



Osservatorio Astronomico di Cagliari



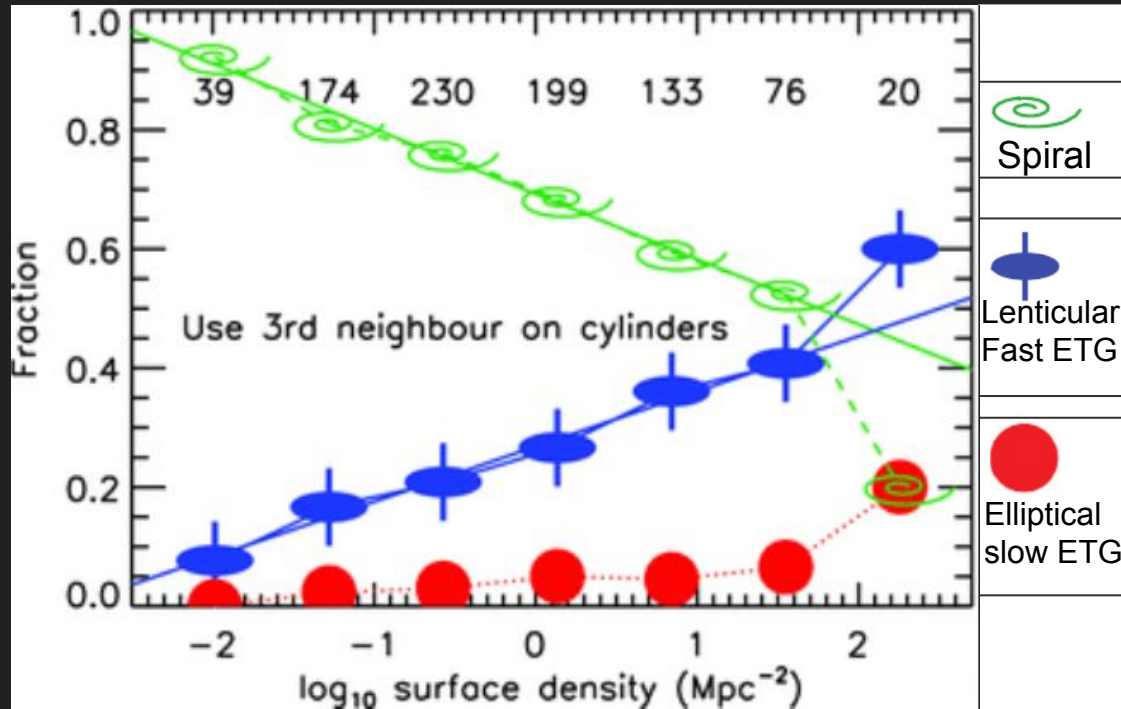
ISM stripping or starvation? The formation of a S0 galaxy in the Fornax cluster

Alessandro Loni

P. Serra , M.Sarzi and Fornax collaboration

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Environment is a key driver of galaxy evolution



Dressler (1980), Cappellari et al. (2011b)



Image credit: ESA/Hubble

Fornax:

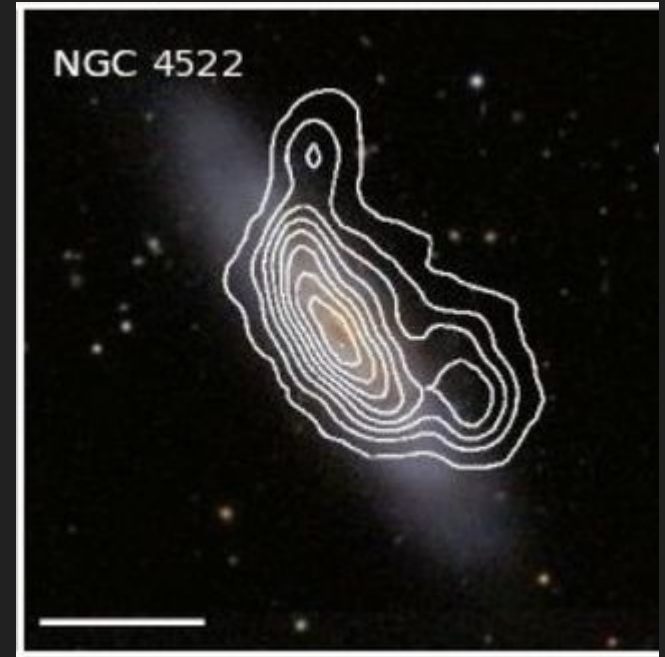
- Second Closest galaxy cluster @ 20 Mpc
(just after Virgo @ 16 Mpc)
- Low mass galaxy cluster with
 $M_{\text{vir}} \sim 5 \times 10^{13} M_{\odot}$
(lower than Virgo $M_{\text{vir}} \sim 8 \times 10^{14} M_{\odot}$)
- Different environments
↓
Different galaxy evolution



