Star Formation Seminar

2015年1月30日

News Letter #265 No.1—5

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No. 2: The VLTI / PIONIER near-infrared interferometric survey of southern T Tauri stars. I. First results by F. Anthonioz et al.

No. 3: The formation of NGC 3603 young starburst cluster: “prompt” hierarchical assembly or monolithic starburst? by S. Banerjee & P. Kroupa

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No. 5: Vulcan Planets: Inside-Out Formation of the Innermost Super-Earths by S. Chatterjee & J.C. Tan

花輪 知幸 (千葉大学)

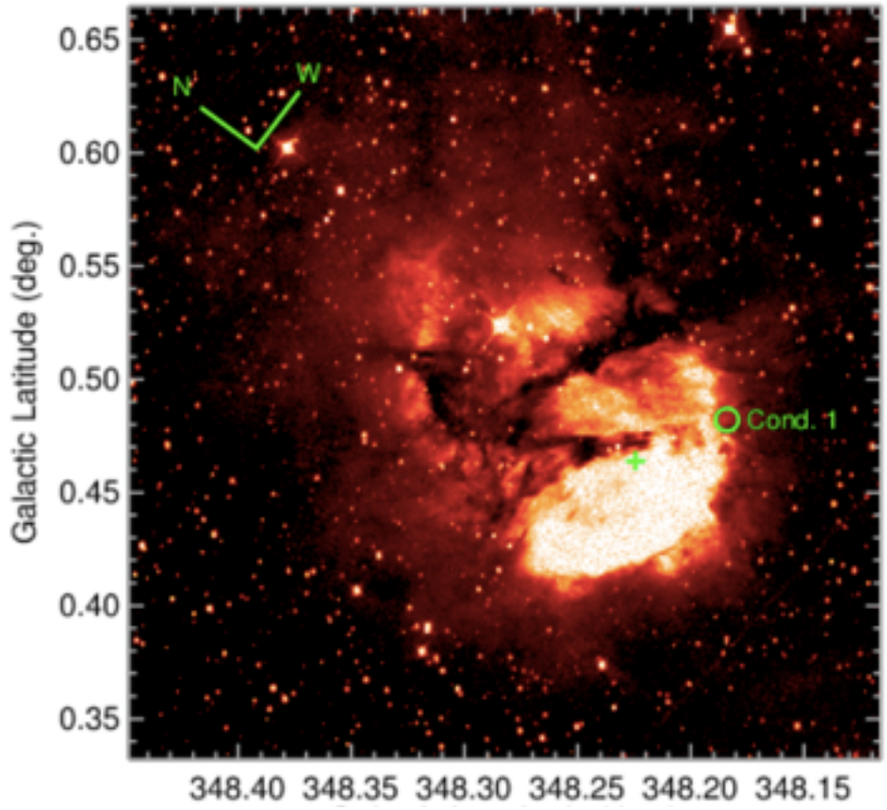
Mopra CO Observations of the Bubble HII Region RCW 120

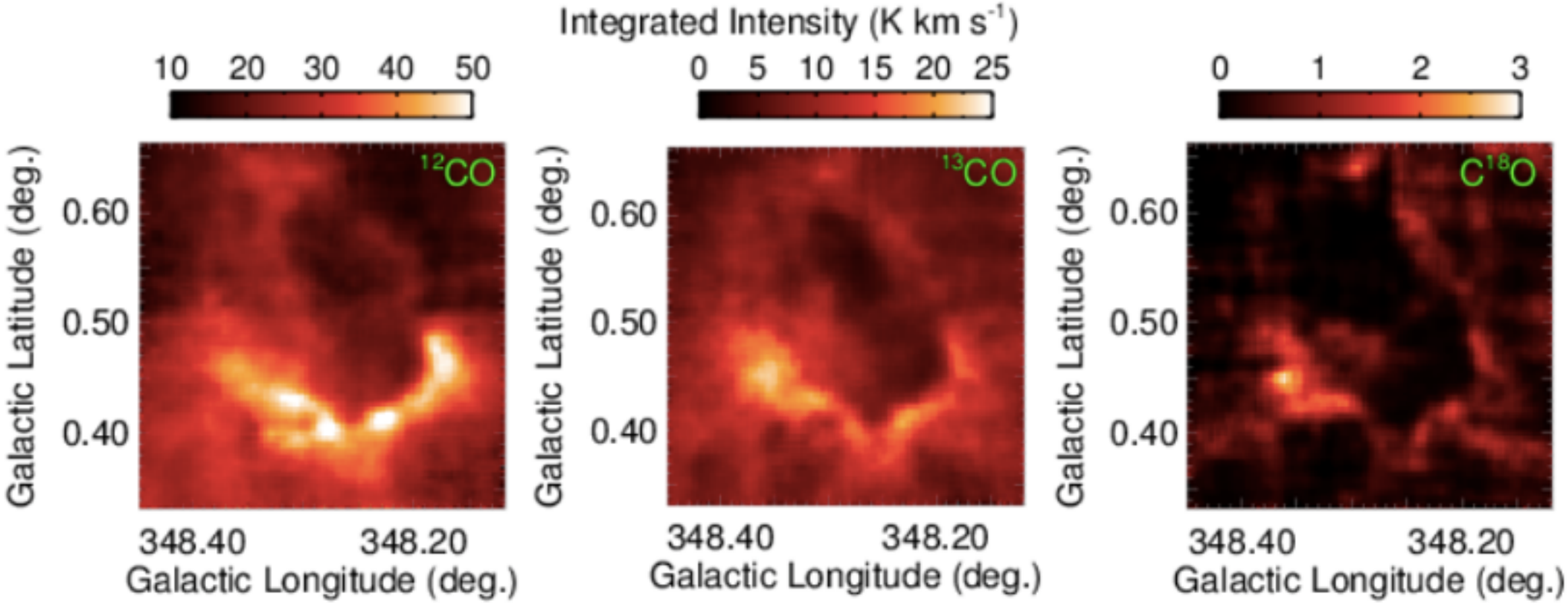
L.D. Anderson et al.

