

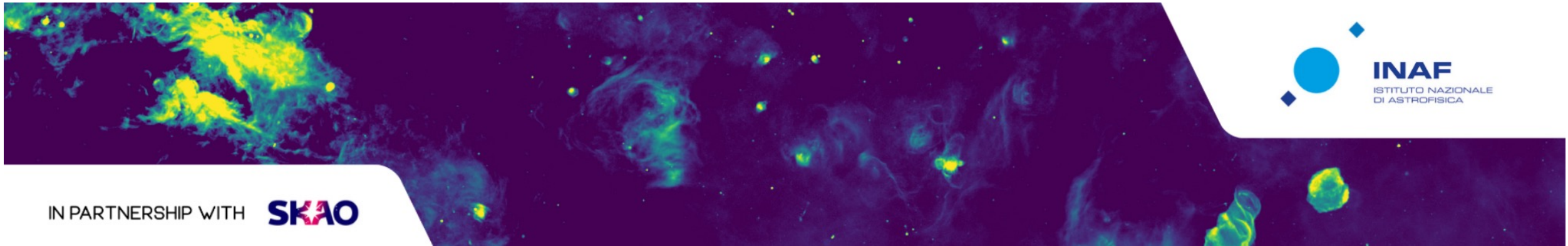
The MeerKAT HI view of NGC 1365

The Great Barred Spiral Galaxy

Viviana Casasola

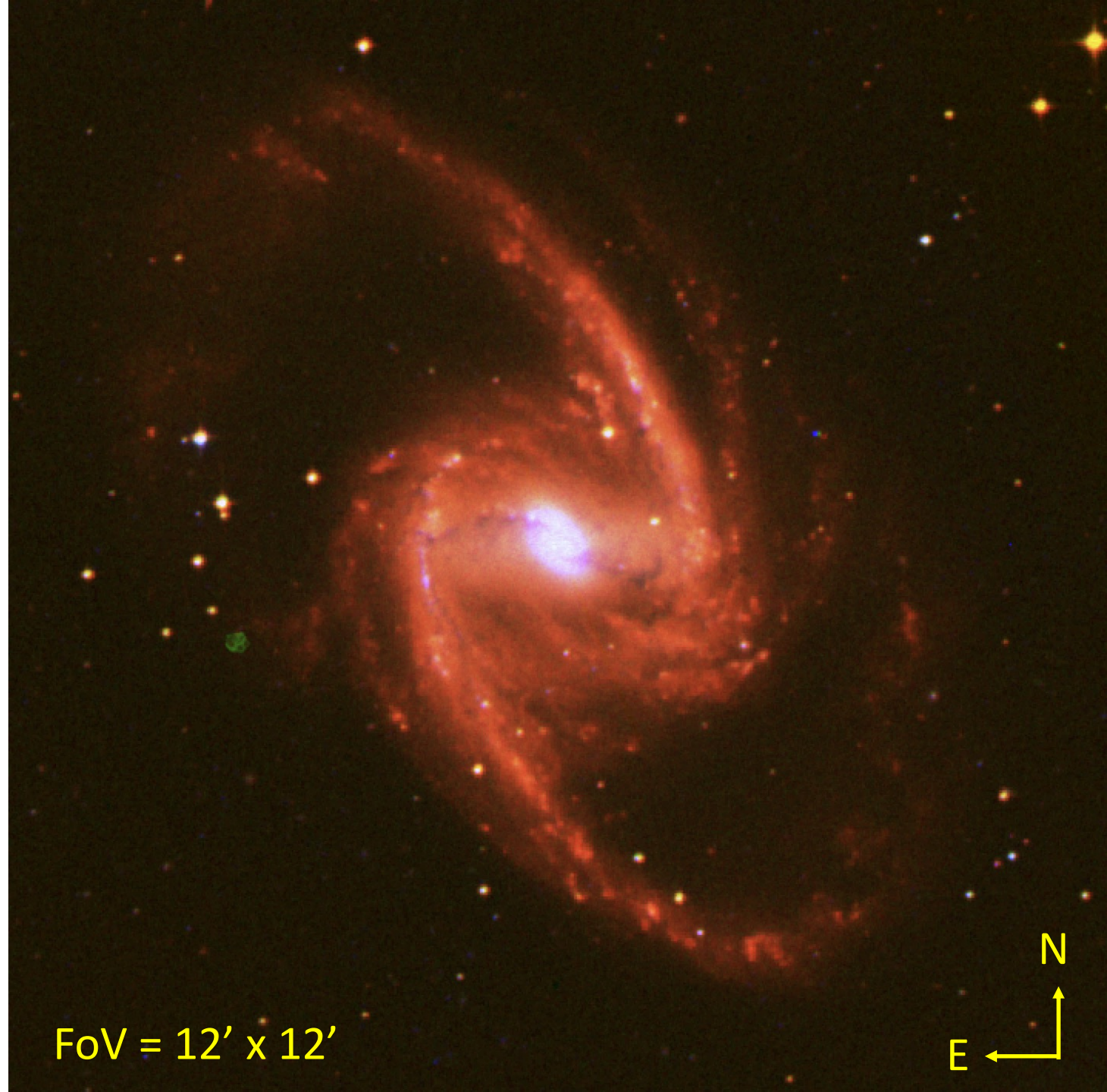
INAF – Istituto di Radioastronomia di Bologna

The Fifth National Workshop on the SKA Project, 24-28 November 2025, Bologna

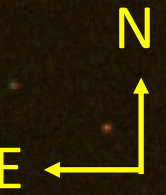


NGC 1365

- A prominent barred spiral galaxy
- Distance = 17.7 Mpc
- Belonging to the Fornax cluster



FoV = 12' x 12''