Image credit: ESO. Acknowledgement: Aniello Grado and Luca Limatola

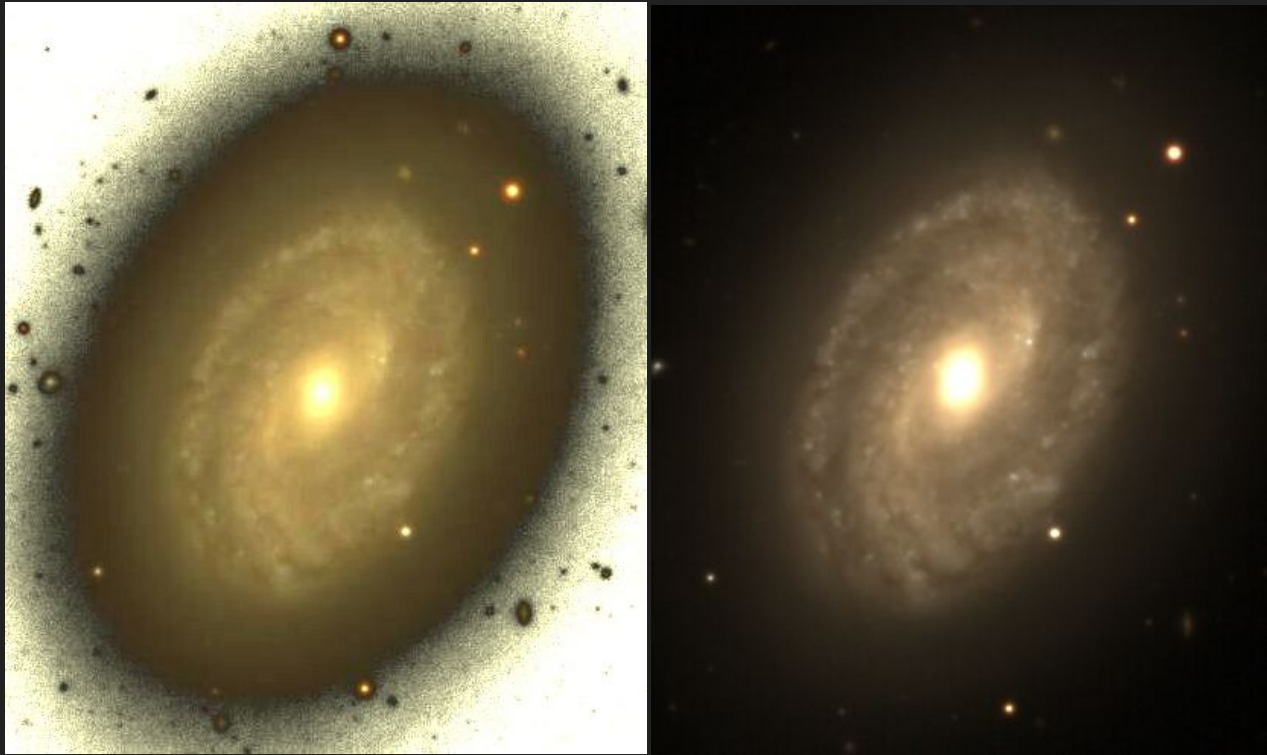
Galaxy cluster in HI

- Neutral Hydrogen (HI) at the outskirts of galaxy (is detectable)
- HI drives the history of a galaxy
- HI morphology as a tracer of what galaxies are experiencing



Chung et al. (2009)

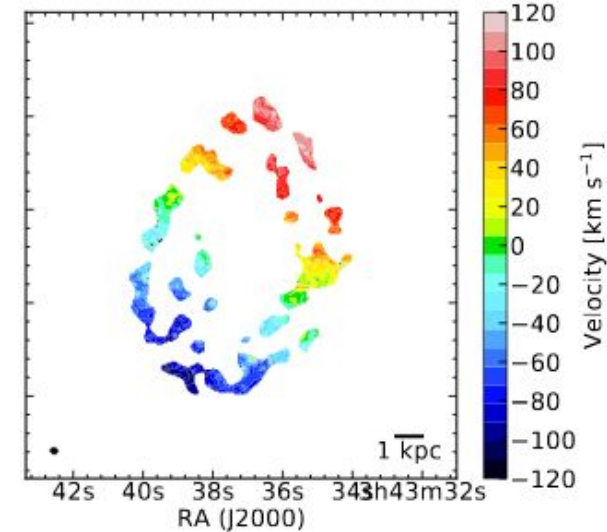
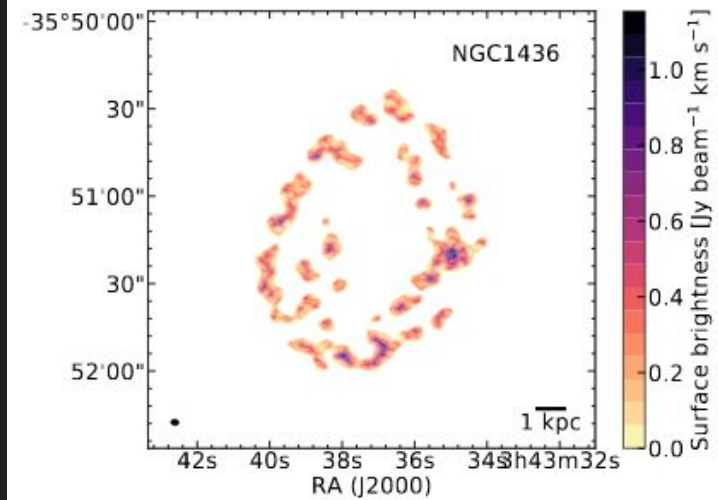
The intriguing case of NGC 1436 (or NGC 1437)



