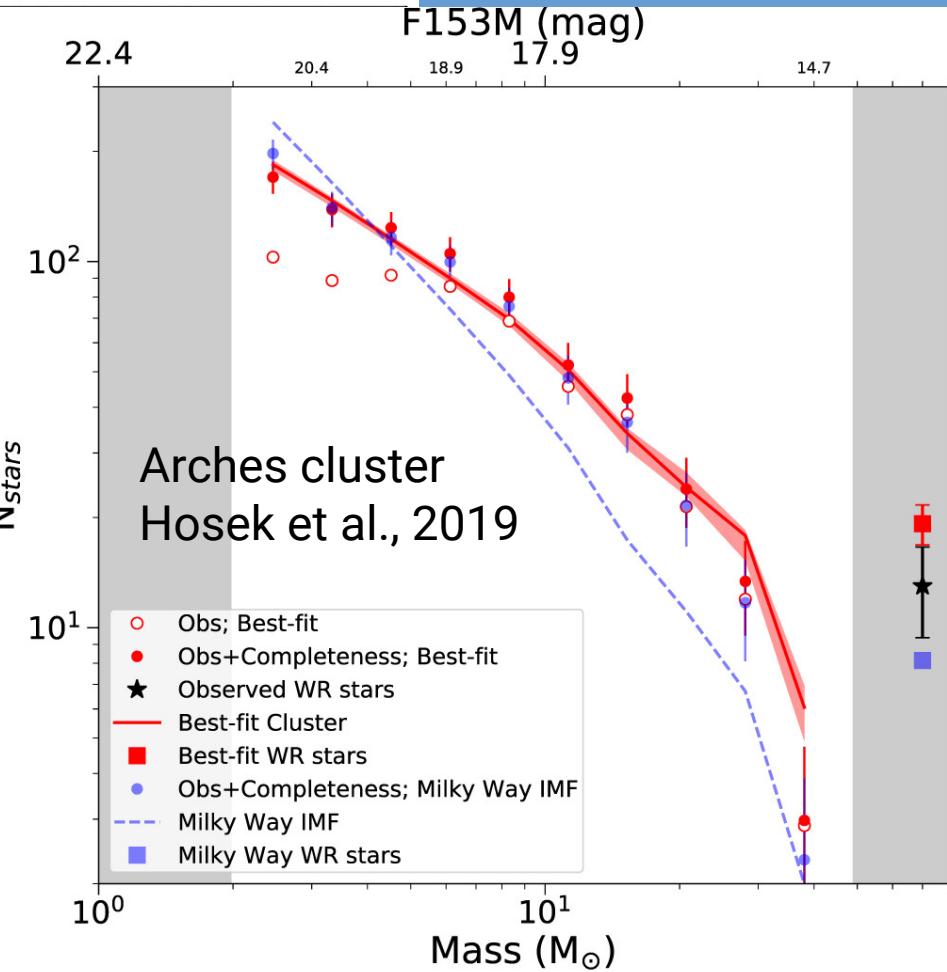
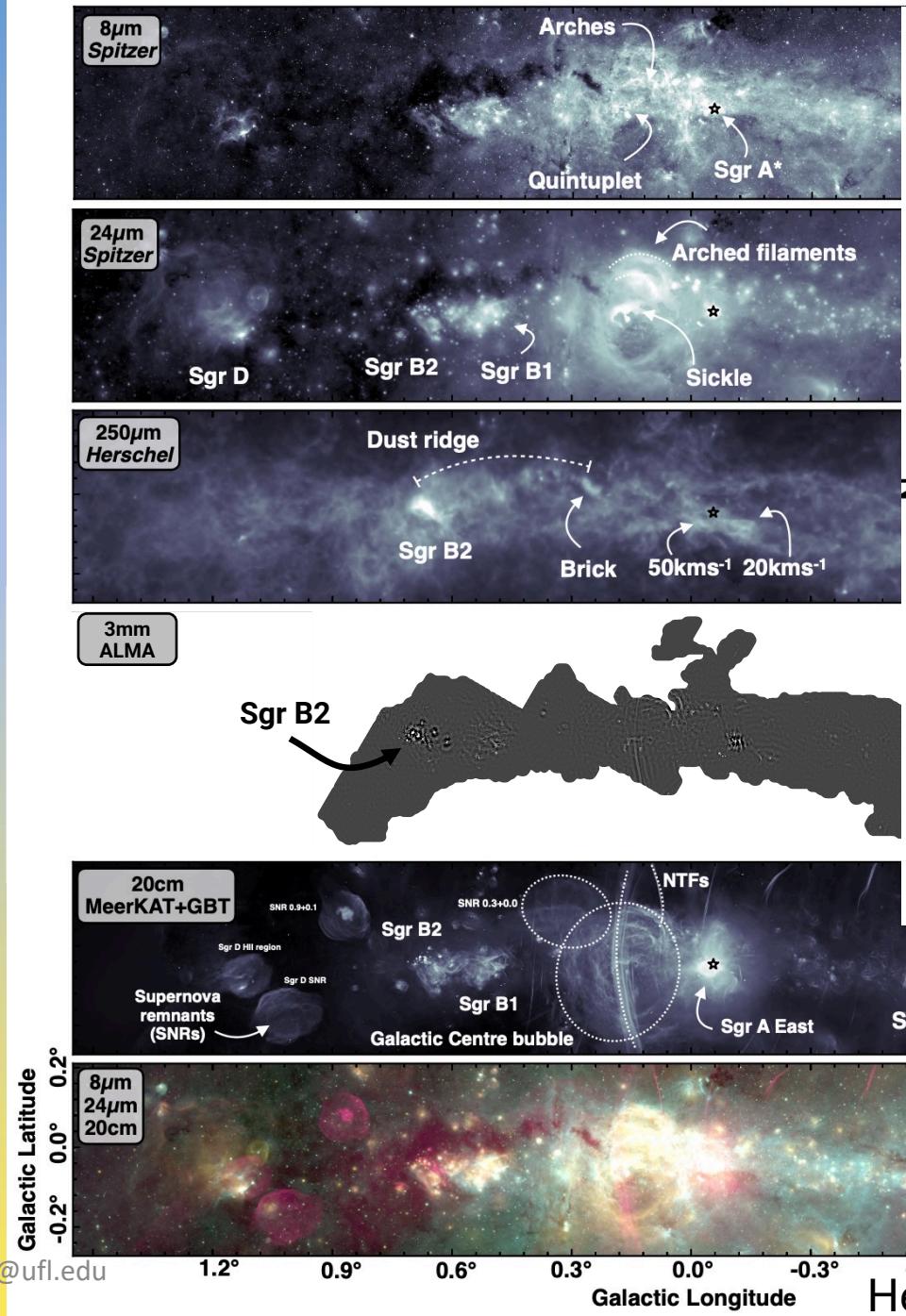


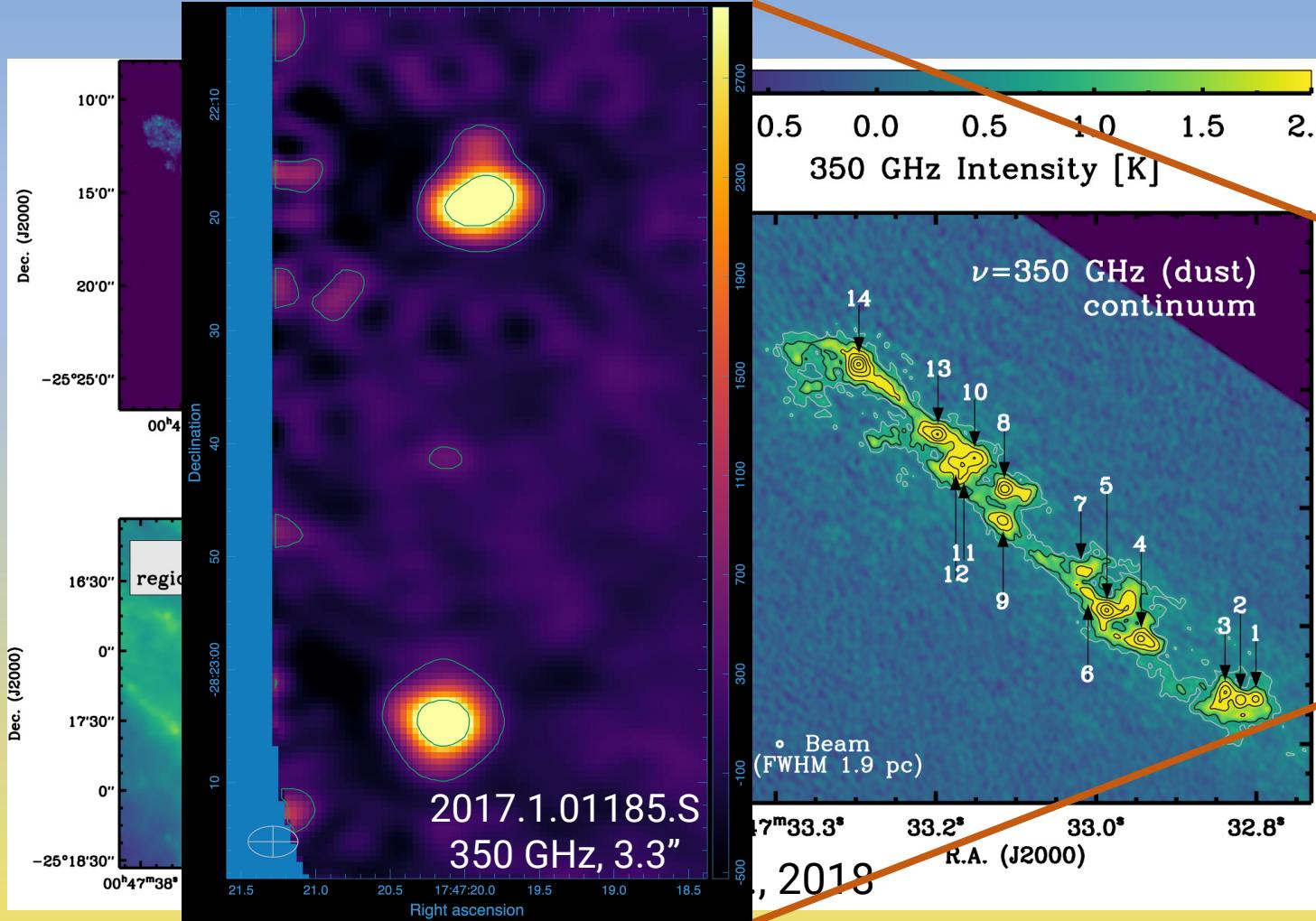
400+ Stage 0/I YSOs in Sagittarius B2 are warm, optically thick, and massive

Nazar Budaiev, University of Florida

Adam Ginsburg, Desmond Jeff, Ciriaco Goddi, Fanyi Meng, Álvaro Sánchez-Monge,
Peter Schilke, Anika Schmiedeke, Taehwa Yoo

