

# HI Structure and Dynamics of Dwarf Galaxies: Insights from the MHONGOOSE Survey

**Brenda Namumba**

**Instituto de Astrofísica de Andalucía, Spain**



**AFAS annual conference—Botswana –24 March 2026**

# OUTLINE

---

- ▶ Why dwarf galaxies and HI
- ▶ MHONGOOSE survey
- ▶ Target galaxies and observations
- ▶ Results
- ▶ Summary

# DWARF GALAXIES

---

Why study dwarf galaxies?

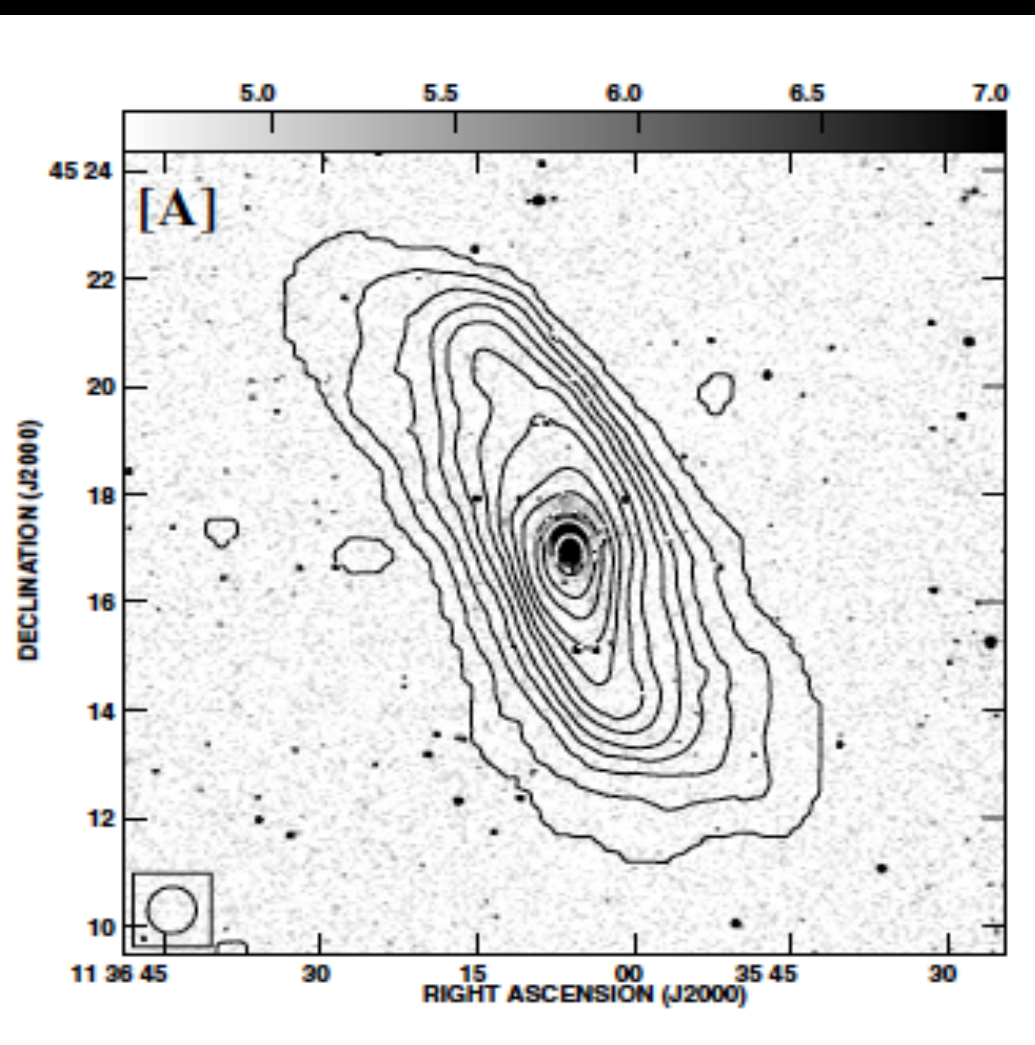
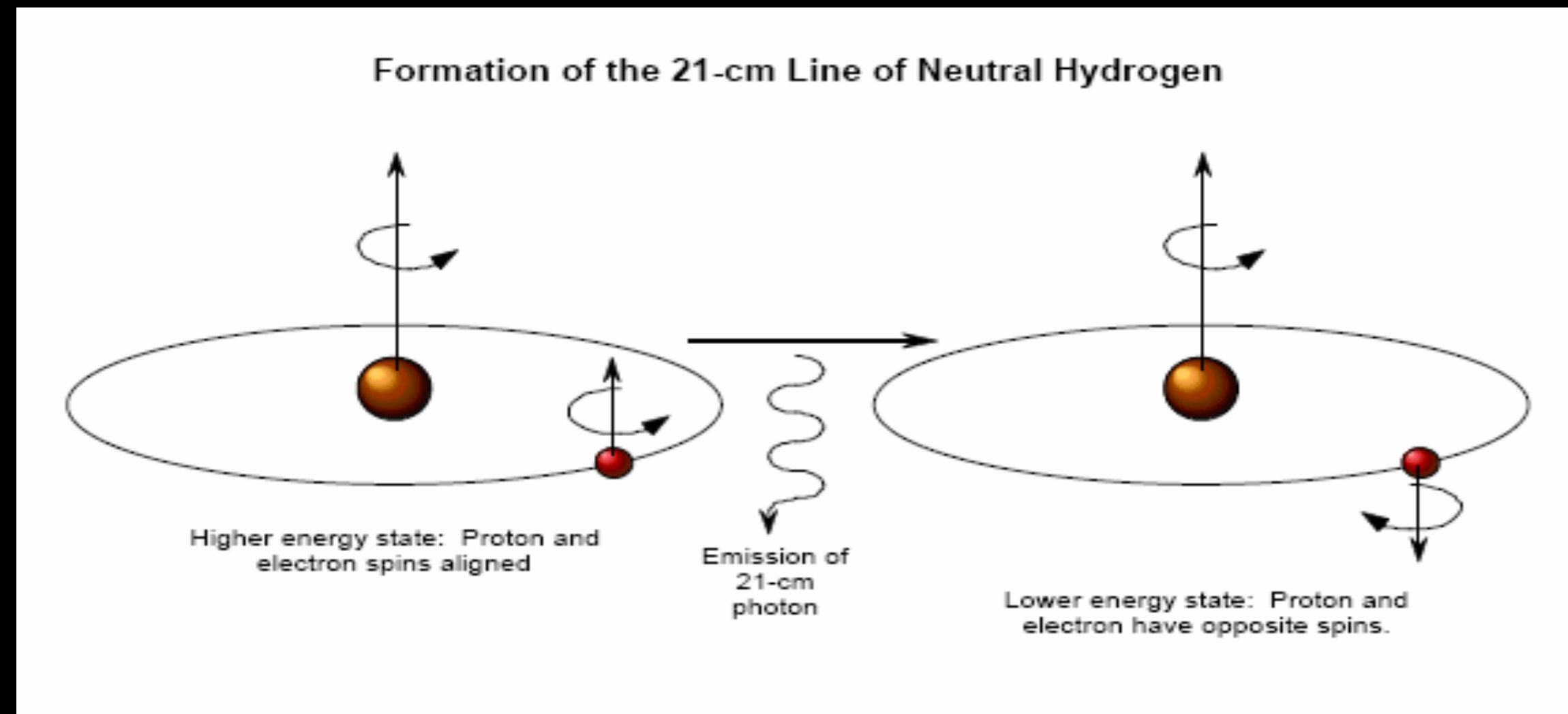


