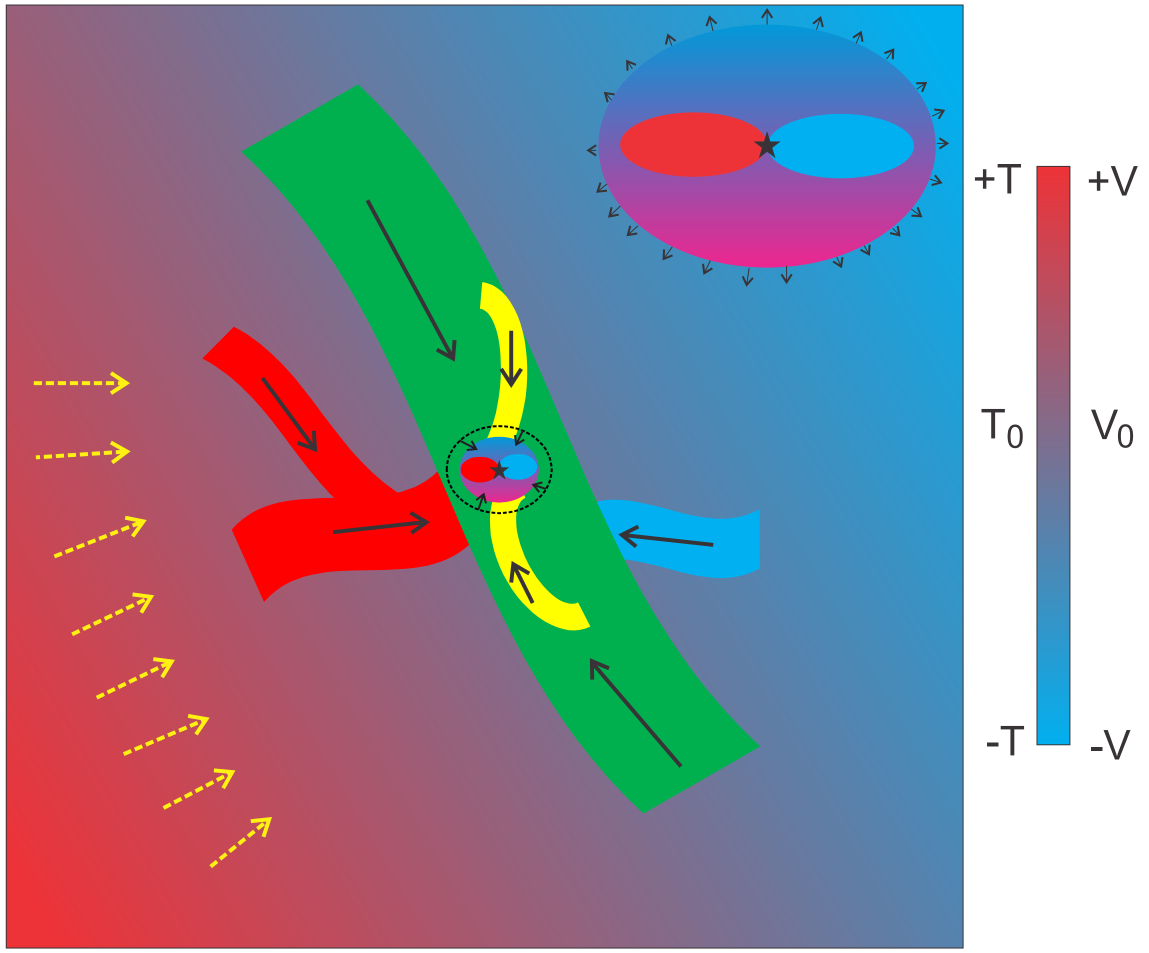


black: 13CO, blue: C18O, red: 850μm

13CO(2-1)PV図



green: system velocity, 49 km/s
red: peak emission



シリンダー

~6200 Msun, ~12pc, (500 Msun/pc)