FDS images: (Iodice et al. 2016; Venhola et al. 2018; Peletier et al. 2020)

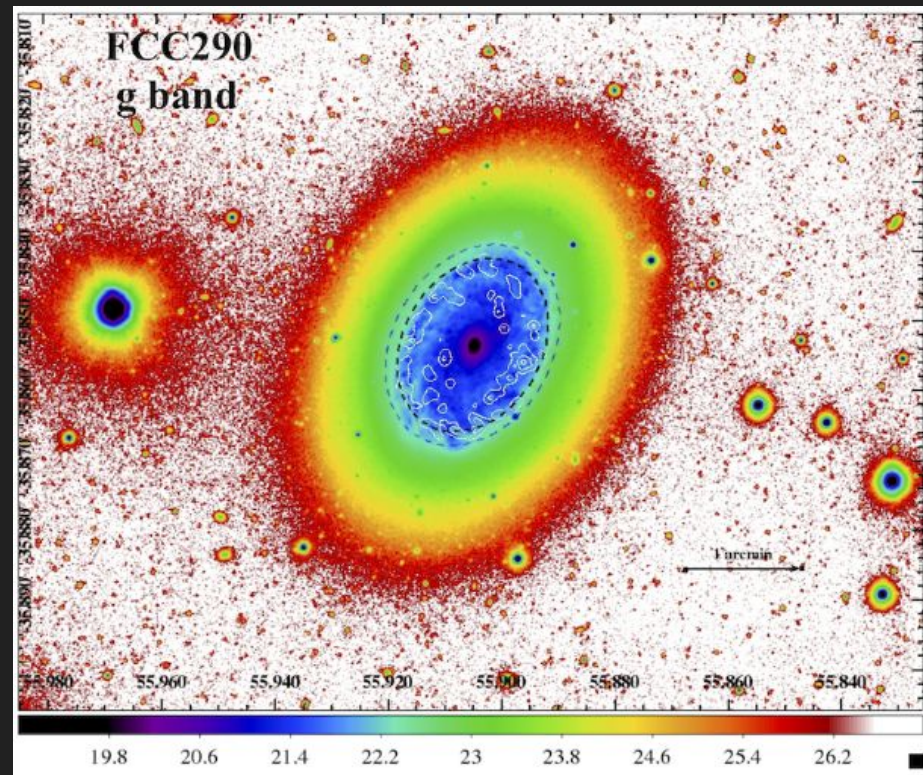
Literature

- Zabel et al 2019 (part of these data are presented here): regular H2 morphology. Only slightly H2 deficient
- Raj et al 2020: moving to S0
- Loni et al 2021: ~ 1 dex HI deficient, large H2/HI ratio.