- ▶ Smaller in size
- ▶ Low luminosity / low mass

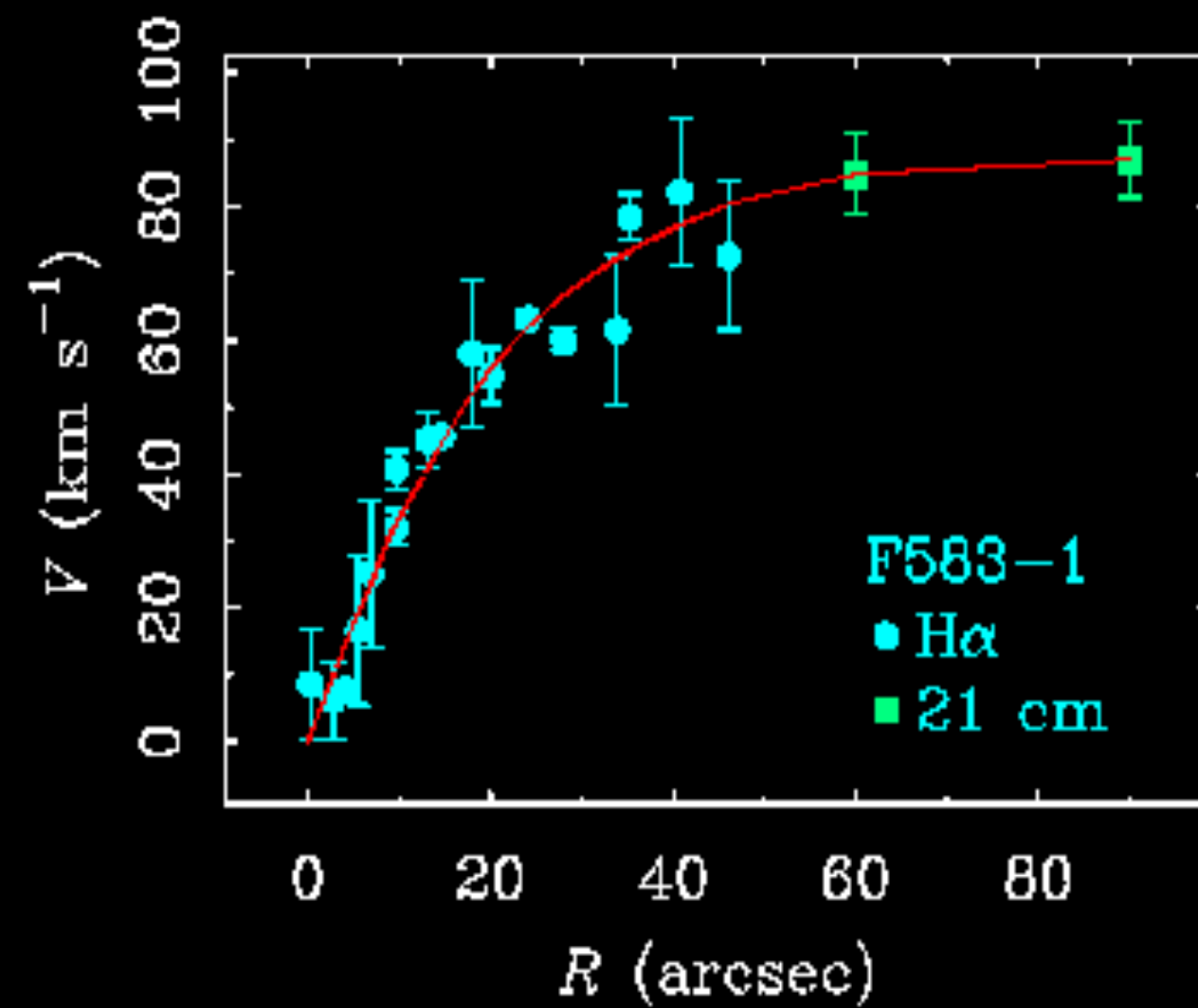
- ▶ Most common galaxies in the Universe
- ▶ Building blocks of large galaxies
- ▶ Dark matter dominated

