Star Formation Newsletter No. 358, #1-14

No. 3 Gap-opening Planets Make Dust Rings Wider, Bi et al.

No. 5 Structured Distributions of Gas and Solids in Protoplanetary Disks (PPVII)

No. 9 Episodic accretion and mergers during growth of massive protostars

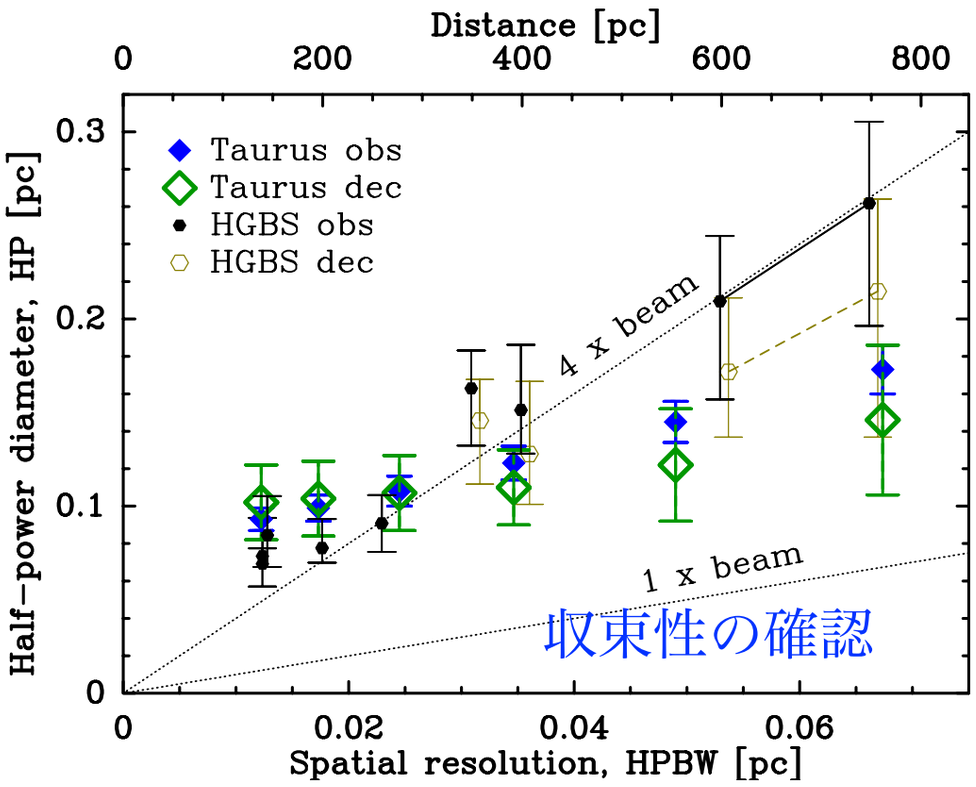
No. 12 300: An ACA 870 μm Continuum Survey of OrionProtostars and their Evolution, Federman et al.

No. 14 Internal or external magma oceans in the earliest protoplanets – Perspectives from nitrogen and carbon fractionation, Grewal et al.

花輪 知幸 (千葉大学)

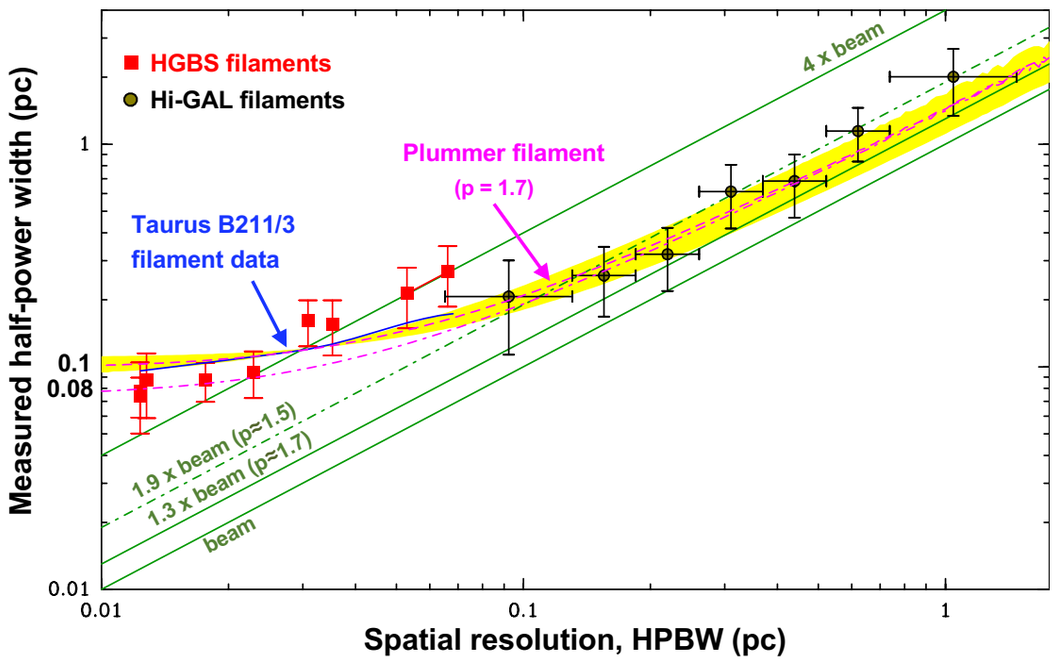
No. 1 The typical width of Herschel filaments, P. Andre et al. A&A, 667, L1 (2022)

幅は空間分解能に依らず 0.1 pc



収束性の確認

Gaussian fit は不適切

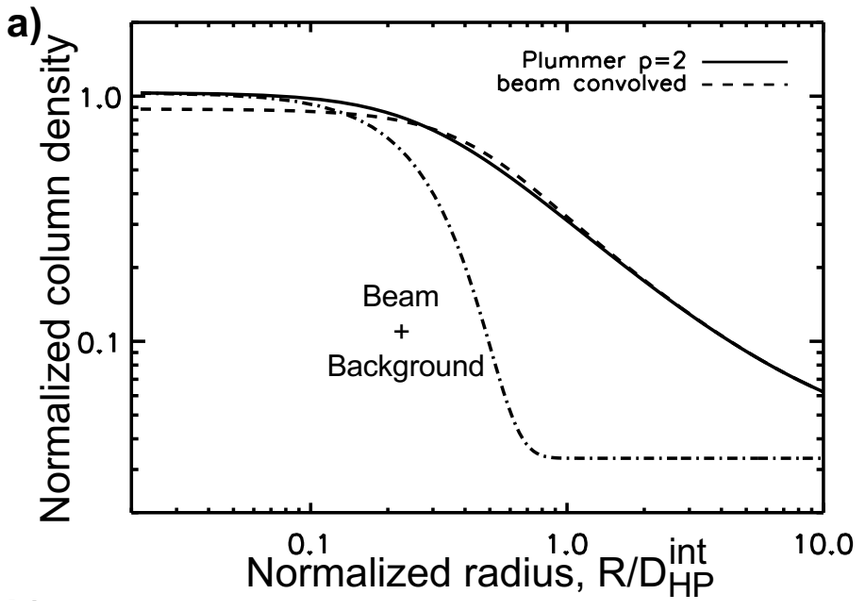


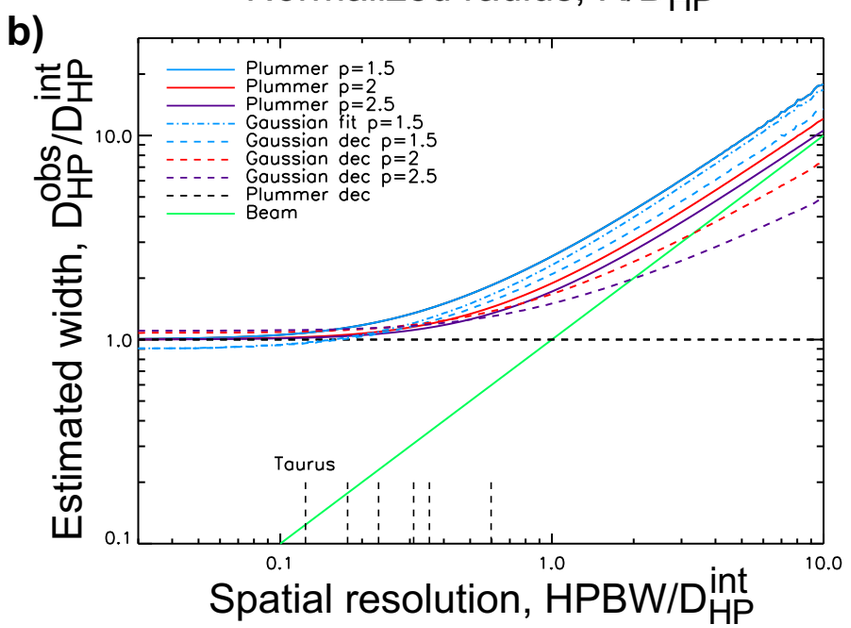
Panopoulou+22 (幅は距離と相関) への反論

$$N_p(r) = \frac{N_0}{[1+\alpha_p (r/R_{\rm HP})^2]^{\frac{p-1}{2}}} + N_{\rm bg},$$