isothermal, non-magnetized turbulent

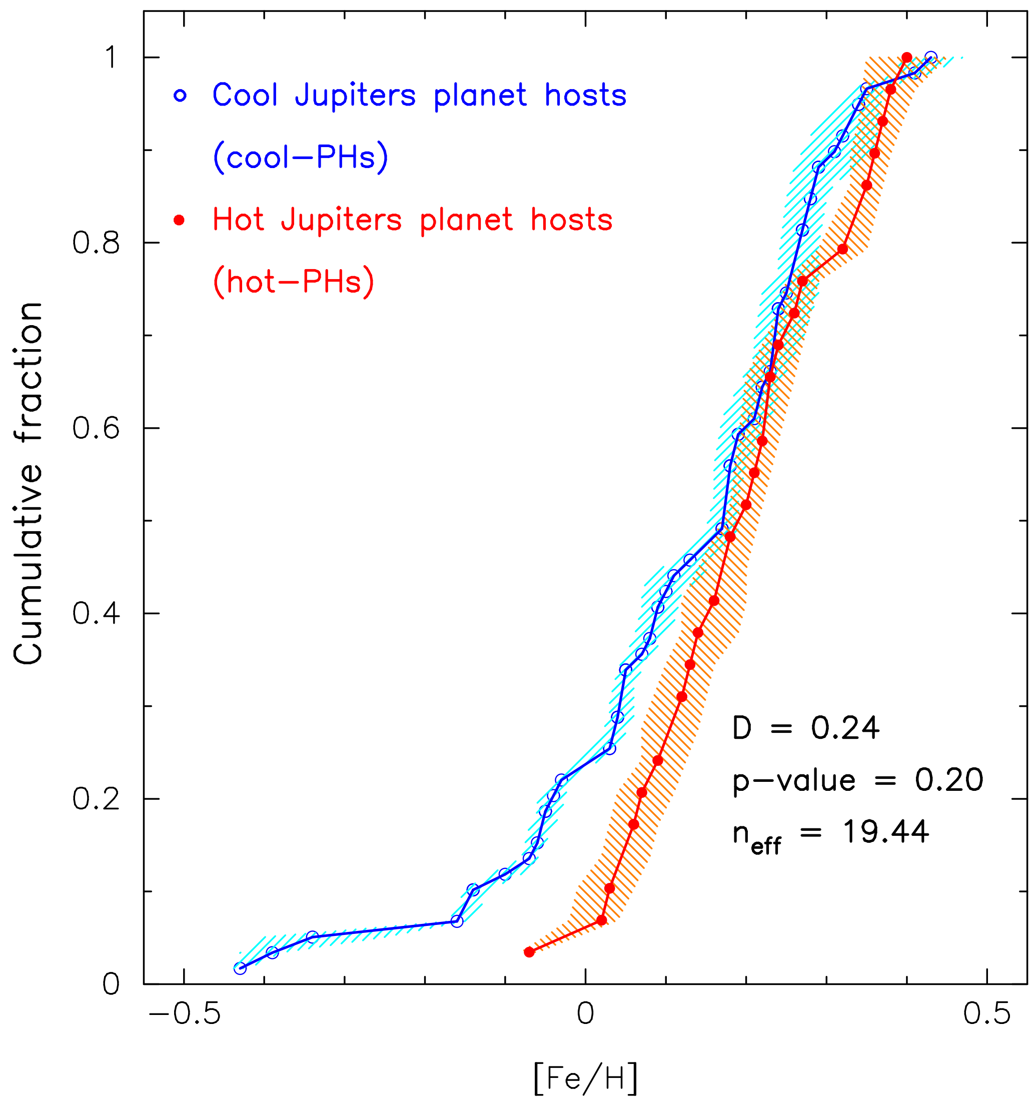
#25 Chemical fingerprints of hot Jupiter planet formation

http://arxiv.org/pdf/1712.01035

Hot Jupiter がどうやって出来たか

-> in situ formation v.s. migration

Cool Jupiter もしくは Hot Jupiter を持つ
約100個の星の化学組成を詳しく分析



-> Hot Jupiter を持つ星は metallicity が高い

(low metallicity で Hot Jupiter を持つ星はない)

Cool Jupiter と Hot Jupiter は形成プロセスが違う

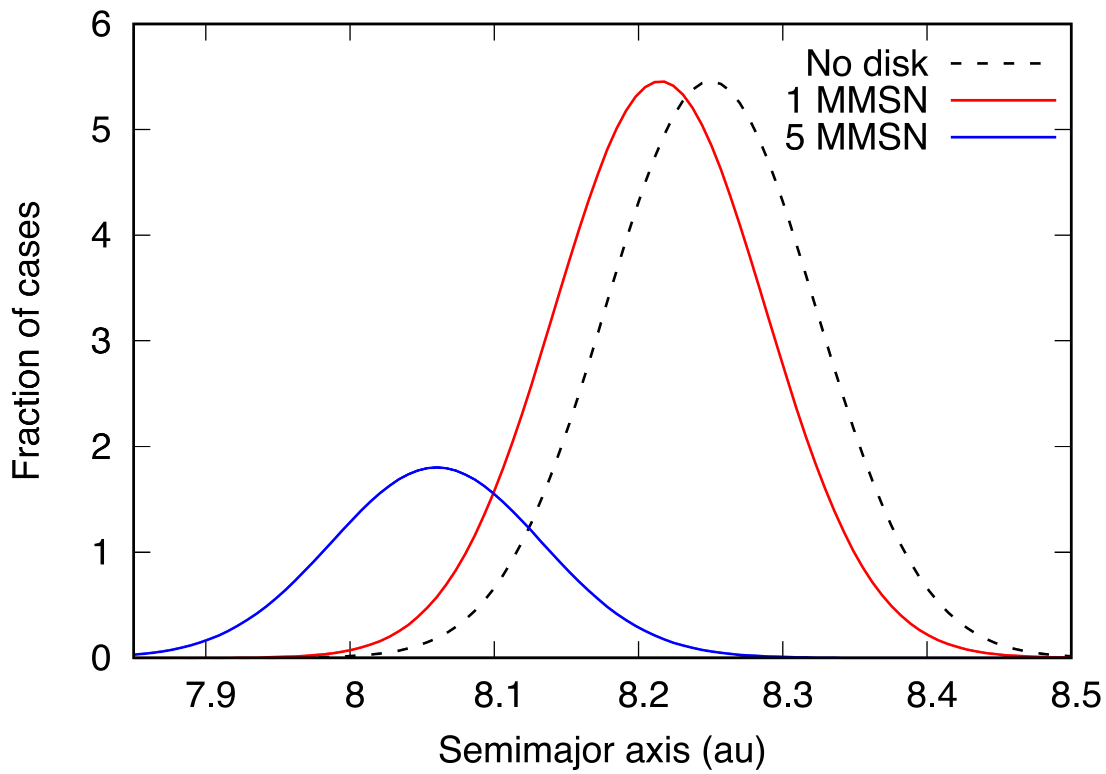
(Cool Jupiter が migration してきたわけでない)