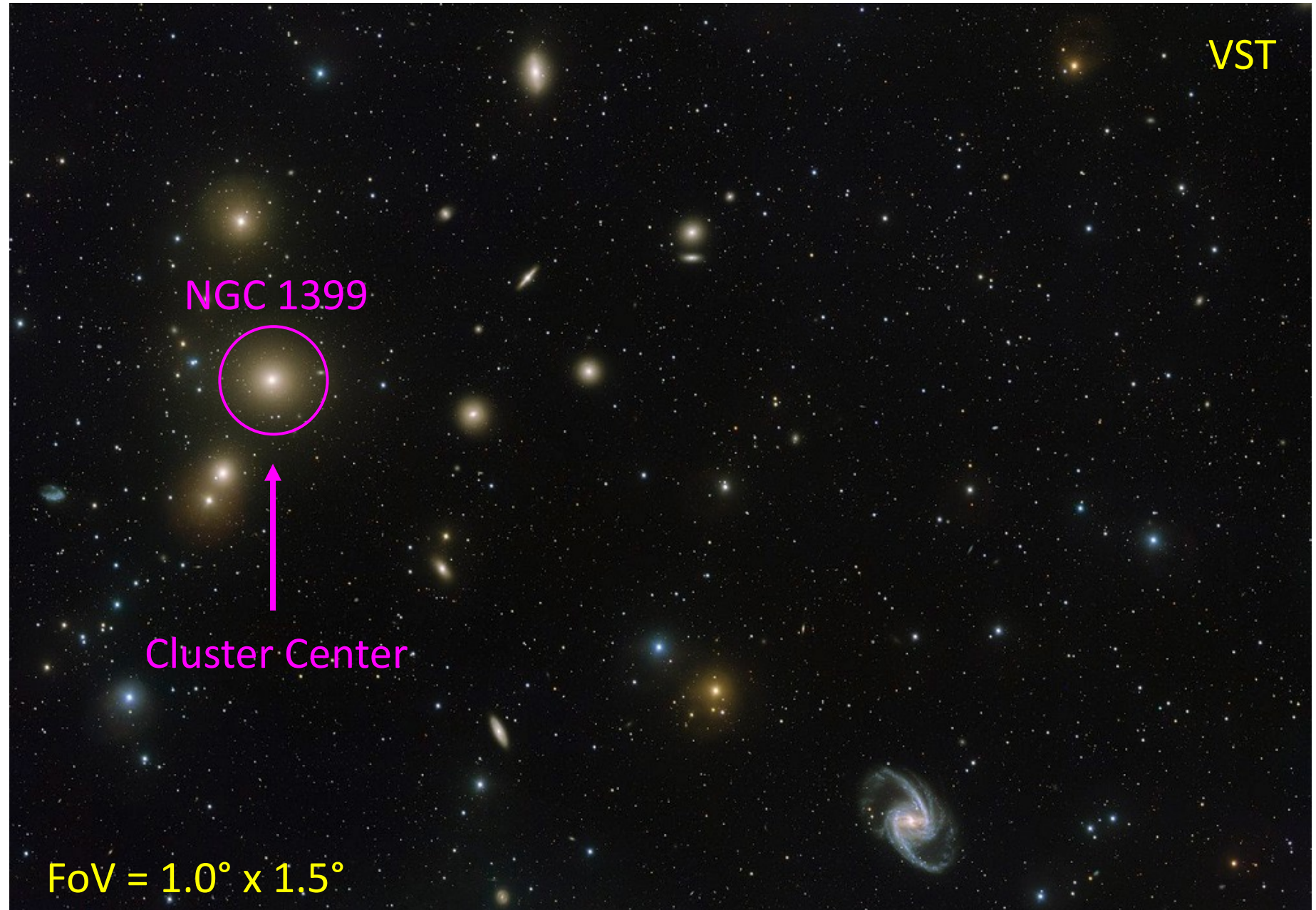
Fornax Cluster

- **Bright galaxies:**
~50 confirmed members
(Ferguson89;
Fornax3D survey)
- **Dwarf galaxies:**
~300–600 likely members
(Venhola+18)



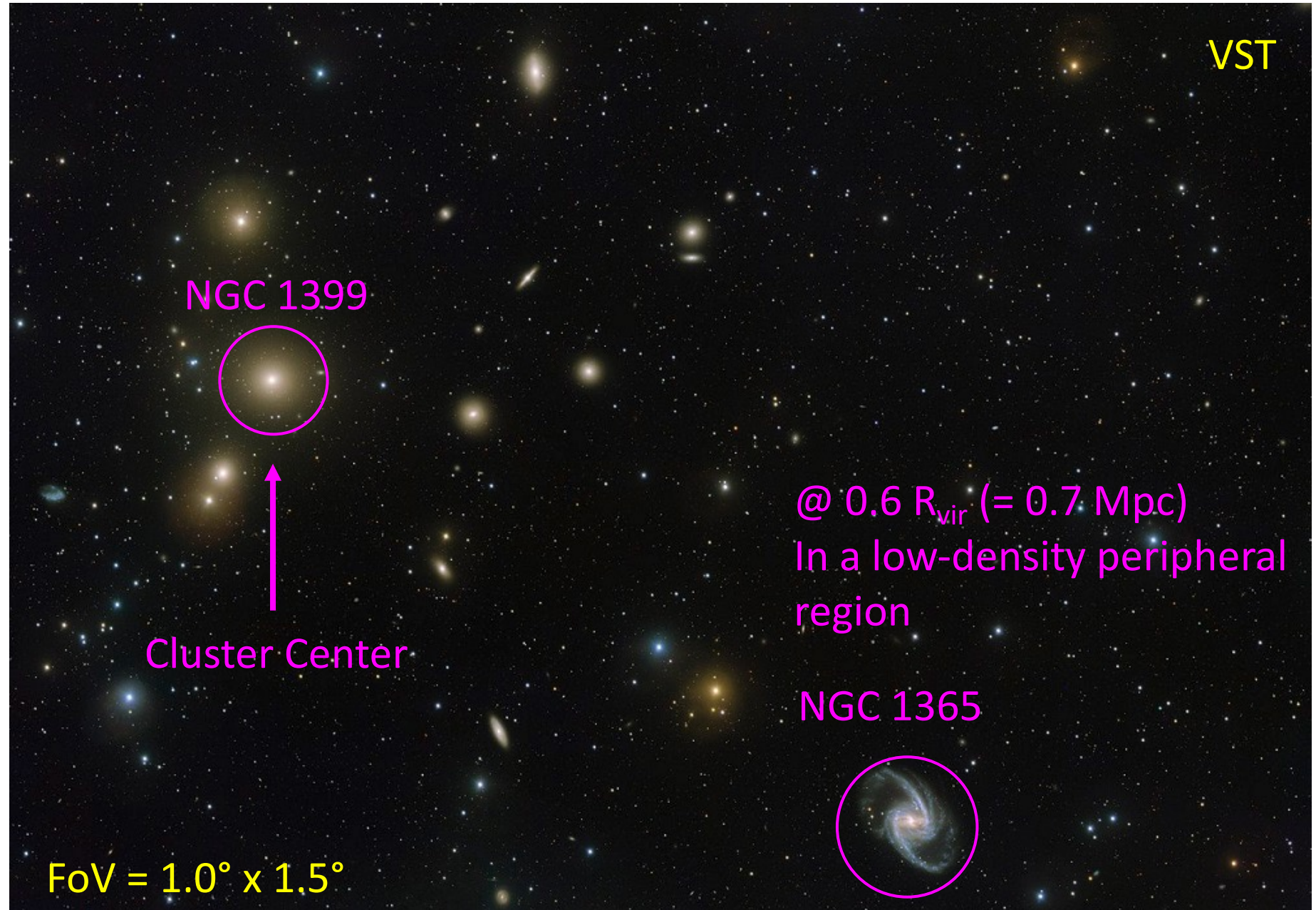
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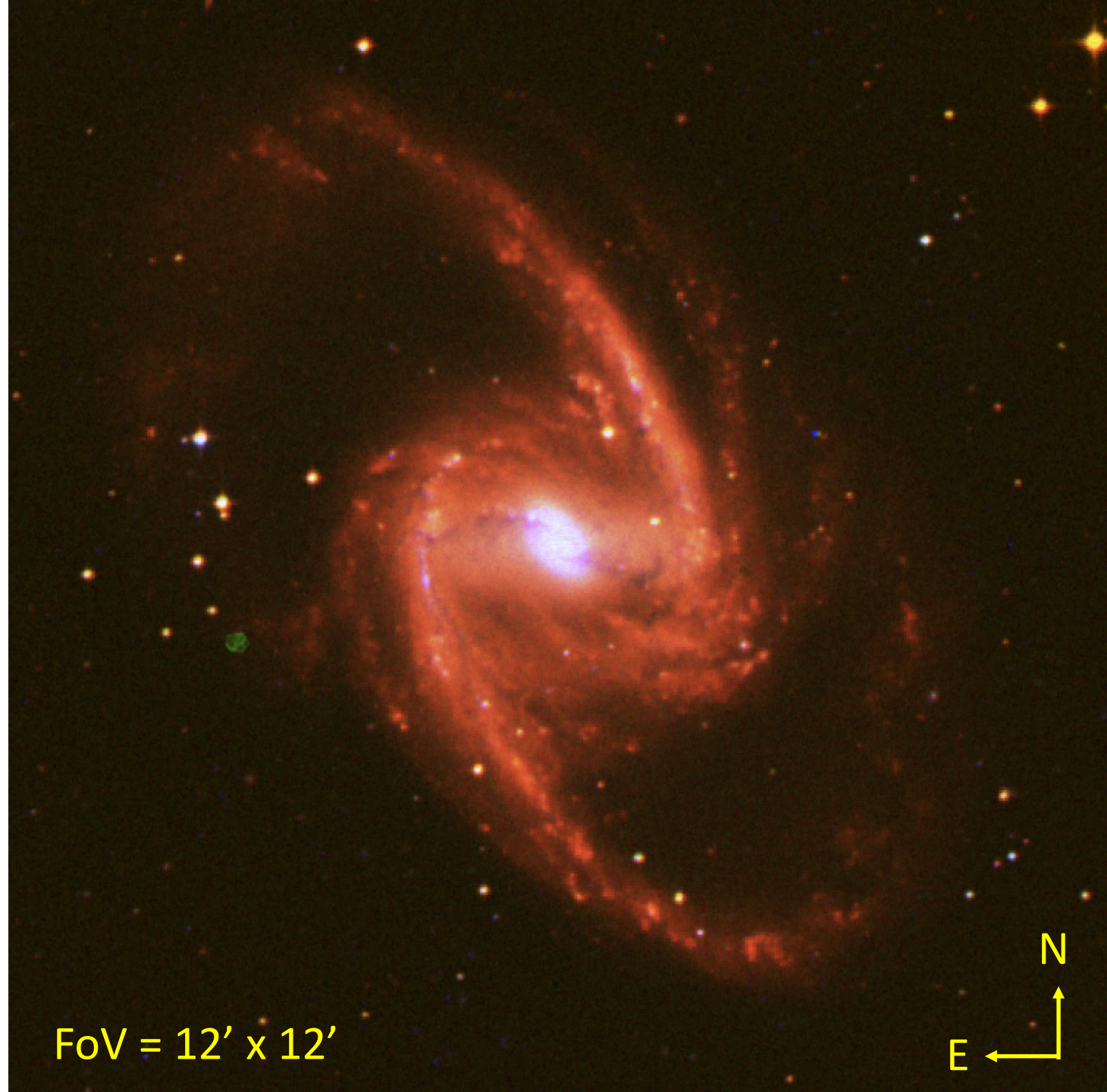
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NGC 1365