ApJ to appear

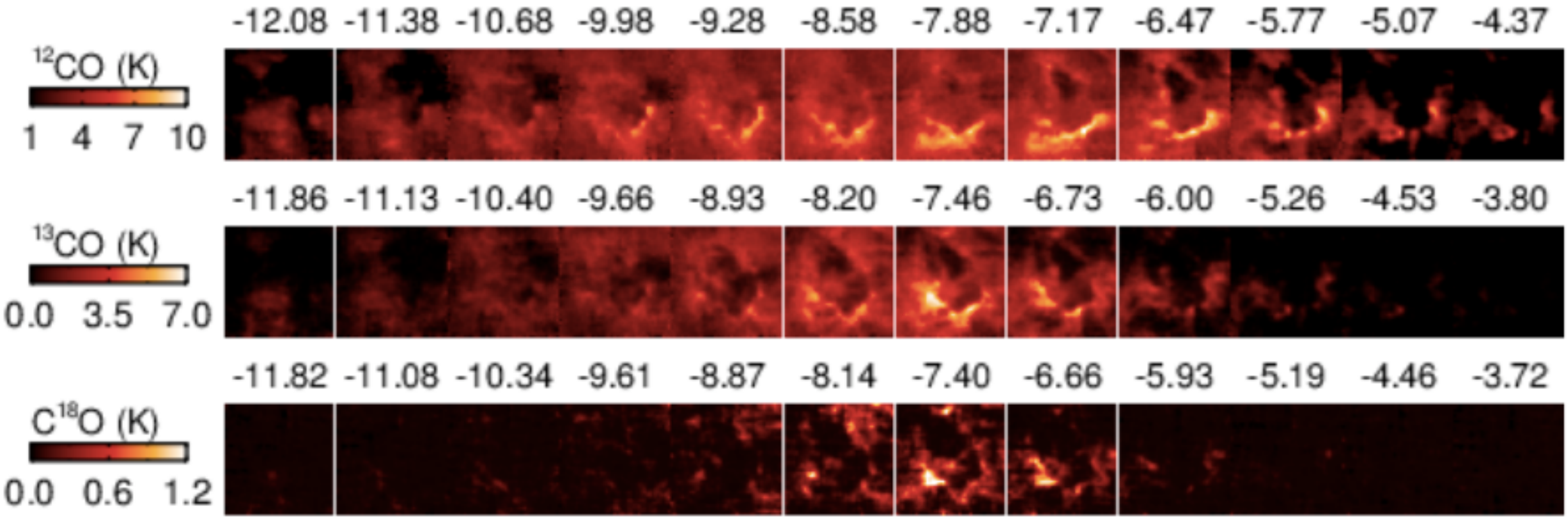
Hα RCW 120

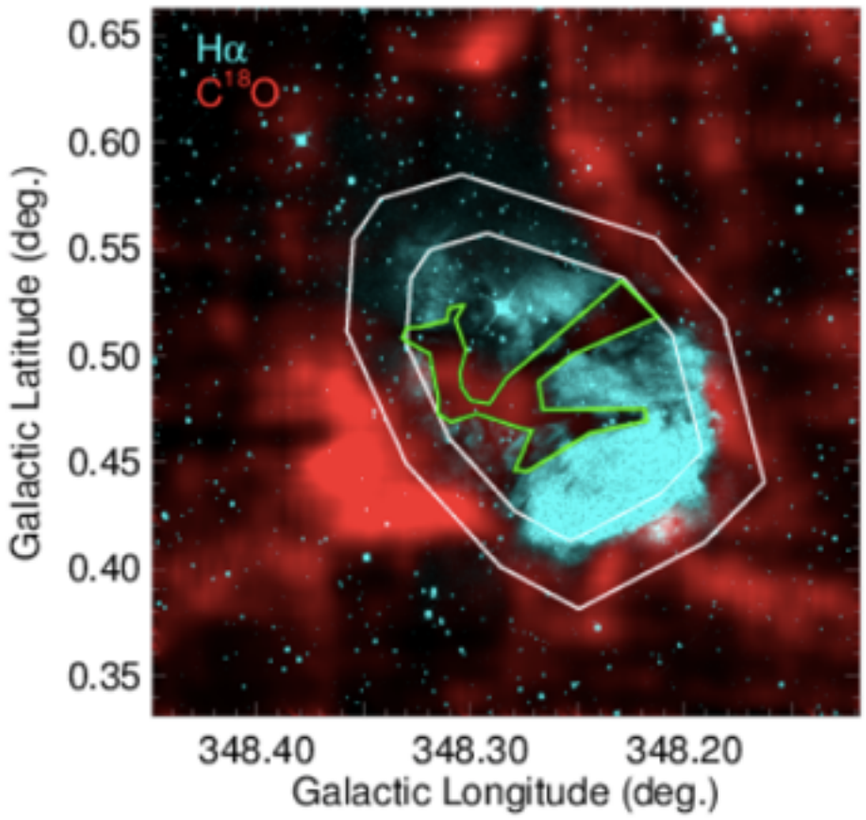
実際は膨張していない

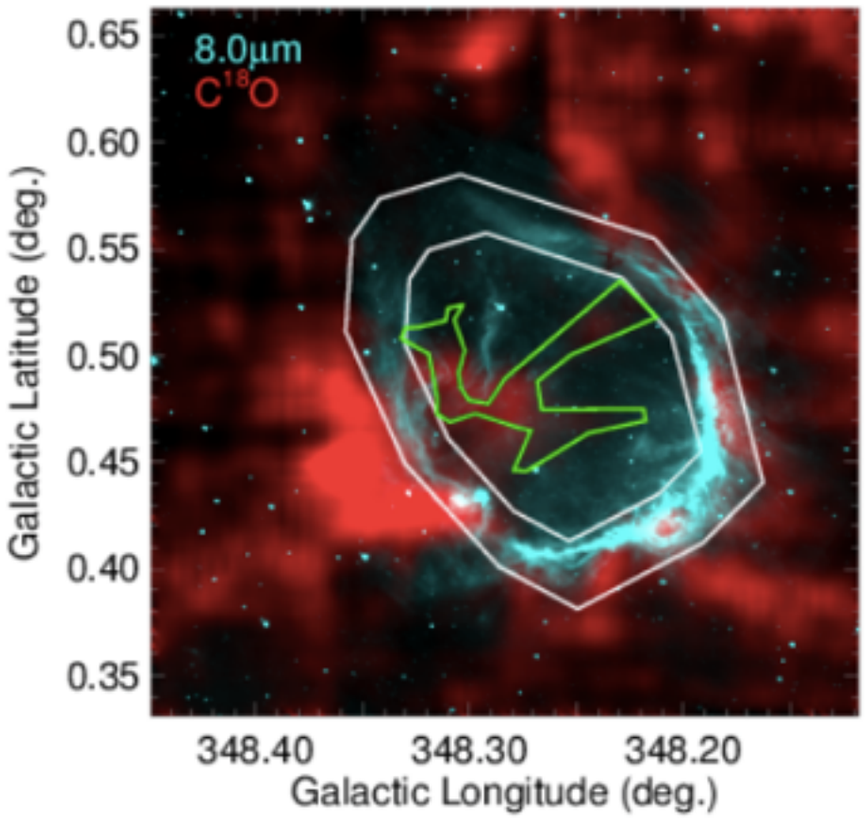




Channel Map

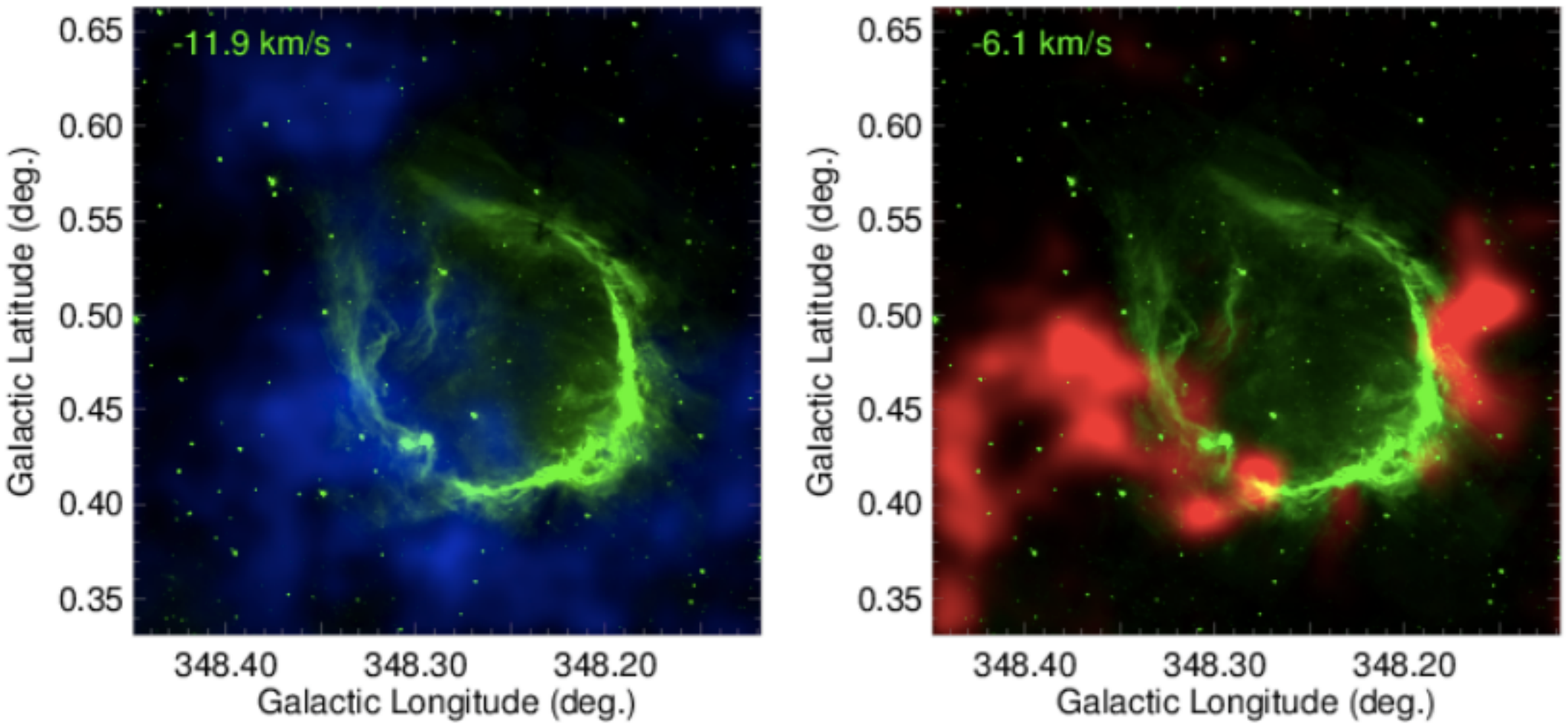






白枠: PDR

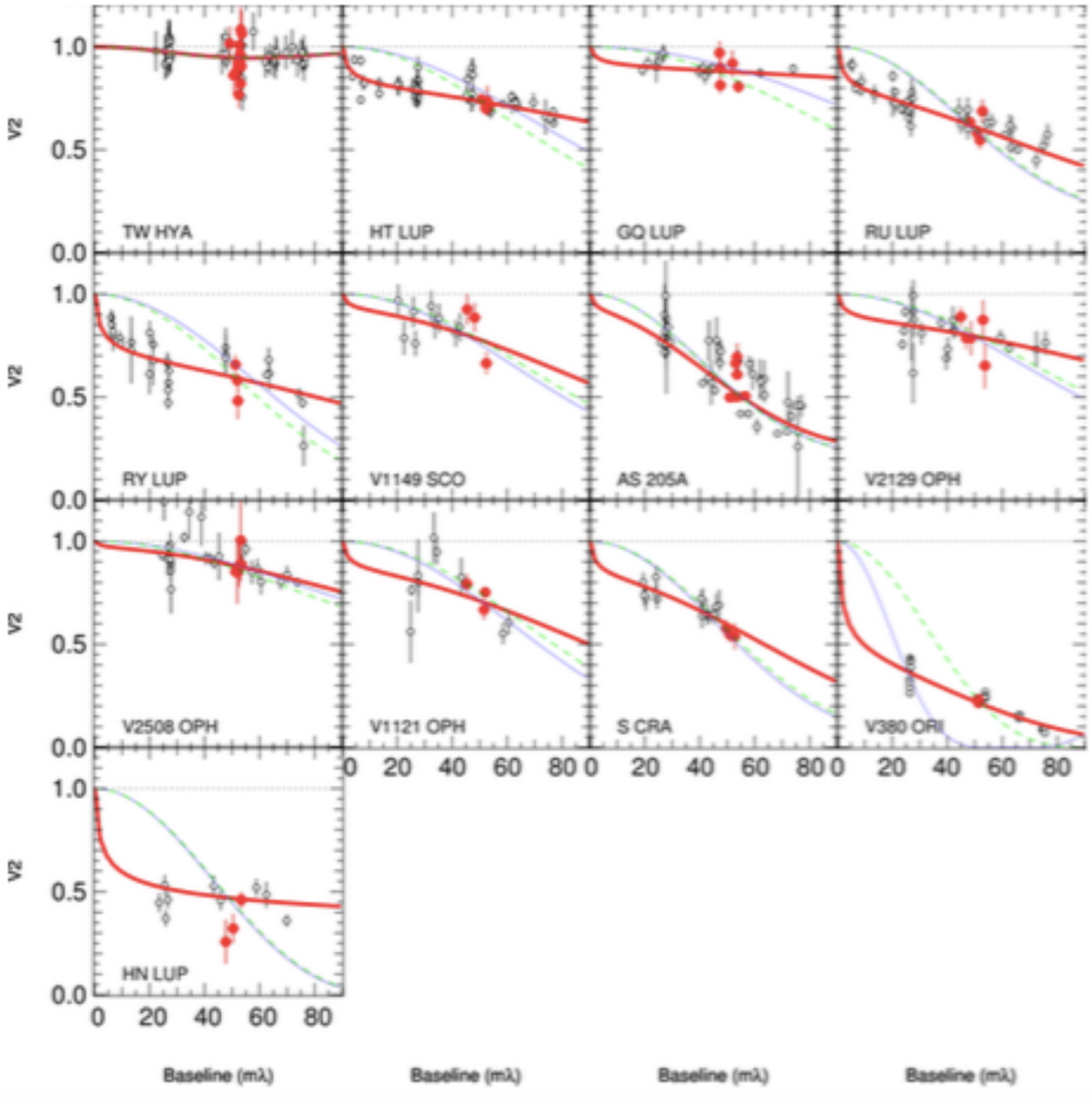
緑: 吸収


-11.9 km/s
-6.1 km/s
0.65
0.60
0.55
0.50
0.45
0.40
0.35
Galactic Latitude (deg.)
348.40
348.30
348.20
Galactic Longitude (deg.)