# THE 21 CM HI LINE

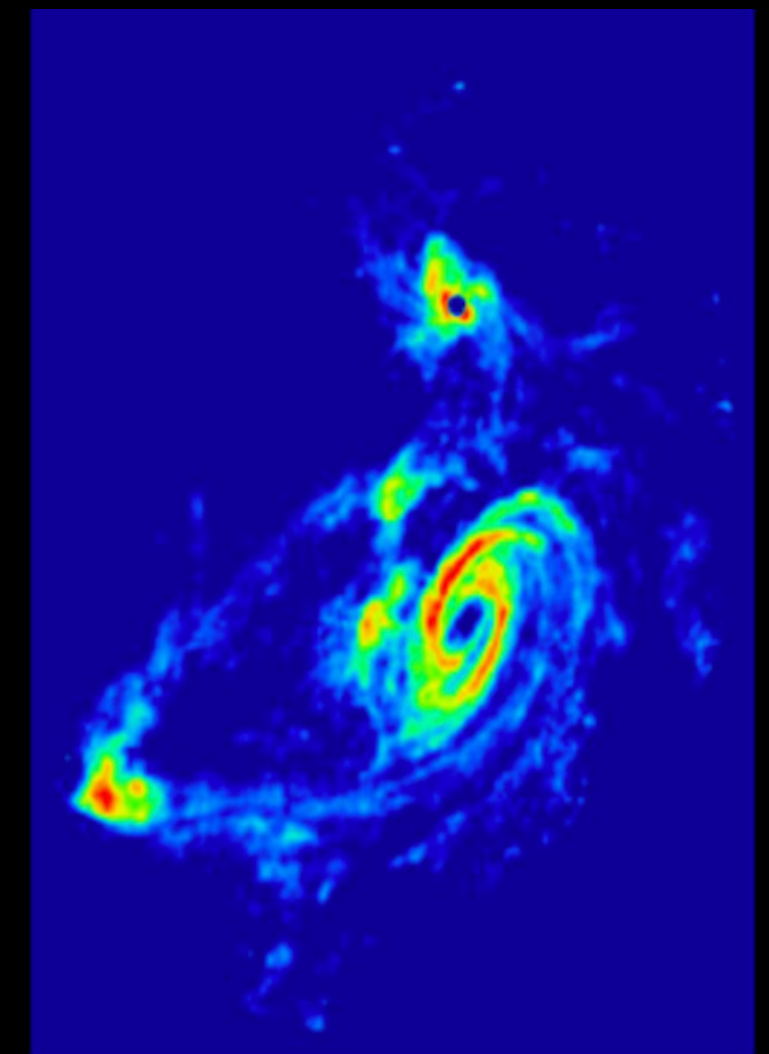
What can we learn from HI?



Gas distribution



Rotation curves



Environment

# MHONGOOSE SURVEY

Dwarfs with MeerKAT

The logo for the MHONGOOSE survey. The word "MHONGOOSE" is written in a large, bold, black, sans-serif font. The letter 'O' in "HONGOOSE" is replaced by a silhouette of a meerkat standing on its hind legs, facing right. The letter 'O' in "MOOSE" is also replaced by a silhouette of a meerkat, facing left. The background of the logo is white, and it is set against a black background.

MHONGOOSE

MeerKAT HI Observations of Nearby Galactic Objects: Observing Southern Emitters

PI: W.J.G. de Blok (ASTRON/UCT/Kapteyn)

- ▶ Deep HI survey with MeerKAT
- ▶ 30 nearby galaxies, including 6 dwarfs
- ▶ Very high sensitivity