$$\alpha_p = 2\frac{2}{p-1} - 1, \qquad \text{Plummer-like}$$

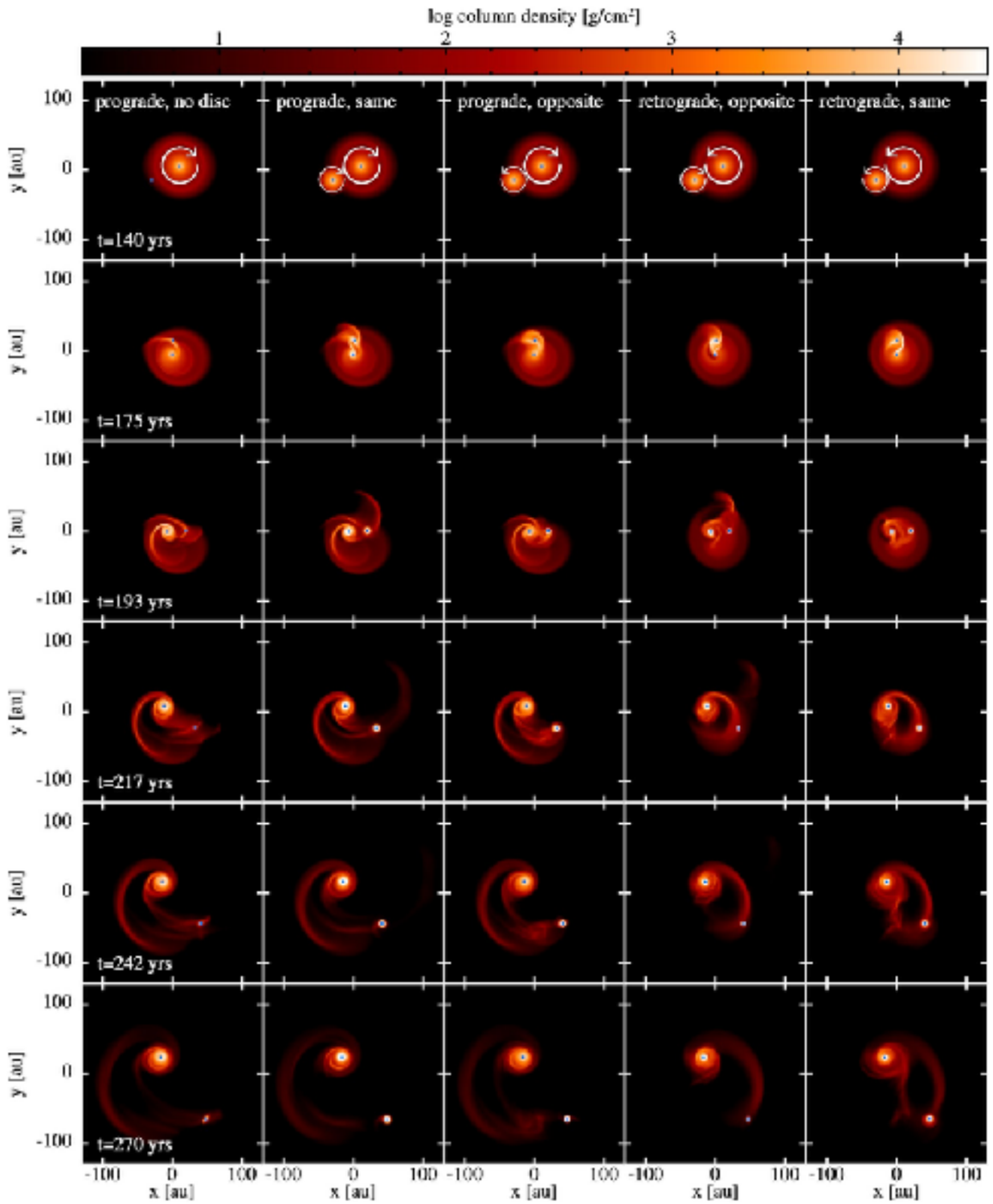
$$p = 1.5 \sim 2.5.$$

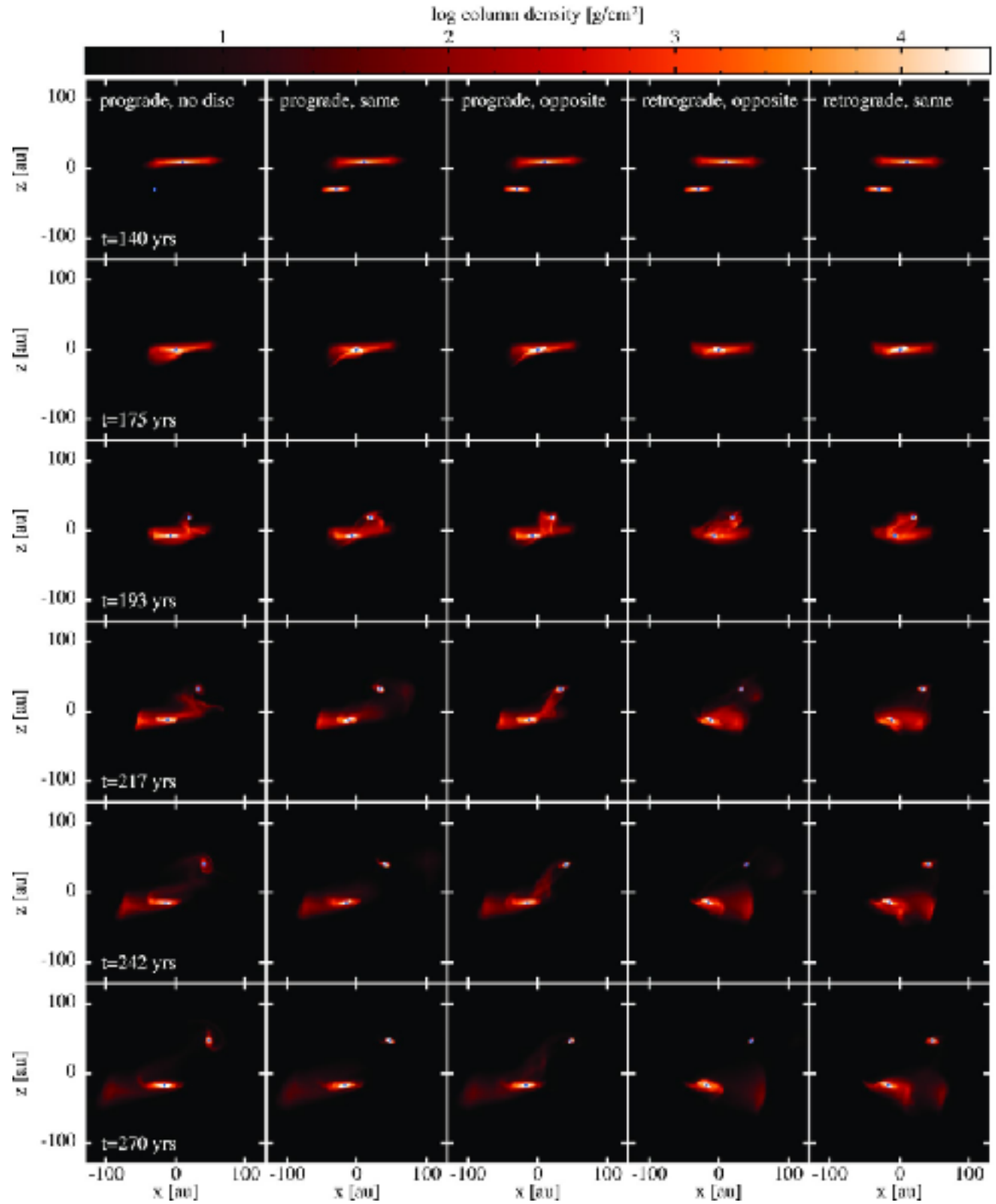




ゆらぎ(雑音)があるとさらに劣化

No 2. Sustained FU Orionis-type outbursts from colliding discs in stellar flybys, Borchert et al., MNRaS, 517, 4436 (2022)　Cuello+19, Borchert+22 の続編