^{13}CO

The VLTI / PIONIER near-infrared interferometric survey of southern T Tauri stars. I. First results

F. Anthonioz et al.　A&Ap to appear



H-band干渉計

0.3ミリ秒角

8/21 T Tau

R>3AU 円盤

WW Cha で伴星

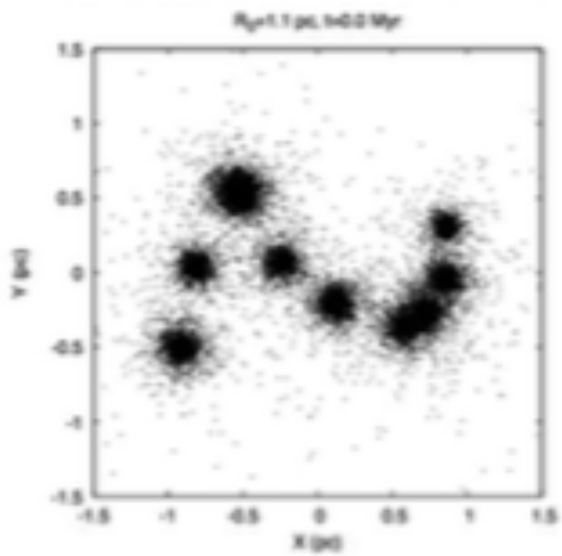
Star	R. A.	Dec	SpT	dist.(pc)	Log($L/L_\odot$)	Refs	H-mag	Resolved?	binary?
V380 Ori	05 36 25	-06 42 57	A1e	510	1.99	1,2,3	6.96	yes	Unresolved,Border
TWA 07	10 42 30	-33 40 16	M3.2	34	-0.94	4	7.13	no	no
TW Hya	11 01 51	-34 42 17	M0.5	56	-0.72	4	7.55	marginally	no
WW Cha	11 10 00	-76 34 57	K5	160	0.74	5,6	7.21	yes	Yes
TWA 3A	11 10 28	-37 31 52	M4.1	35	-0.92	4	7.53	yes	Yes, Outside
TWA 3B	11 10 28	-37 31 52	M4.0	35	-1.10	4	8.15	no	Outside
HT Lup	15 45 12	-34 17 30	K2	150	0.74	4	6.87	yes	Border, Outside
HN Lup	15 48 05	-35 15 52	M1.5	150	-0.28	7,14	8.1	yes	Outside
GQ Lup	15 49 12	-35 39 05	K7	150	0.17	27	7.70	yes	Outside
RU Lup	15 56 42	-37 49 15	K7	150	0.16	8,9,22	7.82	yes	no
V1149 Sco	15 58 36	-22 57 15	G6	145	0.39	10	7.69	yes	no
RY Lup	15 59 28	-40 21 51	G0V	150	0.41	2,11,12	7.69	yes	no
MY Lup	16 00 44	-41 55 31	K0	150	-0.20	13,23	8.69	no	no
V1000 Sco	16 11 08	-19 04 46	K2	145	0.44	14,24	7.98	yes	Yes
AS 205 A	16 11 31	-18 38 24	K5	125	0.60	15	6.75	yes	Outside
V2129 Oph	16 27 40	-24 22 04	K5	121	0.15	26	7.67	yes	no
V2508 Oph	16 48 45	-14 16 35	K6	125	0.46	16,17	7.57	yes	no
V1121 Oph	16 49 15	-14 22 08	K5	130	0.176	2,12	7.45	yes	no
AK Sco	16 54 44	-36 53 18	F5V	145	0.61×2	18,22	7.06	yes	Yes
V4046 Sgr	18 14 10	-32 47 34	K5V	73	-0.41×2	19	7.44	no	Unresolved
FK Ser	18 20 22	-10 11 13	K6IV	32	0.2	2,20,25	6.92	no	Outside
S CrA N	19 01 08	-36 57 19	K3	130	0.36	15	7.05	yes	Outside
V709 CrA	19 01 34	-37 00 56	K1IV	130	0.19	21	7.97	no	no

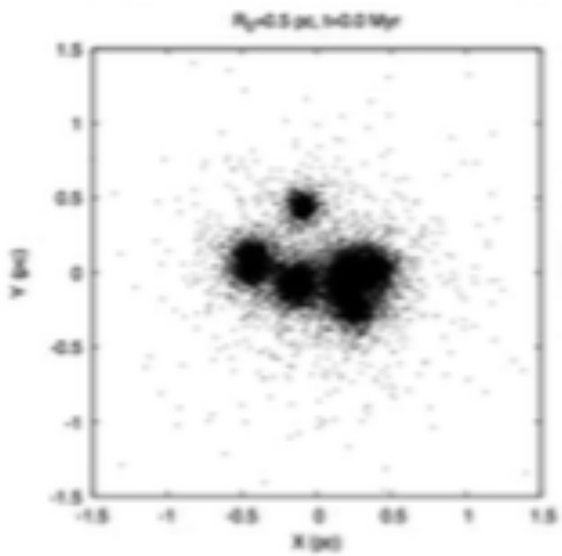
Star	Date of observation	Sep.(mas)	P.A. (°)	a(mas)	b(mas)	θ(°)	$F_{(comp)}/F_\star$
WW Cha	2012-07-02	4.73	-140	0.57	0.35	22	0.62
	2012-03-06	6.18	-48.8	0.98	0.40	117	0.62
	2011-02-10	6.44	173.4	0.50	0.18	150	0.62
V1000 Sco	2012-07-17	4.33	105.7	0.40	0.19	164	0.34
	2012-08-19	- - - - - - - - - - multiple local minima - - - - - - - - - -					
TWA 3A	2011-02-09	3.51	108.1	0.57	0.43	1	0.76

The formation of NGC 3603 young starburst cluster: ‘prompt’ hierarchical assembly or monolithic starburst?
S. Banerjee & P. Kroupa,
MNRaS, 447, 728—746 (2015)

Quantity	Measurement	Value(s)	Reference(s)
Mass M_*	Photometry	$(1.0–1.6) \times 10^4\,M_\odot$	Stolte et al. (2006); Harayama et al. (2008)
Mass M_*	Kinematics	$(1.7–1.9) \times 10^4\,M_\odot$	Rochau et al. (2010); Pang et al. (2013)
Age	Photometry	1 Myr	Stolte et al. (2004); Pang et al. (2013)
Velocity dispersion σ_{1d} (mean 1D)	Proper motion	$4.5 \pm 0.8\,km\,s^{-1}$	Rochau et al. (2010)
Velocity dispersion σ_{1d}(orthogonal 1D)	Proper motion	$(4.8–6.5) \pm 0.5\,km\,s^{-1}$	Pang et al. (2013)
Central concentration parameter k	King/EFF profile fit[a]	4.2	Harayama et al. (2008)
Core radius r_c	King/EFF profile fit	4.8 arcsec(≈ 0.15 pc)	Harayama et al. (2008)
Tidal radius r_t	King/EFF profile fit	large	Harayama et al. (2008)
Distance from the Sun	Photometry	$6.0 \pm 0.8(0.3)$ kpc	Harayama et al. (2008); (Stolte et al. 2004)

Note. [a]The theoretical King (also Elson-Fall-Freeman or EFF) profiles are best fitted with the observed surface mass density profile of HD 97950 for the stellar mass range 0.5–2.5 $M_\odot$. See also Table 4.


R_{cl}=1.1 pc, t=0.0 Myr
Y [pc]
X [pc]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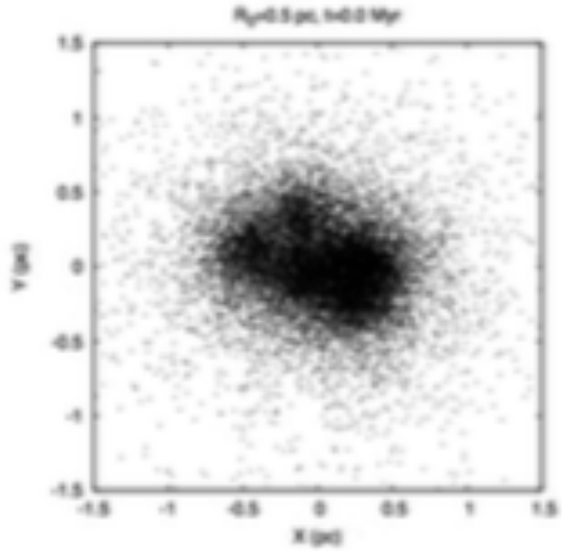
Y [pc]
X [pc]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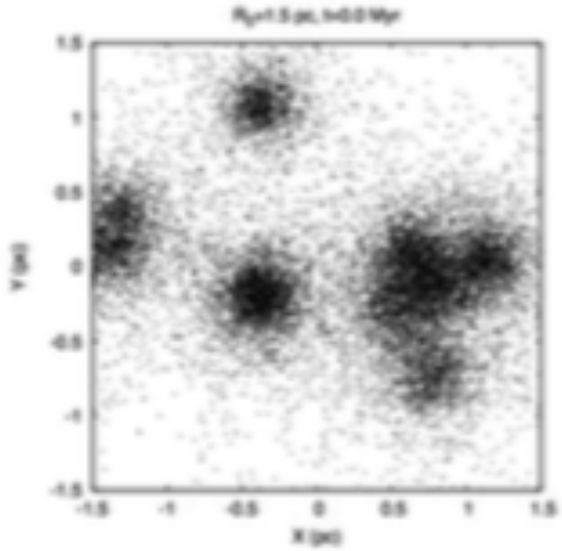
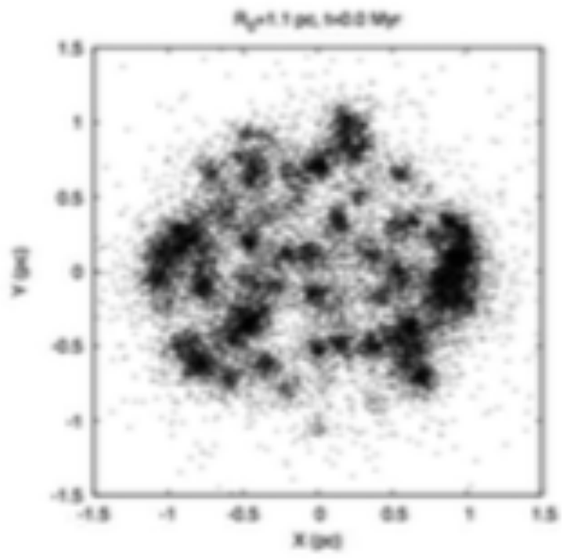
Y [pc]
X [pc]