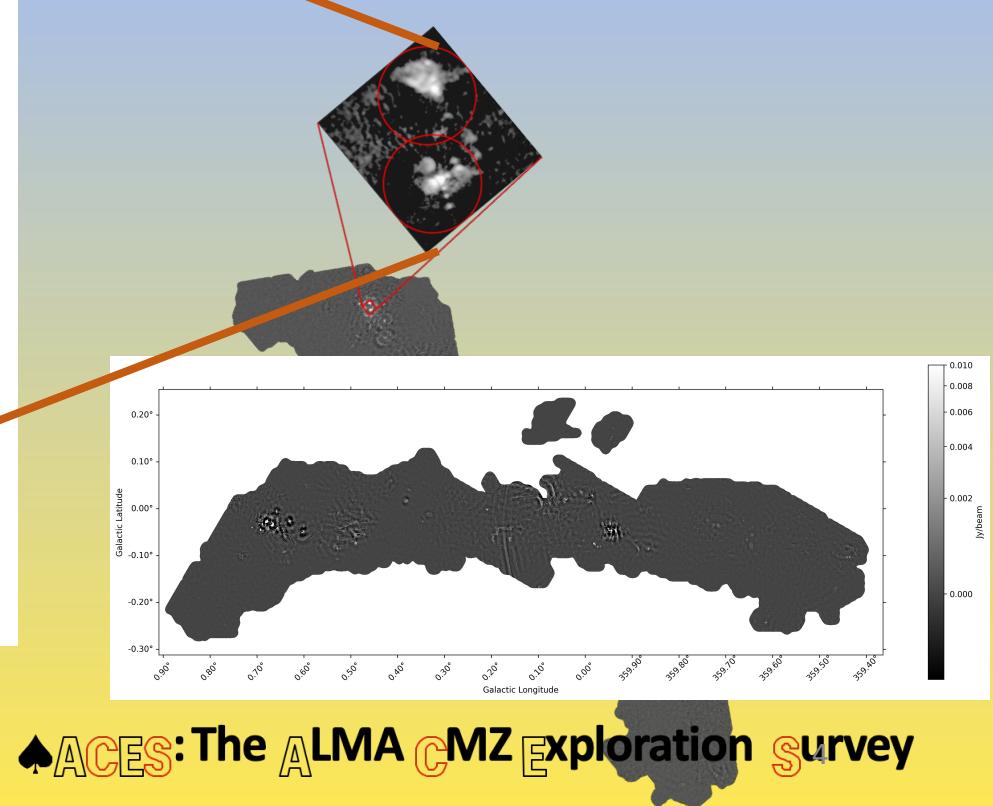


The universe in our own backyard!

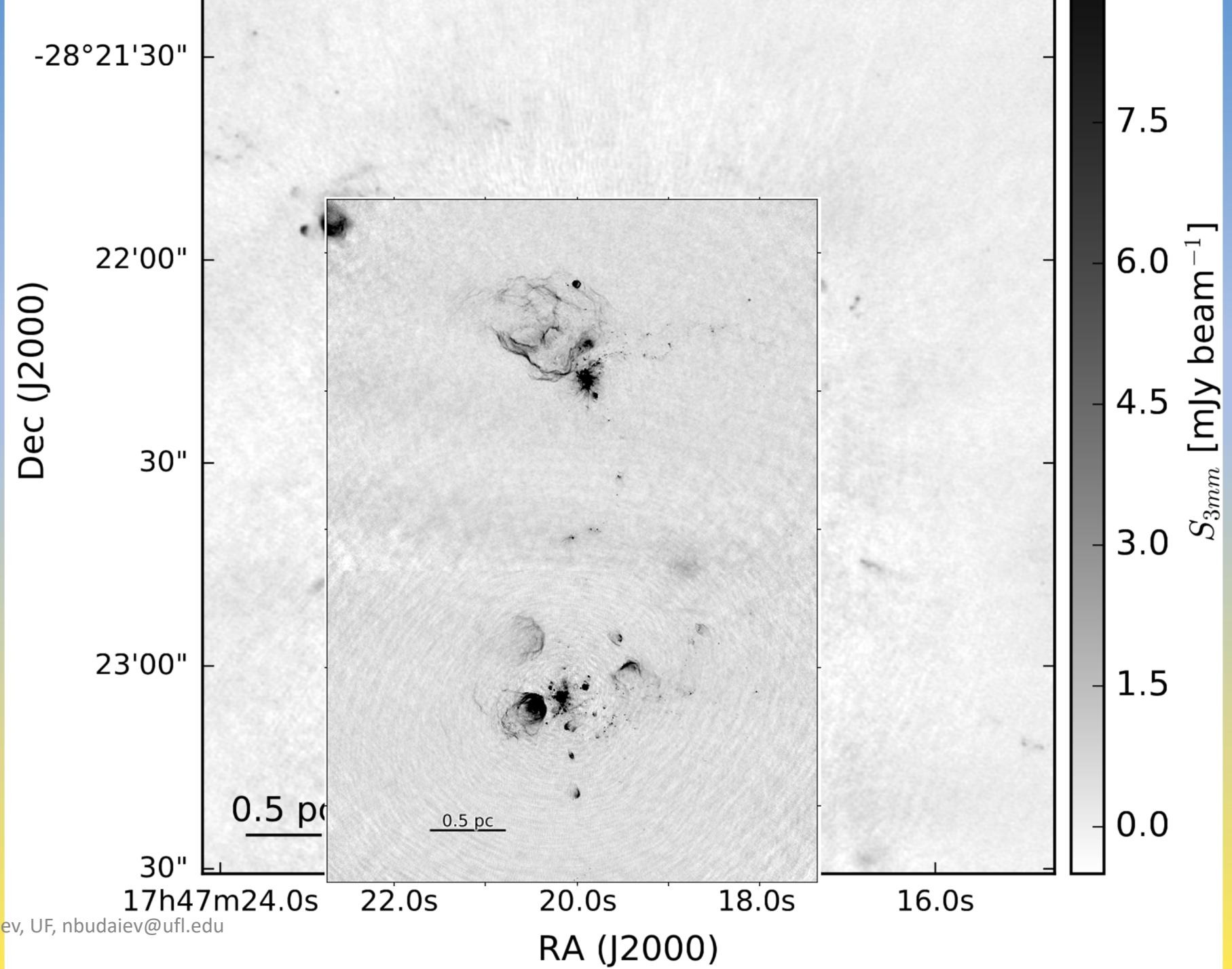


Nazar Budaev, UF, nbudaev@ufl.edu

NGC 253



♠ACES: The ALMA CMZ Exploration Survey



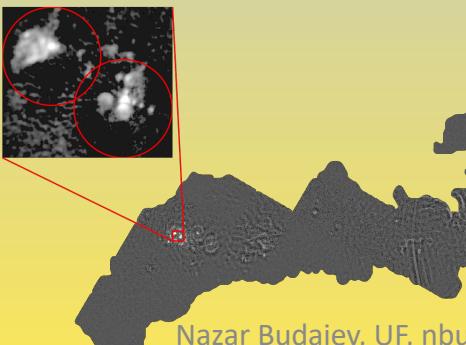
Sagittarius B2

<1% of the CMZ volume
 $(5 \times 10^4 \text{ pc}^3)$

\sim 10% of the mass
 $(8 \times 10^6 M_\odot)$

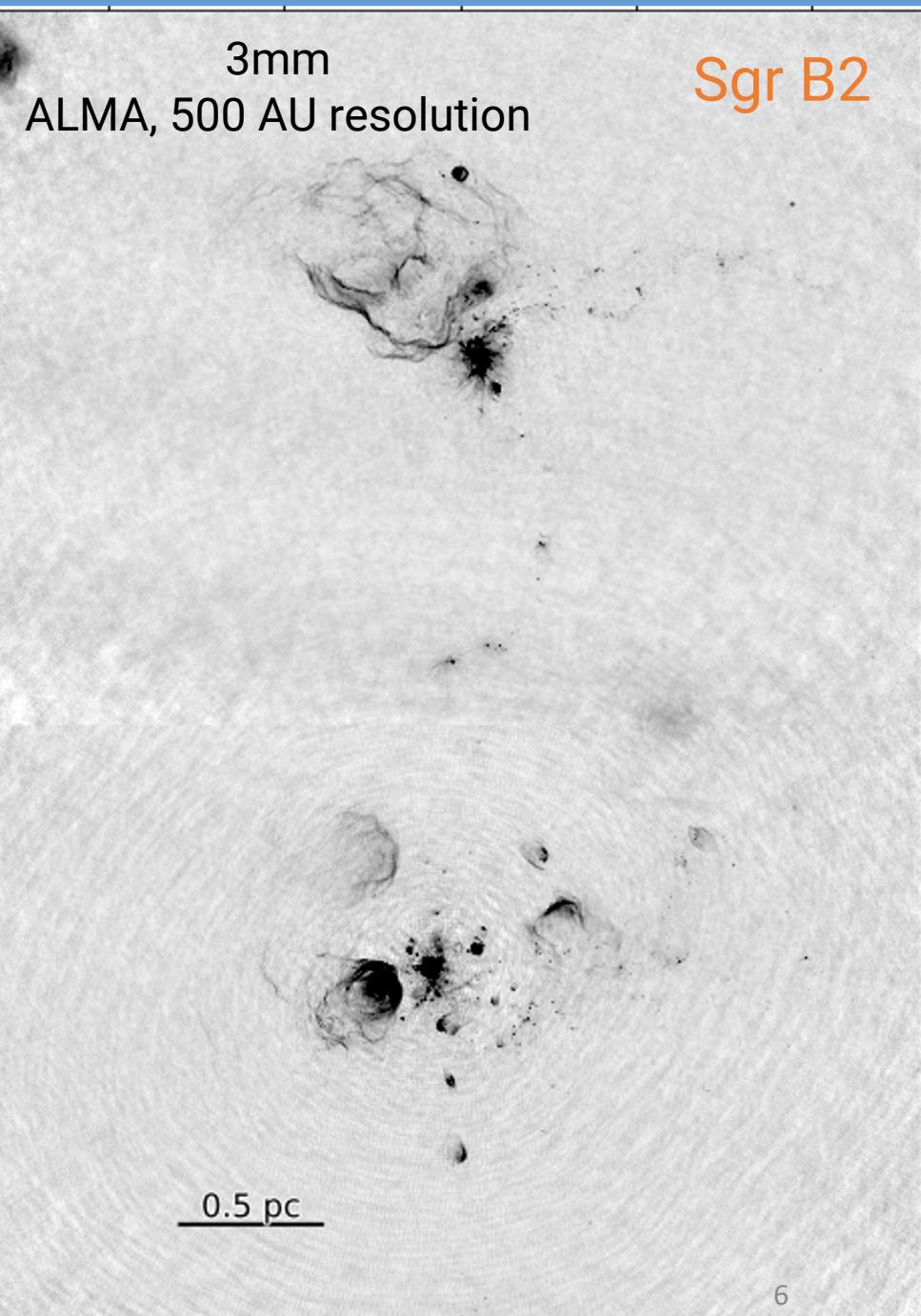
50% of star formation!