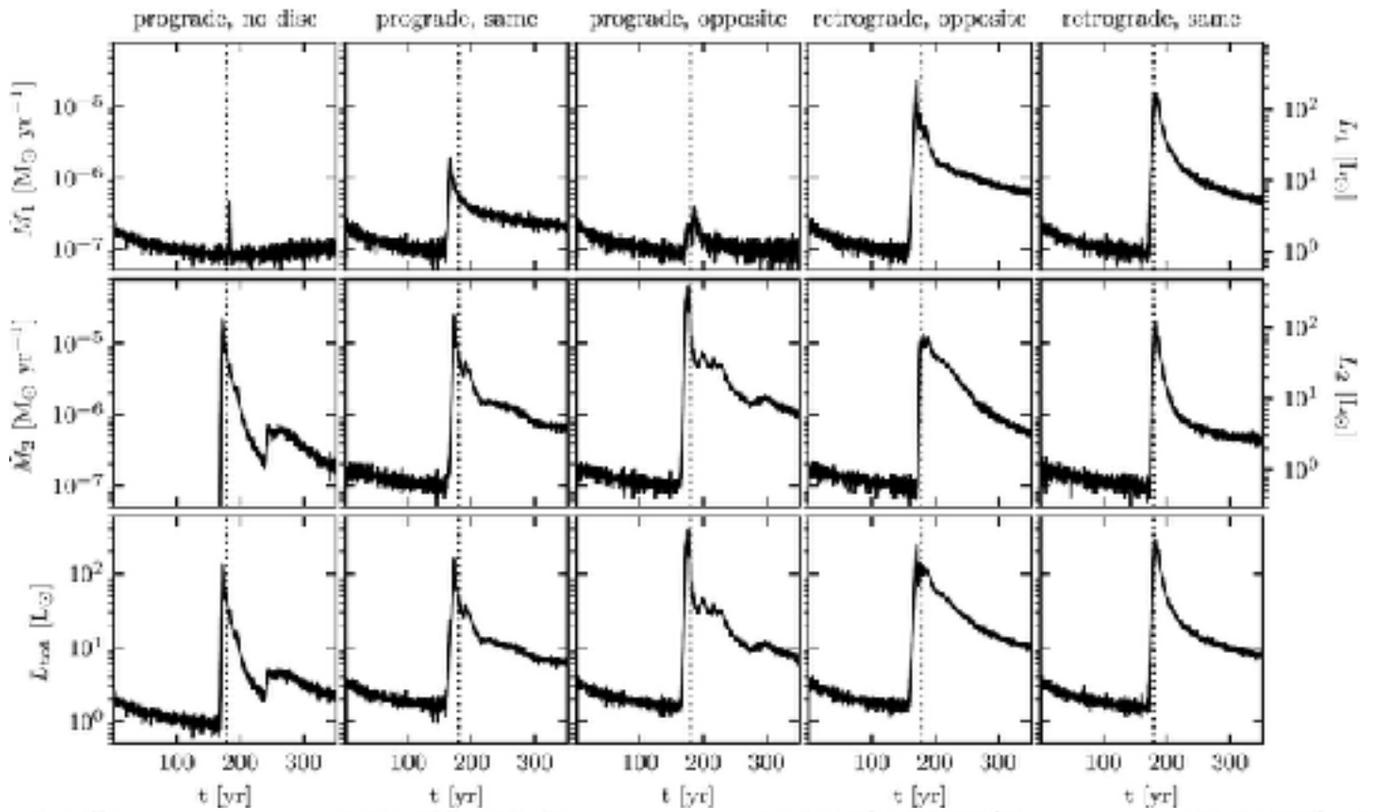


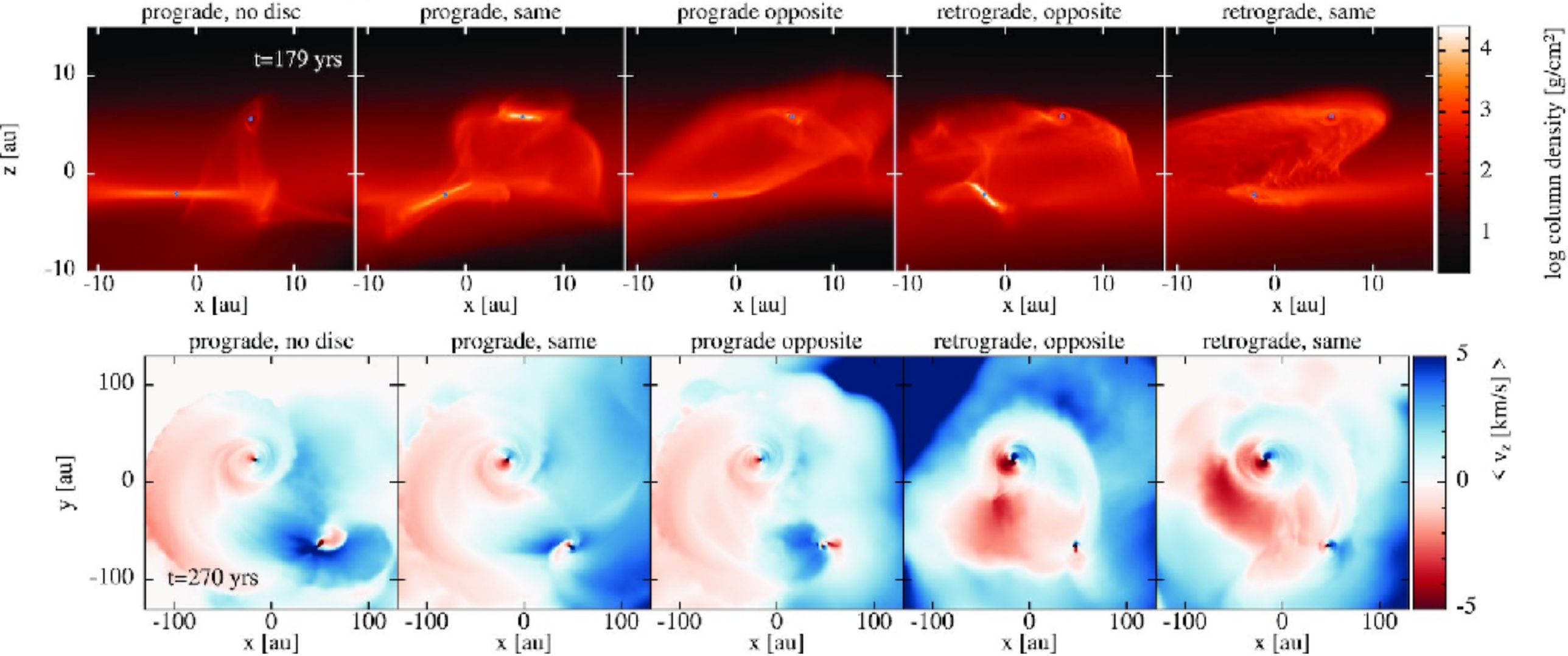


主星: $M_* = 1.4\ M_\odot$, $M_{disk} = 0.02\ M_\odot$, $r_{min} = 1$ au, $r_{max} = 50$ au

伴星: $M_* = 0.5\ M_\odot$, $M_{disk} = 0.007\ M_\odot$, $r_{min} = 1$ au, $r_{max} = 17$ au