R_{cl}=1.5 pc, t=0.0 Myr
Y [pc]
X [pc]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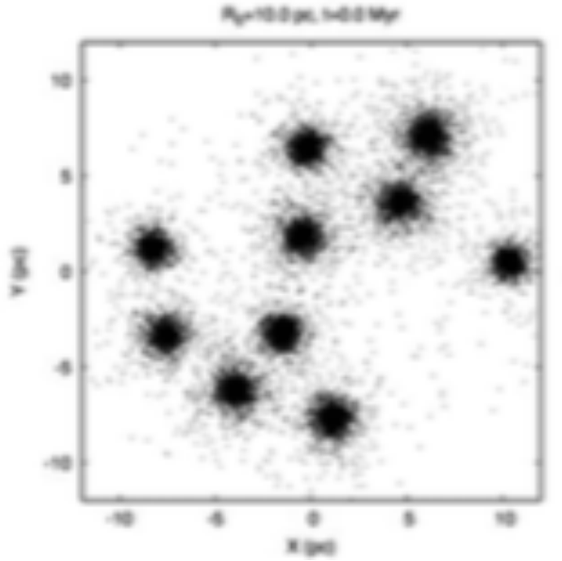
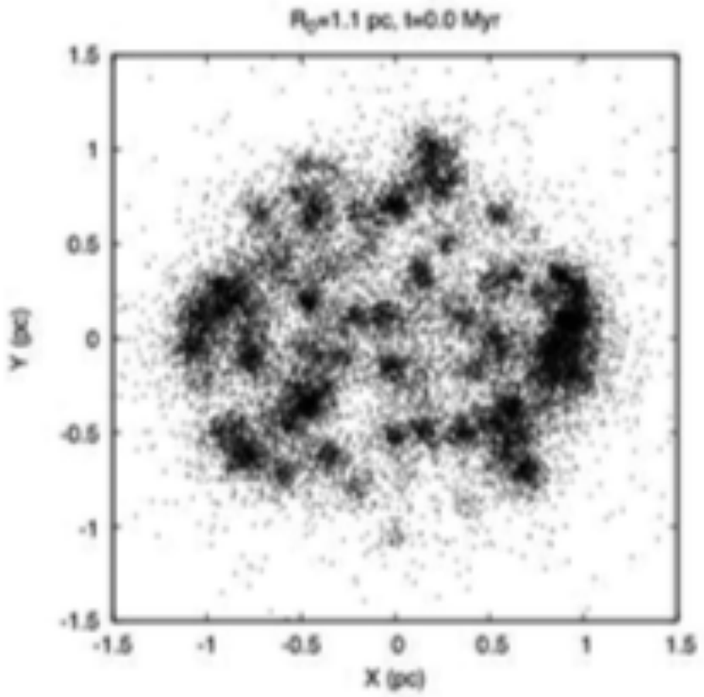
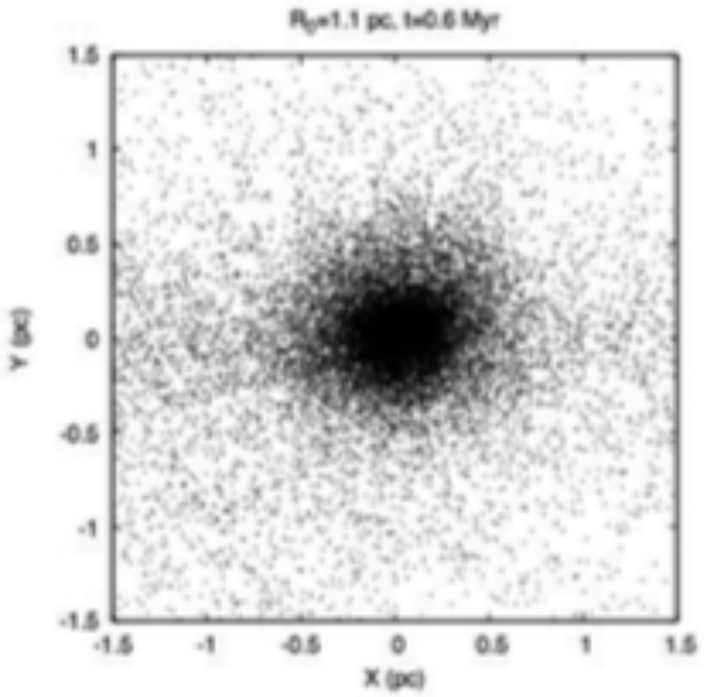
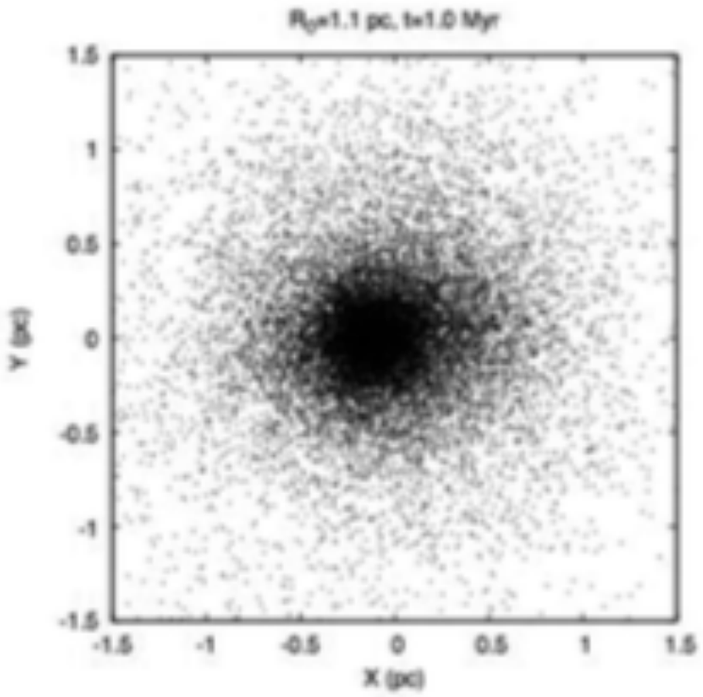
Y [pc]
X [pc]

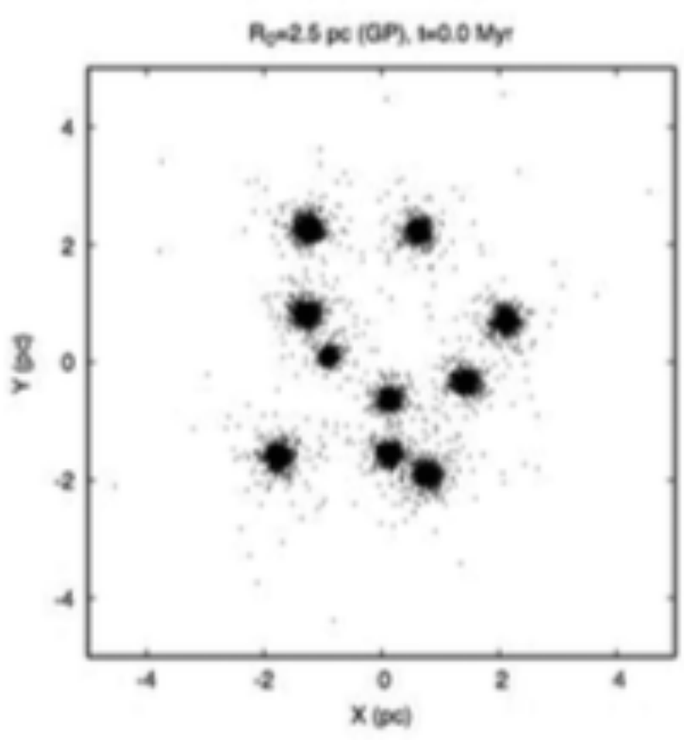

R_{cl}=10.0 pc, t=0.0 Myr
Y [pc]
X [pc]

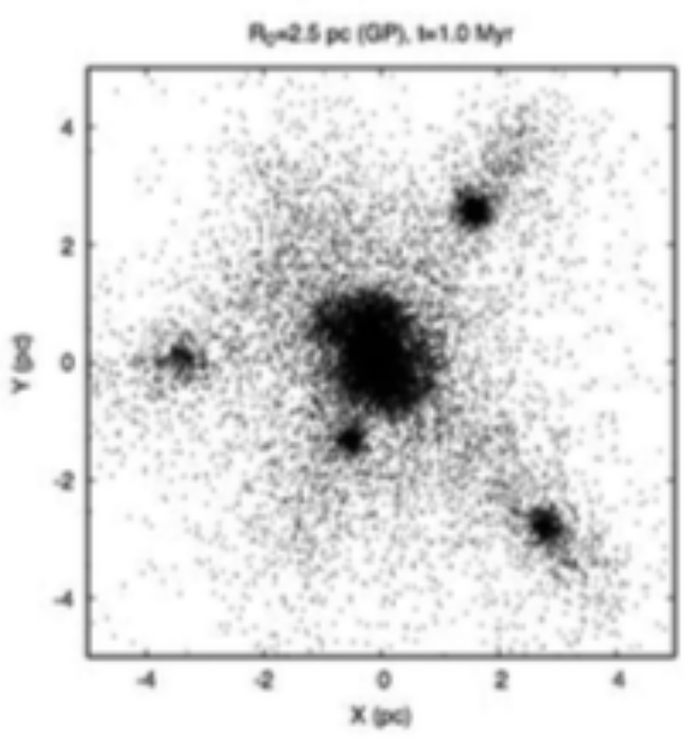
進化

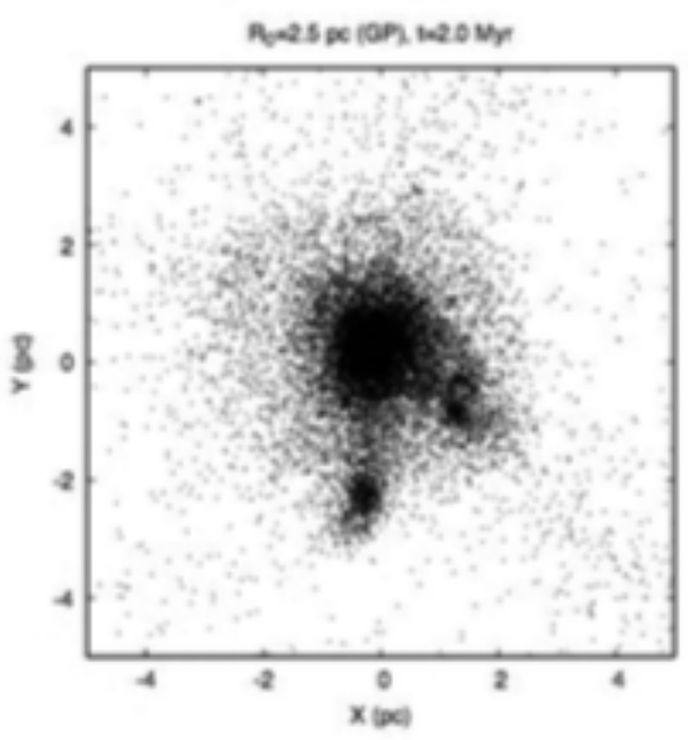

R_cl=1.1 pc, t=0.0 Myr
Y (pc)
X (pc)