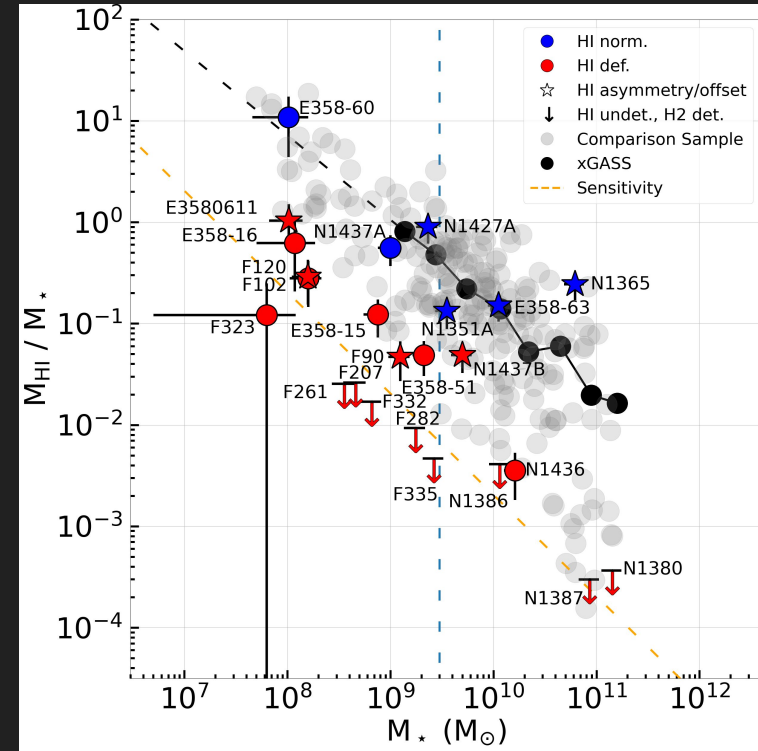
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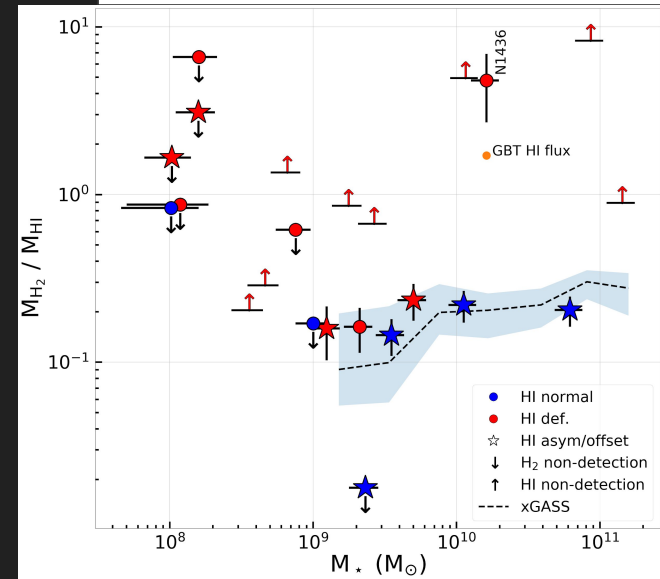
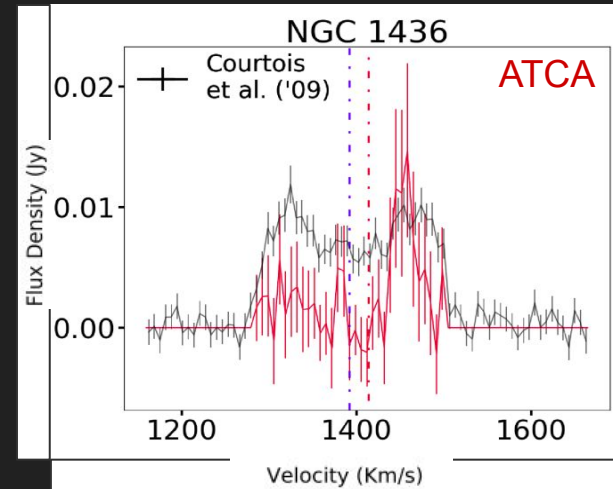
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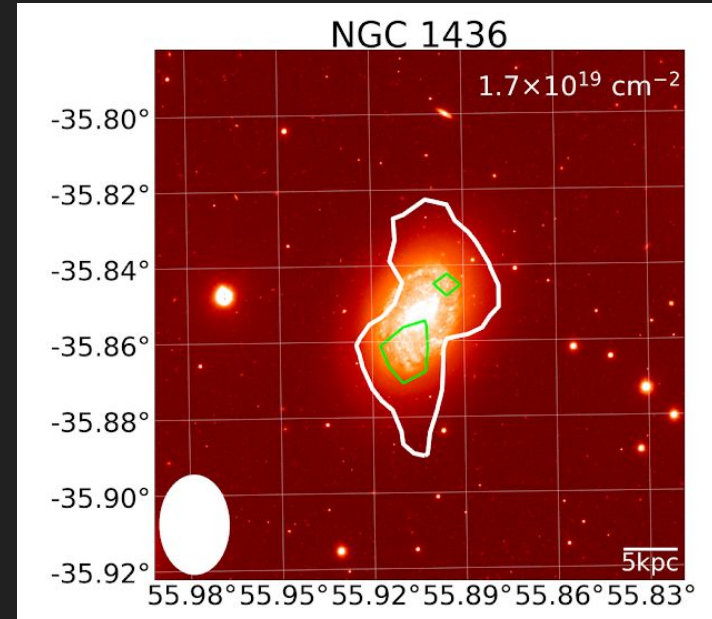
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Literature