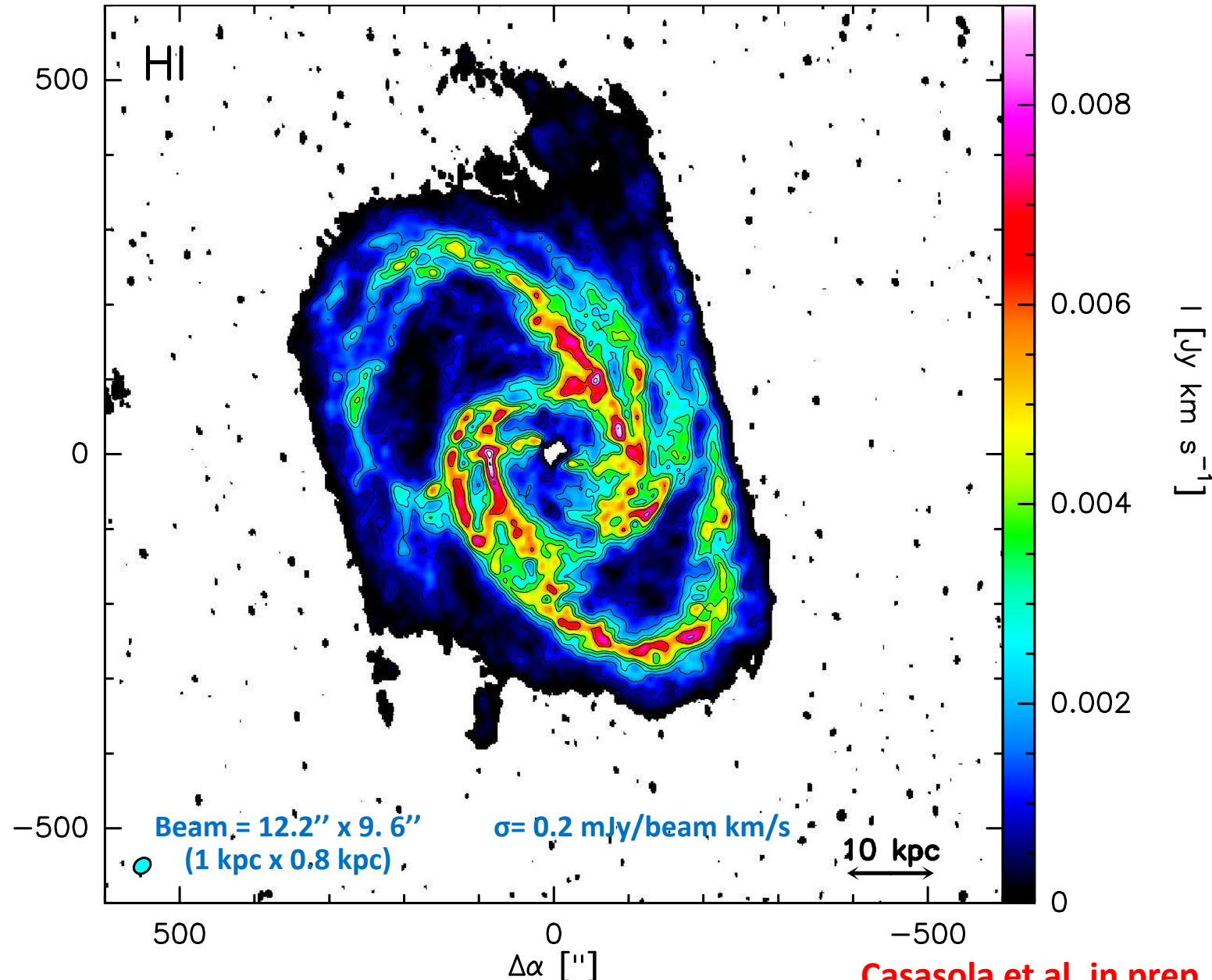
- A prominent barred spiral galaxy
- Distance = 17.7 Mpc
- Belonging to the Fornax cluster
- SFR = $13 M_{\odot}/\text{yr}$
- $L_B = 5.37 \times 10^{10} L_{\odot}$
- $D_{25} = 61.8 \text{ kpc}$
- $M_{\text{star}} = (8.37 \pm 2.77) \times 10^{10} M_{\odot}$
- One of the brightest / largest / most massive in Fornax
- **Well-studied: from X-ray to radio bands**