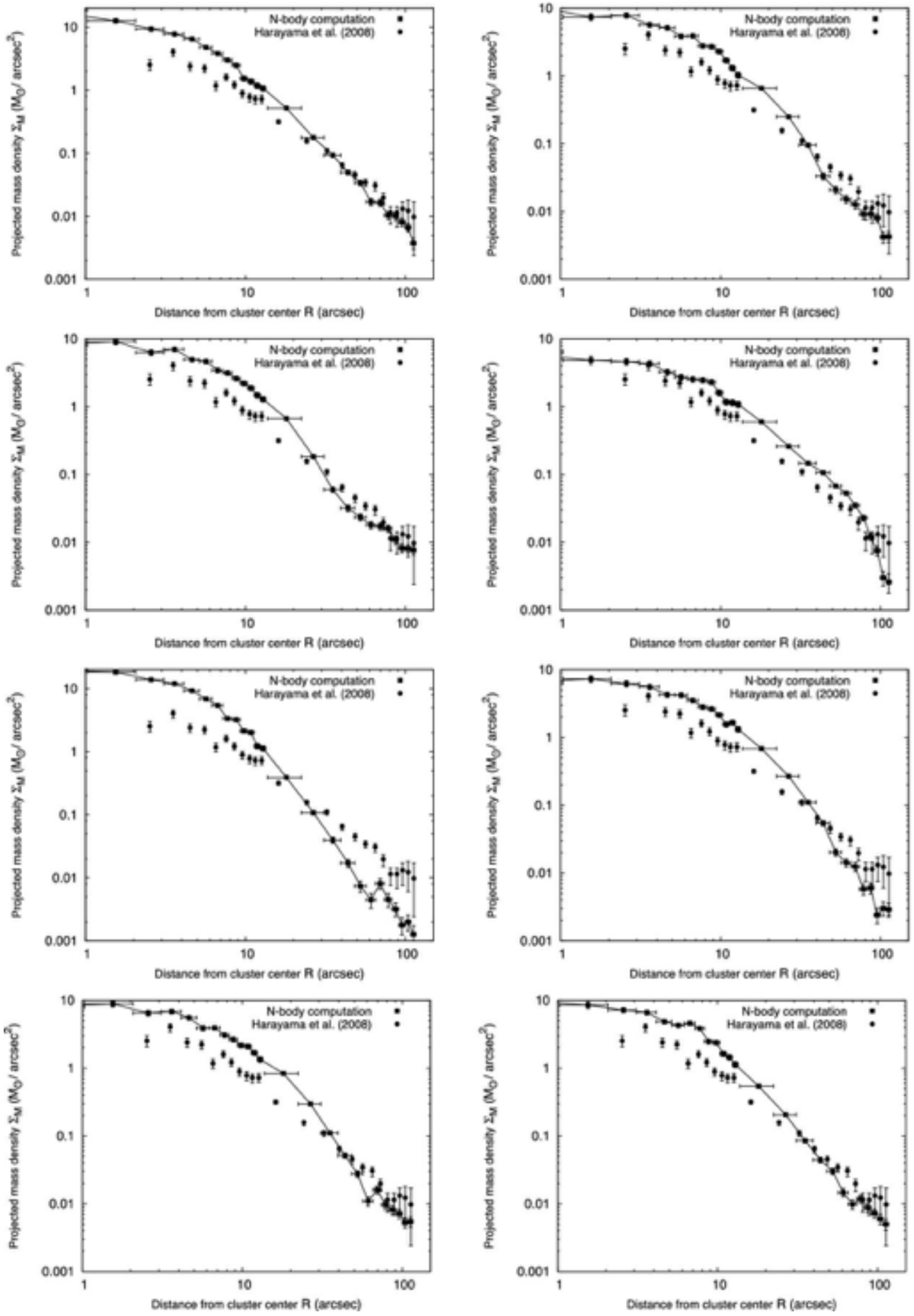

R_cl=1.1 pc, t=0.6 Myr
Y (pc)
X (pc)


R_cl=1.1 pc, t=1.0 Myr
Y (pc)
X (pc)


R_cl=2.5 pc (GP), t=0.0 Myr
Y (pc)
X (pc)


R_cl=2.5 pc (GP), t=1.0 Myr
Y (pc)
X (pc)

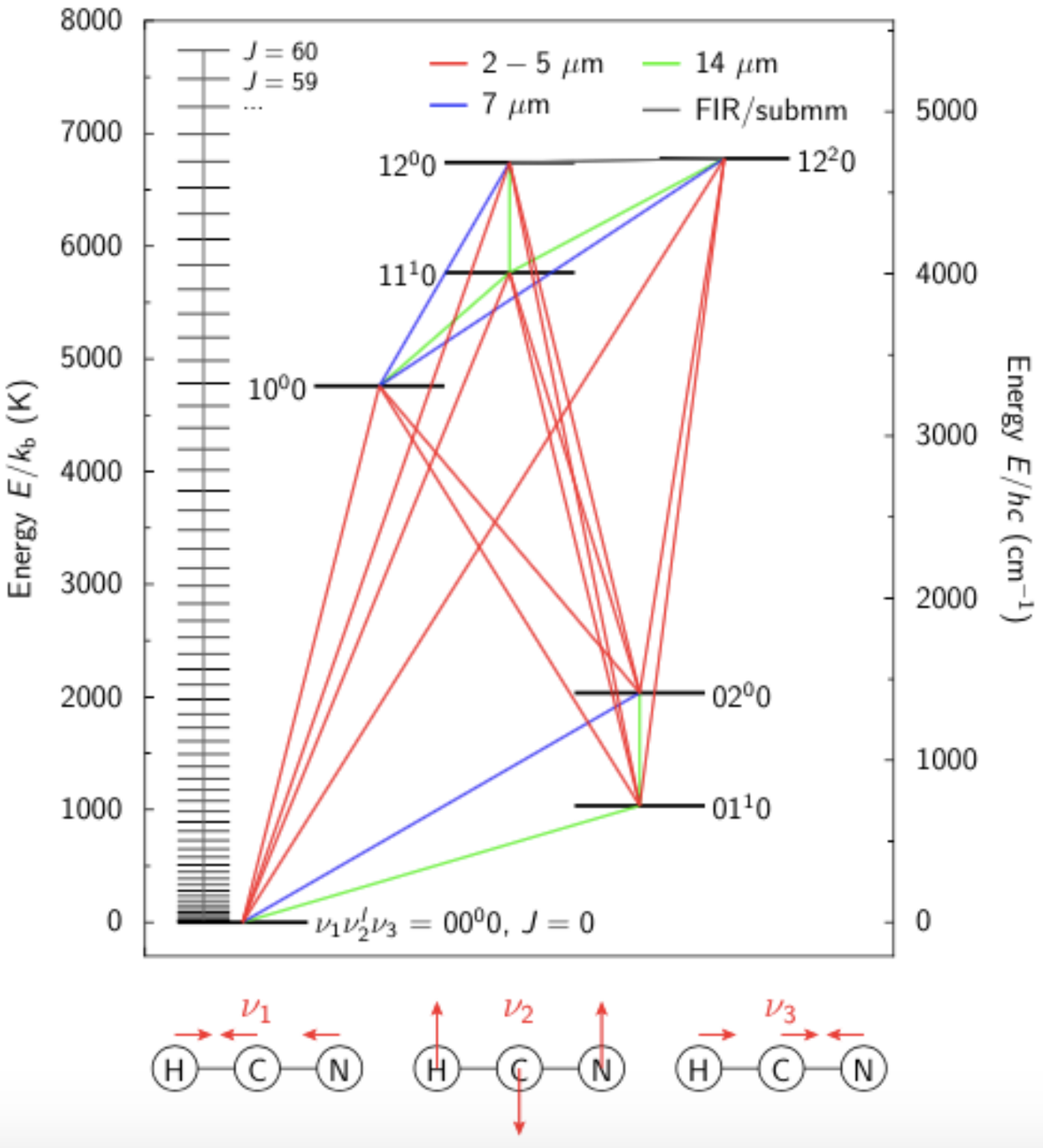

R_cl=2.5 pc (GP), t=2.0 Myr
Y (pc)
X (pc)



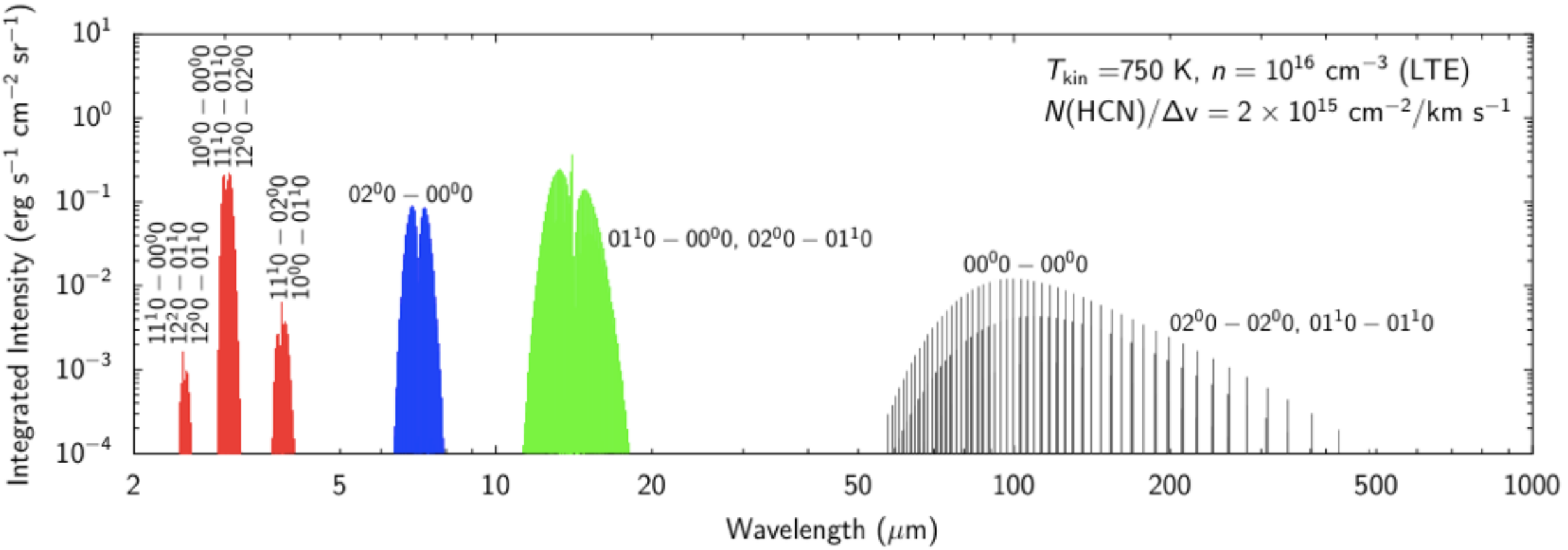
Sub cluster が1 Myr 以内に丸くなった場合は密度が高くなりすぎる。