# TARGET GALAXIES & OBSERVATIONS

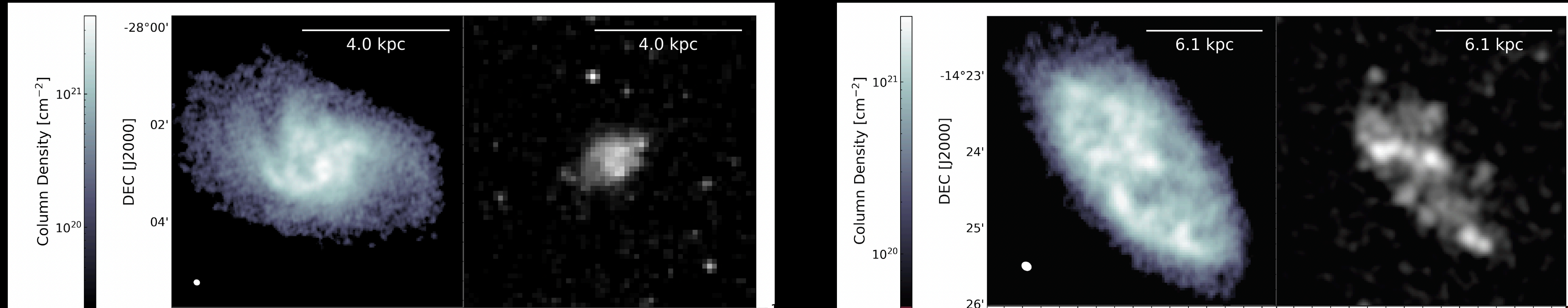
---

*ESO444-G084 & [KKS2000]23*

- ▶ Gas-rich dwarf galaxies
  - ▶ Extended HI disks
  - ▶ Well resolved kinematics
  - ▶ Ideal for dark matter and disk stability studies
- 
- ▶ ~ 50 hrs on source
  - ▶ ~ 0.7 km/s velocity resolution
  - ▶ ~ 8 arcsec spatial resolution

# RESULTS

*HI morphology*

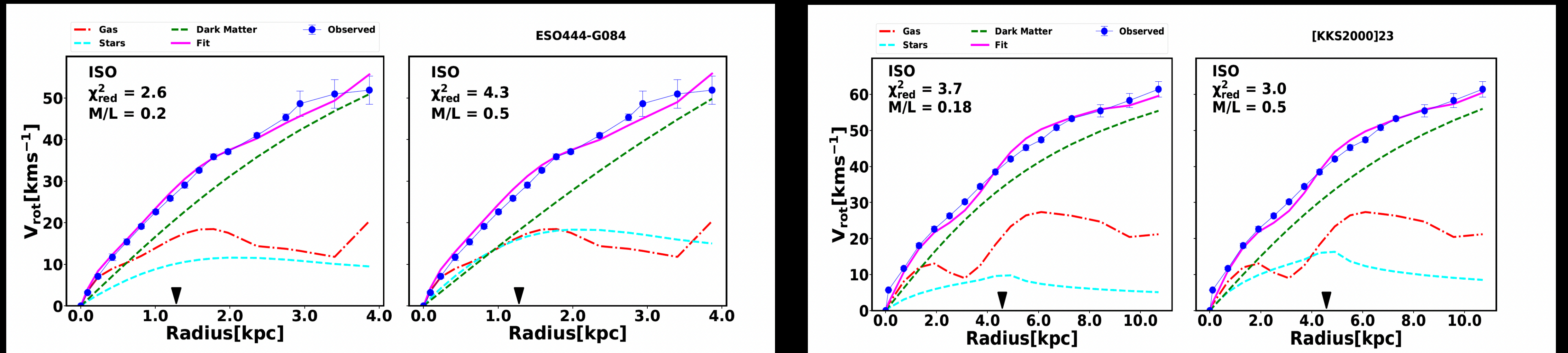


- ▶ ESO444—G084: smooth, centrally concentrated HI
- ▶ KKS2000-23: irregular, clumpy gas distribution
- ▶ FUV emission follows high HI density regions

The high spatial resolution of MeerKAT reveals detailed H I structure.