1



ACES, 15000 AU resolution

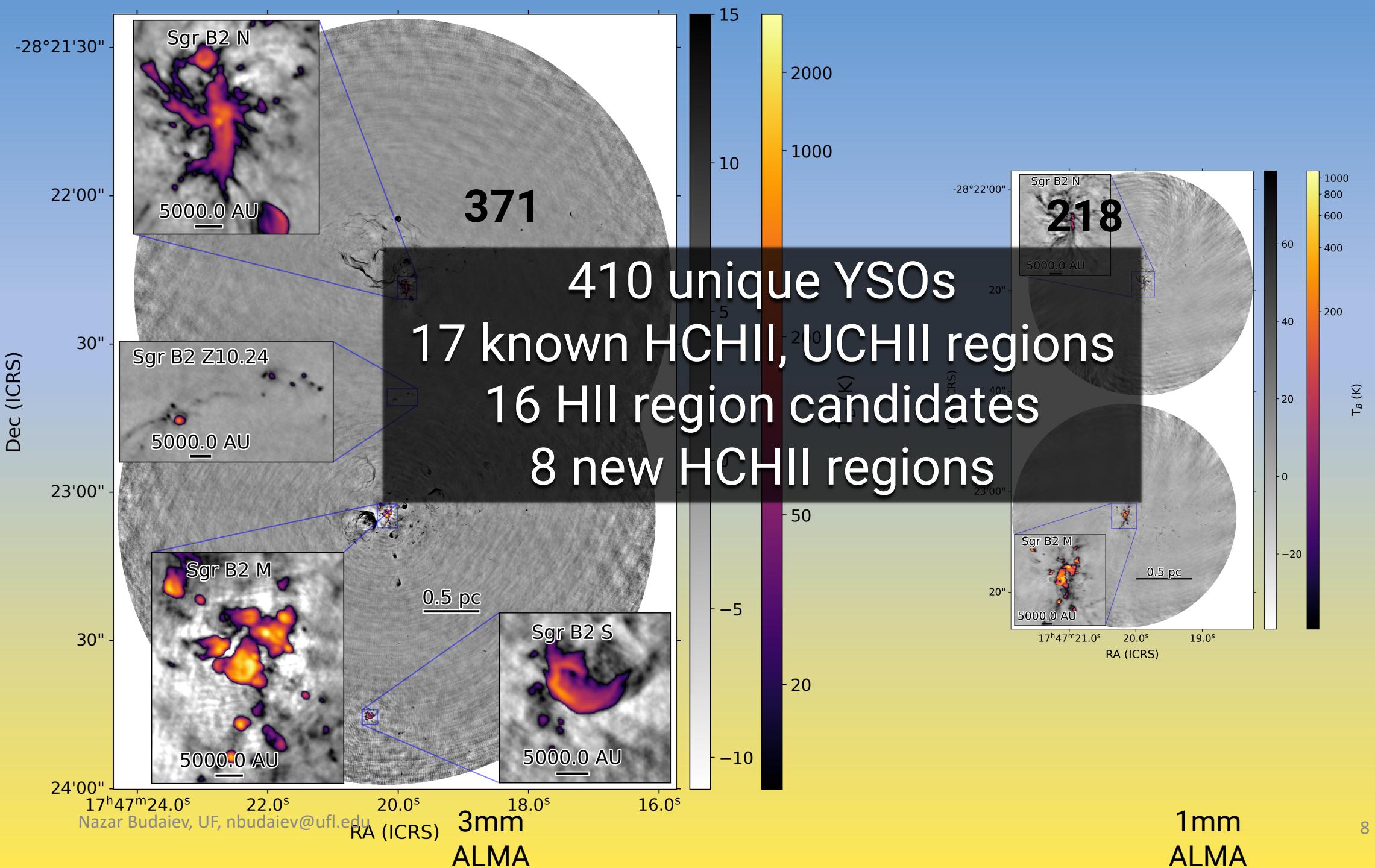
Nazar Budaev, UF, nbudaev@ufl.edu



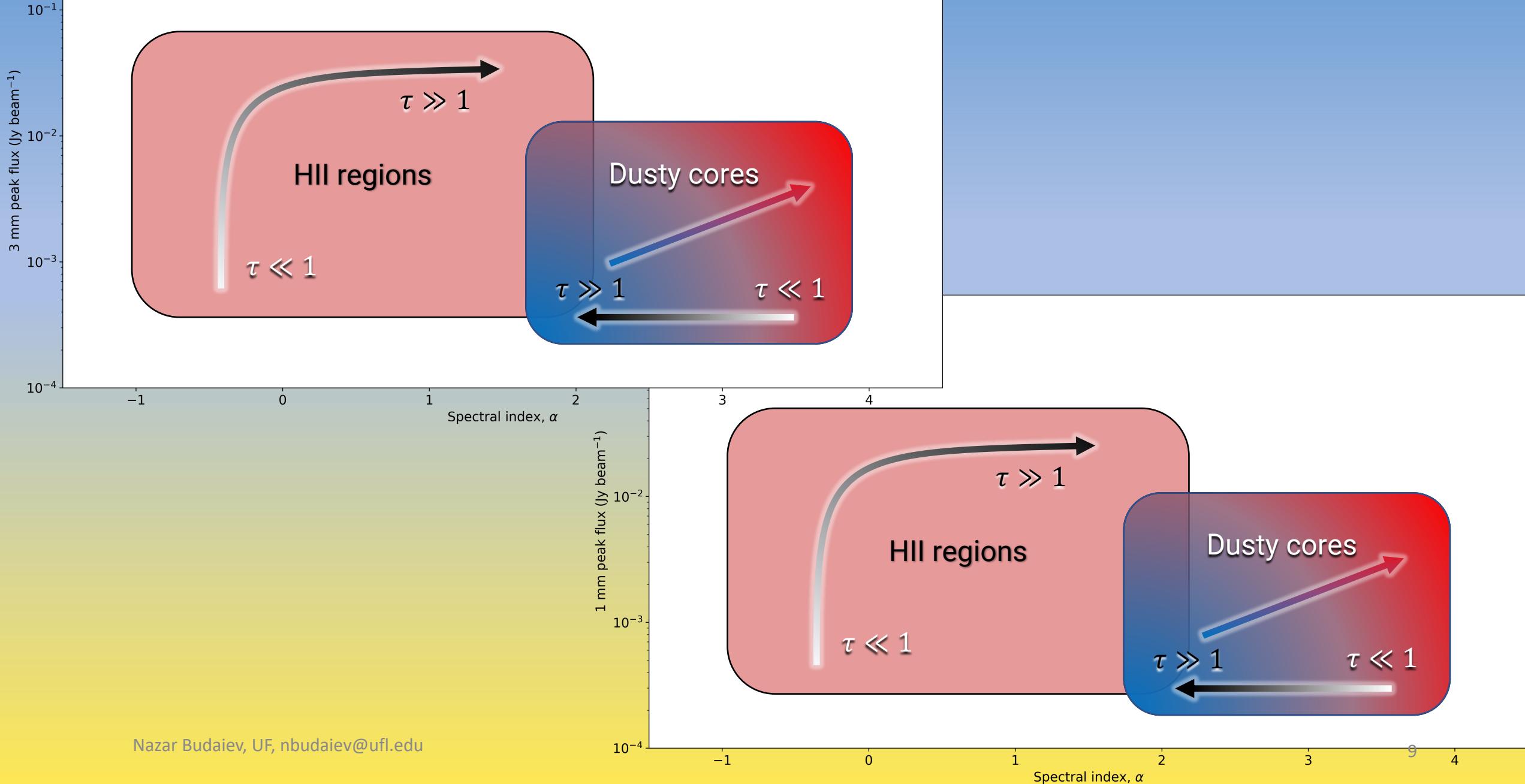
✖ Resolved out, ✓
✖ Keep listening to find out