Ro-vibrational excitation of an organic molecule (HCN) in protoplanetary disks

S. Bruderer, D. Harsono, E.F. van Dishoeck, A&Ap, to appear



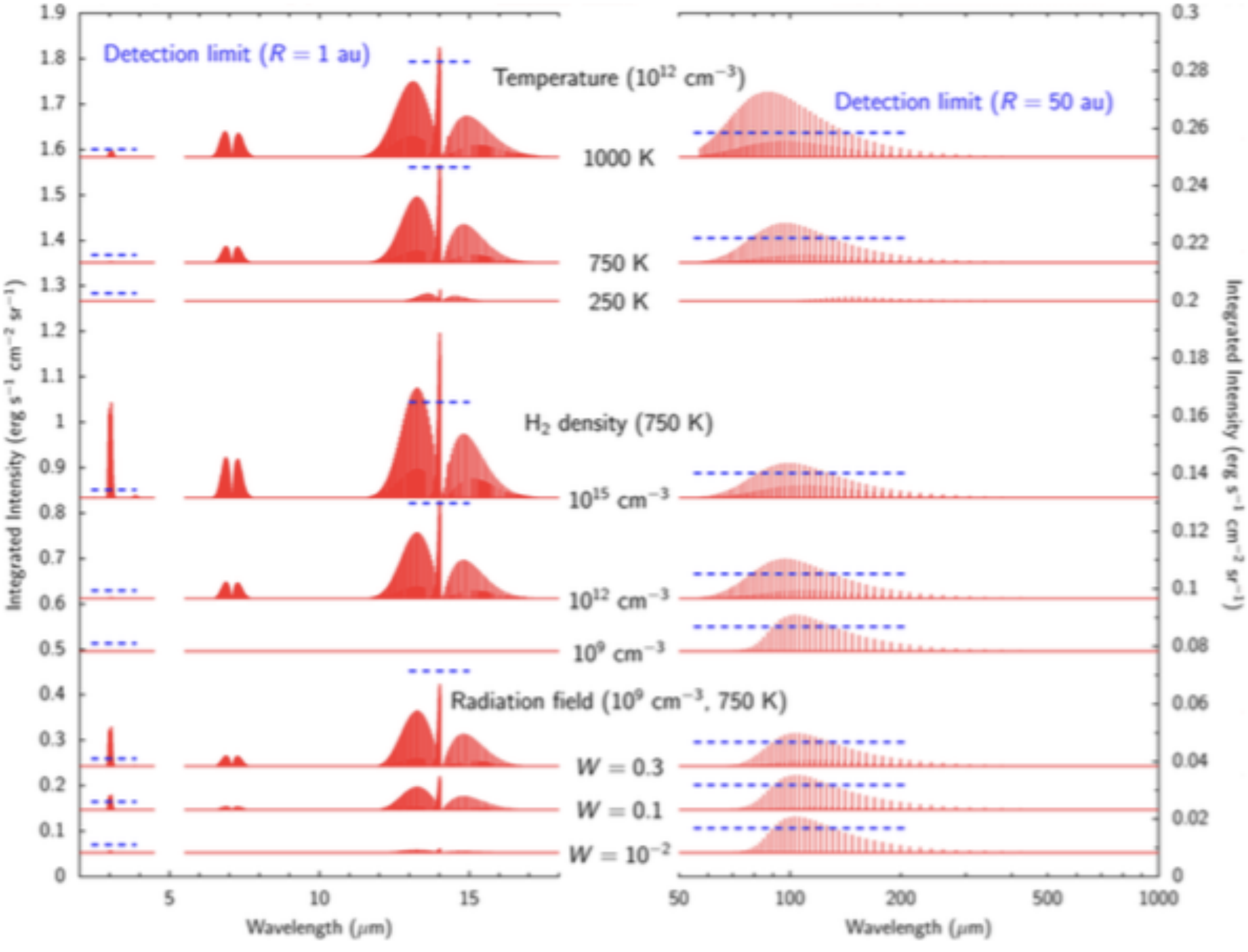
輻射励起によりLTEに近い状態が実現される。衝突でLTEにするには高温高密度(>750 K, >10^{14} g cm^{-3})が必要。　　AS 250 (N)



AS 250 (N)

Parameter		Value
Star		
Mass	M_* [$M_\odot$]	1.0[a]
Luminosity	L_* [$L_\odot$]	4.0[a]
Effective Temperature	$T_{\rm eff}$ [K]	4250[a]
Disk		
Disk mass	$M_{\rm disk}$ [$M_\odot$]	0.029[a,d]
Surface density index	γ	0.9[a]
Characteristic radius	$R_{\rm c}$ [au]	46[a]
Inner radius	$R_{\rm in}$ [au]	0.14[a]
Scale height index	ψ	0.11[a]
Scale height angle	$h_{\rm c}$ [rad]	0.18[a]
Dust properties[e]		
Size	a [μm]	$0.005 - 1000$[a]
Size distribution		$dn/da \propto a^{-3.5}$[a]
Composition		ISM[a,b]
Distance	d [pc]	125[c]
Inclination	i [°]	20[c]

2×10^{15} cm^{-2}, $\Delta v = 1$ km s^{-1}



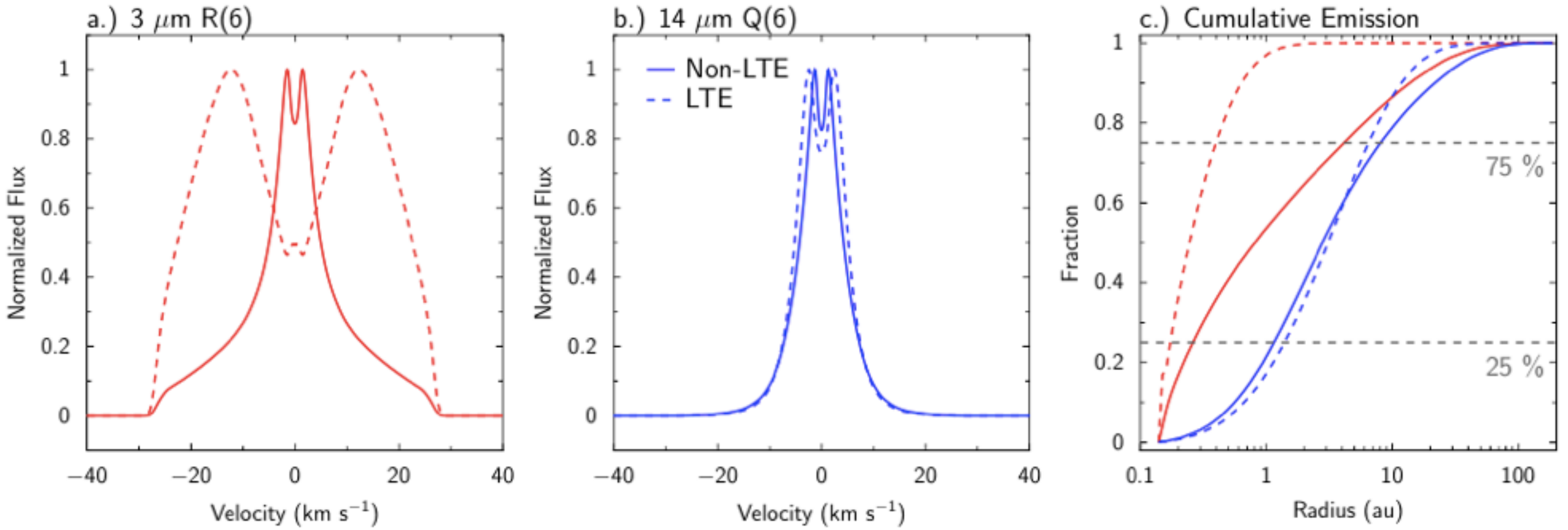
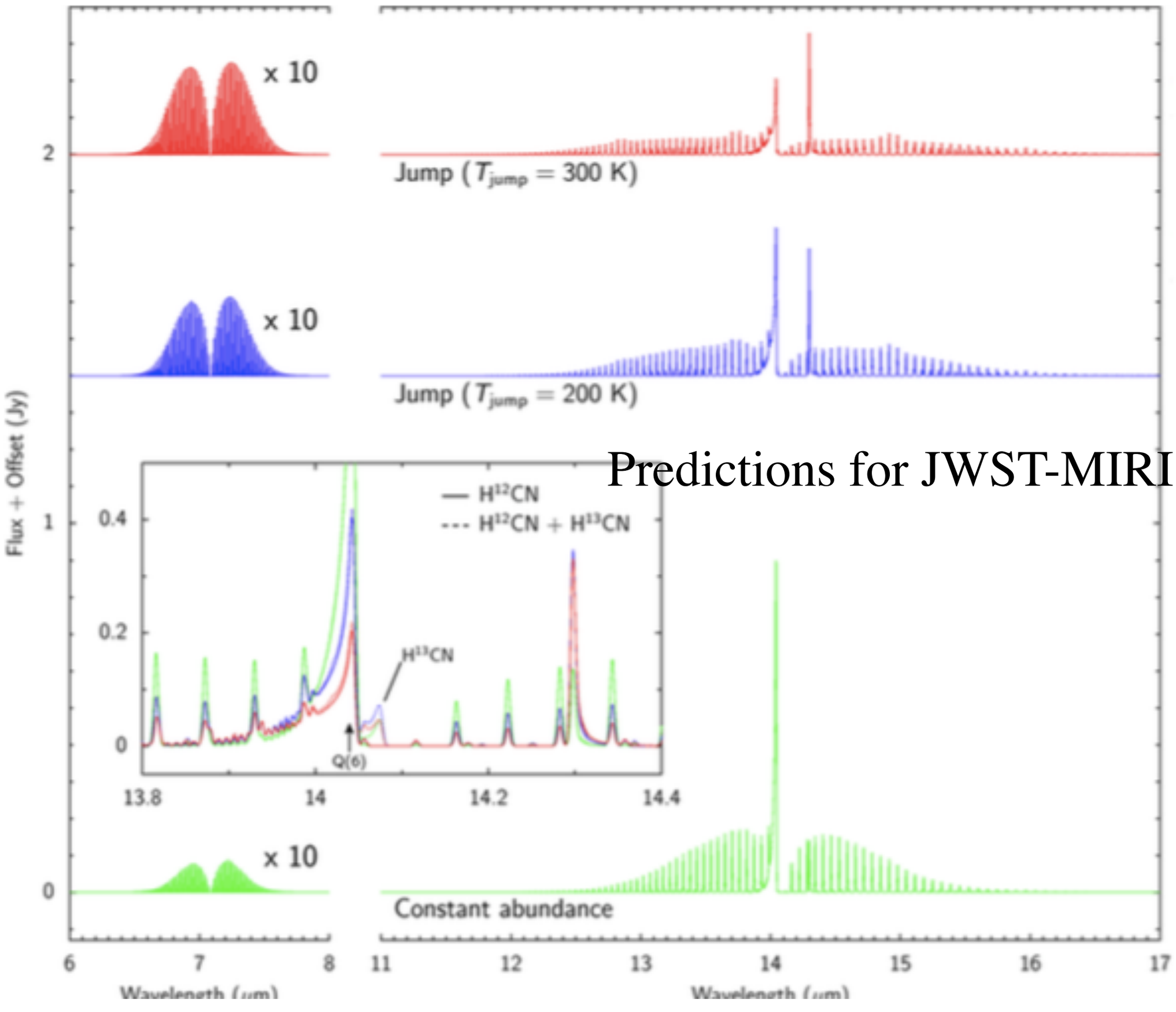