# RESULTS

## *HI kinematics & mass modelling*

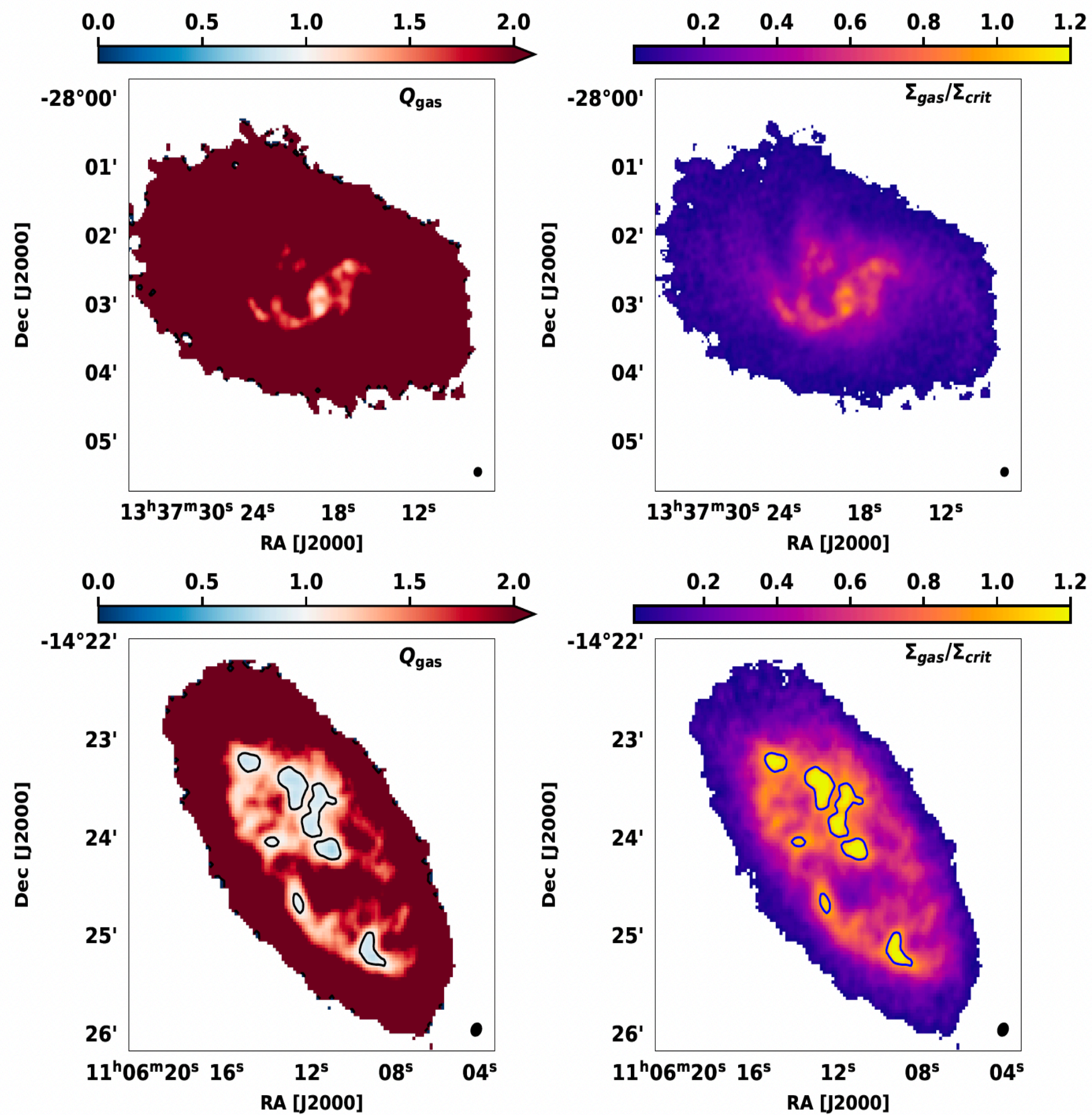


- ▶ Rotation curves from 3D modelling
- ▶ Disk-like rotation in both galaxies
- ▶ Mass decomposition: gas + stars + halo
- ▶ Different rotation curves indicate different halo structures
- ▶ Dark matter dominates the outer regions

MeerKAT sensitivity allows us to trace the rotation curve to larger radii.

# RESULTS

## *Disk stability and star formation*



- ▶  $Q > 1$  stable,  $Q < 1$  unstable
- ▶  $\Sigma_{\text{gas}} / \Sigma_{\text{crit}} > 1 \rightarrow$  star formation possible
- ▶ ESO444 is stable but forms stars locally
- ▶ KKS is unstable but shows weak recent star formation
- ▶ Star formation is not set by gas density alone

MeerKAT's high H I resolution allows us to study the star formation threshold at smaller scales.

# SUMMARY

---

*MHONGOOSE dwarfs*

- ▶ Extended HI disks in both galaxies
- ▶ Different morphologies and mass distributions
- ▶ Both galaxies are dark-matter dominated
- ▶ Star formation is not set by gas density alone
- ▶ Disk stability and internal processes regulate star formation