NGC 1365 seen with MeerKAT in HI

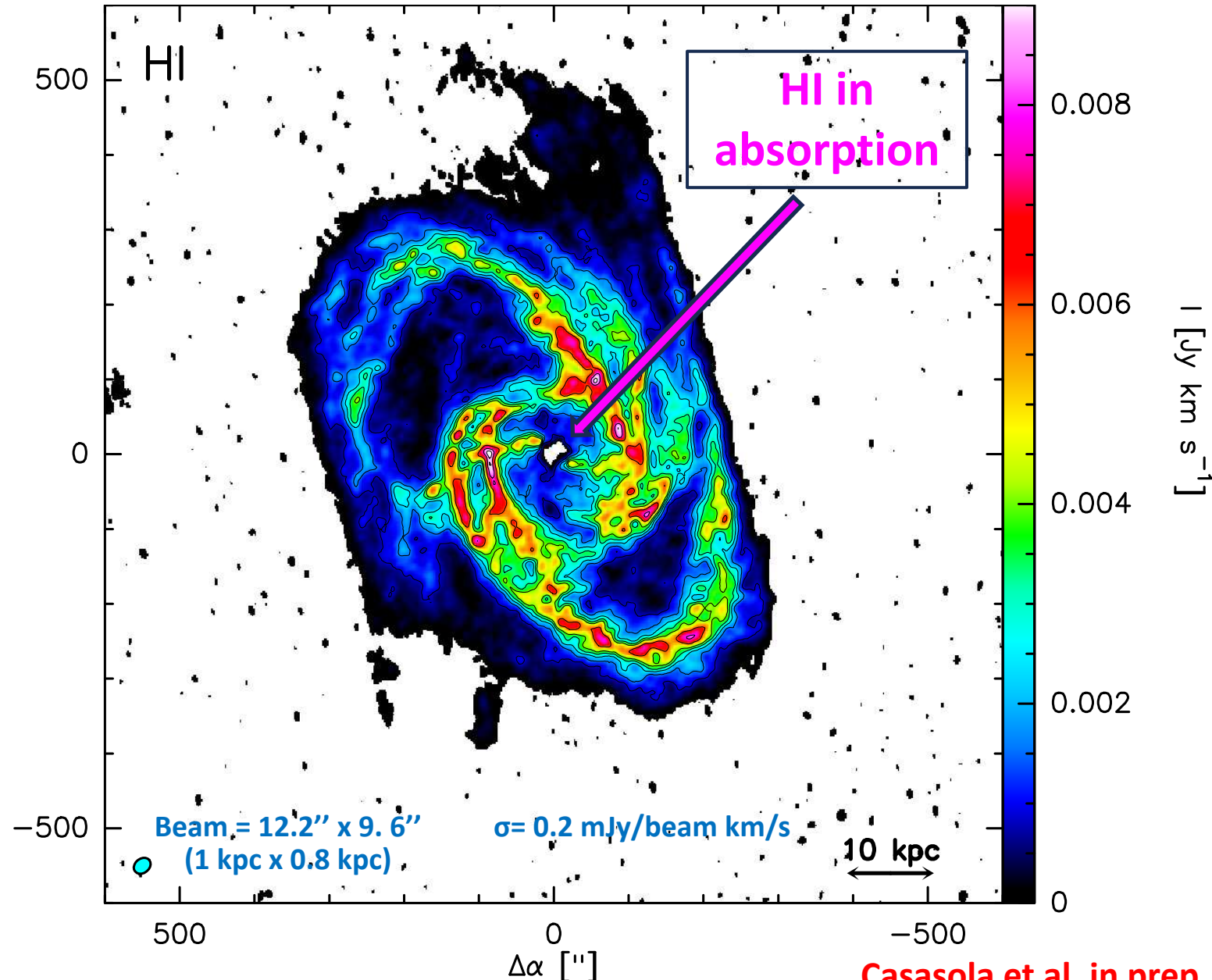
NGC 1365 seen with MeerKAT in HI

- HI along spiral arms
- HI ring ($r \sim 5\text{--}13$ kpc) with peaks
- HI bar connects E-W extremes of the ring
- Good agreement with previous VLA maps (low: $24'' \times 32''$; high: $11.5'' \times 6.3''$)
- **New: HI detected along the bar**
- HI absence in strong bars is not the “rule”