Fig. 7. Spectrum of the **a)** R(6) $10^00 - 00^00$ line at 3 μm and **b)** Q(6) $01^10 - 00^00$ line at 14 μm of the AS 205 (N) model with a gas-to-dust ratio of 1000 and a constant abundance of $x_{\rm in} = x_{\rm out} = 3 \times 10^{-8}$. **c)** Contribution to the line flux within a certain radius. Results from the non-LTE and LTE model are shown in solid and dashed lines, respectively.

Predictions for JWST-MIRI.

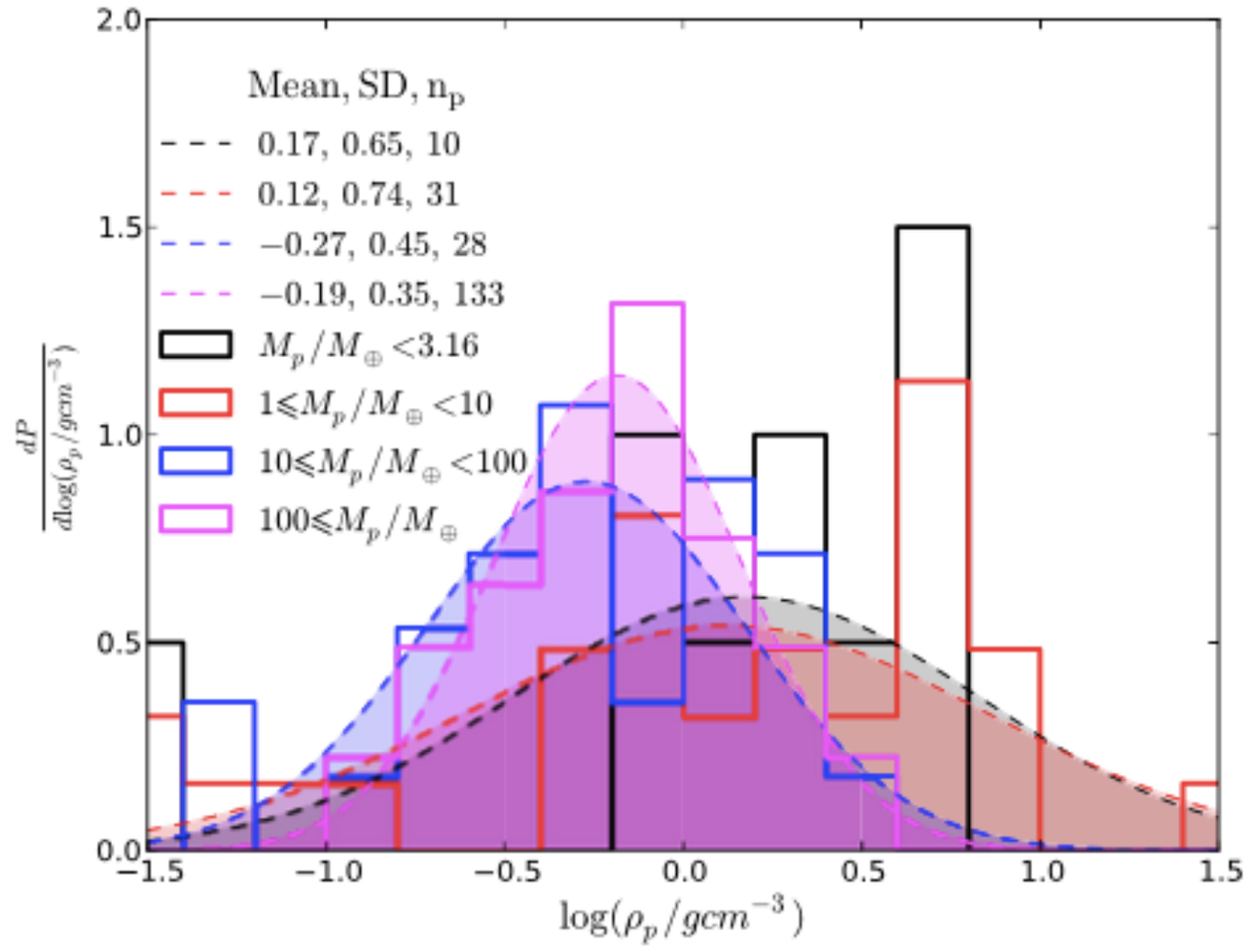
Predictions for JWST-MIRI.