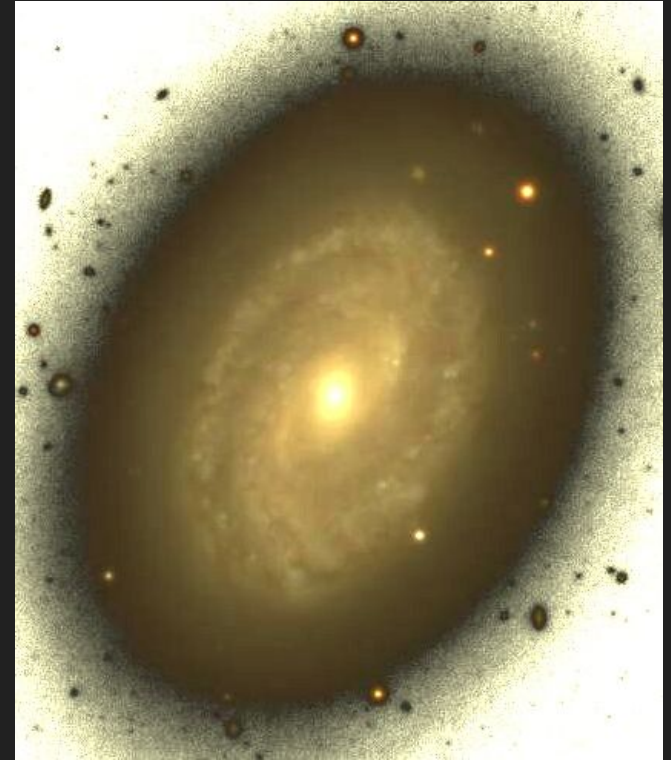
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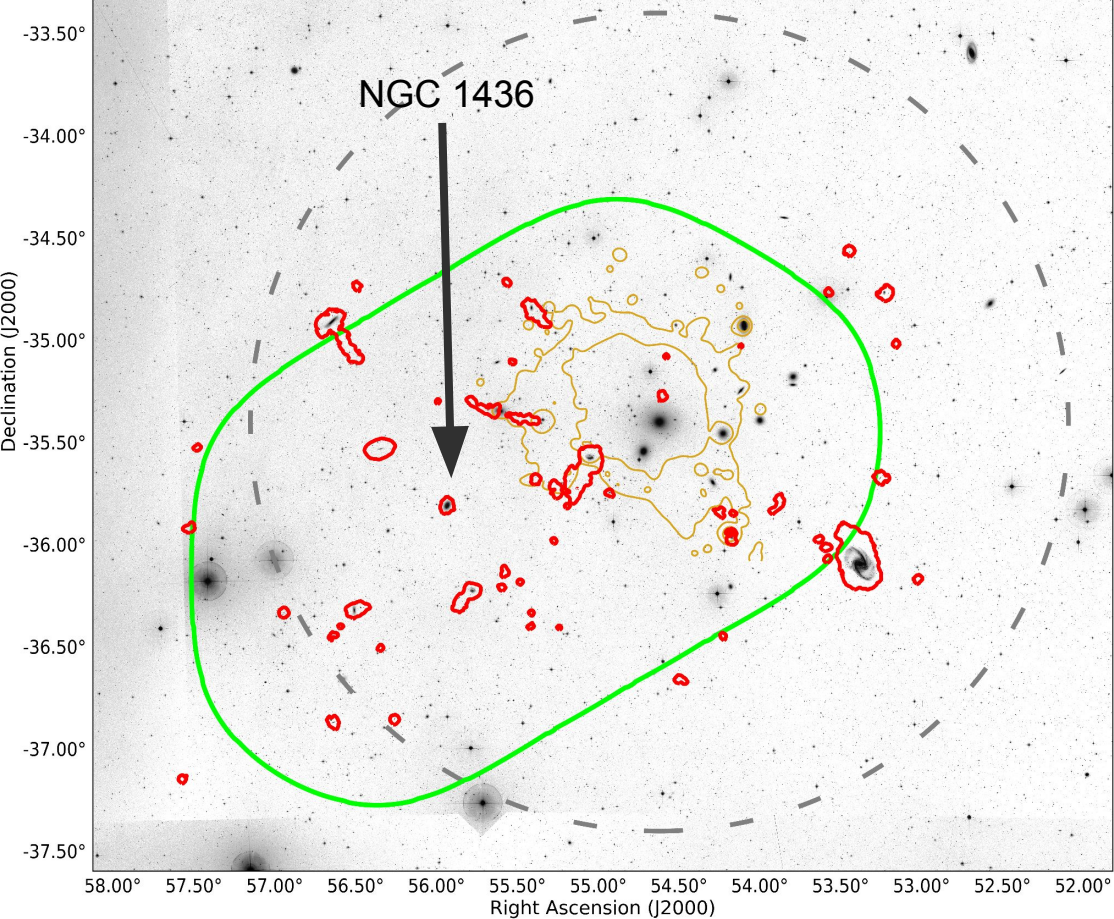


Morphological transformation in action?

- A multiwavelength analysis to characterize NGC 1436
- Data sets from: MeerKAT, ALMA and MUSE
- Spatial distribution of multiphase ISM
- SFH within the star forming and quiescent regions of the galaxy