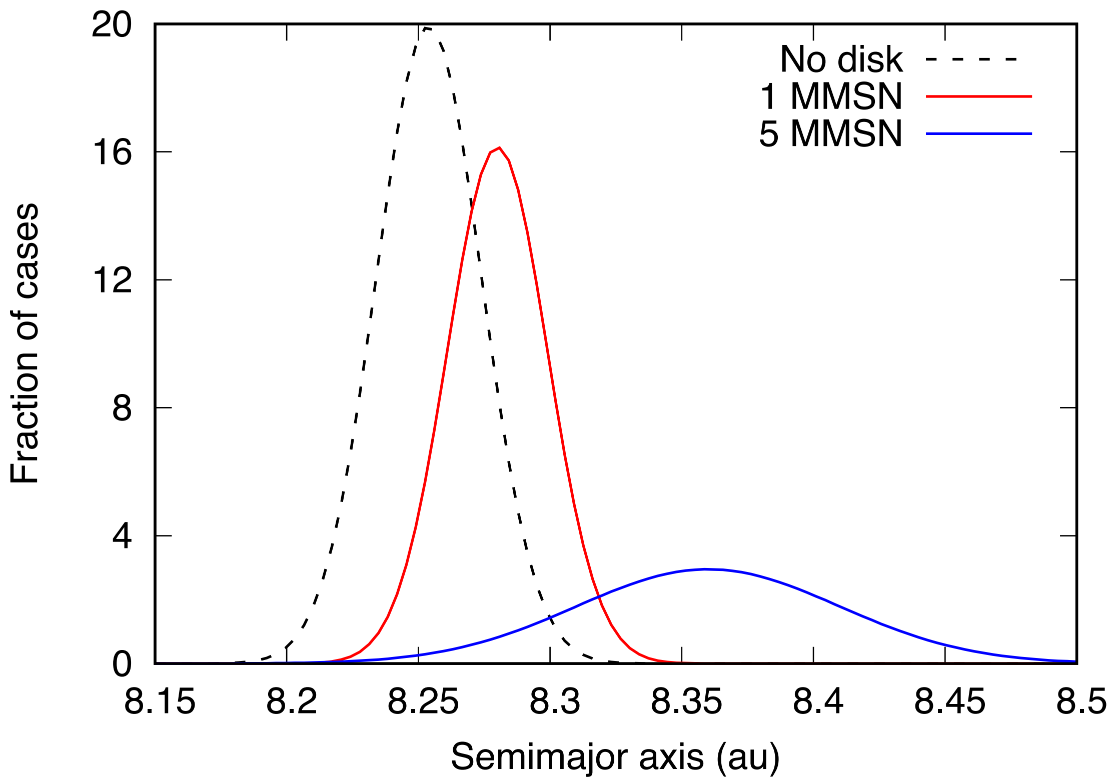
もしくは metallicity に依存するような
migration のモデルが必要

#26 Shifting of the resonance location for planets embedded in circumstellar disks

http://arxiv.org/pdf/1712.04178

discポテンシャルを含めて2つの惑星の軌道共鳴を計算





木星と土星の2:1共鳴

-> discの質量を5倍にすると内側に移動

2つのスーパーアース(地球質量の5倍)の2:1共鳴

-> discの質量を5倍にすると外側に移動

discの質量と惑星の質量に依存

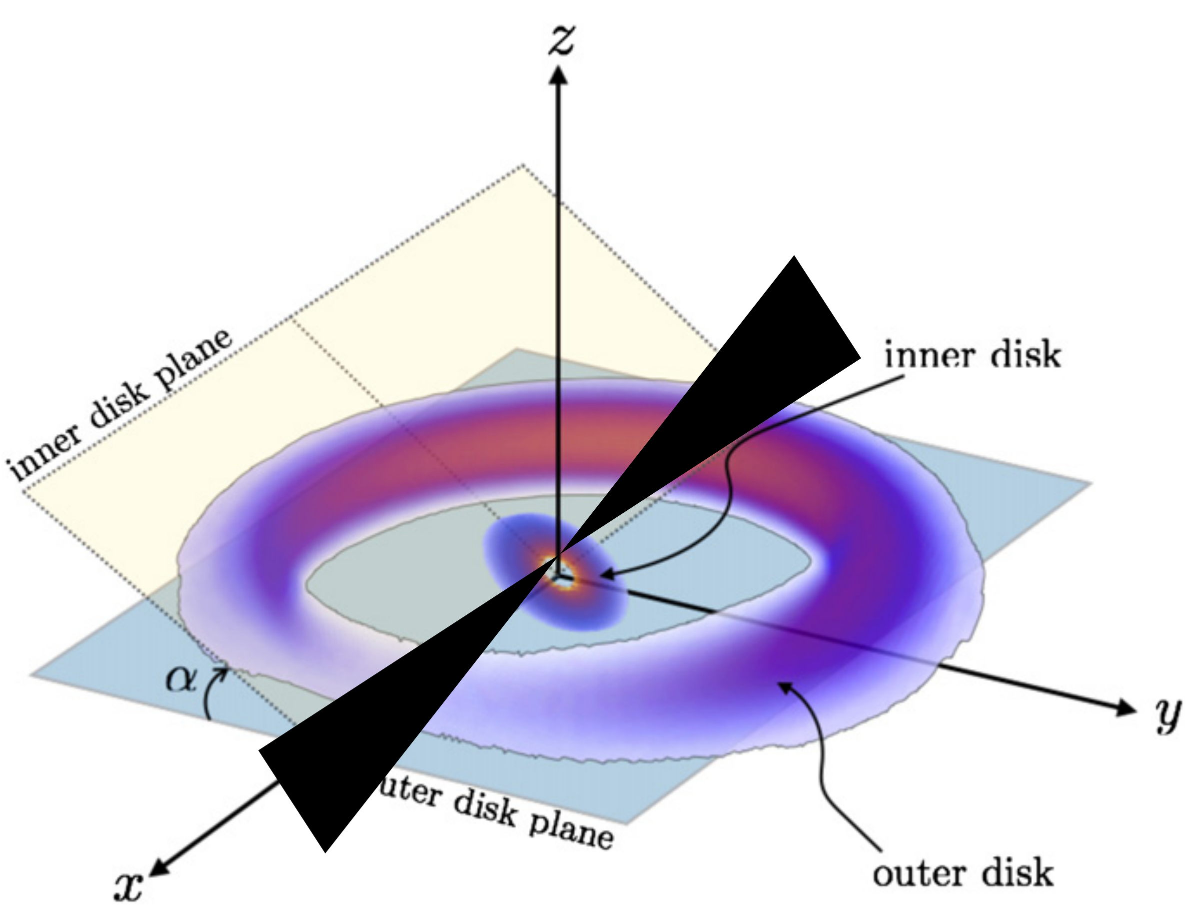
#27 Planetary-like spirals caused by moving shadows in transition discs