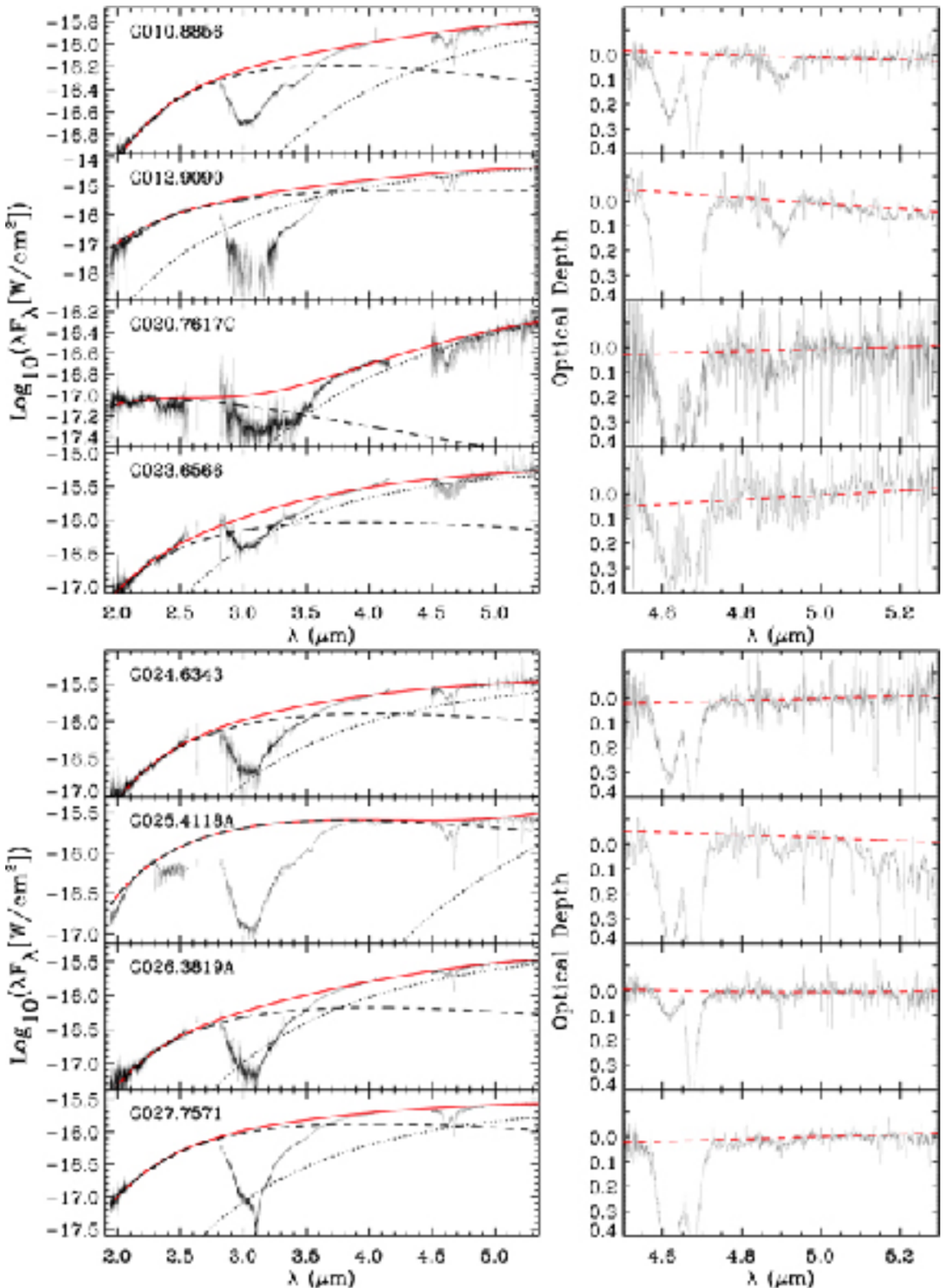
$L_* + L_{acc}$ 星を考慮して
温度分布を求める。


prograde, no disc
prograde, same
prograde, opposite
retrograde, opposite
retrograde, same
$\dot{M}_1$ [$M_\odot$ yr^{-1}]
$\dot{M}_2$ [$M_\odot$ yr^{-1}]
L_{tot} [$L_\odot$]
L_1 [$L_\odot$]
L_2 [$L_\odot$]
t [yr]


prograde, no disc
prograde, same
prograde opposite
retrograde, opposite
retrograde, same
t=179 yrs
z [au]
x [au]
log column density [g/cm^2]
t=270 yrs
y [au]
x [au]
< v_z [km/s] >

No. 4 Survey of Ices toward Massive Young Stellar Objects. I. The 4.90 μm absorption band of OCS ice is detected in 20 sight lines, more than 5 times the previously known detections.
Boogert et al. ApJ, 941, 32

2–5 μm spectra of 23 massive YSOs, taken with the NASA InfraRed Telescope Facility SpeX spectrometer.



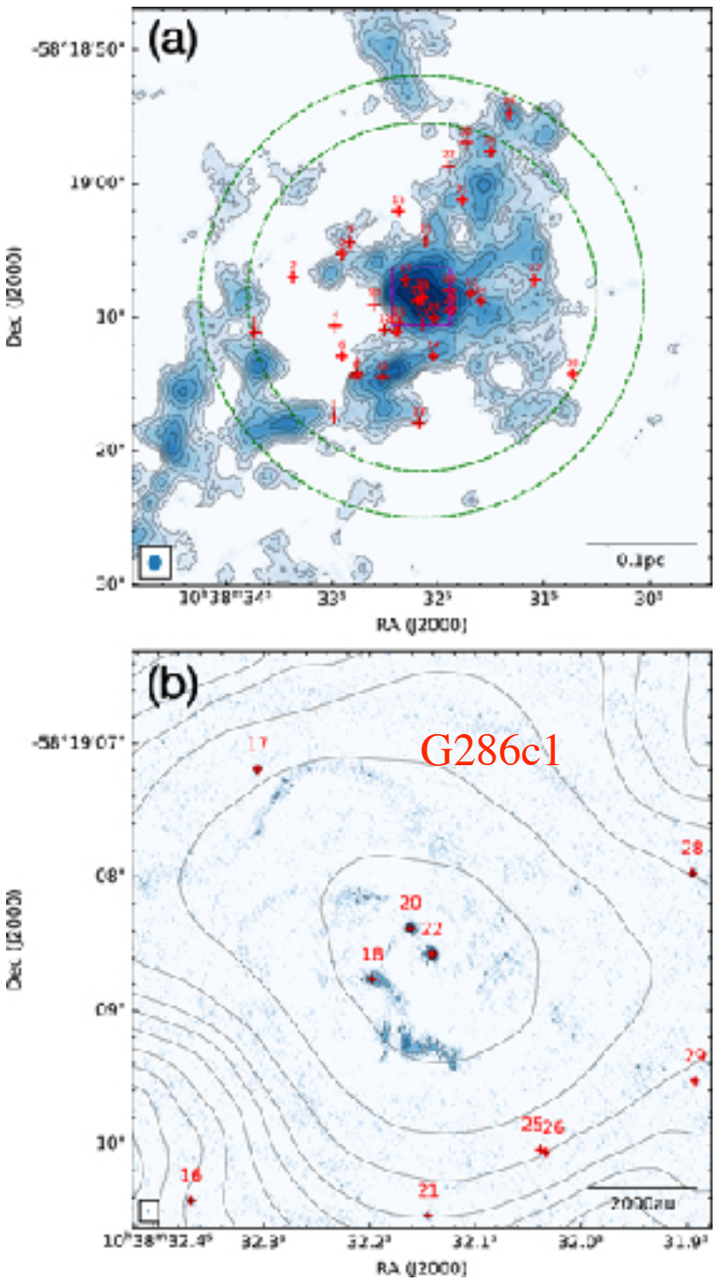
The 4.90 μm absorption band of OCS ice is detected in 20 sight lines, more than 5 times the previously known detections.