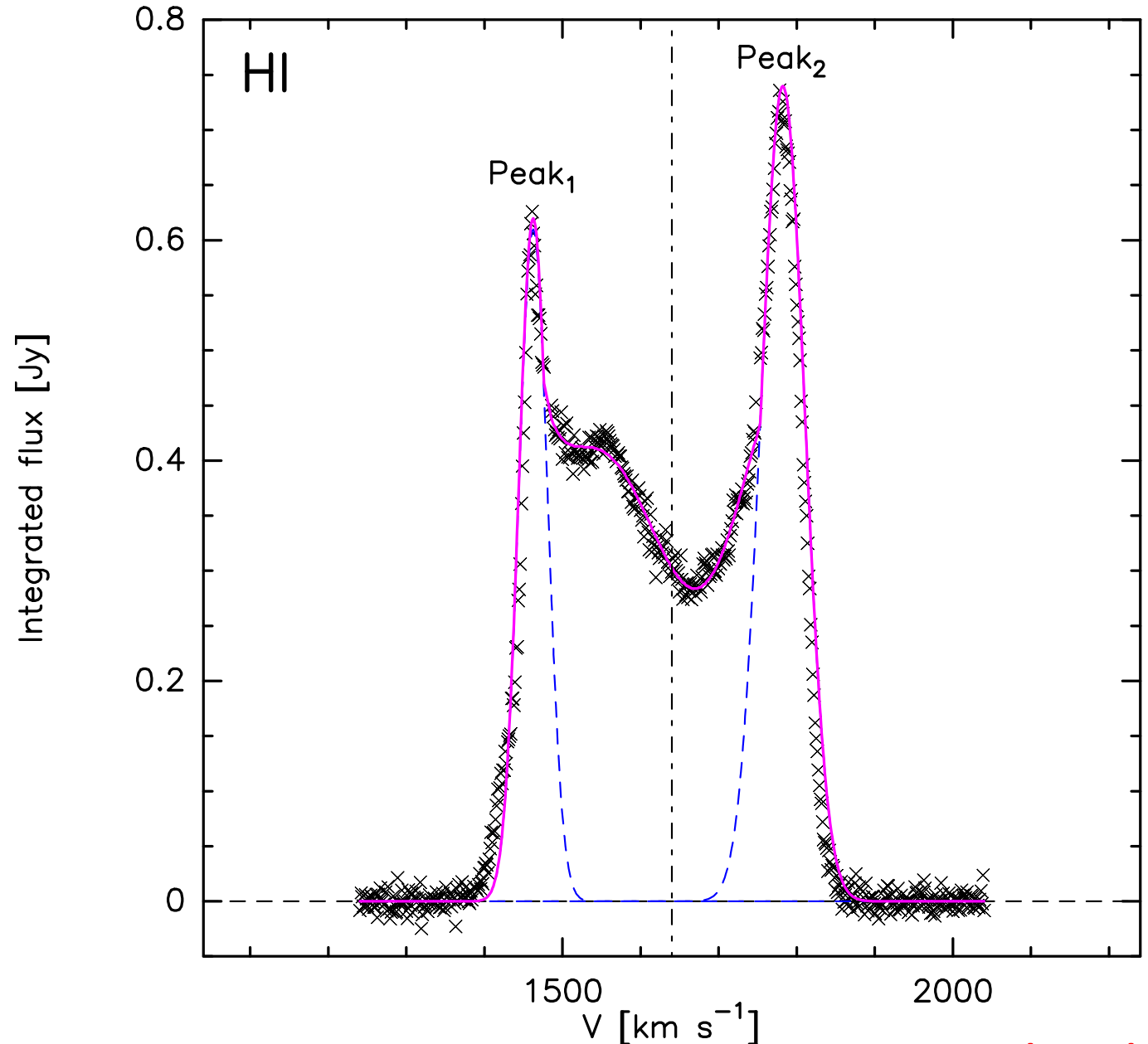
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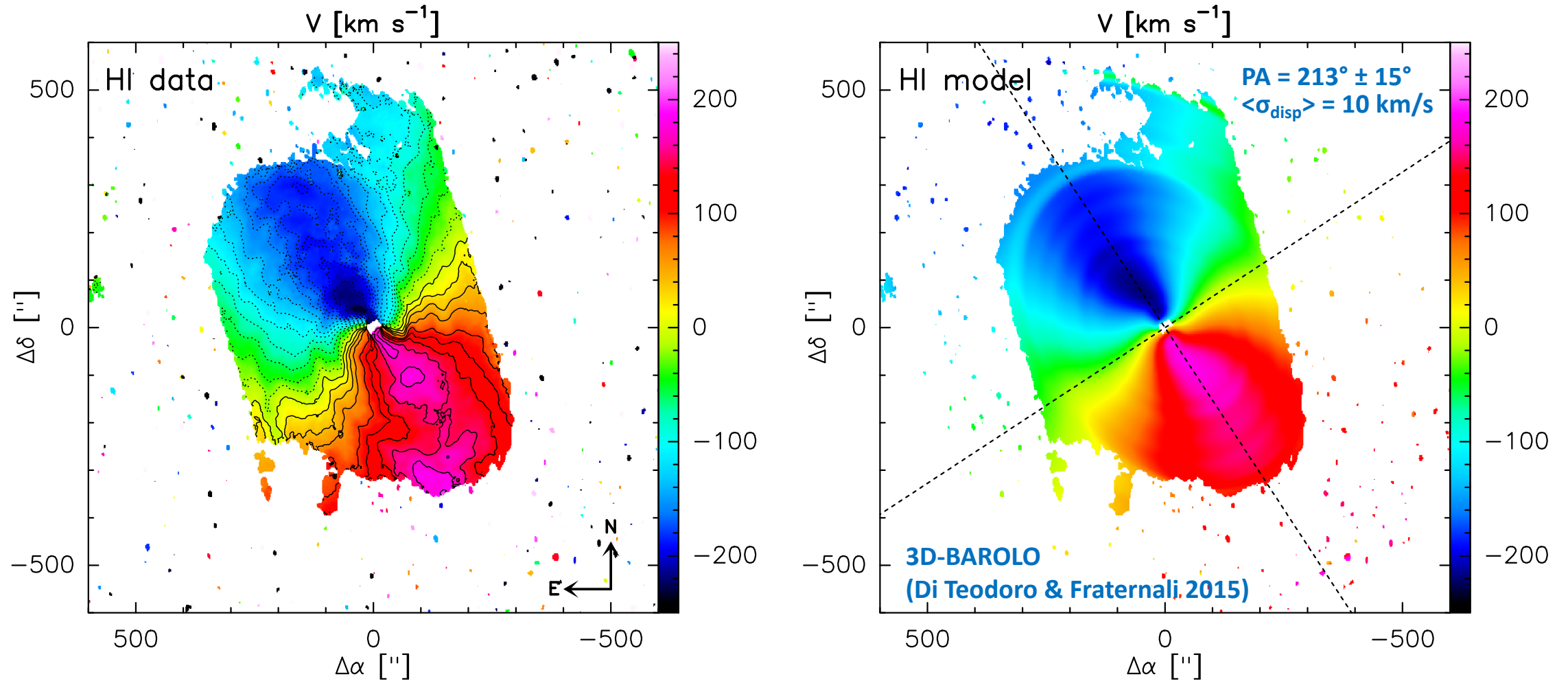


NGC 1365: HI MeerKAT Spectrum

- A double-horned profile, typical of spiral galaxies with a flat rotation curve
- $W_{50} = (318.4 \pm 2.8) \text{ km/s}$
- $S_{\text{HI}} = (163.3 \pm 1.8) \text{ Jy km/s}$
- $M_{\text{HI}} = (1.2 \pm 0.1) \times 10^{10} M_{\odot}$
(seen in emission)