400+ Stage 0/I, 50 K, 500 AU YSOs

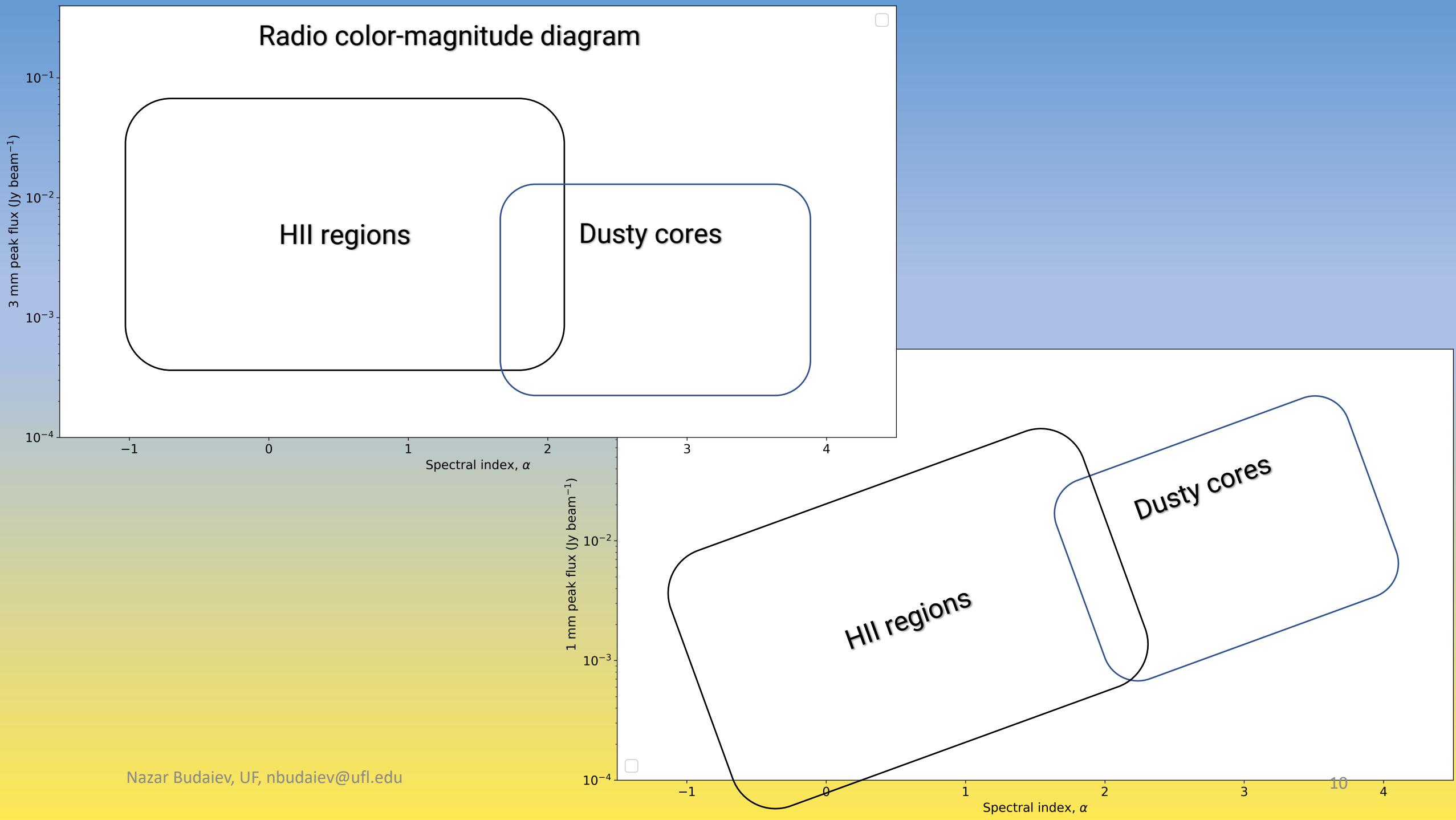
3 mm, ALMA

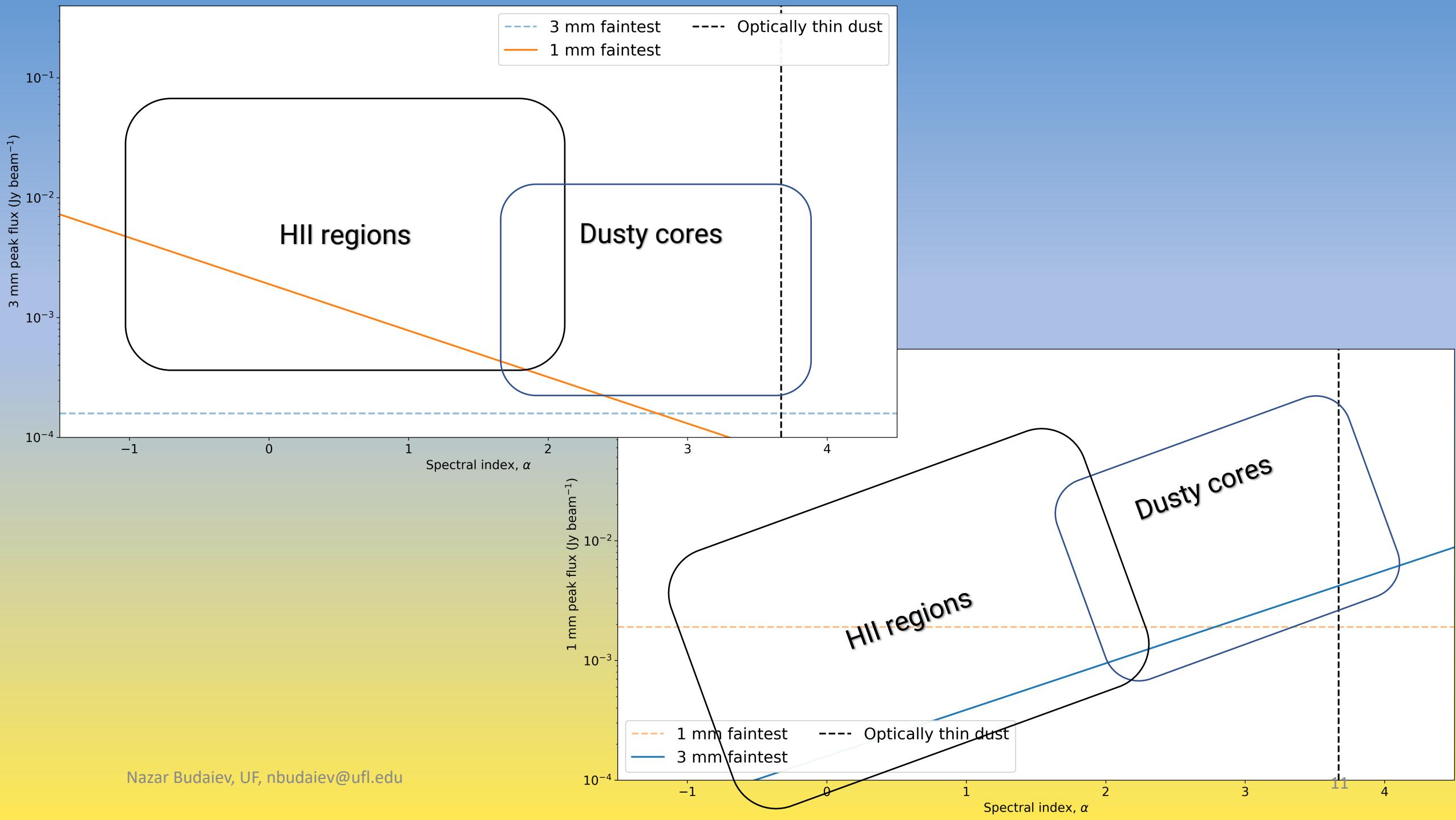


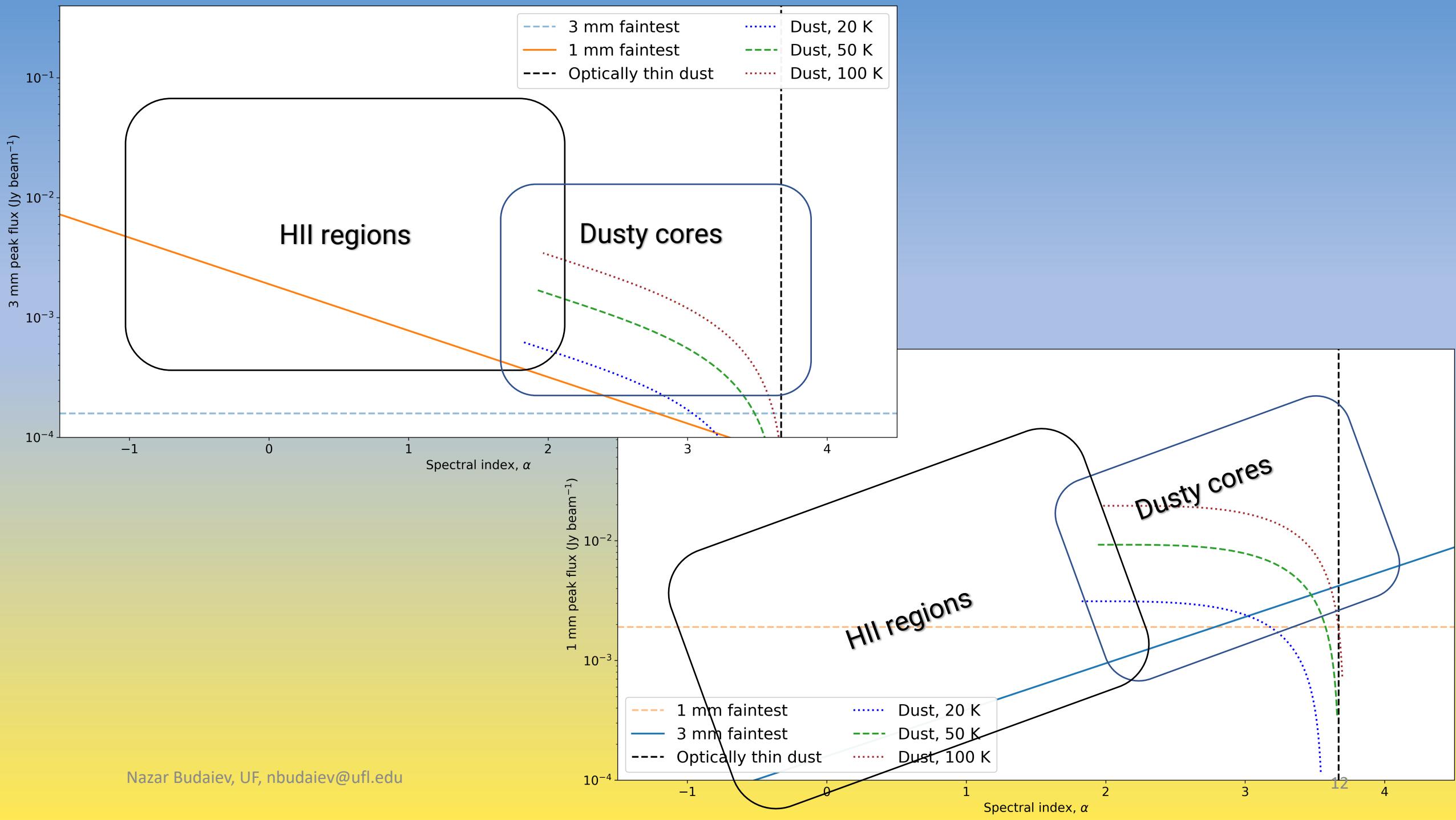
Radio color-magnitude diagram

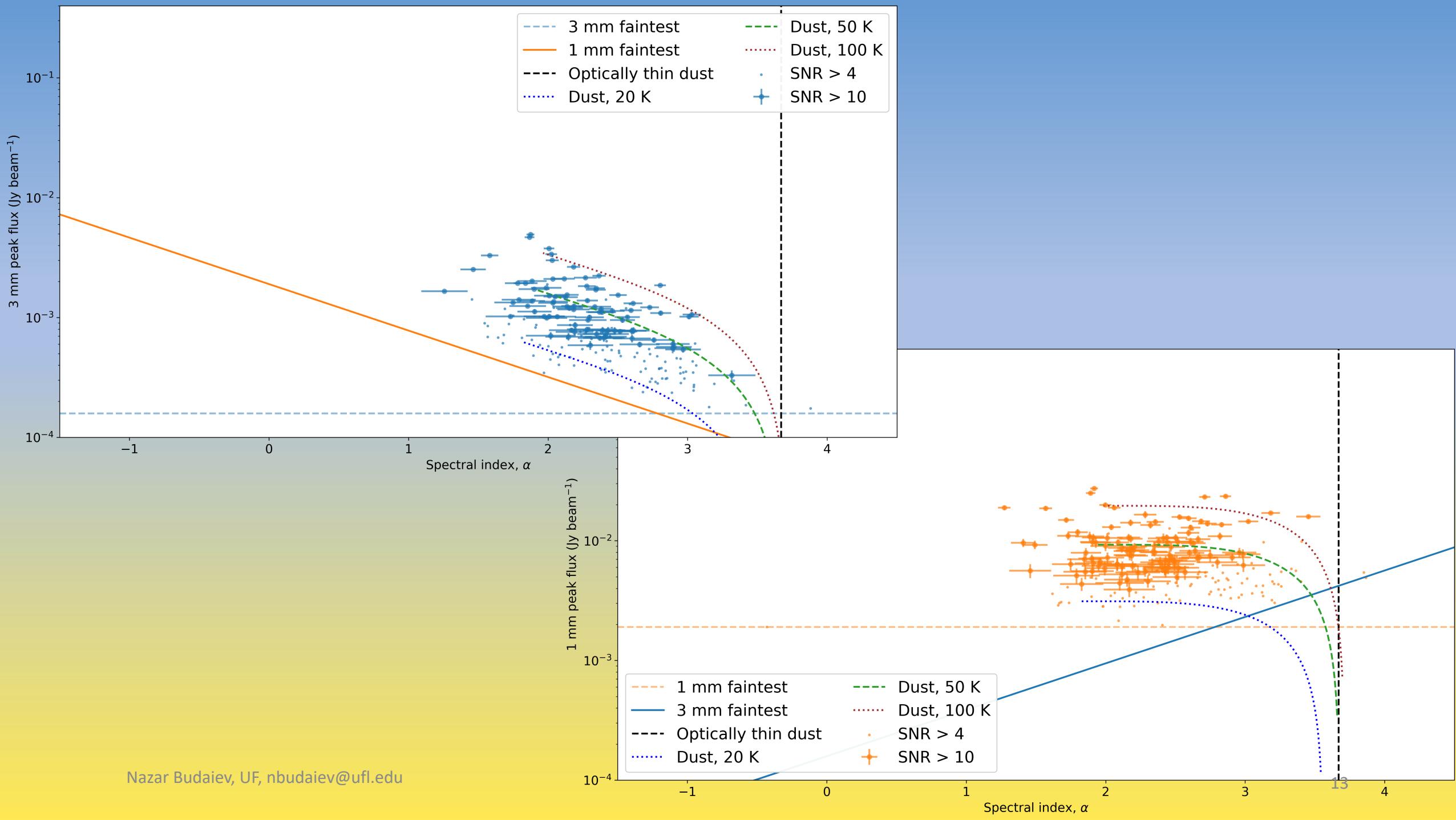


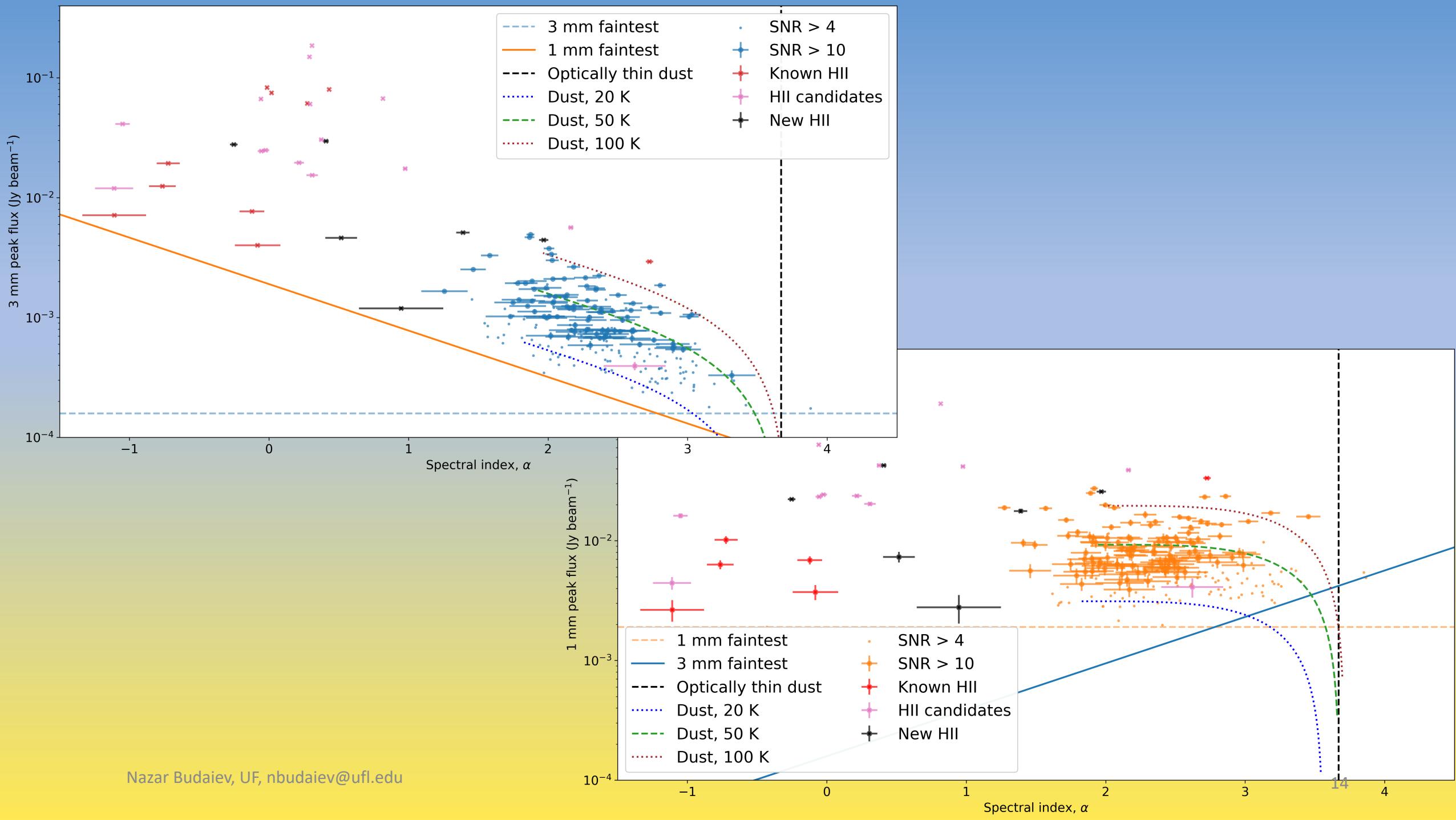