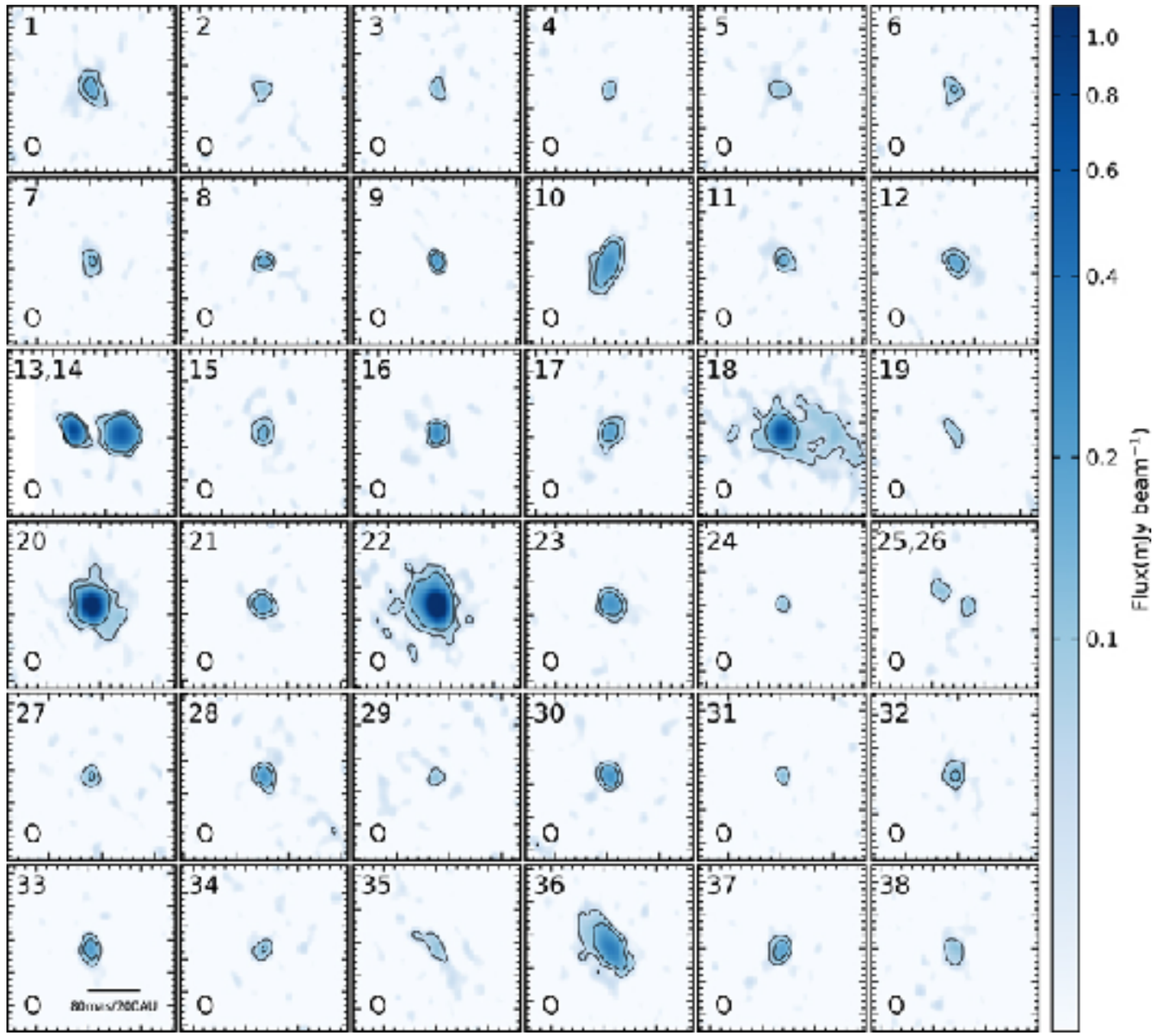
$CO:CH_3OH:OCN^-:OCS = 24:20:1.53:0.15.$

No 6. The Disk Population in a Distant Massive Protocluster, Cheng et al., ApJ, 940, 124 (2022)

G286.21+0.17 (d = 2.5 kpc) ALMA 1.3 mm, 23 mas (65 au x 50 au) 15 mJy beam^{-1}

2017年秋観測





- 6円盤が NIR (HST) でも見える
- 4円盤がX線源(Chandra)と一致
- 16 (11) 円盤がコア (G286c1) に(見かけ)付随

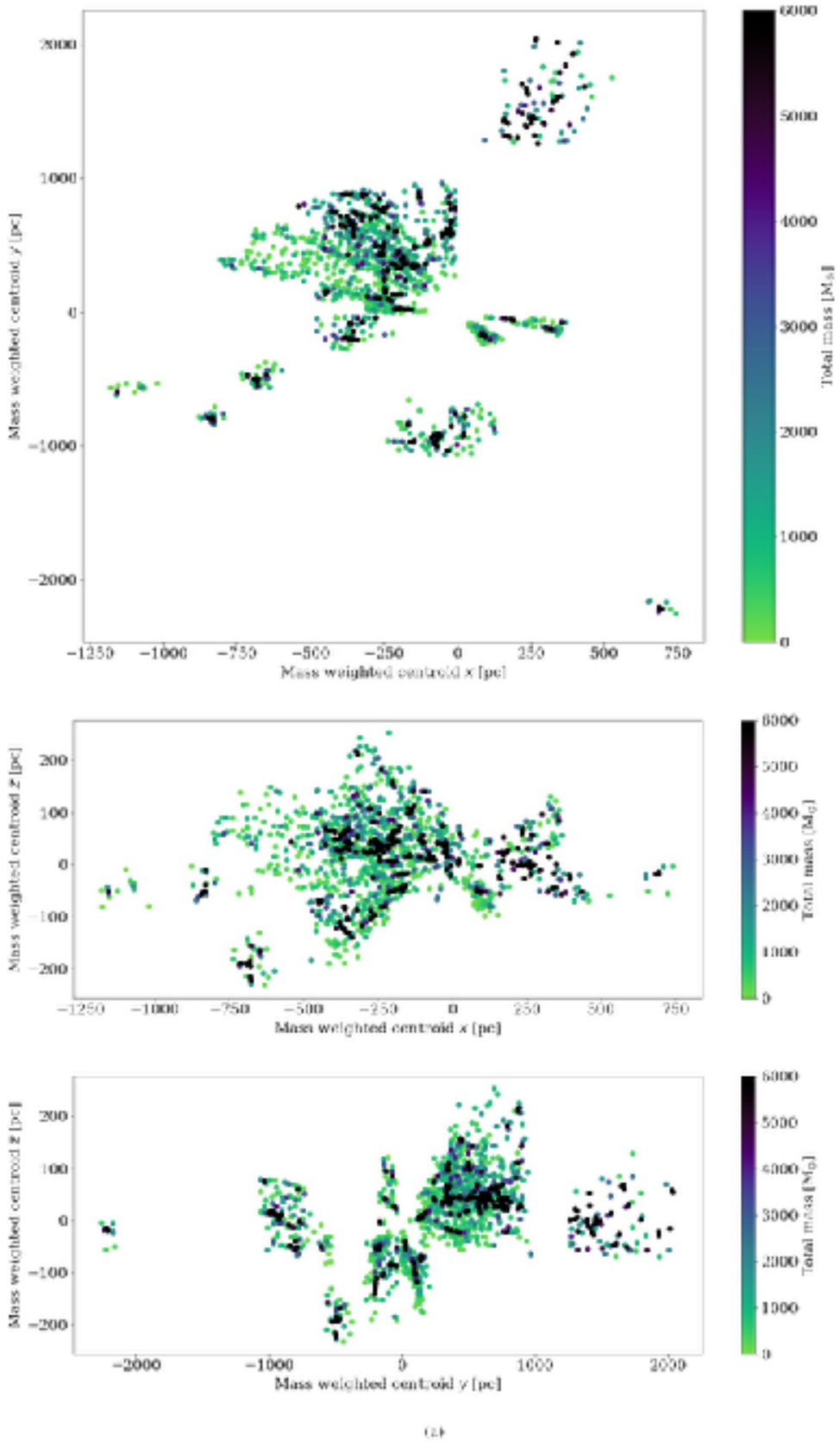
カタログが掲載されている。

Orion clusterの円盤と似ている

ClassI/Flat 天体が主体

距離と質量・半径の相関は有意ではない

No. 7 The three-dimensional structure of galactic molecular cloud complexes out to 2.5 kpc, Dharmawardena et al., MNRaS, 519, 228 (2023)