NGC 1365: HI MeerKAT Kinematics

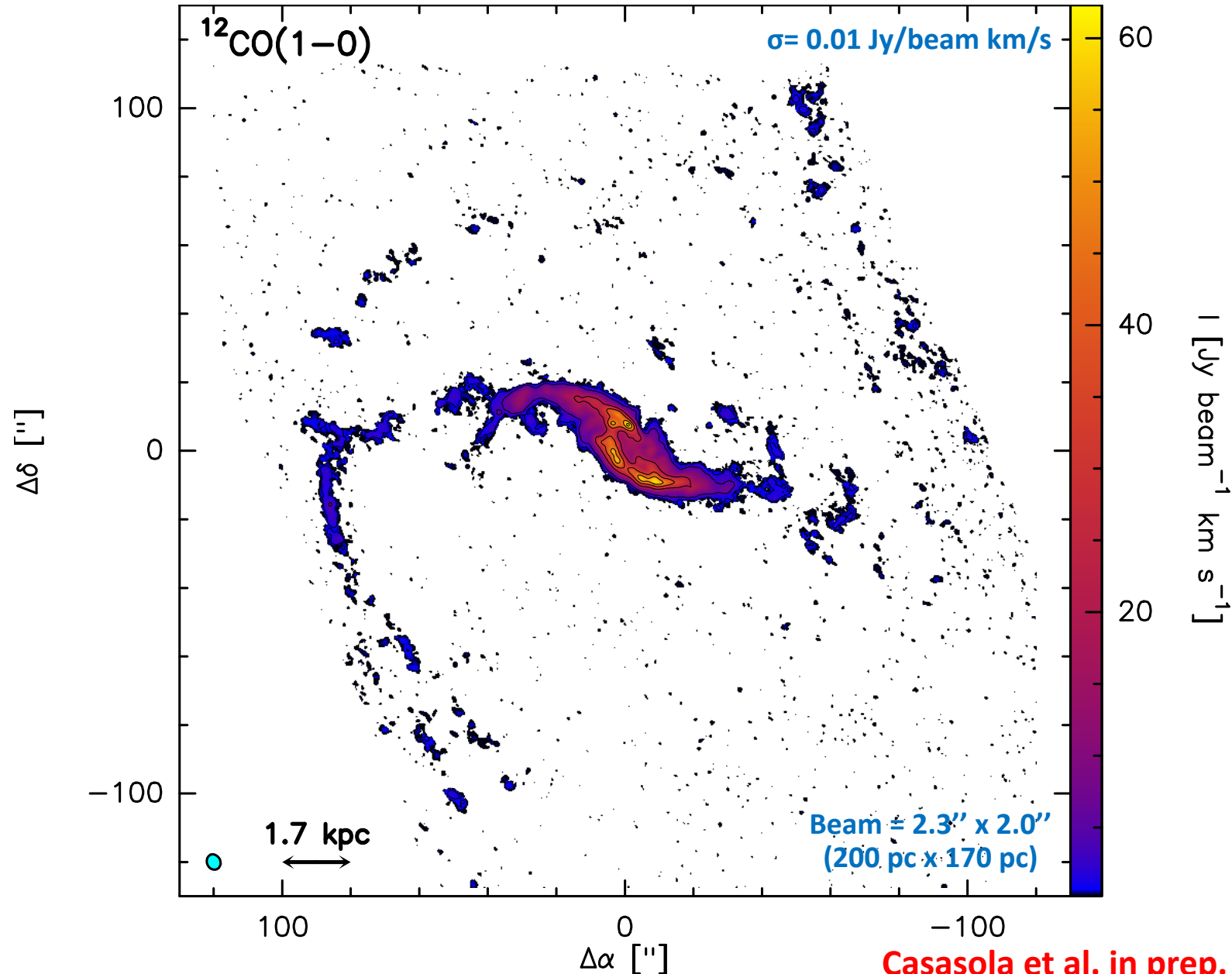


- An inclined rotating disk
- Non-circular motions along the HI bar and the NW spiral arm (consistent with H $_{\alpha}$, Venturi +18)

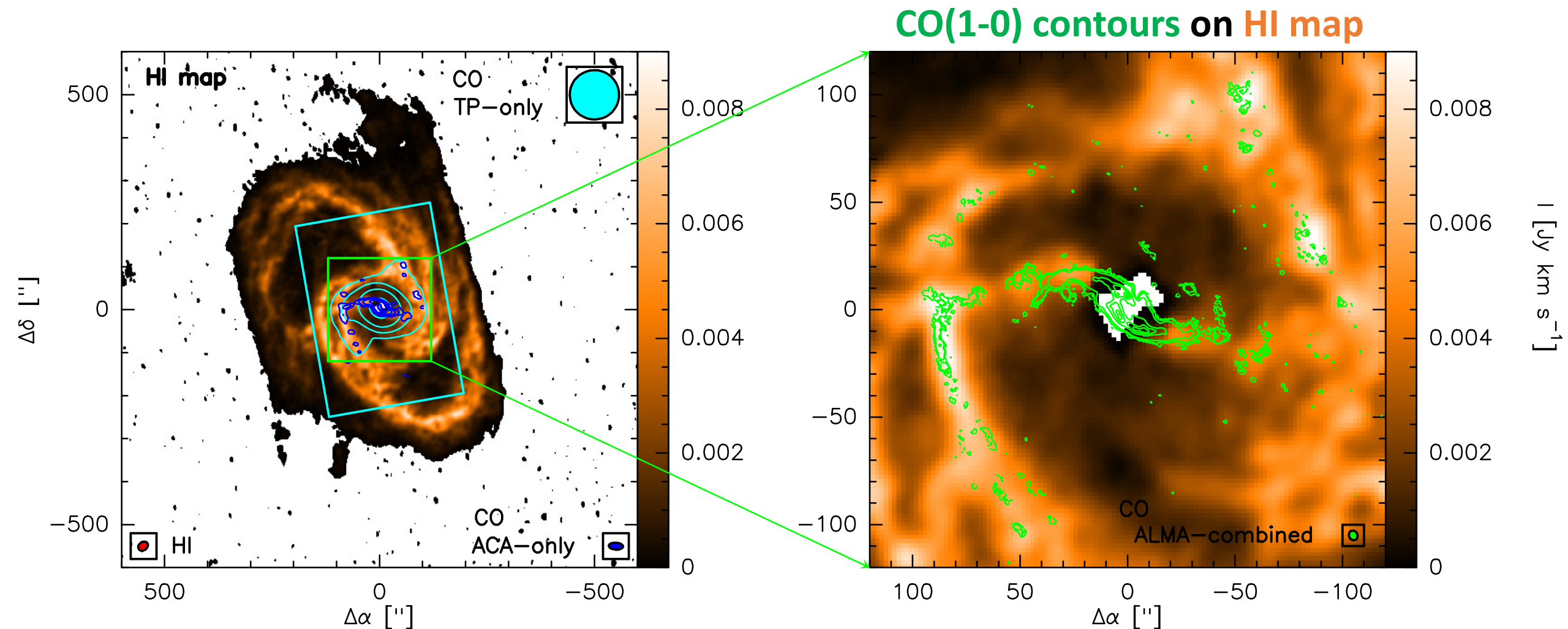
NGC 1365: CO ALMA Observations

NGC 1365: CO ALMA Observations

- 12m+7m+TP ALMA
- CO (molecular gas) detected in the bar and spiral arms
- $M_{\text{H}_2} = (4.3 \pm 1.3) \times 10^9 M_{\odot}$ (constant X_{CO})