Radio color-magnitude diagram

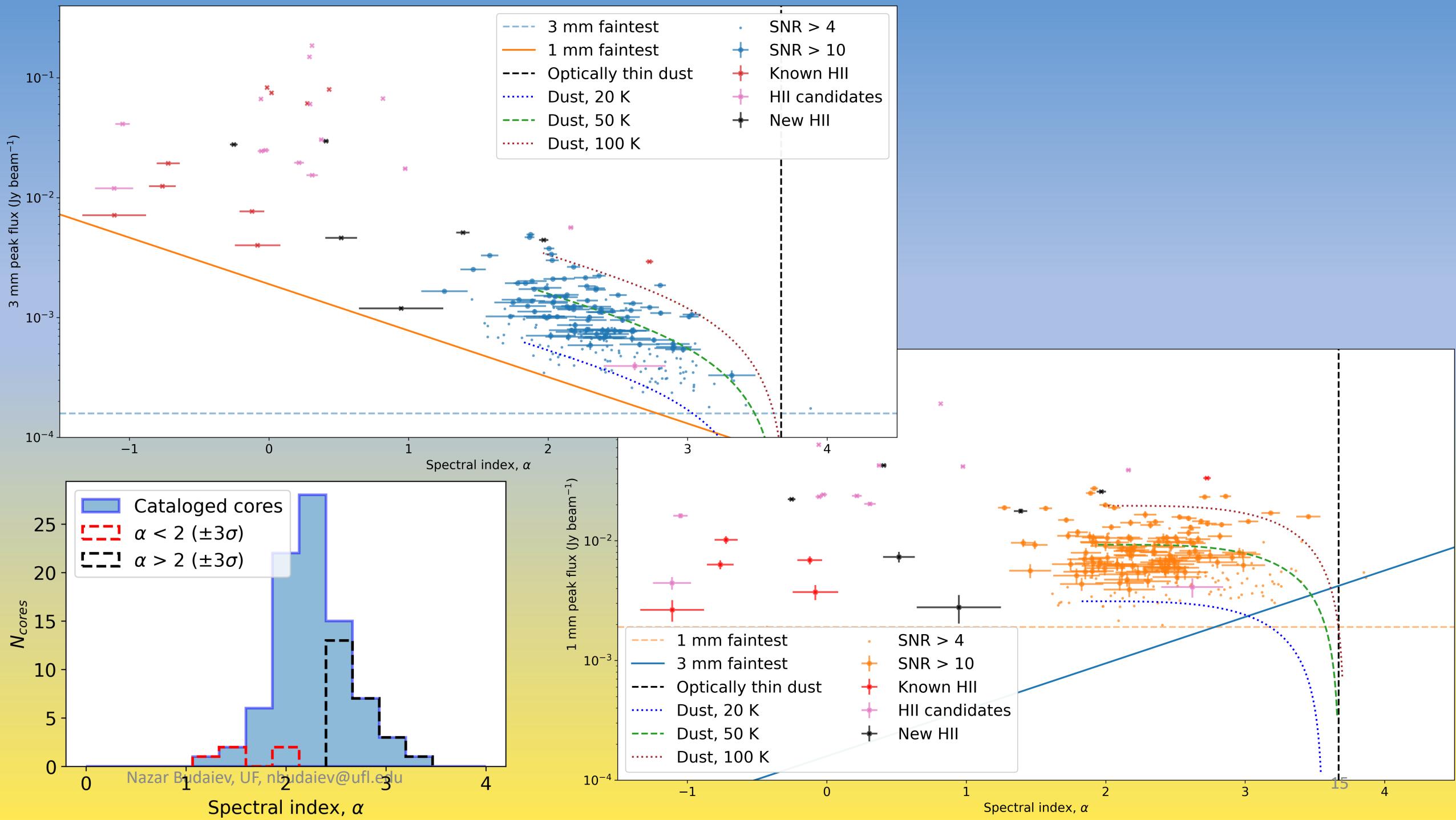








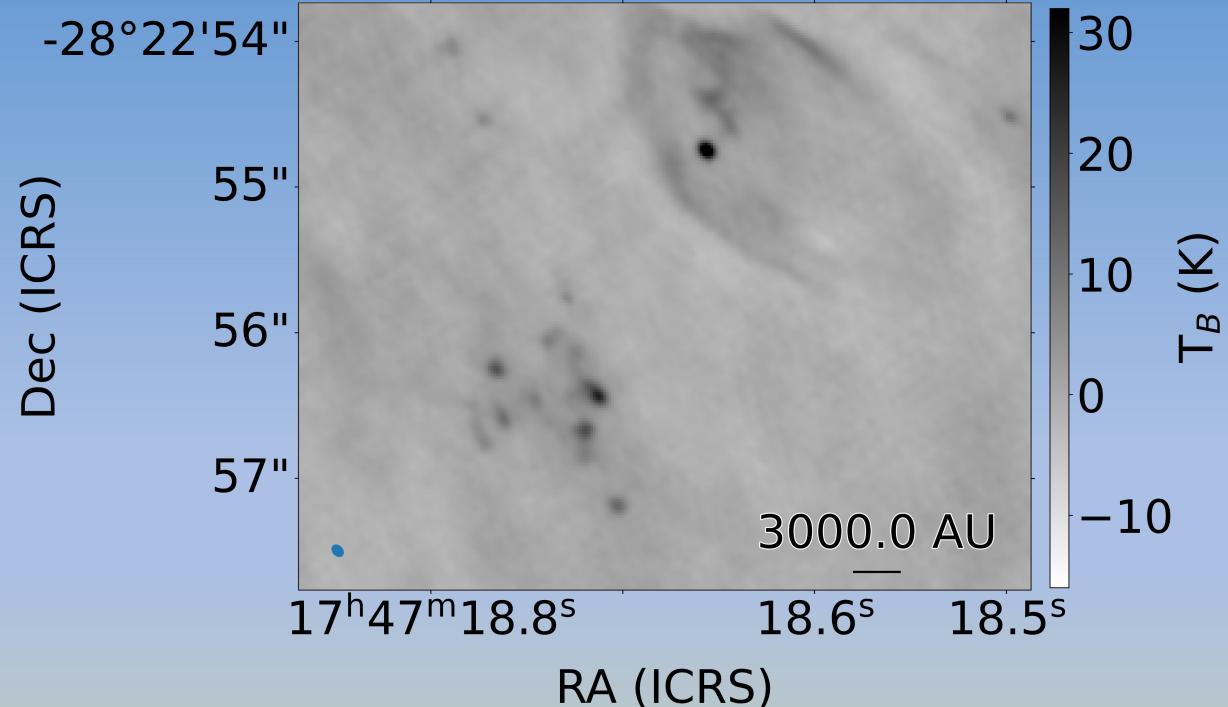




What are our sources?

Stage 0/I YSOs:

- Compact dusty sources
- Rotationally supported
- 200-1000 AU
- 50 K



Prestellar cores?