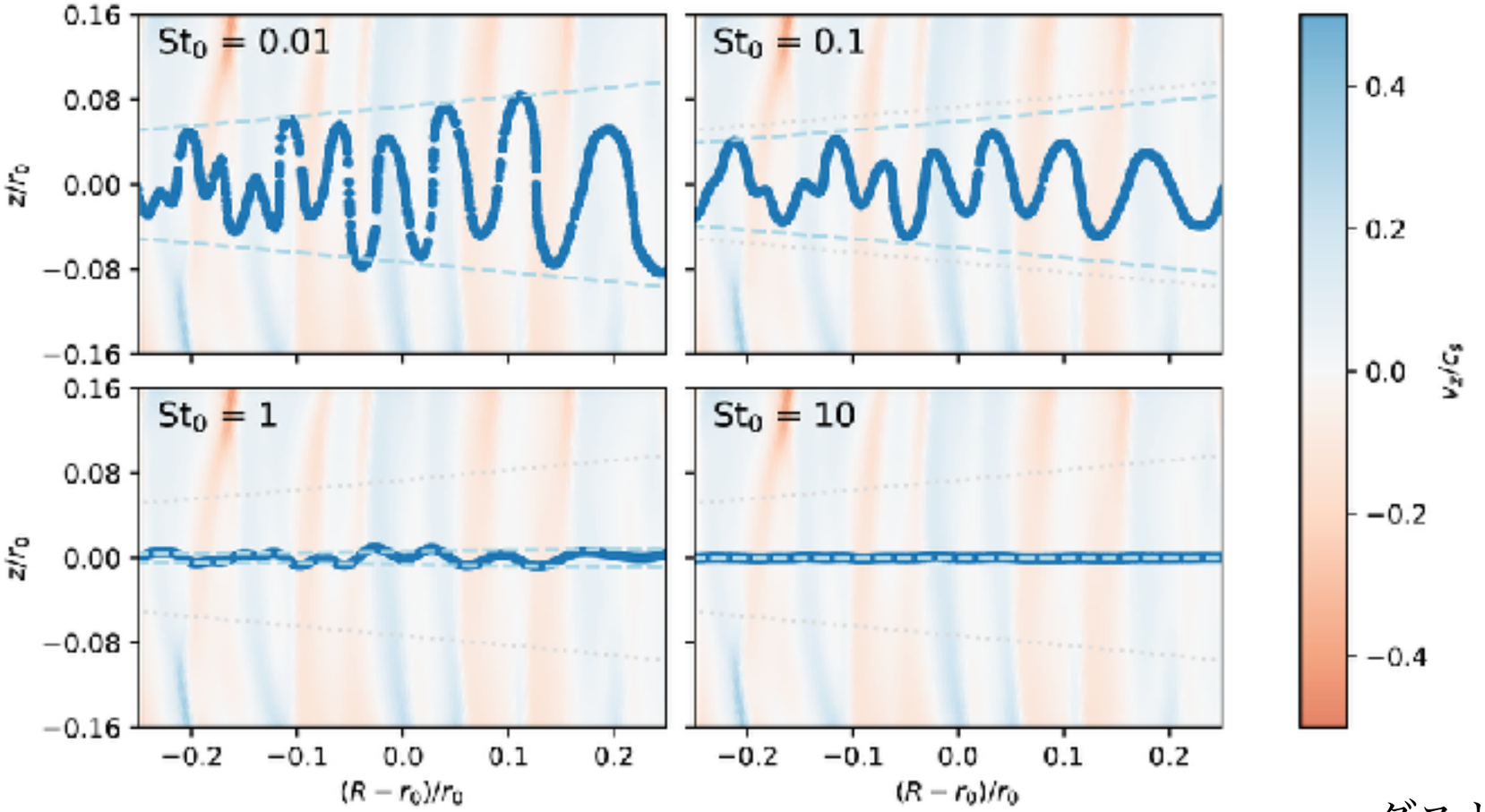


光赤外線での減光とGaia で求めた距離を使って分子雲(暗黒星雲)の3次元構造を求めた。

計算法の改良がセールスポイントらしいが、その原理は別論文

No 8 Razor-thin dust layers in protoplanetary disks: Limits on the vertical shear instability, Dullemond et al., A&A, 668, A105 (2022)

原始惑星系円盤が 1.3 mm で幾何的に薄く見えるには VSI が起きていない章子



VSI $d\Omega/dz \neq 0$ がある場合の不安定

z 方向の turbulence によりダストも持ち上がる

St > 1 は非現実的

a: ダストの半径

$$\mathrm{St}_{\mathrm{big}} = \frac{\pi \rho_{\mathrm{s}} a}{2\Sigma_{\mathrm{g}}},$$

$$\kappa_\lambda = Q_\lambda \kappa_{\mathrm{geom}} = \frac{3}{4}\frac{Q_\lambda}{\rho_{\mathrm{s}} a},$$

$$Z_{\mathrm{big}} \equiv \frac{\Sigma_{\mathrm{big}}}{\Sigma_{\mathrm{g}}} = \frac{8}{3\pi}\frac{\mathrm{St}_{\mathrm{big}}\tau_{\lambda,\mathrm{big}}}{Q_\lambda}.$$