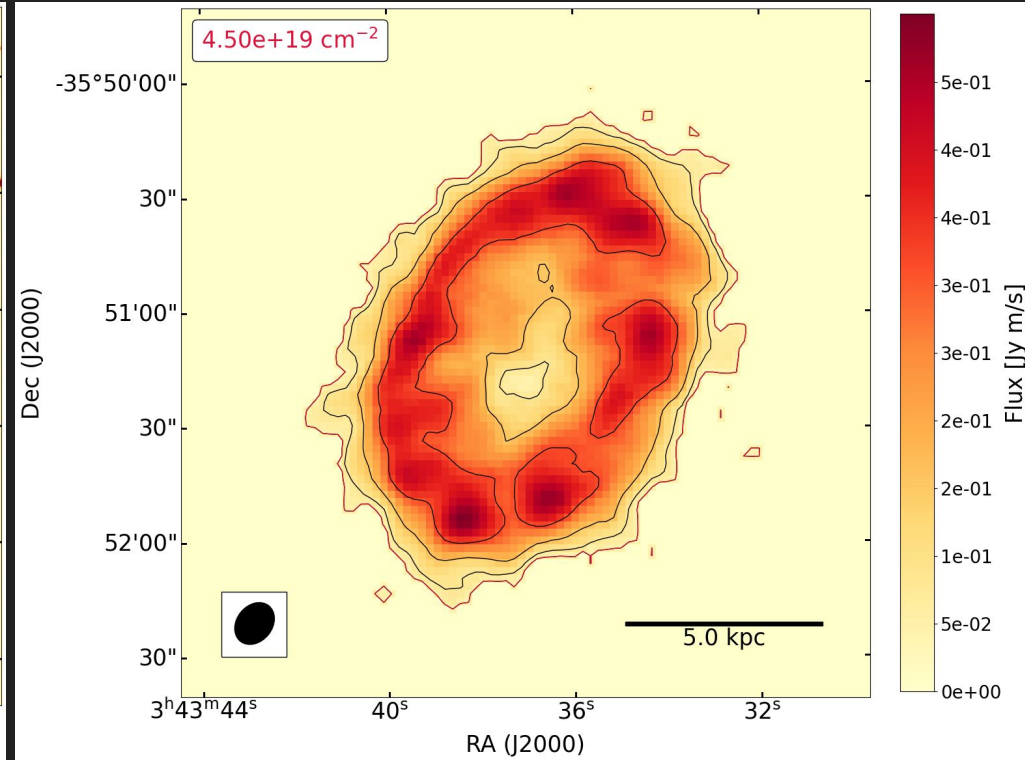
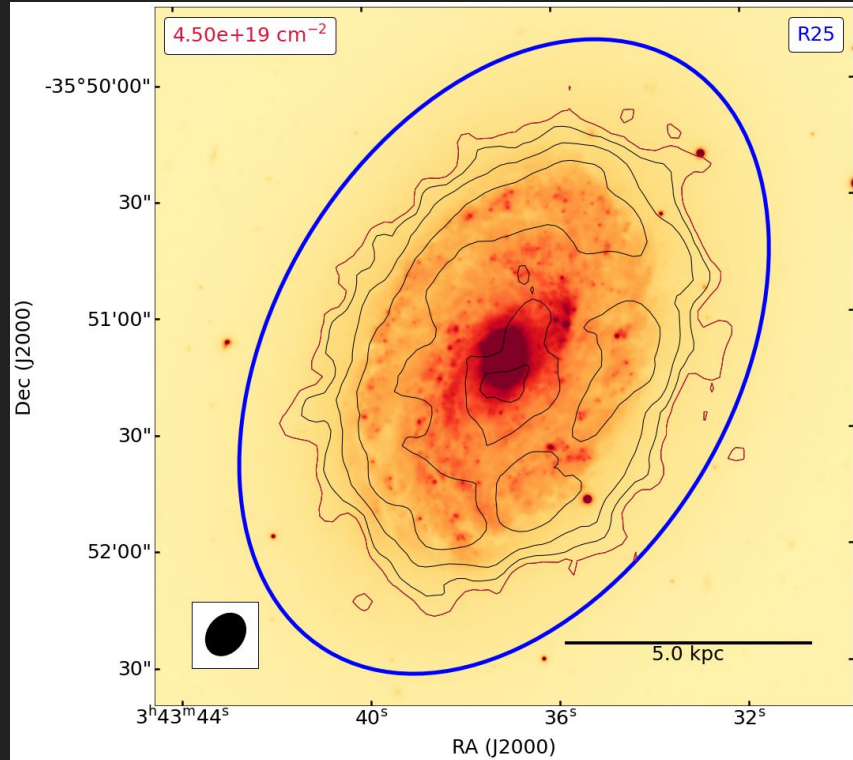


The MeerKAT Fornax Survey



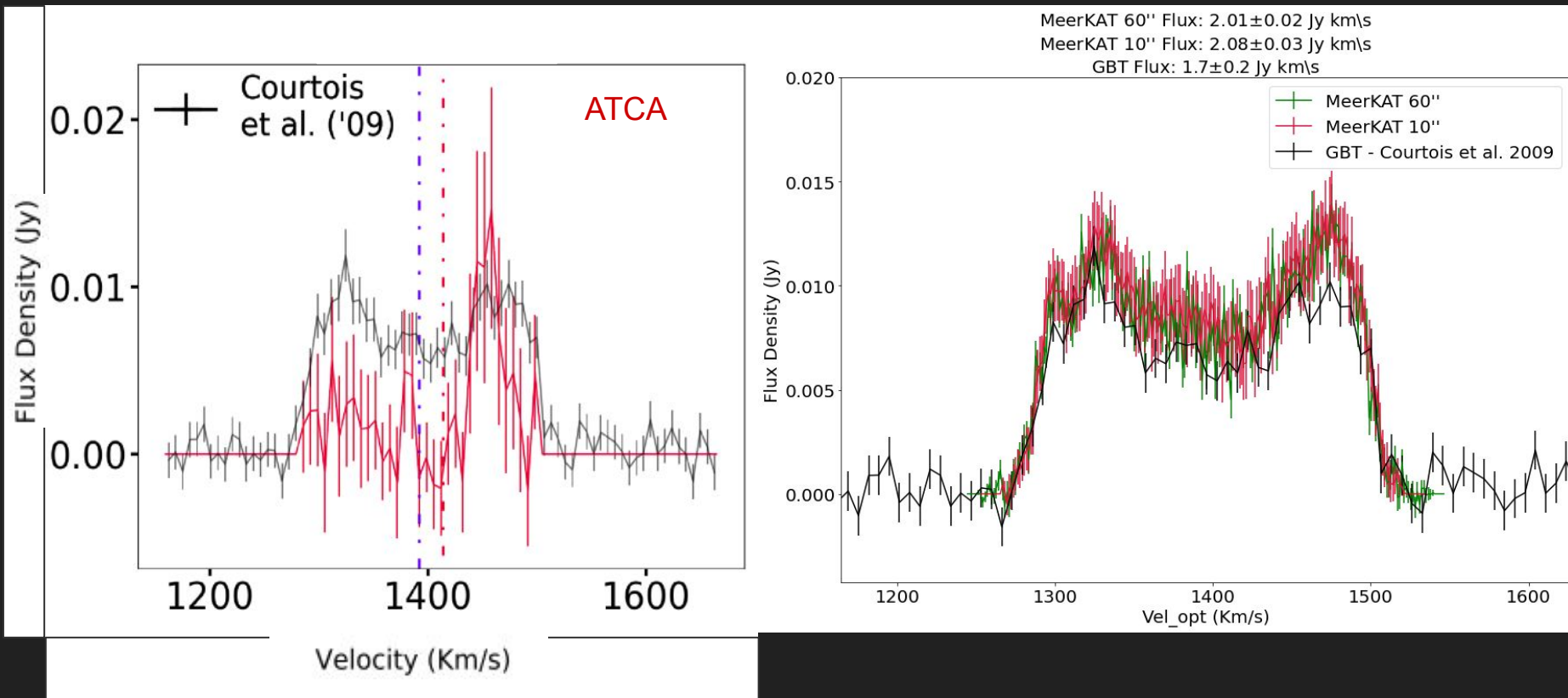
- 25% complete
- 24 mosaicked pointings so far
- $N(\text{HI})$ (3σ , 25 km/s) $\sim 10^{18} \text{ cm}^{-2}$
- Angular resolution $\sim 10''$
- Velocity resolution = 1.4 Km/s