http://arxiv.org/pdf/1712.09157

原始惑星系円盤のスパイラル構造はどうやって出来たか

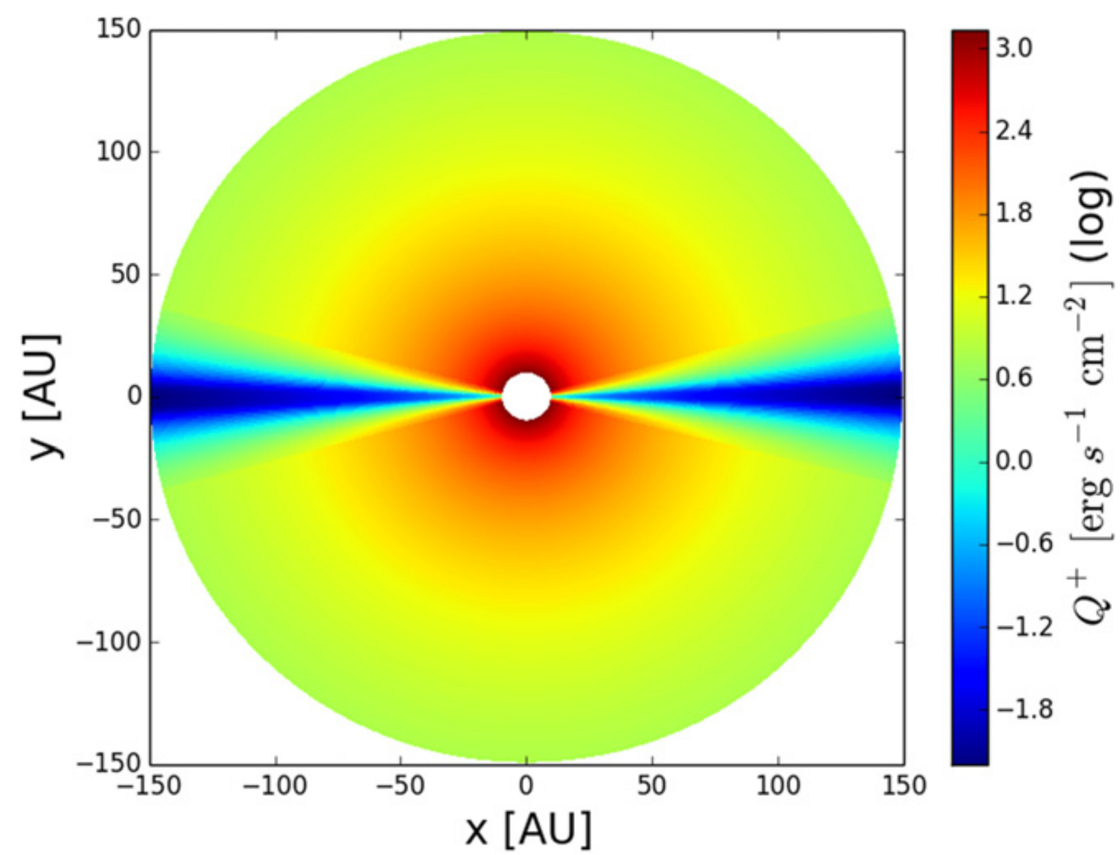
-> 惑星がなくてもできるのではないか

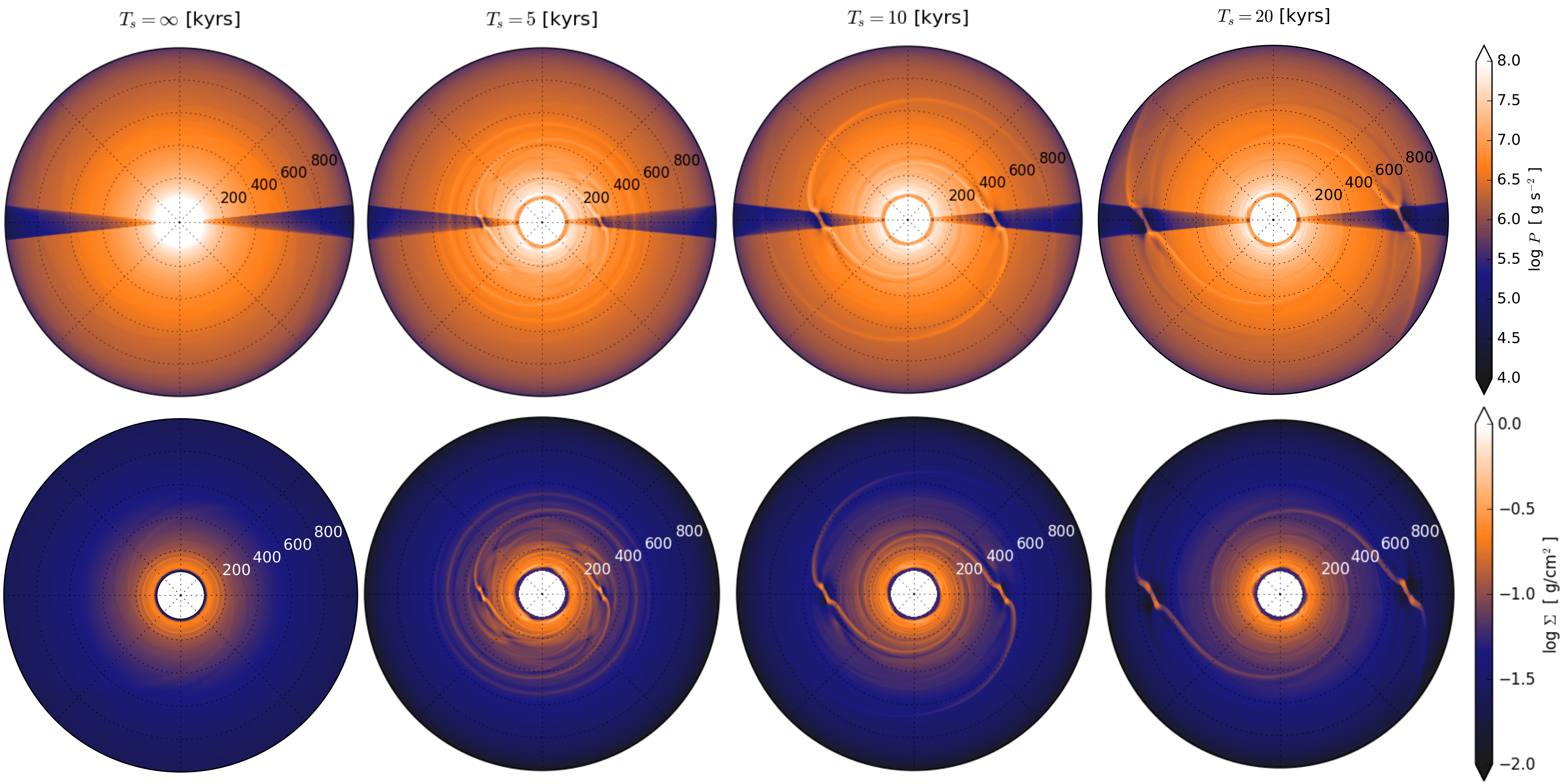
shadow を考慮したシミュレーションでもスパイラルができた



Marion et al. (2015)