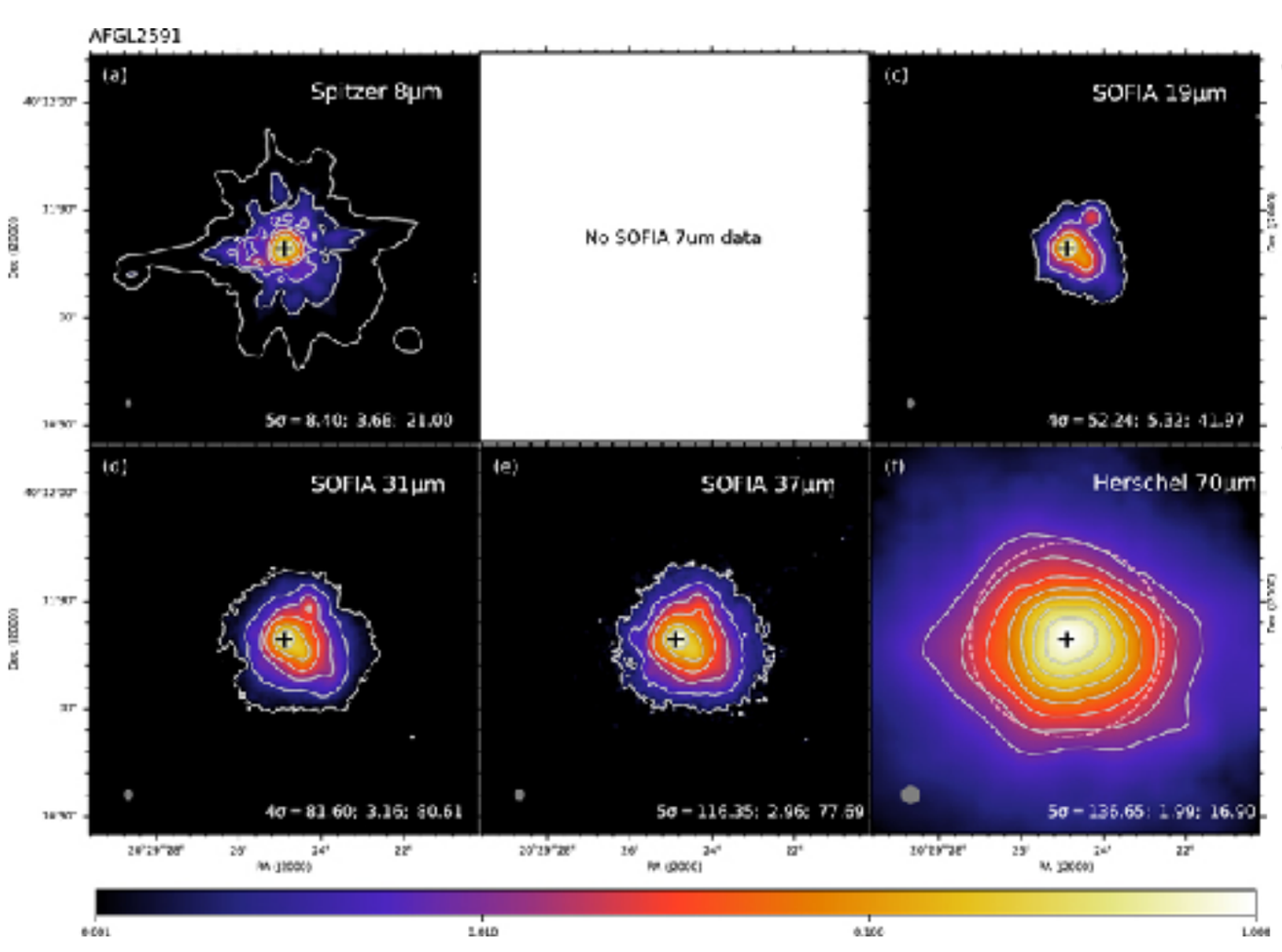
ダストが成長すると、1.3 mm で暗くなる。

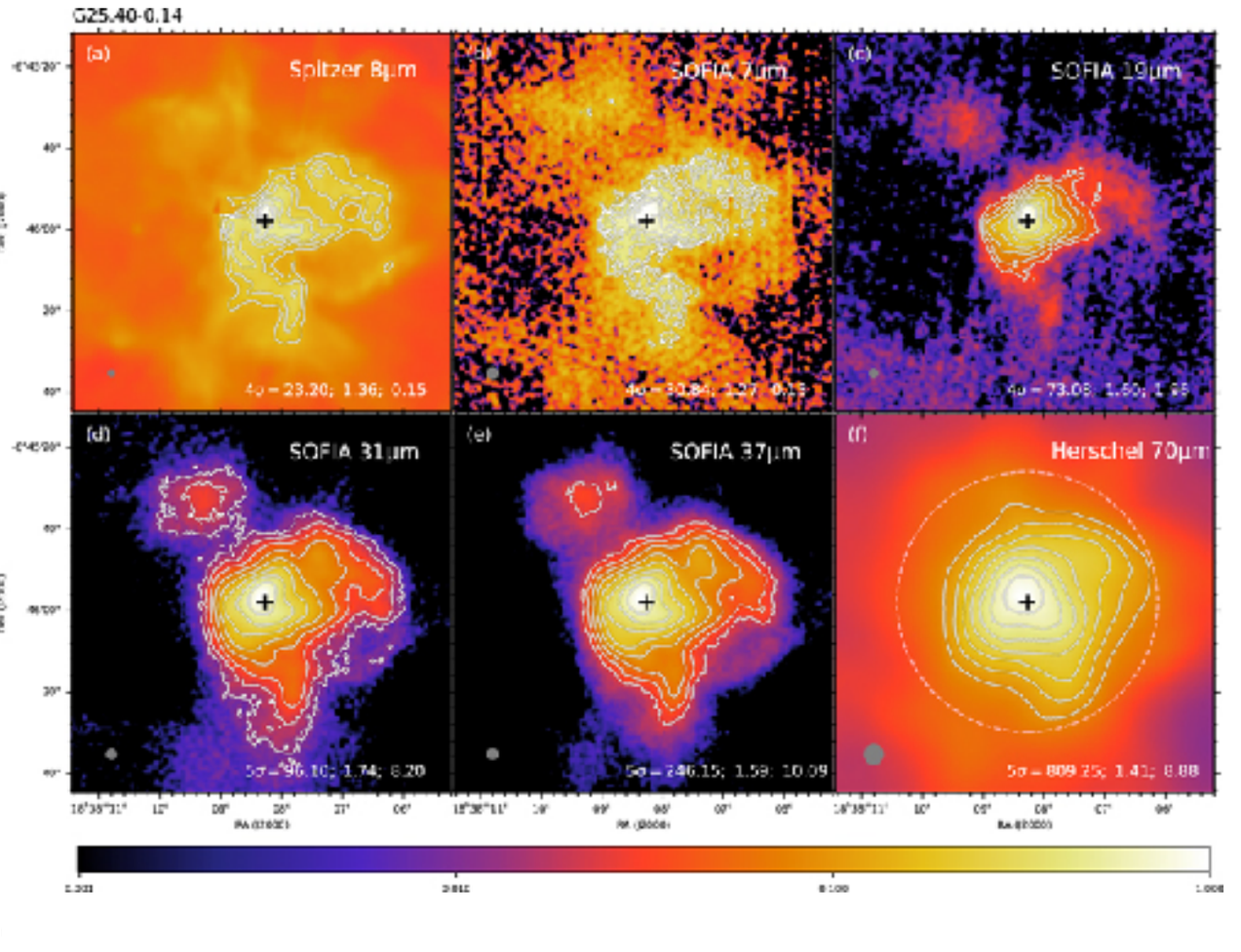
観測では τ = 0.3

なぜ VSI が安定になる理由を議論

No. 10 The SOFIA Massive (SOMA) Star Formation Survey. IV. Isolated Protostars, Fedriani et al., ApJ, 942, 7 (53pp)

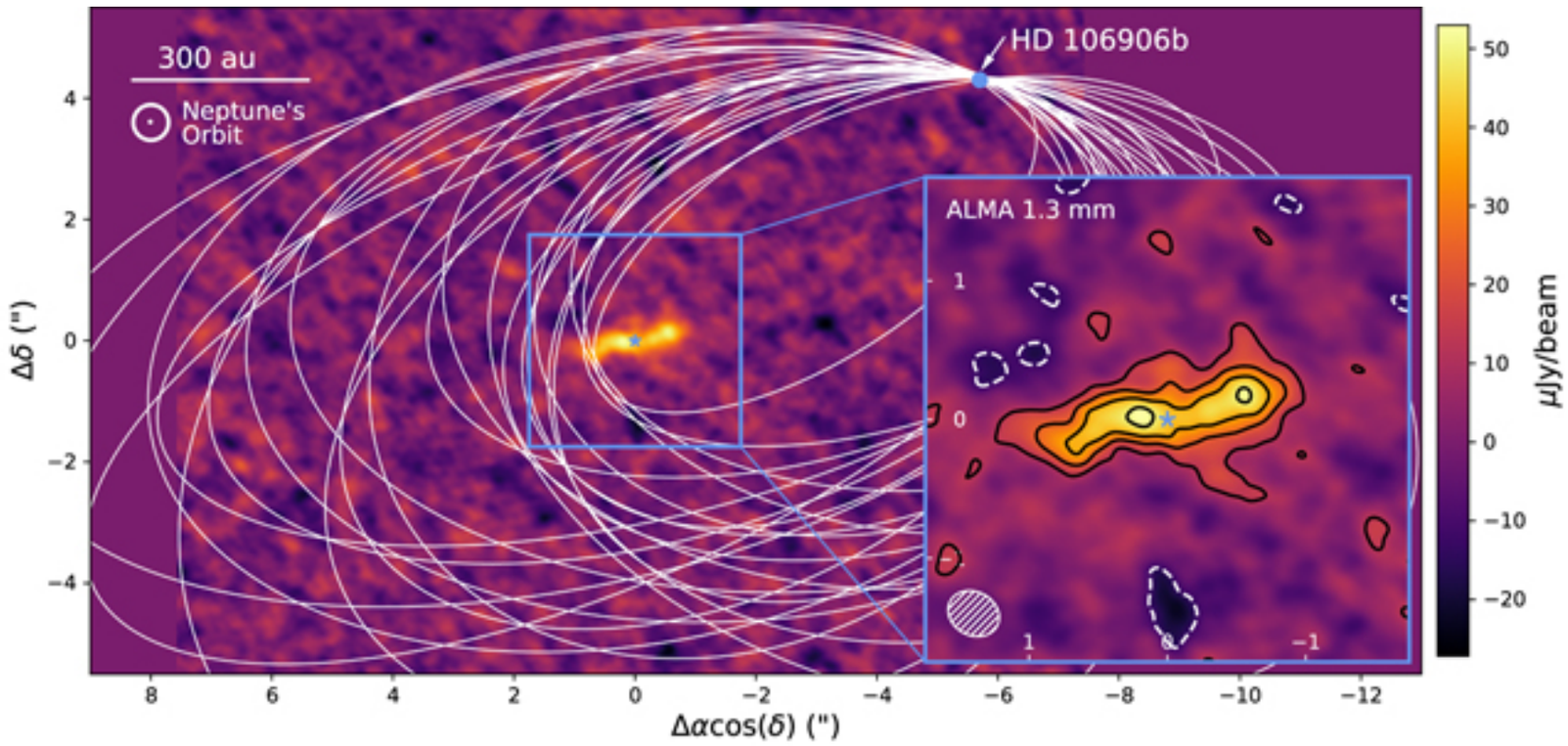
~10–40 μm SOFIA-FORCAST images of 11 isolated protostars





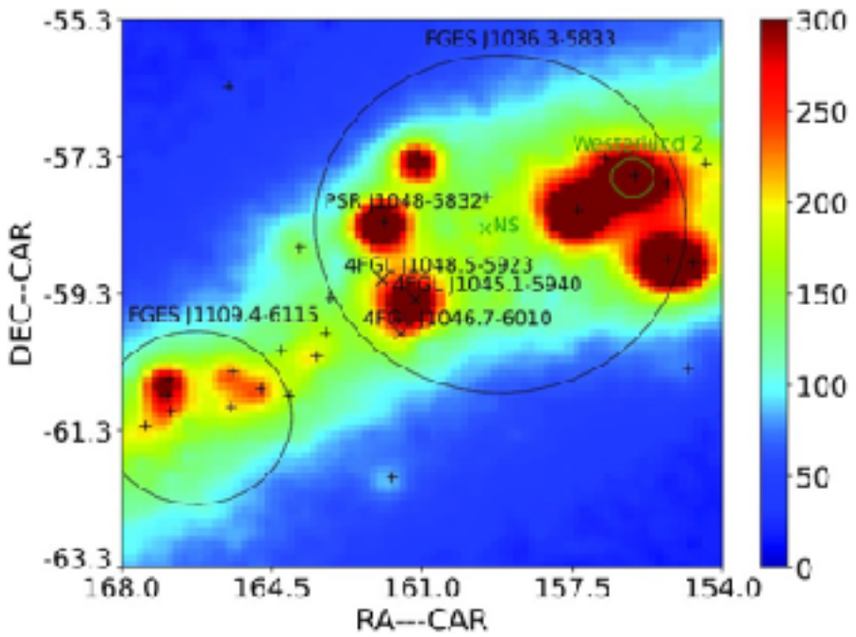
No. 11 Millimeter Dust Emission and Planetary Dynamics in the HD 106906 System, Fehr et al., ApJ, 939, 5121