MeerKAT: HI spatial resolution 10'' - $N_{\text{HI}}(3\sigma, 25 \text{ km/s}) = 4.5 \times 10^{19} \text{ cm}^{-2}$

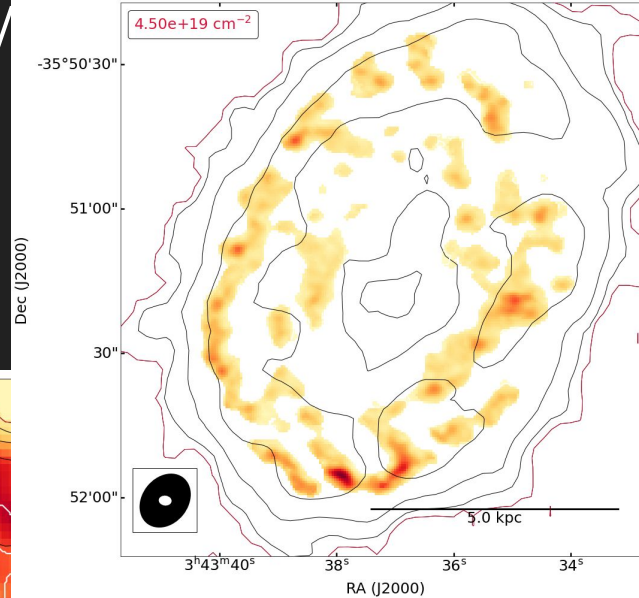
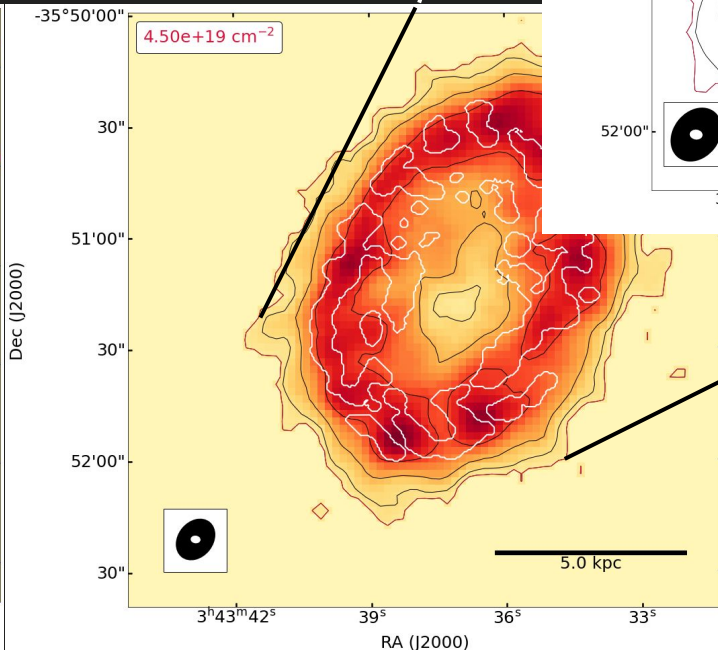
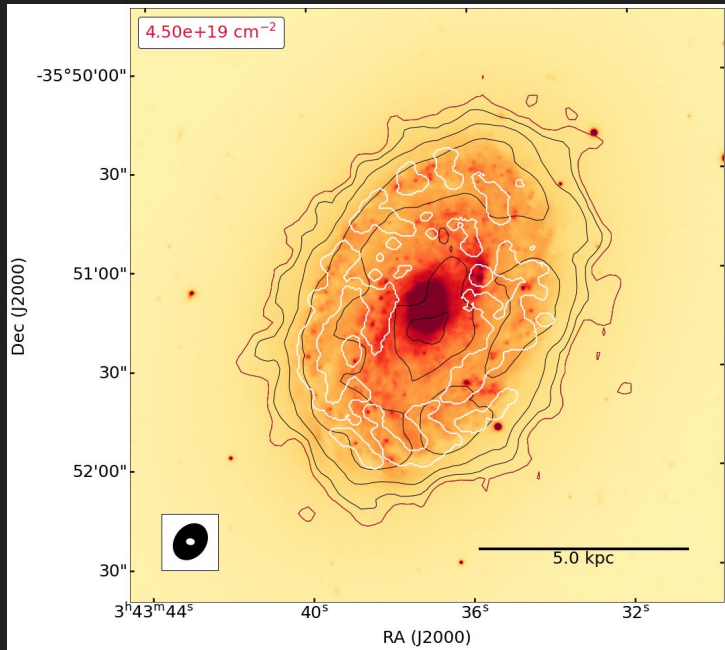