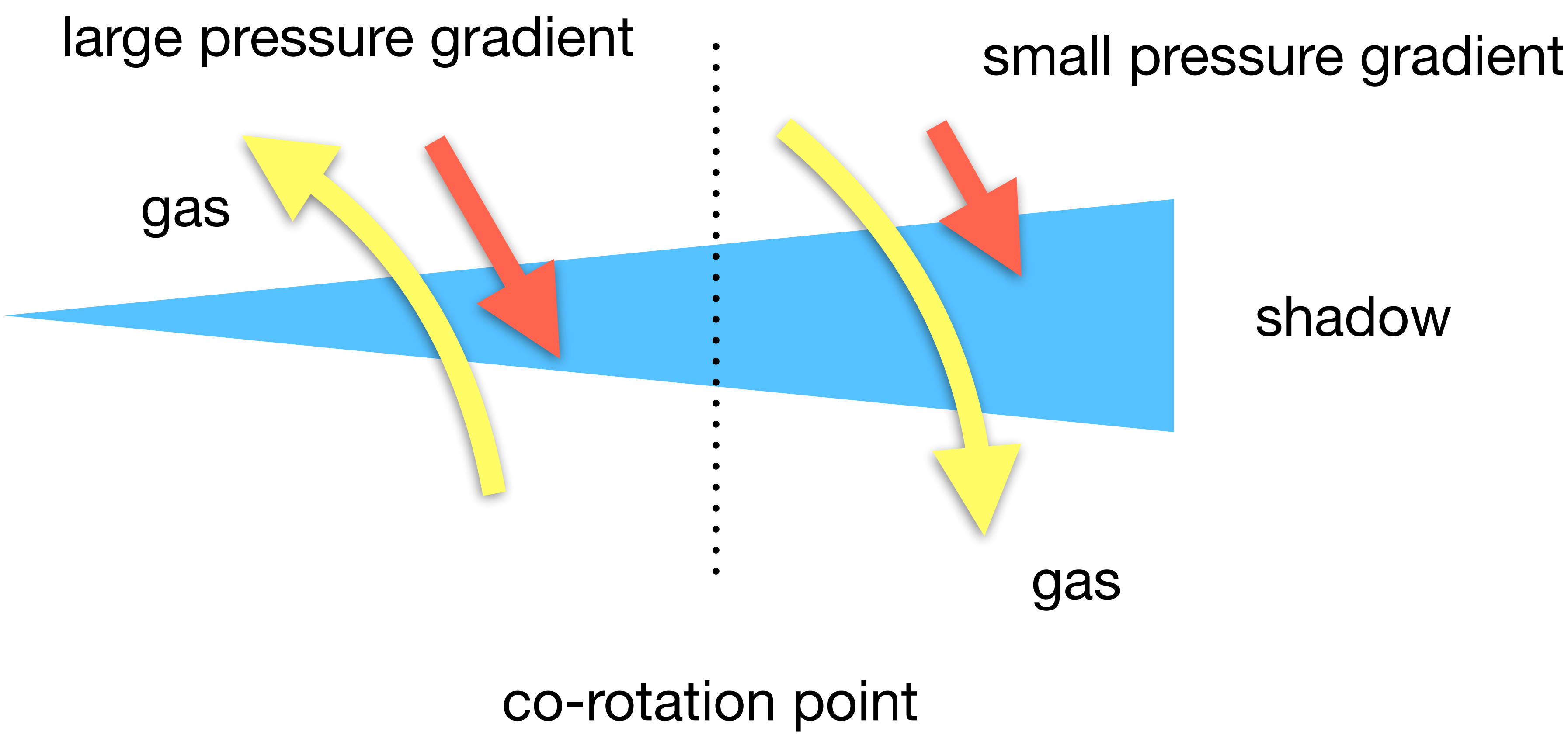
Heating rate





$T_s = \infty$ [kyrs]
$T_s = 5$ [kyrs]
$T_s = 10$ [kyrs]
$T_s = 20$ [kyrs]
200
400
600
800
log P [g s^{-2}]
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
log Σ [g/cm^2]
0.0
−0.5
−1.0
−1.5
−2.0

なぜスパイラルができるか

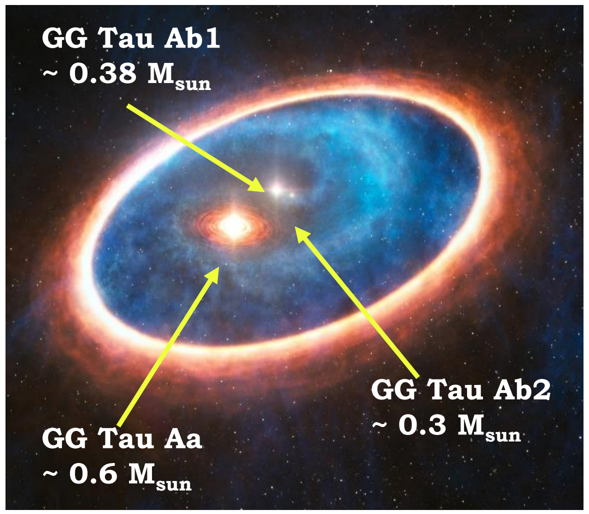