$$t_{ff} = \sqrt{\frac{3\pi}{32G\rho}}$$

~ 1200 years at 1 Msun

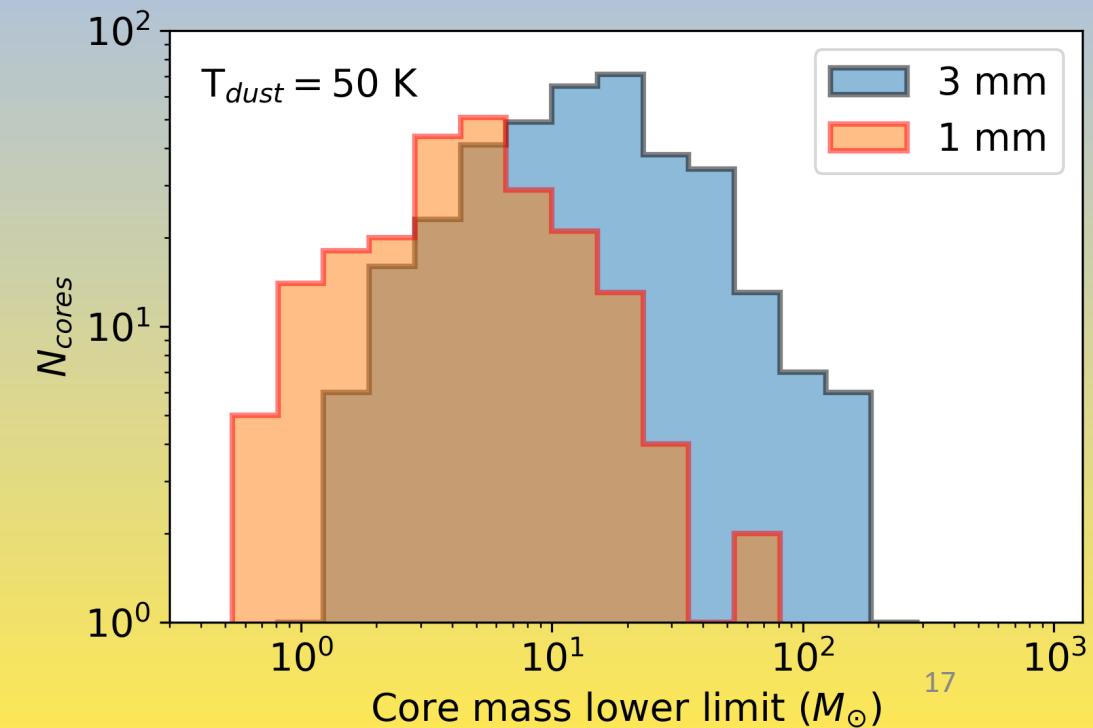
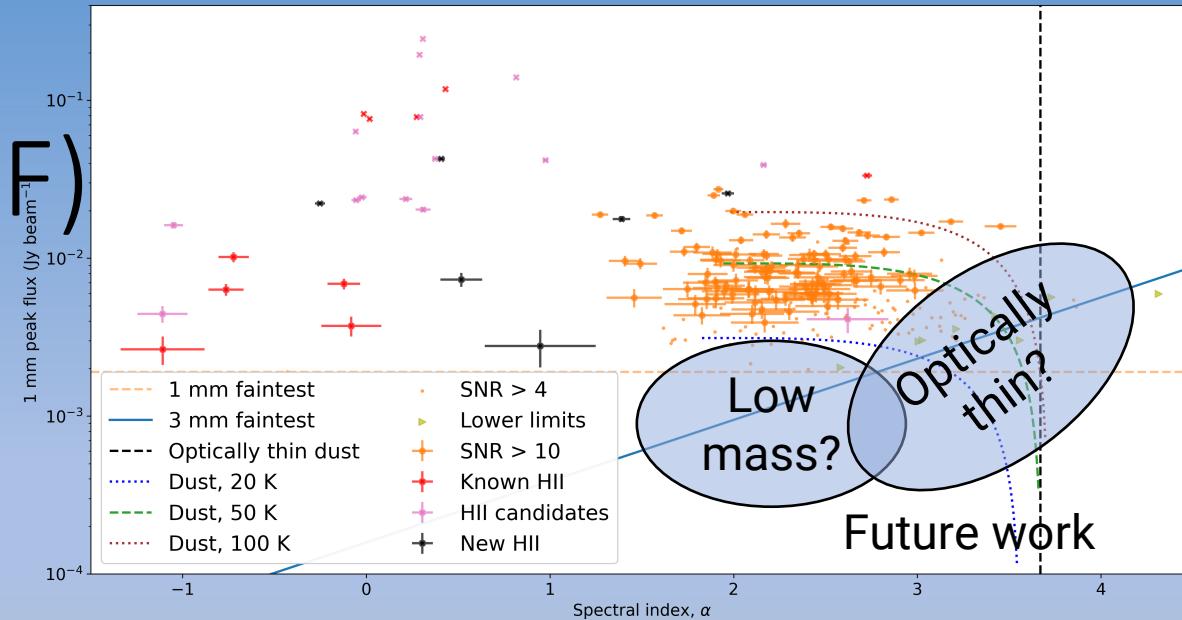
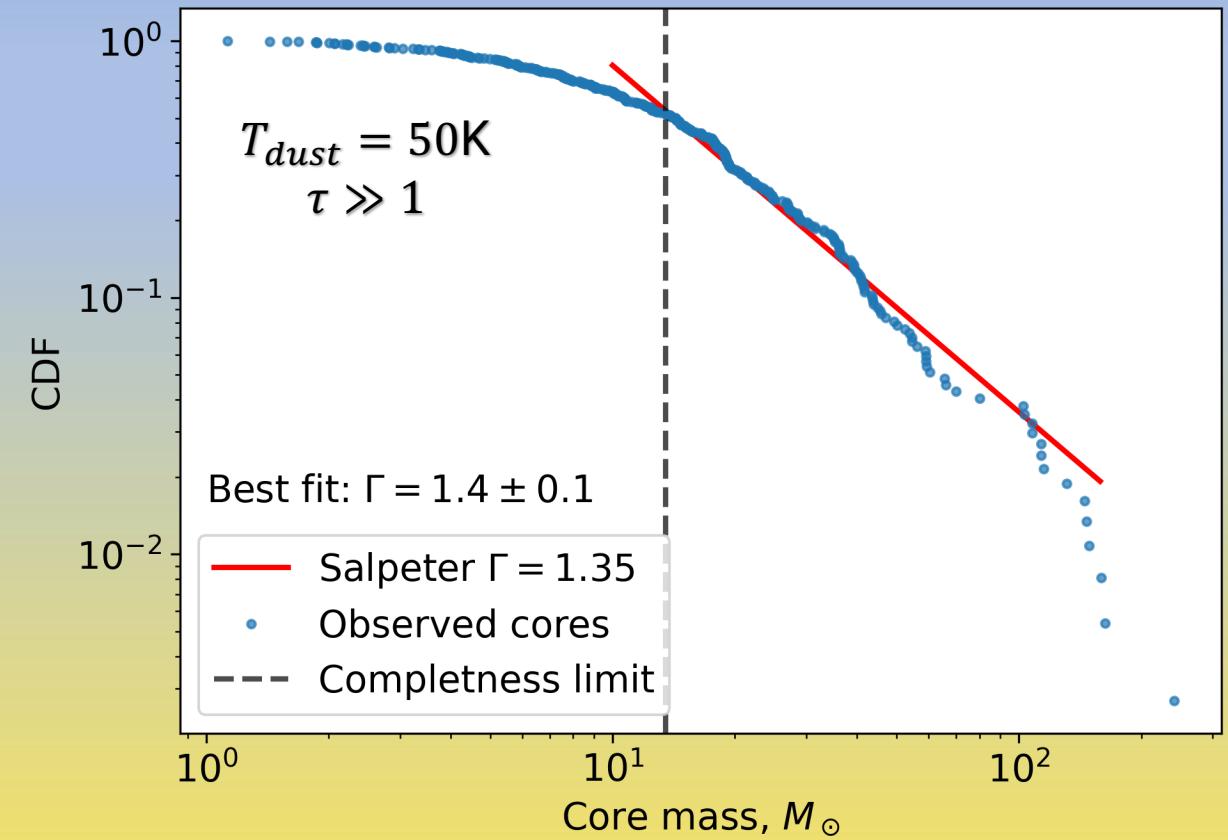
Stage II YSOs?

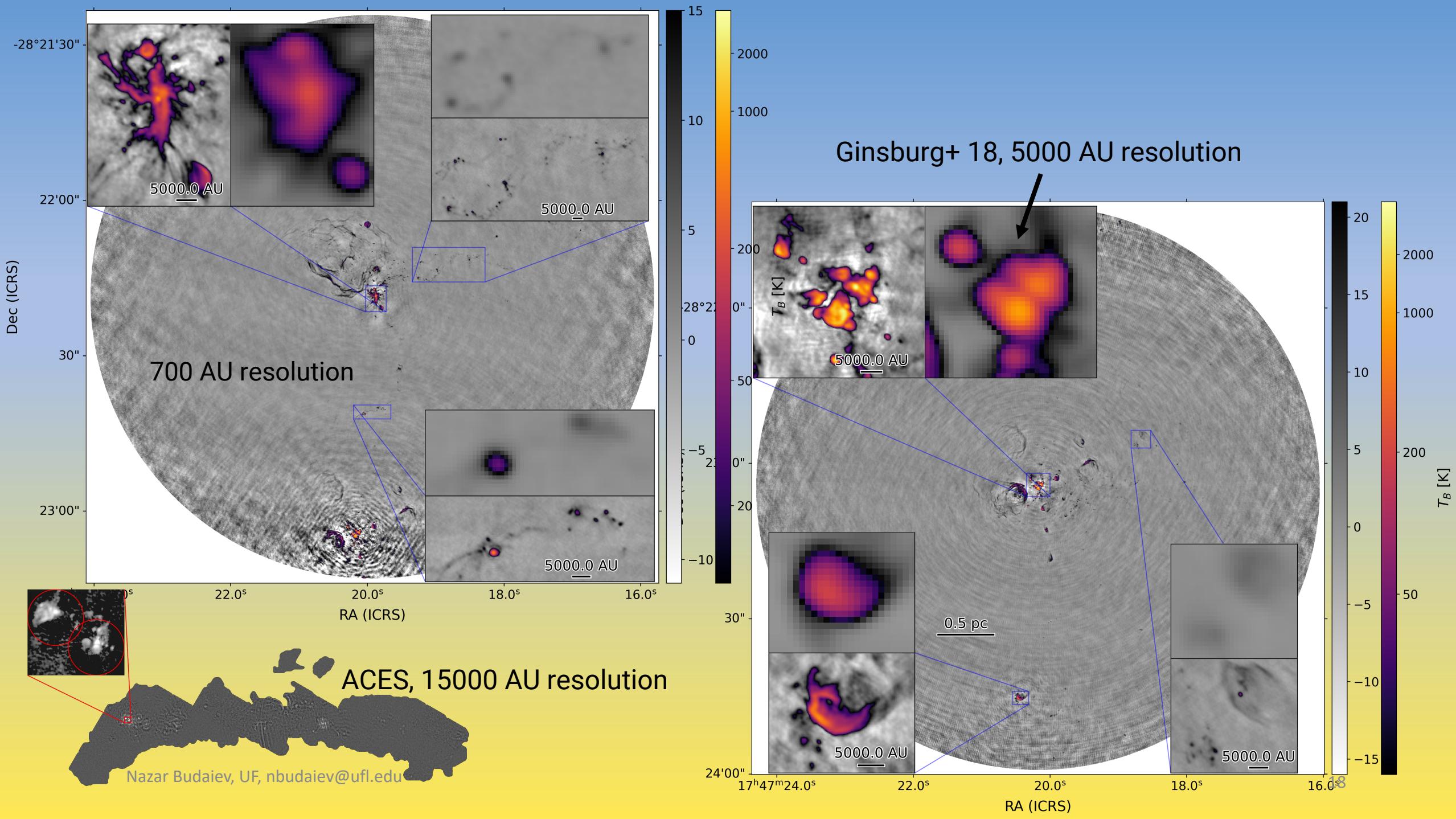
Faintest source ->
30 Msun central star

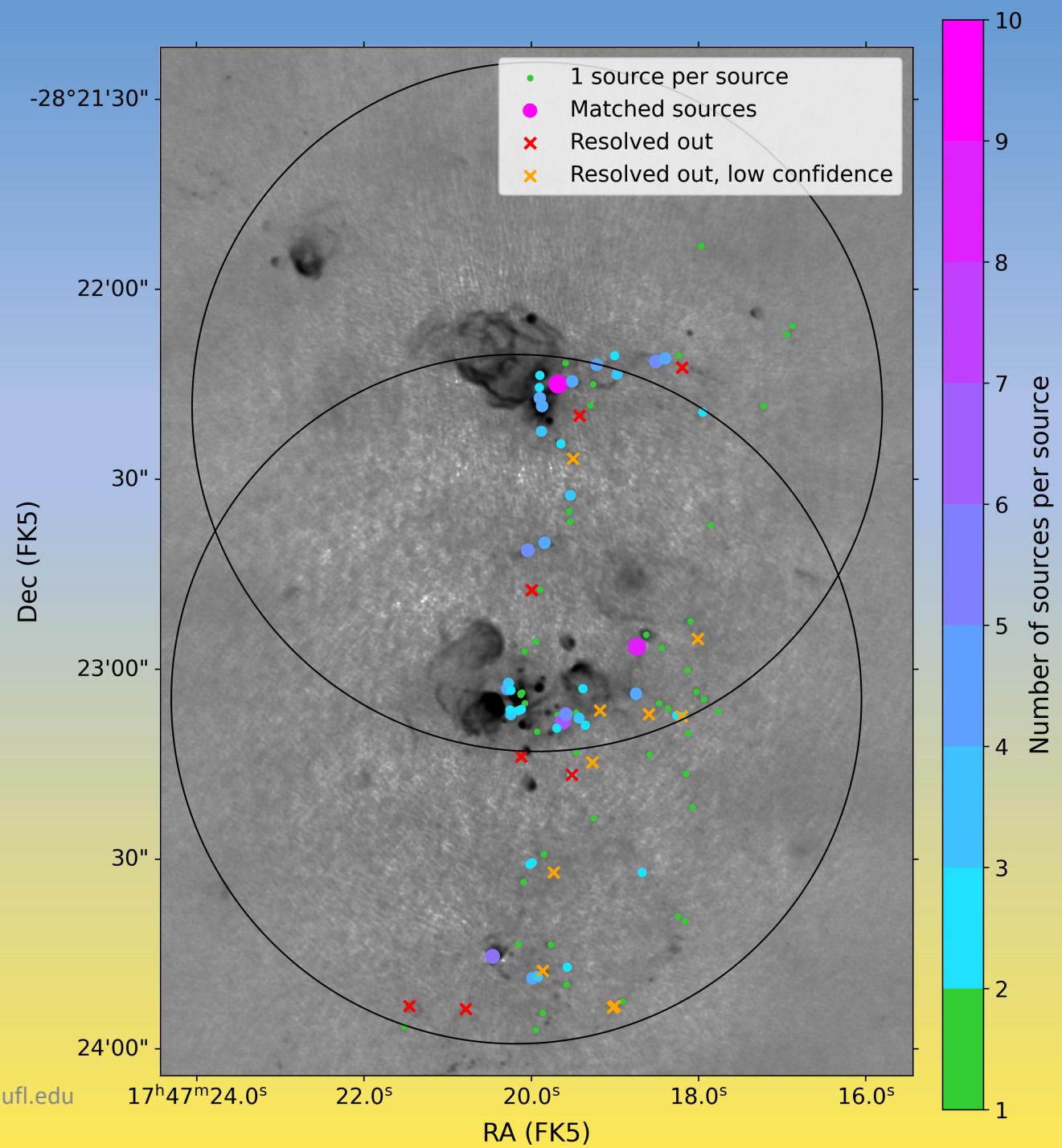
HII regions?