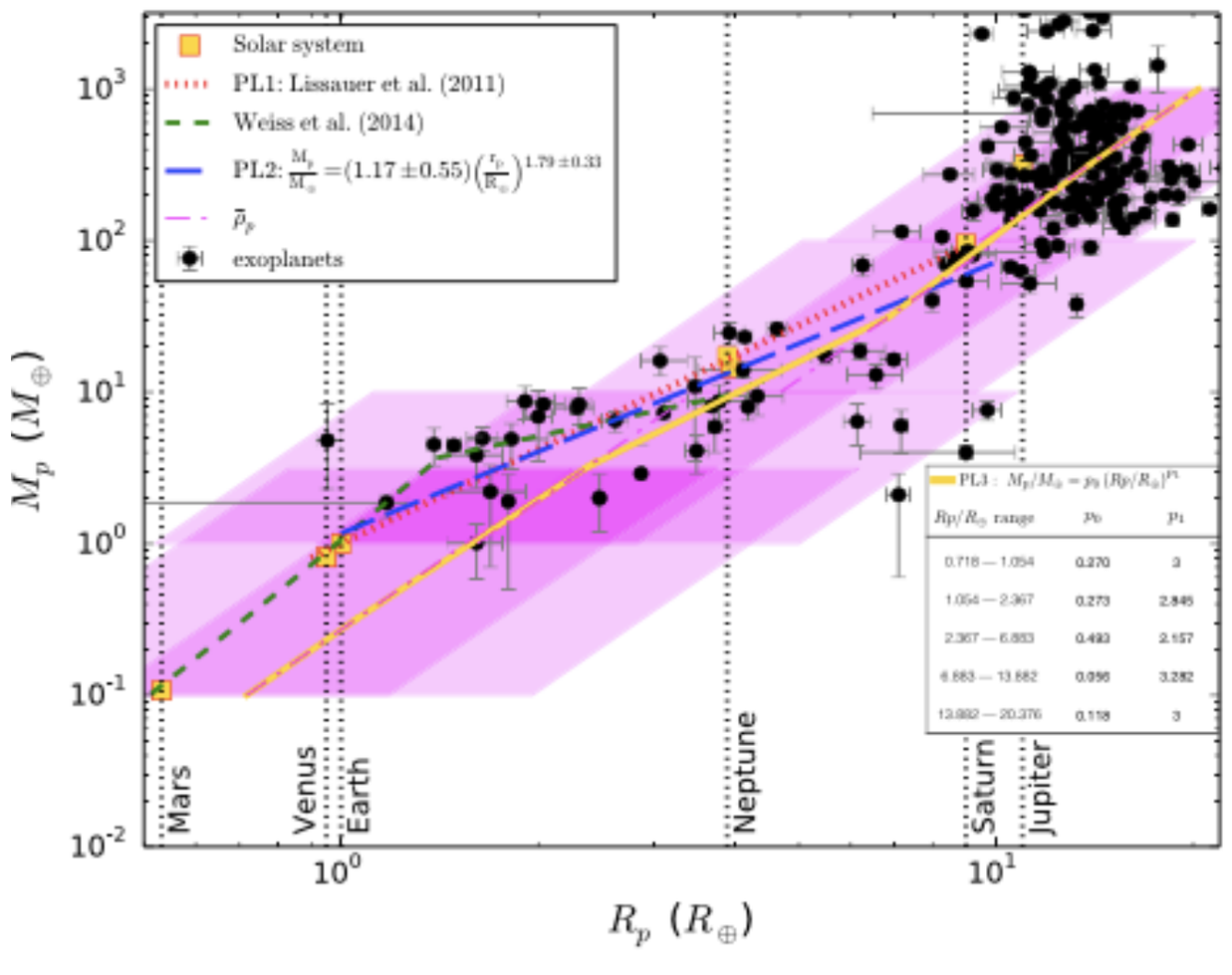


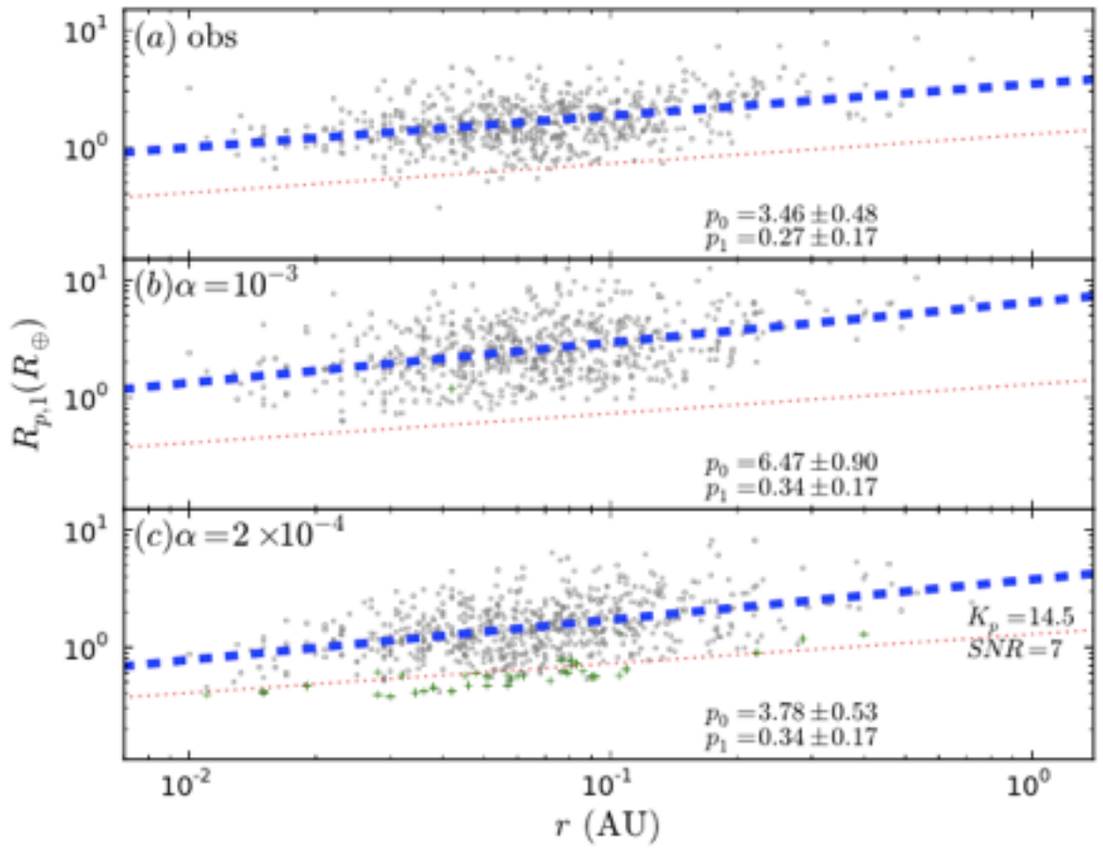
VULCAN PLANETS: INSIDE-OUT FORMATION OF THE INNERMOST SUPER-EARTHS

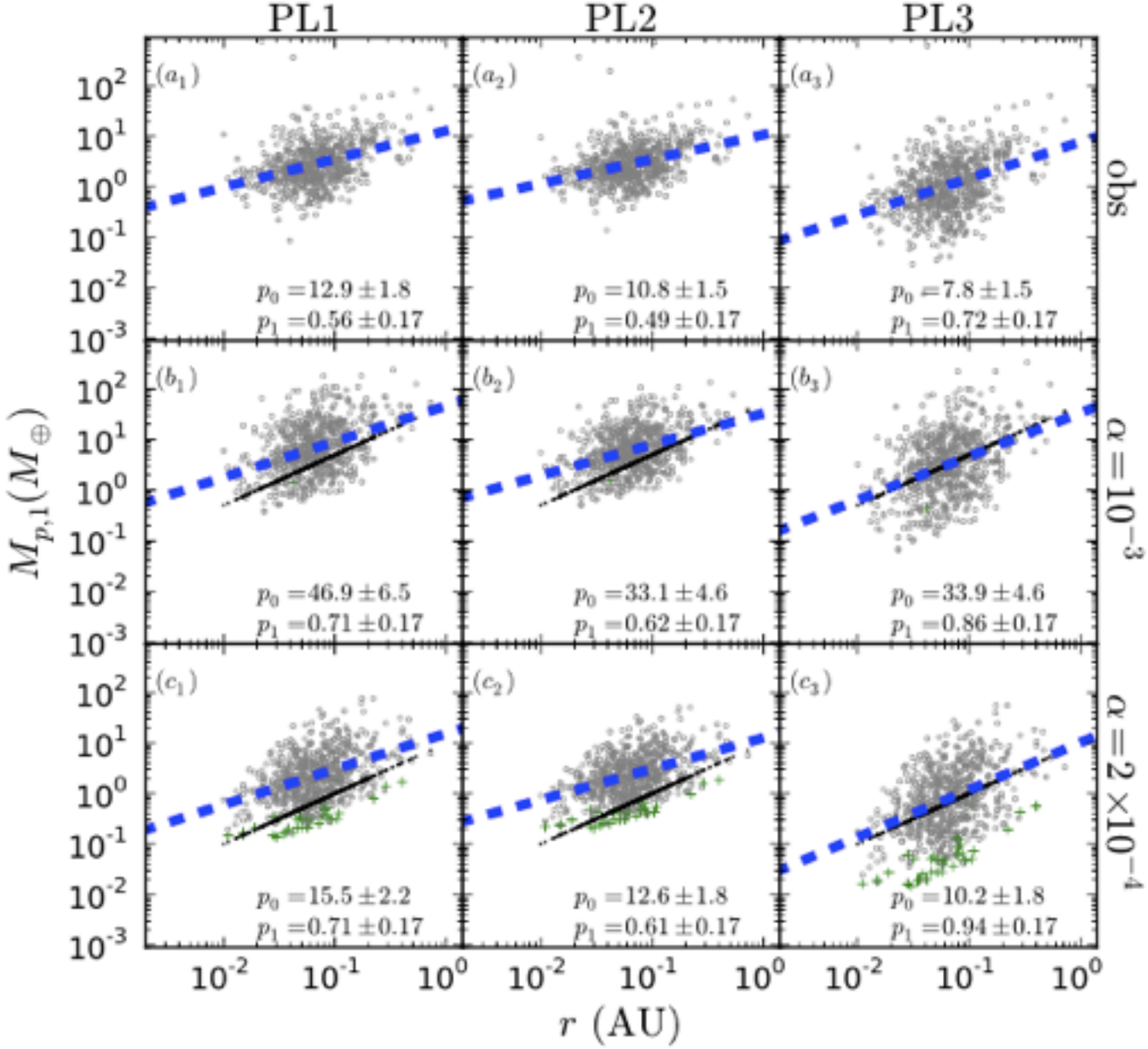
S. Chatterjee & J.C. Tan

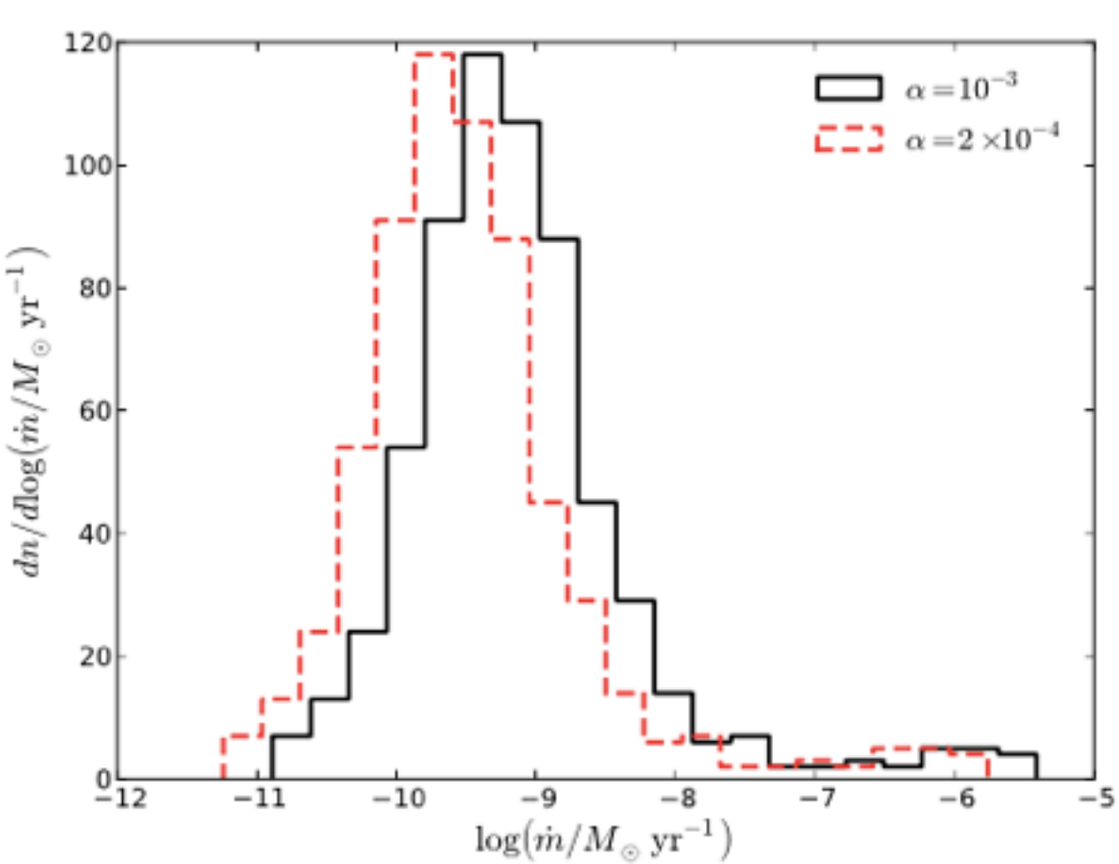
ApJ Letters, 798, L43 (2015)






(a) obs
$p_0 = 3.46 \pm 0.48$
$p_1 = 0.27 \pm 0.17$
(b) $\alpha = 10^{-3}$
$p_0 = 6.47 \pm 0.90$
$p_1 = 0.34 \pm 0.17$
(c) $\alpha = 2 \times 10^{-4}$
$K_p = 14.5$
$SNR = 7$
$p_0 = 3.78 \pm 0.53$
$p_1 = 0.34 \pm 0.17$
$R_{p,1}(R_\oplus)$
r (AU)


PL1
PL2
PL3
obs
$\alpha = 10^{-3}$
$\alpha = 2 \times 10^{-4}$
$M_{p,1}(M_\oplus)$
$p_0 = 12.9 \pm 1.8$
$p_1 = 0.56 \pm 0.17$
$p_0 = 10.8 \pm 1.5$
$p_1 = 0.49 \pm 0.17$
$p_0 = 7.8 \pm 1.5$
$p_1 = 0.72 \pm 0.17$
$p_0 = 46.9 \pm 6.5$
$p_1 = 0.71 \pm 0.17$
$p_0 = 33.1 \pm 4.6$
$p_1 = 0.62 \pm 0.17$
$p_0 = 33.9 \pm 4.6$
$p_1 = 0.86 \pm 0.17$
$p_0 = 15.5 \pm 2.2$
$p_1 = 0.71 \pm 0.17$
$p_0 = 12.6 \pm 1.8$
$p_1 = 0.61 \pm 0.17$
$p_0 = 10.2 \pm 1.8$
$p_1 = 0.94 \pm 0.17$
r (AU)


$\alpha = 10^{-3}$
$\alpha = 2 \times 10^{-4}$
$dn/d\log(\dot{m}/M_\odot\ \mathrm{yr}^{-1})$
$\log(\dot{m}/M_\odot\ \mathrm{yr}^{-1})$