-> larger pitch angle

-> small pitch angle

#28 Morphology of the 13CO(3-2) millimeter emission across the gas disc surrounding the triple protostar GG Tau A using ALMA observatio

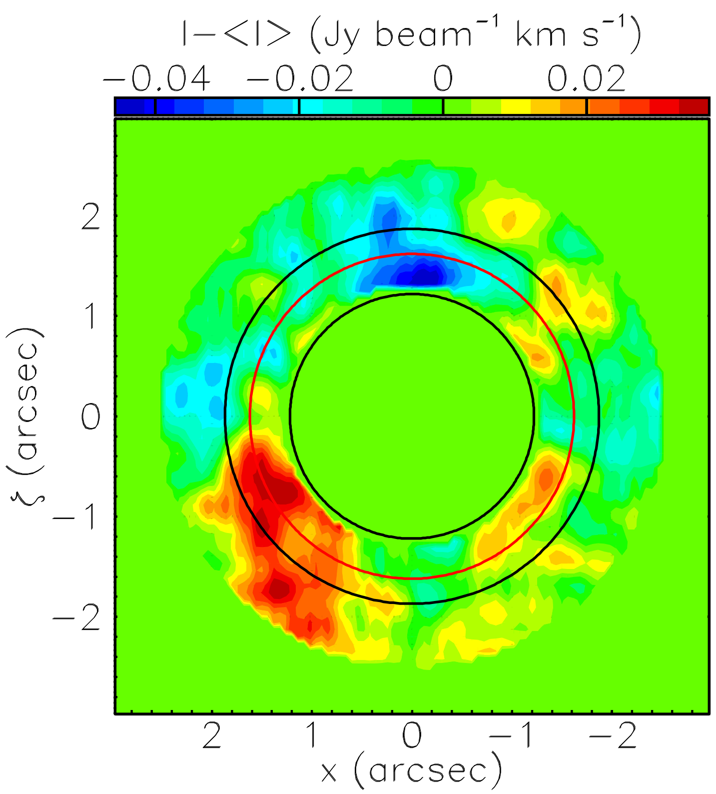
http://www.raa-journal.org/docs/papers_accepted/0225.pdf