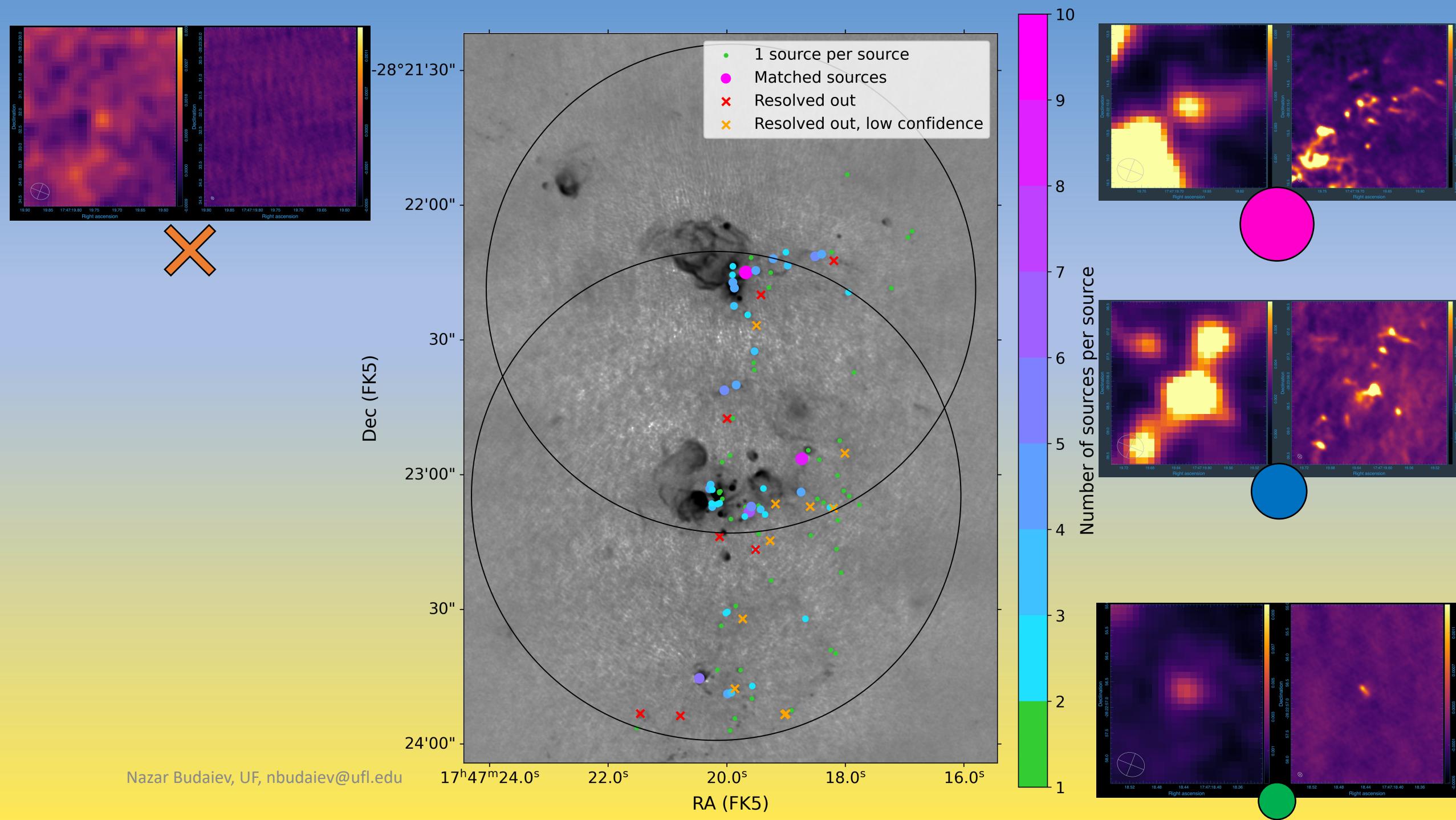
Only optically thick,
30-80 AU in diameter

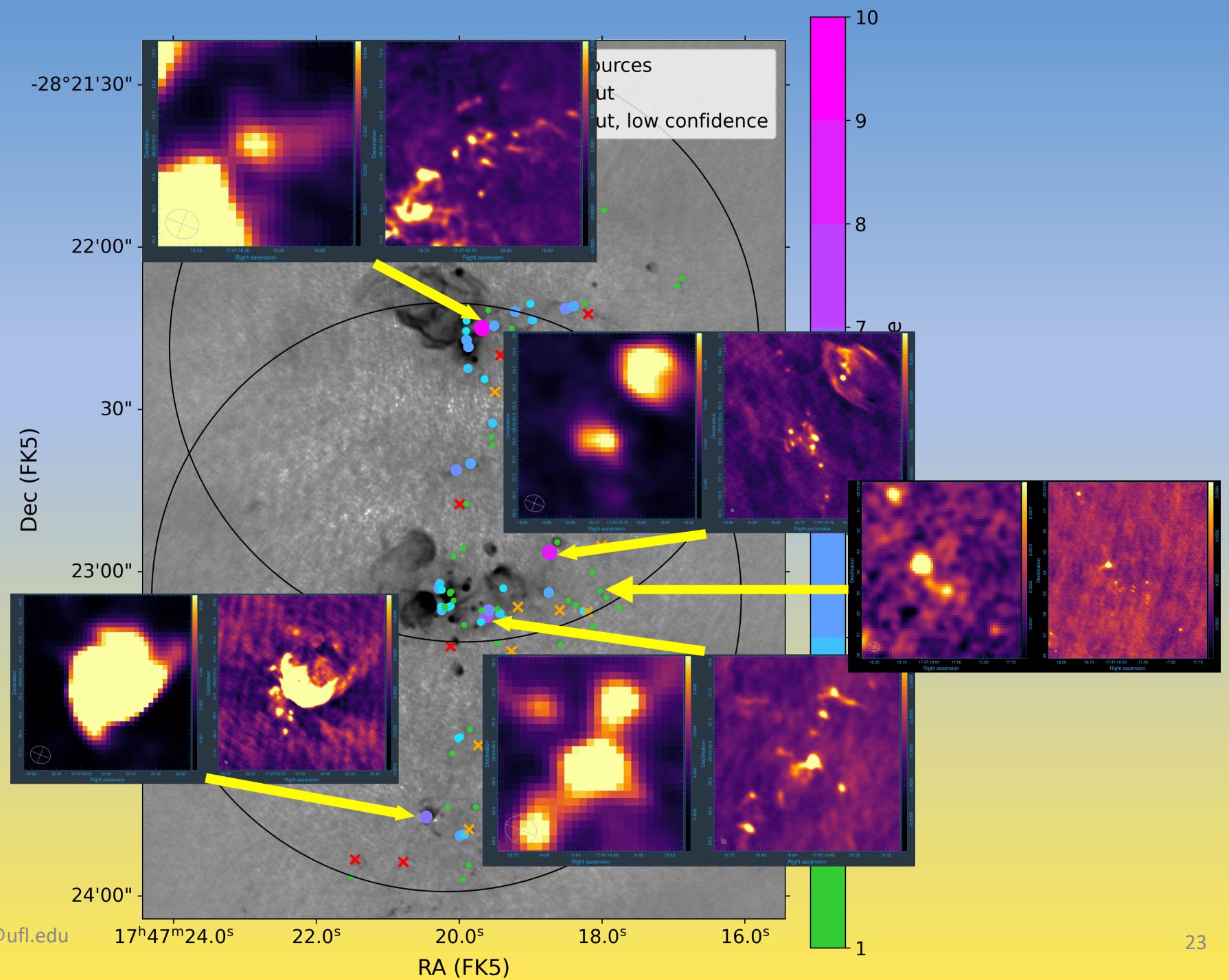
Core Mass Function (CMF)