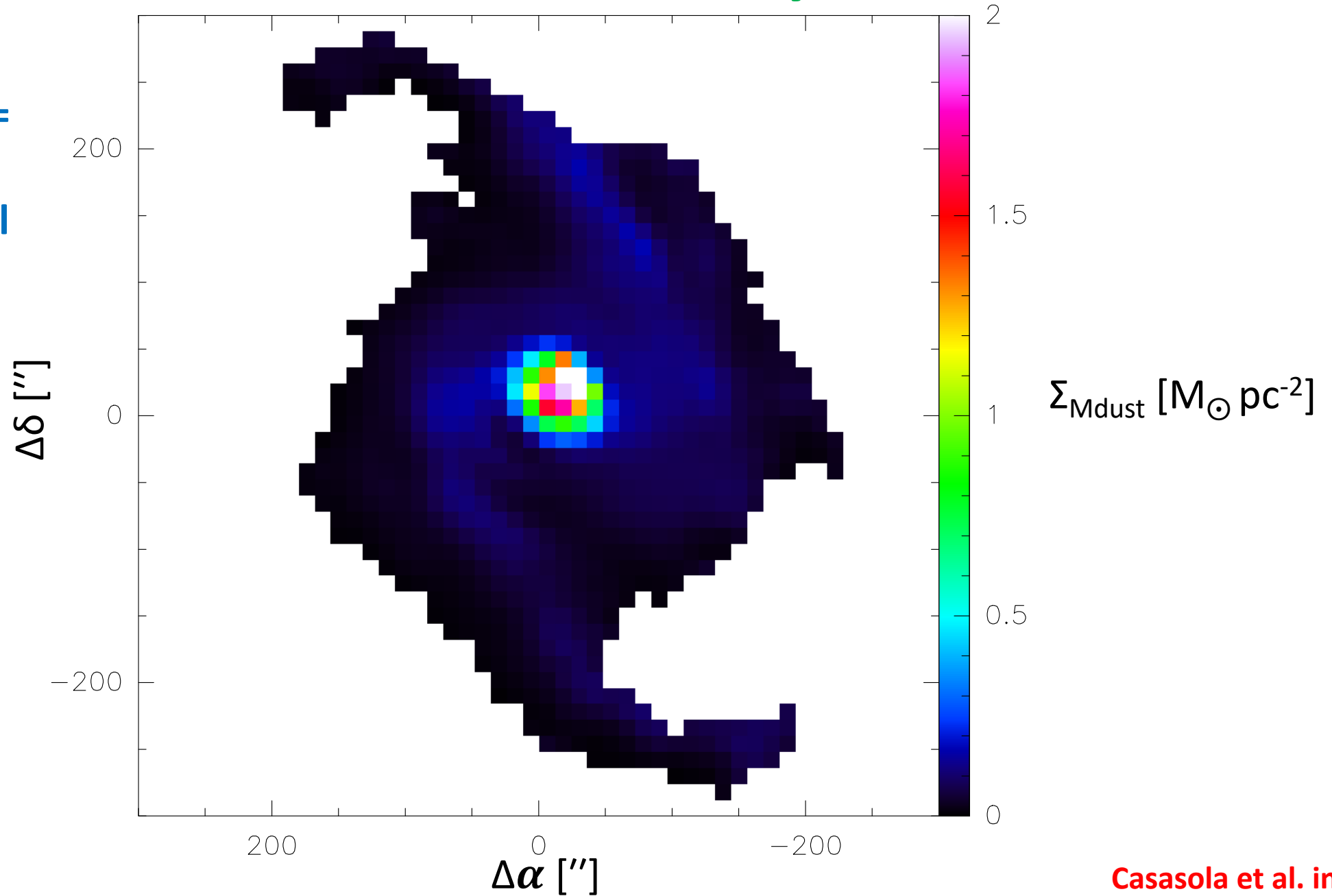
NGC 1365: HI MeerKAT + CO ALMA



- ALMA observations cover a good portion of the total $M(\text{H}_2)$
- Only $\sim 2\%$ of the $M(\text{H}_2)$ of the MW has been detected at $r >$ optical disk

NGC 1365: Cold dust seen by *Herschel*

Dust/(H₂+HI) =
Dust/Total gas:
A powerful tool
for galaxy
evolution

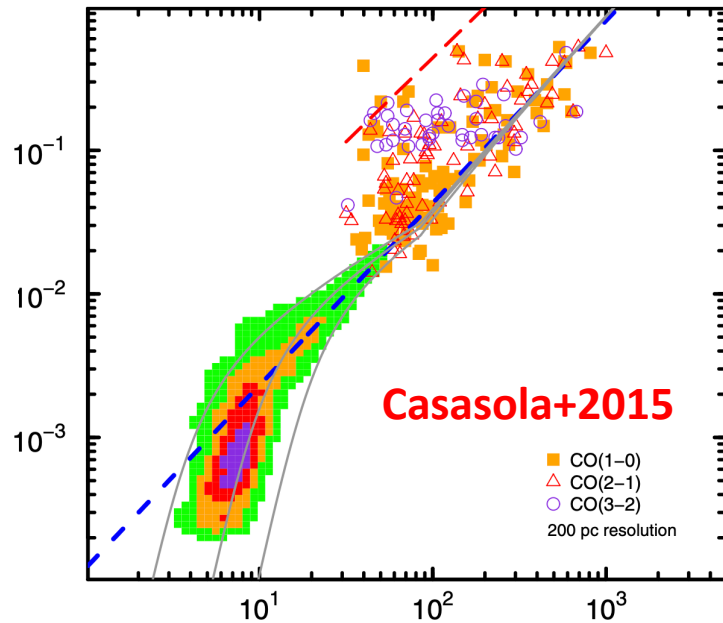


Synergy: SKA (and its precursors) – SPACE

PRORIS - PROGRAMMA DI RICERCA SPAZIALE DI BASE

SFR4ALL: Intercalibrating indicators of SFR across scales and cosmic time
(PI: Sergio Molinari, Extragalactic RU Leader: Viviana Casasola)

SF relation



SFR:
JWST, ...

GAS:
SKA, ALMA, ...