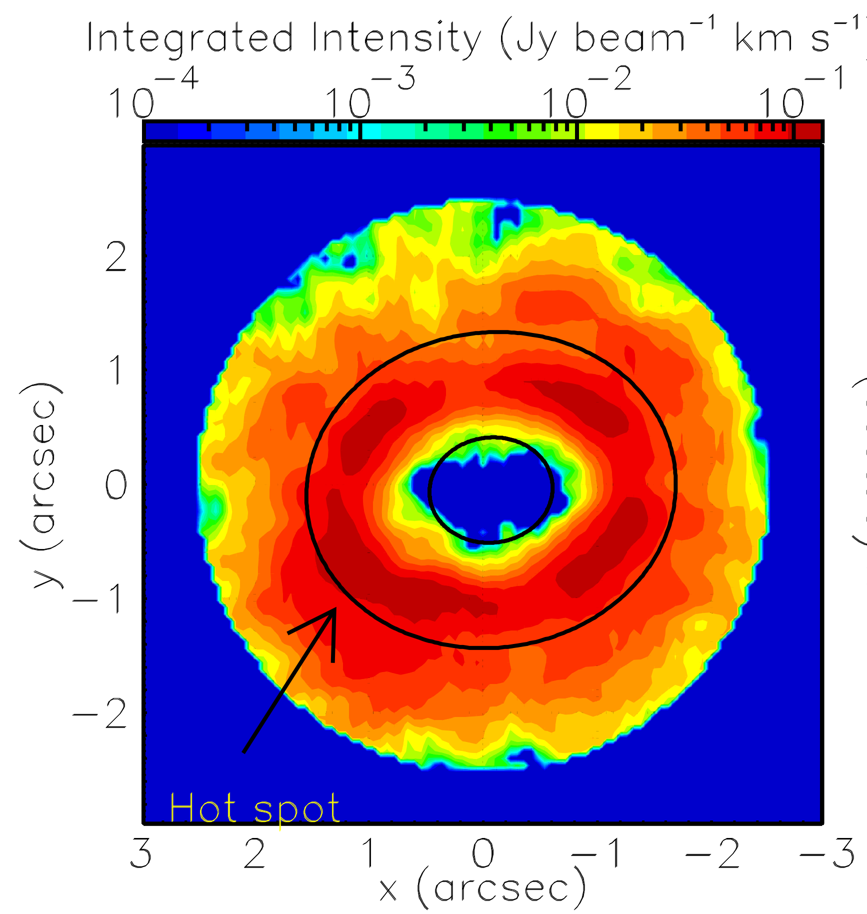
ALMA でGG Tau Aを観測

-dust continuum

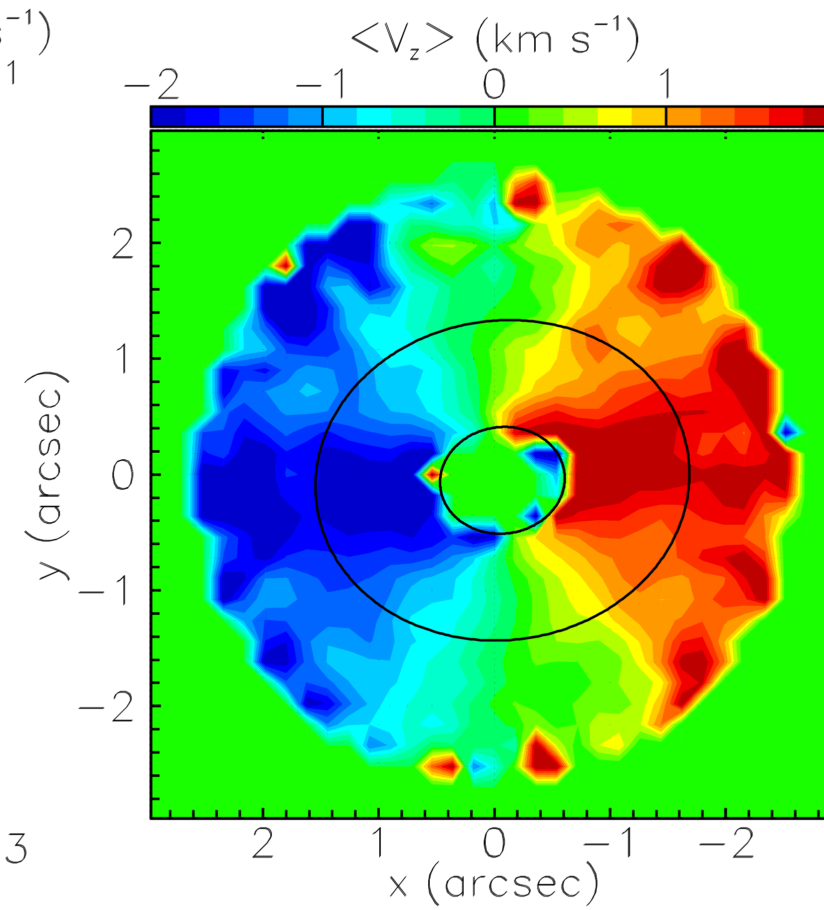
-13CO(3-2)