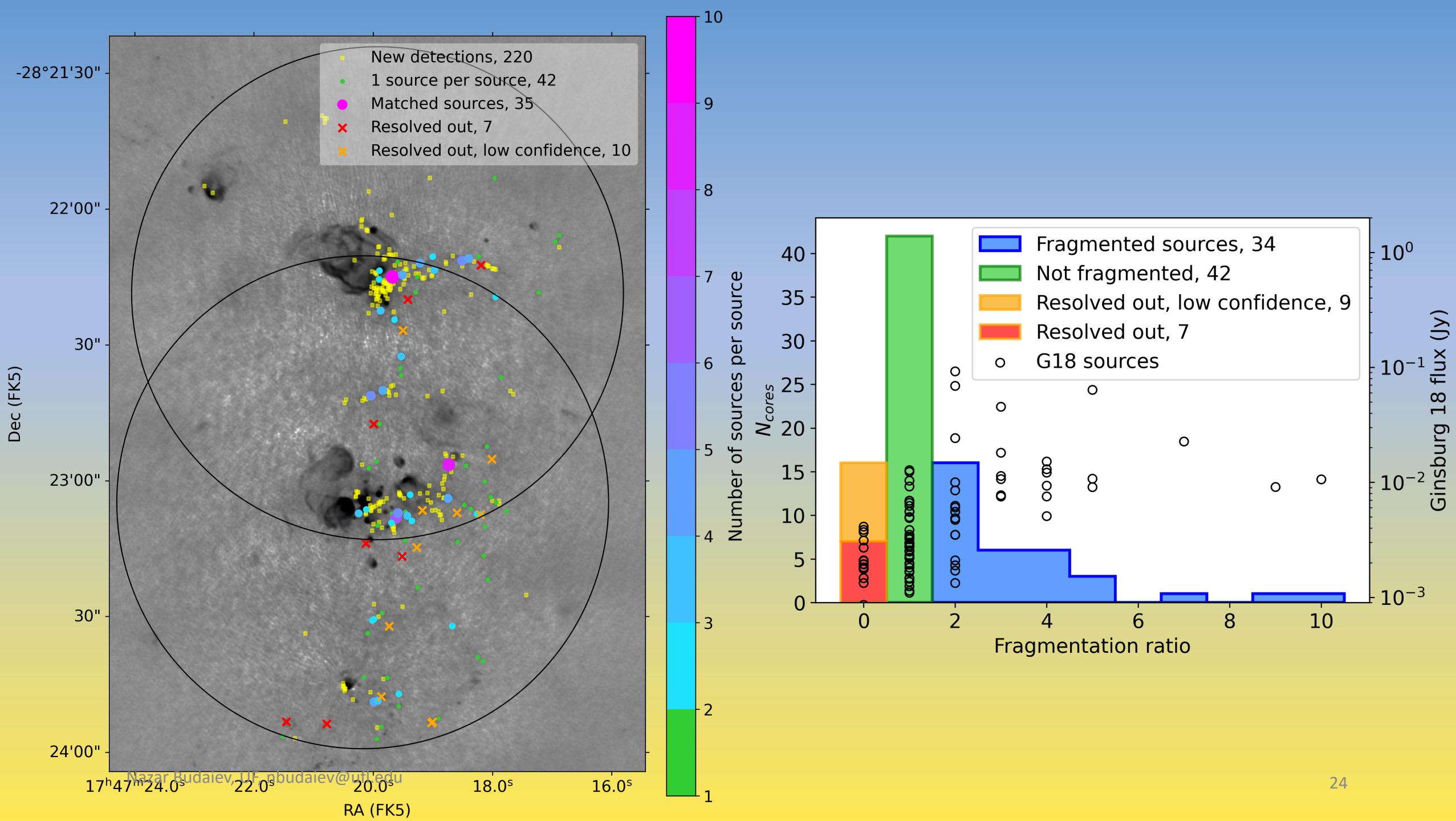












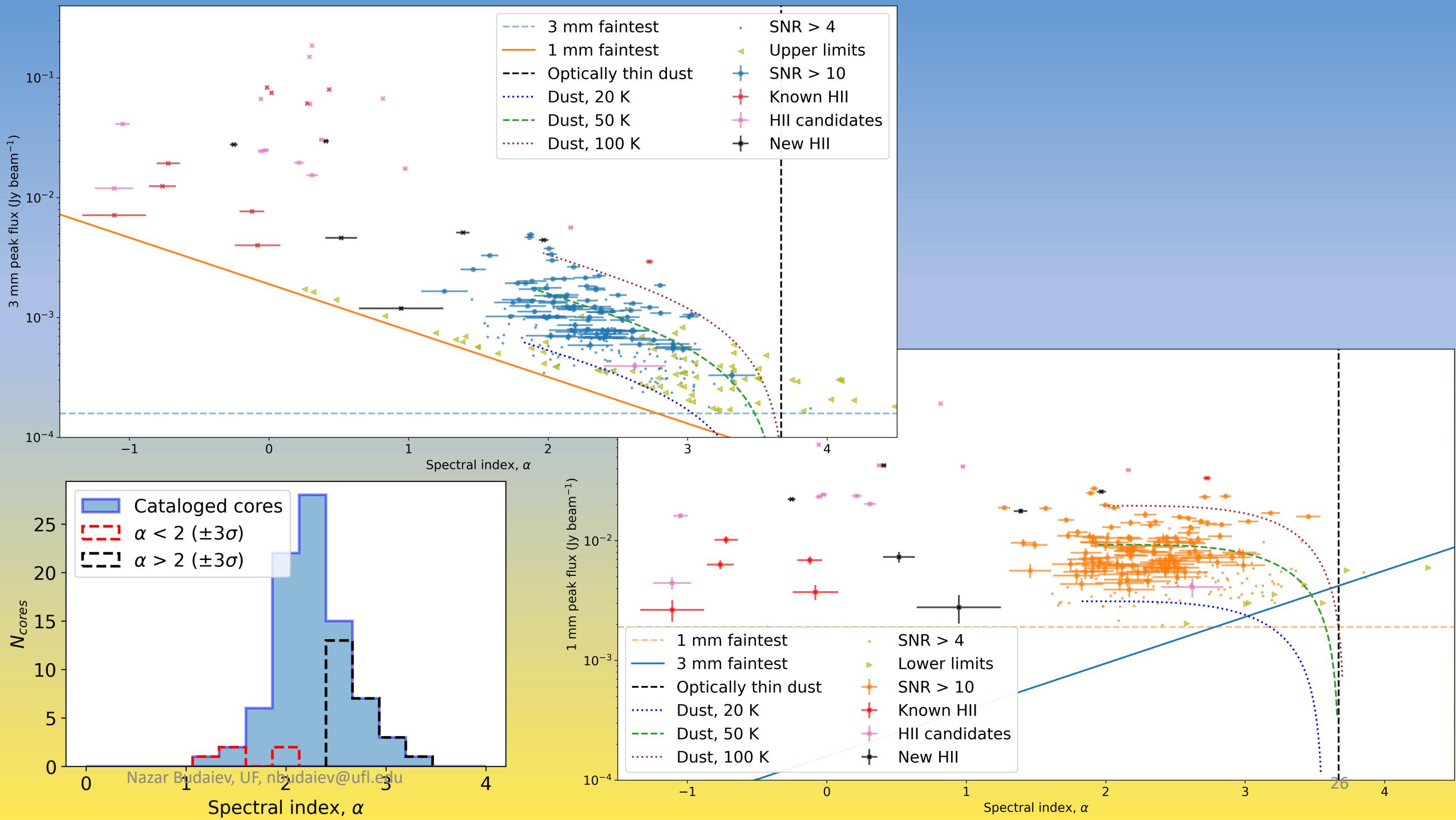
Summary

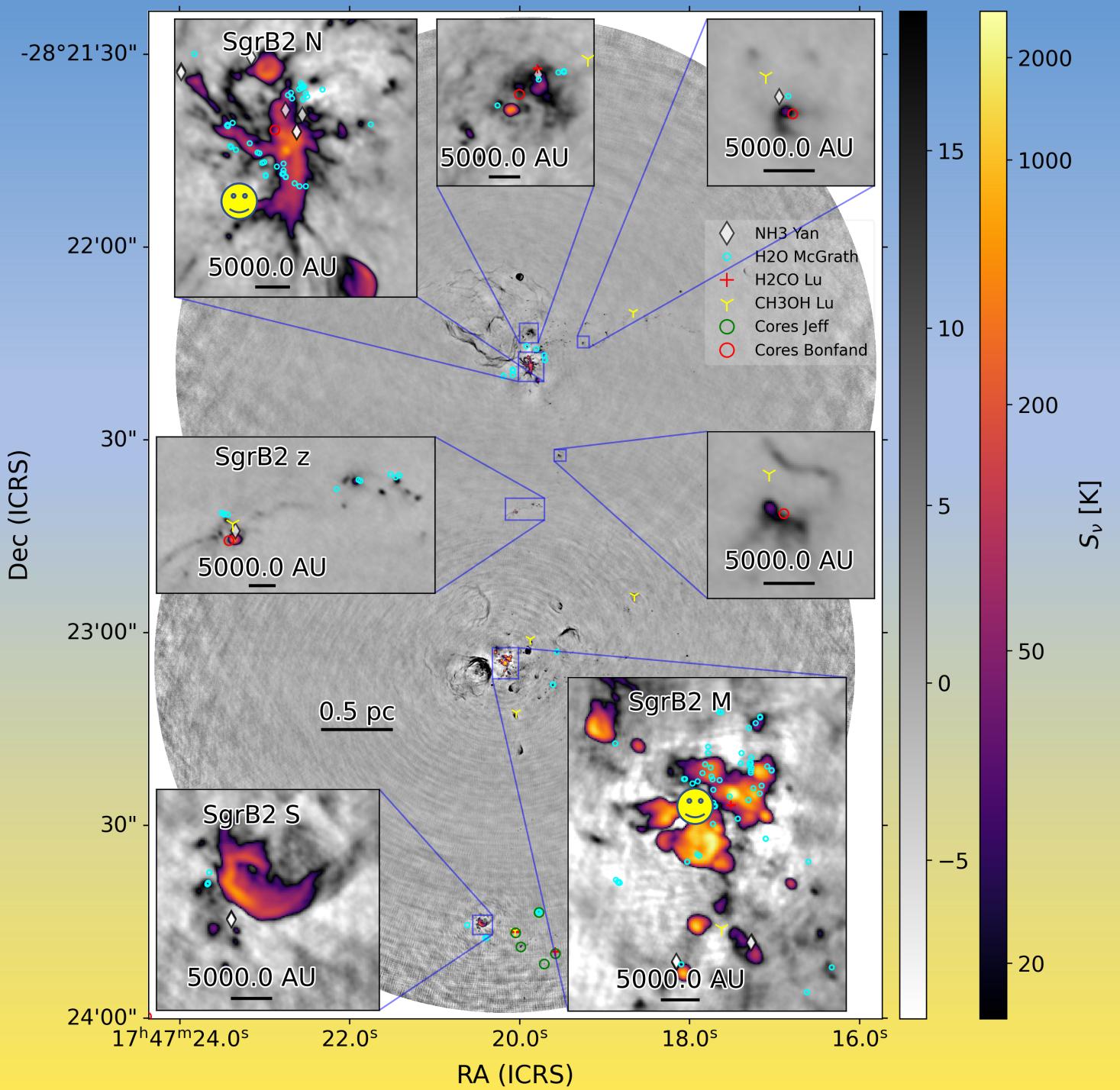
Budaiev+23 →
Accepted to ApJ



We observed Sgr B2 with ALMA at 3 mm and 1 mm at 700 AU resolution

- **410 Stage 0/I YSOs within 2x4 pc FOV**
- **YSOs are optically thick**
- **YSOs are warm (50 K), large (200–2000 AU), and massive (0.5–400 Msun)**





Physical Quantity	CMZ	Solar Neighborhood	$z \sim 2$
Distance [kpc] ^(a)	8.2	0.1 to 0.5	$\sim 10^6$ ($z \sim 2$)
SFR [$M_\odot \text{yr}^{-1}$] ^(b)	0.07 (0.012 to 0.14)	0.002	1 to 100
Σ_{gas} [$\log_{10}(M_\odot \text{pc}^{-2})$] ^(c)	3.1 (2.8 to 3.2)	1.5	x100
Σ_{SFR} [$\log_{10}(M_\odot \text{yr}^{-1} \text{kpc}^{-2})$] ^(d)	0.3 (-0.4 to 0.6)	-2.5	x100
Σ_* [$\log_{10}(M_\odot \text{pc}^{-2})$] ^(e)	3.9	1.5	x100
t_{dep} [Gyr] ^(f)	0.5 (0.4 to 1.5)	1	0.2 to 1
t_{dyn} [Myr] ^(g)	5	220	?
$B[\mu\text{G}]$ ^(h)	10 to 1000	1 to 100 x10-100	?
Metallicity, Z ⁽ⁱ⁾	2	1	0.2 to 0.6
CRIR [$\log_{10}(\text{s}^{-1})$] ^(j)	-15 to -13	-17 to -15	?
Linewidth, $\sigma(10\text{pc})$ [km s^{-1}] ^(l)	12	3	x4
Linewidth scaling, b ^(m)	0.7	0.5	?
IMF slope, α ⁽ⁿ⁾	≤ 2.35	2.35	?
DGMF, $f(n > 10^4)$ ^(o)	0.95	0.03	x30
T_{gas} [K] ^(p)	50 to 100	10 to 30	x3-5
T_{dust} [K] ^(q)	20 to 50	10 to 30	x2
P_{ext}/k_B [K cm $^{-3}$] ^(r)	$\gtrsim 10^7$	$\gtrsim 10^5$?