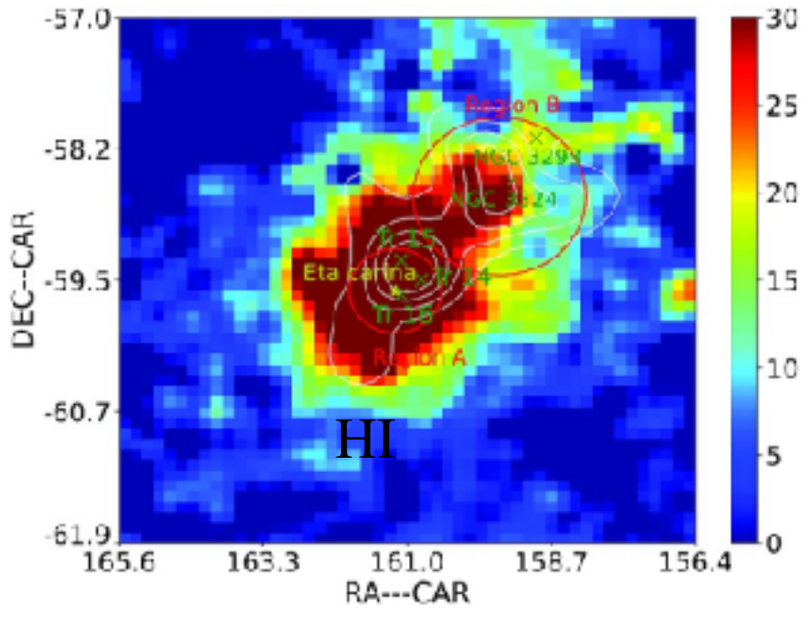
HD106906AB ＝短周期連星，Debri 円盤 と惑星が付随



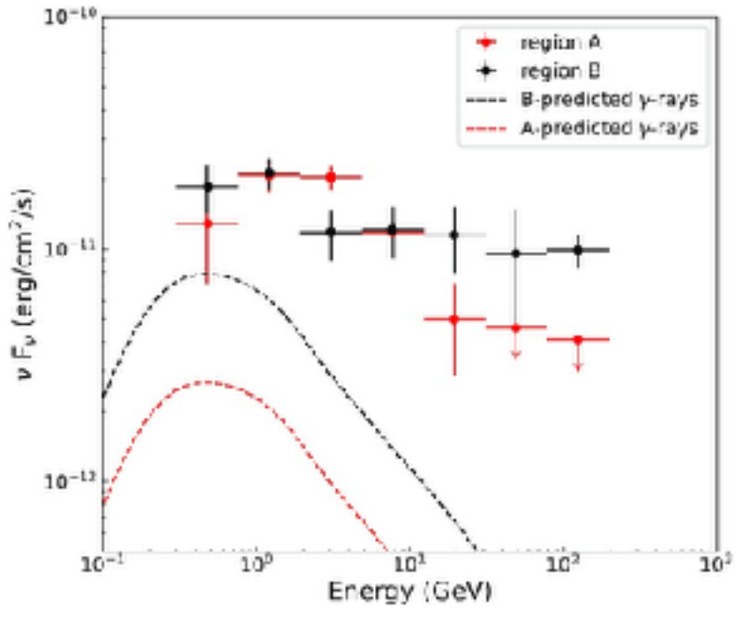
No. 13 Diffuse γ -ray emission around the massive star forming region of Carina Nebula Complex, Ge et al., MNRaS, 517, 5121

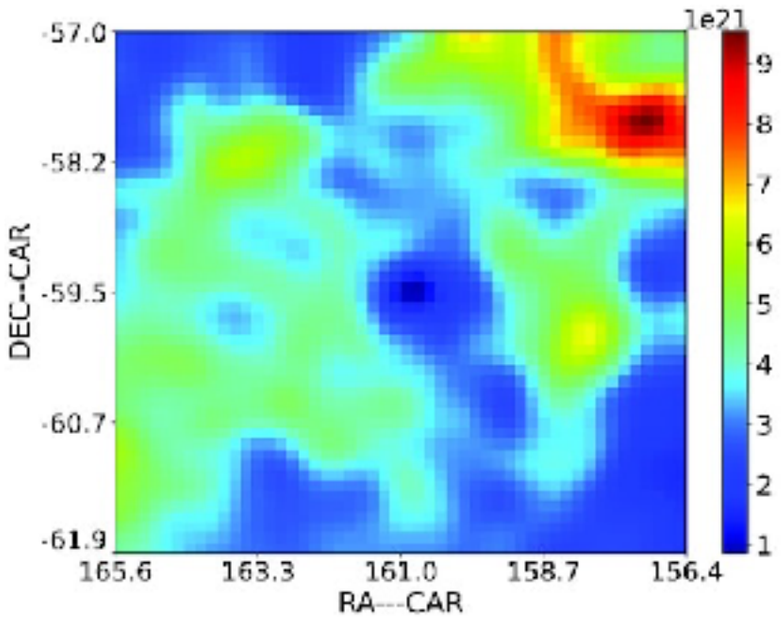
Fermi LAT 2008-2021 (13年分) E > 500 MeV



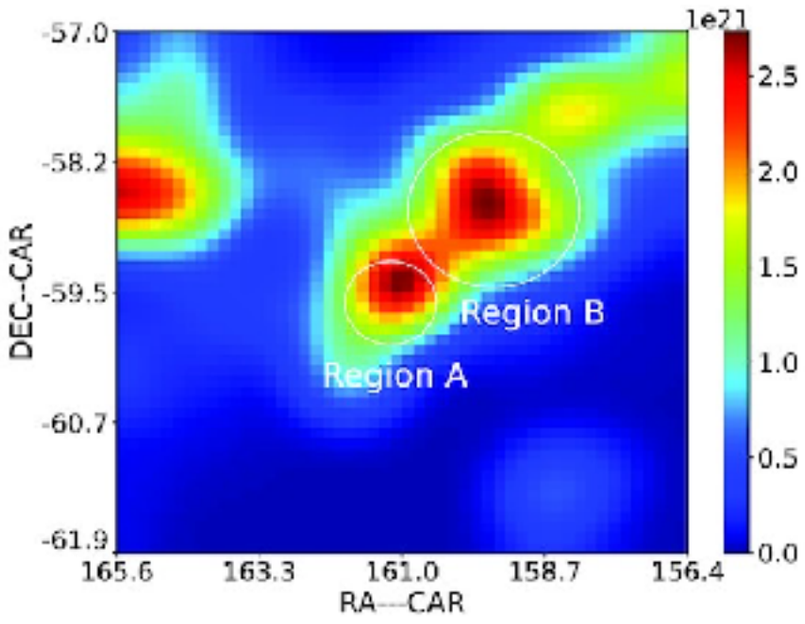


HI

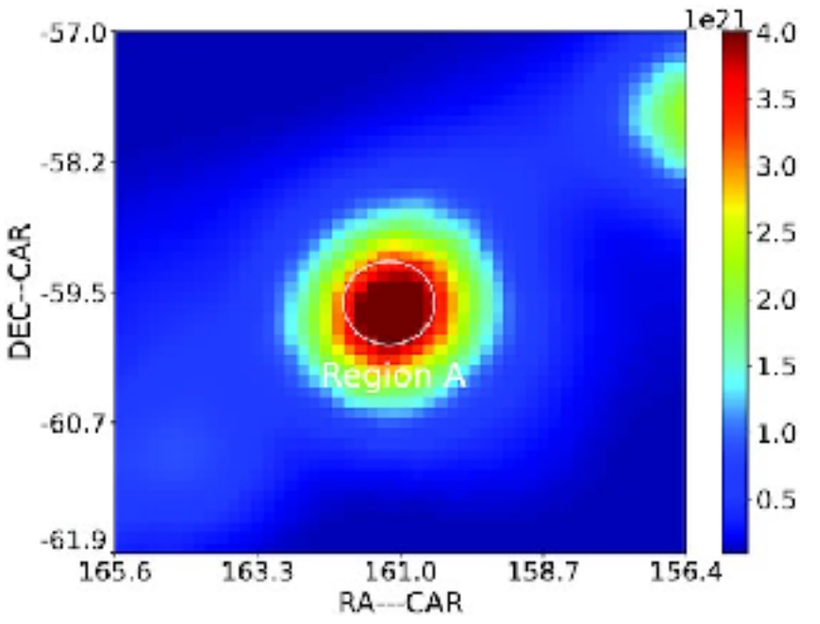




HI



H_2 (CO)



HII