line emission



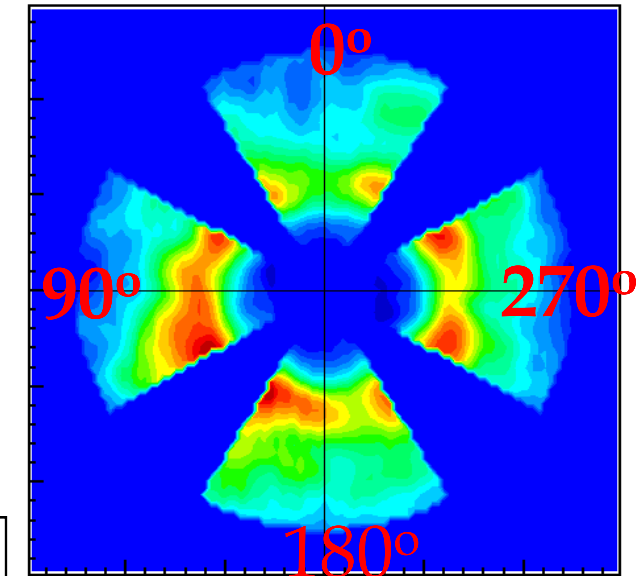
13CO(3-2) integrated intensity



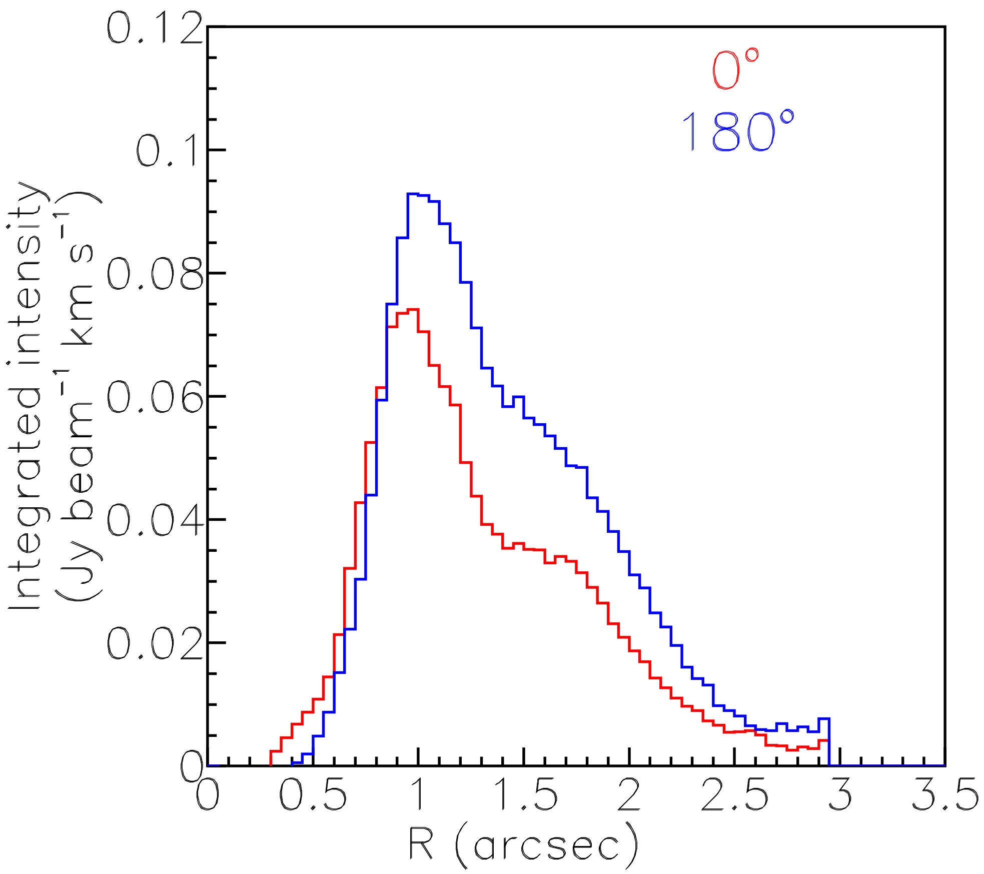
mean Doppler velocity

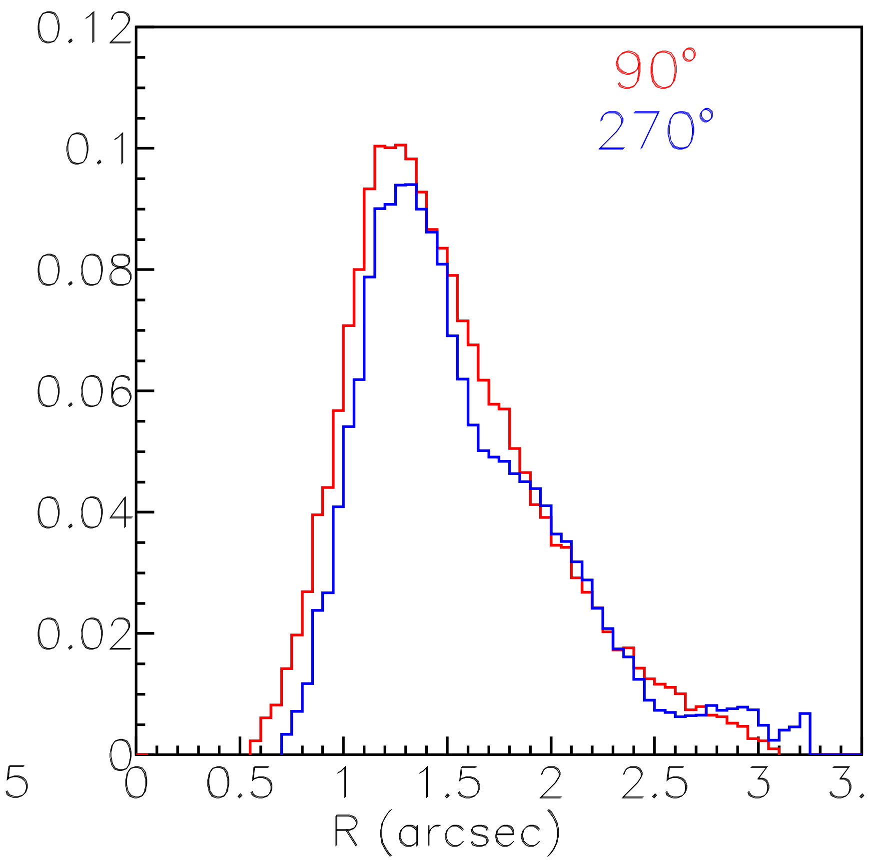
rotation velocity ~ 3.1 km/s

dust disc tilt : 32°
gas disc tilt : 35°



line integrated intensity v.s. R





minor axis (0°, 180°)
-> discの厚みを反映

major axis (90°, 270°)
-> キャンセル

スケールハイト: H(r) ~ 0.24 arcsec (34 au)

at r ~ 1 arcsec (140 au)

Keplerian velocity: 3 km/s