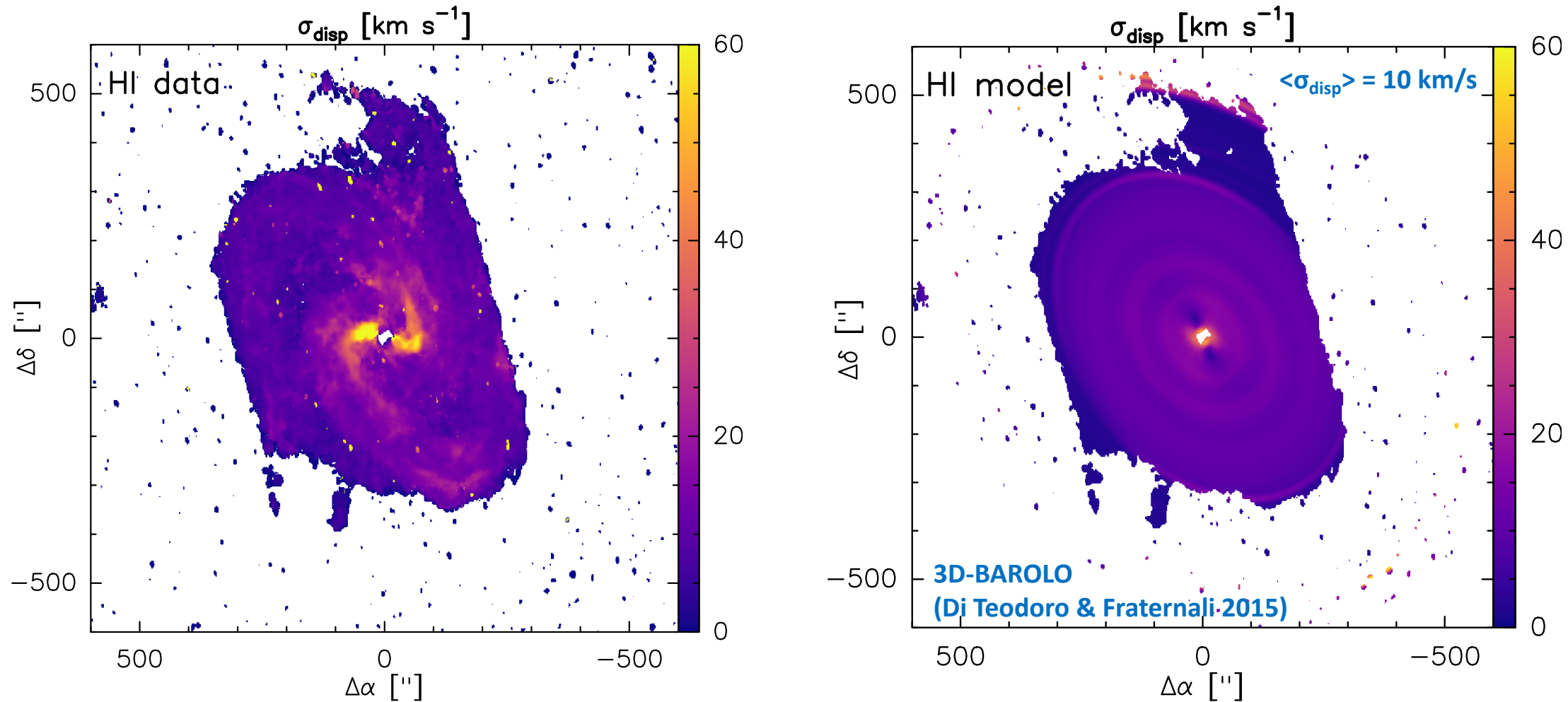
Two 2-year fixed-term researcher positions:

1. SF in external galaxies (INAF-IRA Bologna)
2. SF in the MW (INAF-IAPS Roma)

Thank you for your attention!

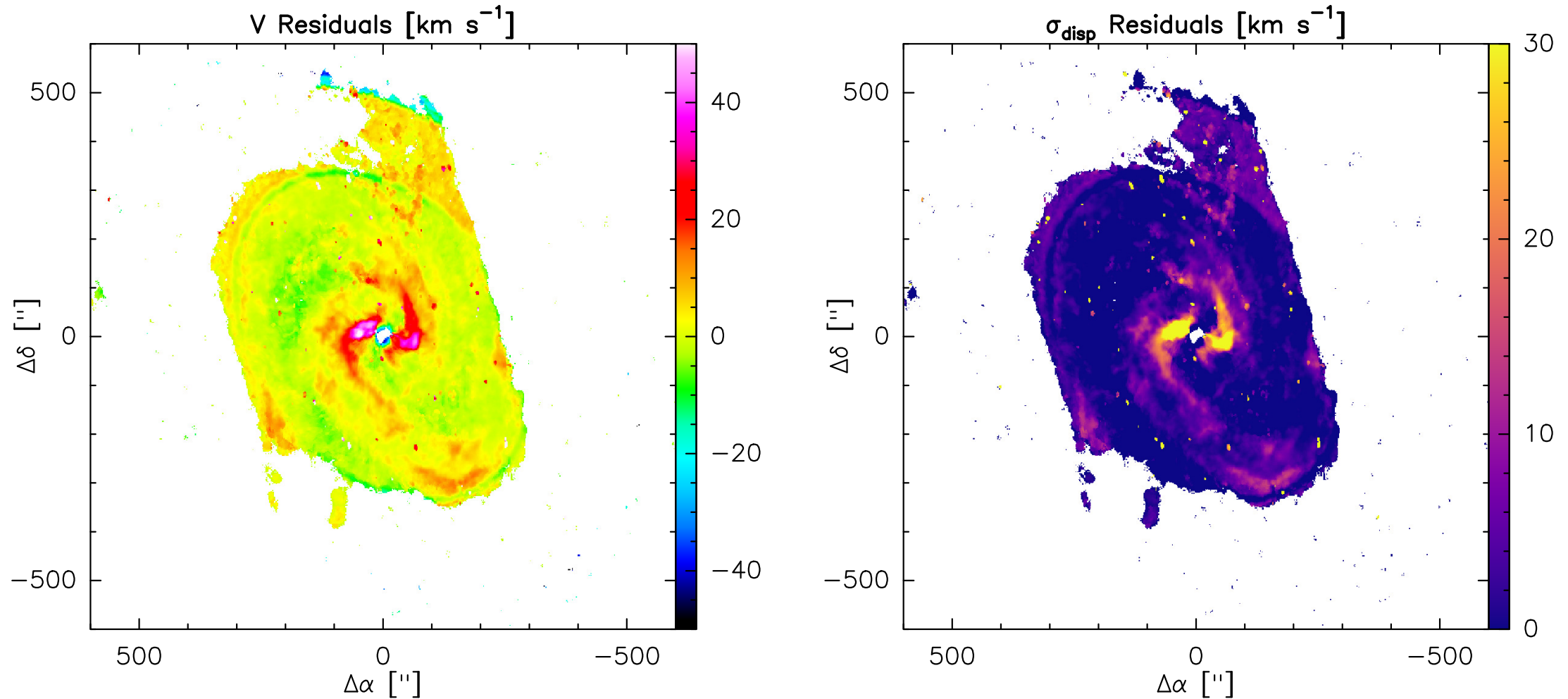
Additional slides

NGC 1365: HI MeerKAT Kinematics



- Increase of σ_{disp} along spiral arms and the bar (consistent with Casasola+11, Newnham+20)
- The masked nuclear region (absorption) could boost σ_{disp}

NGC 1365: HI MeerKAT Kinematics



- 3D-BAROLO reproduces quite well the overall V and σ_{disp} from $r \sim 150'' - 200''$
- 3D-BAROLO fails along the HI nuclear bar and the spiral arms
- Expected “failures” since 3D-Barolo is based on a kinematics dominated by rotation

NGC 1365: CO(1-0) ALMA Spectrum

- A one-peak profile
- $\text{FWHM} = (307.1 \pm 1.0) \text{ km/s}$
- $S_{\text{CO}} = (1756.5 \pm 5.5) \text{ Jy km/s}$
- $M_{\text{H}_2} = (4.3 \pm 1.3) \times 10^9 M_{\odot}$
(constant X_{CO})