optical image from FDS

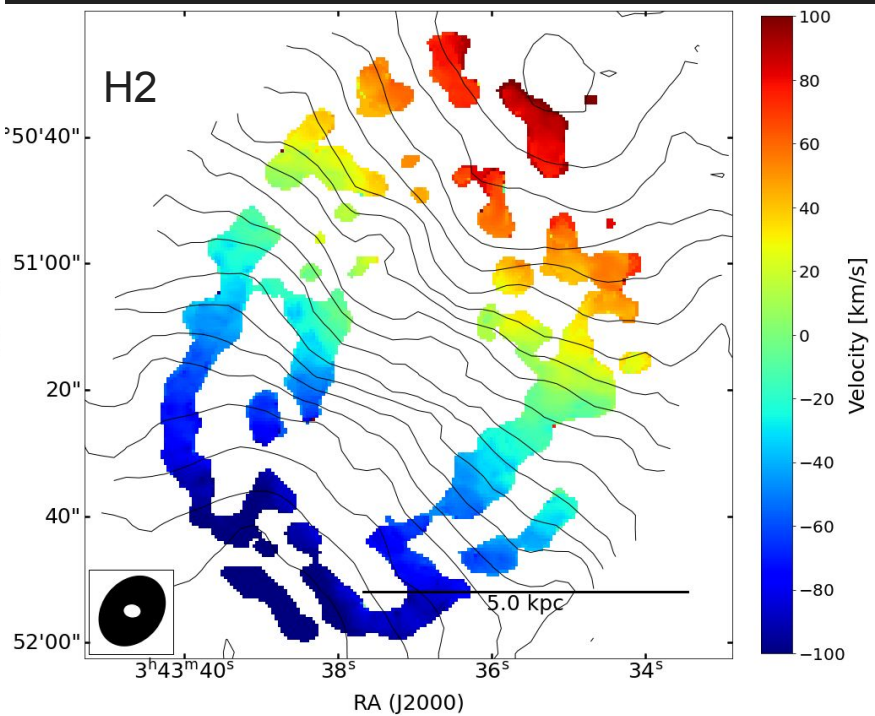
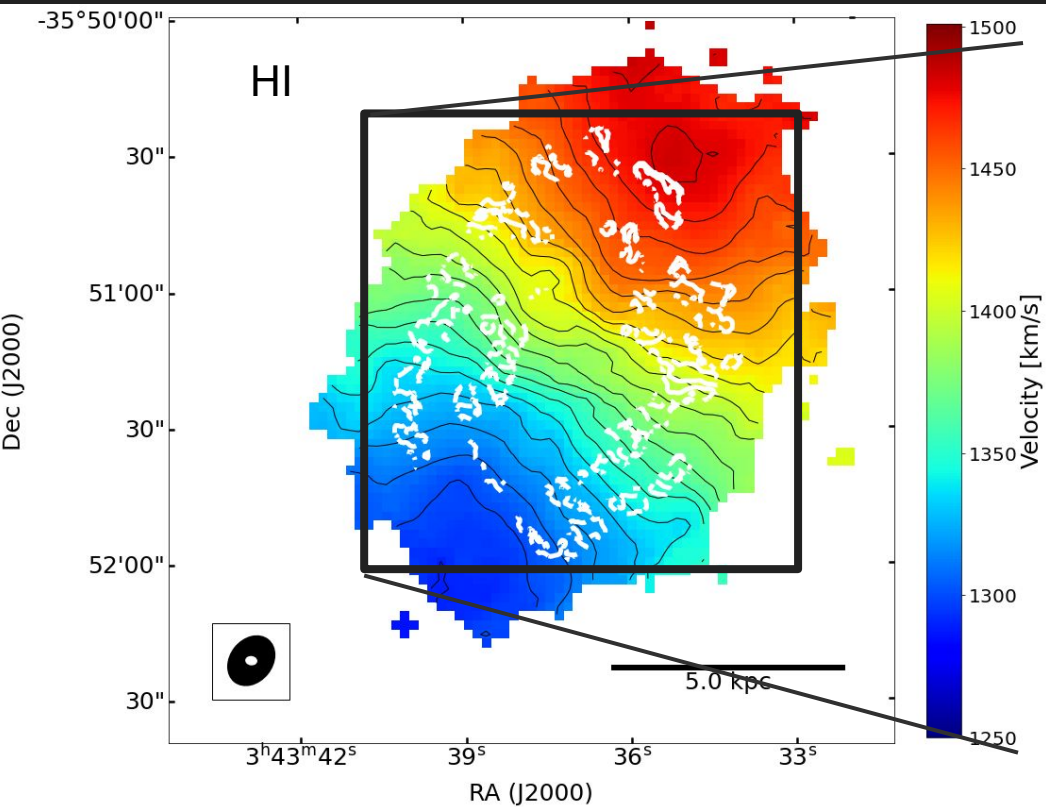
MeerKAT: comparison with single dish



ALMA compared with MeerKAT

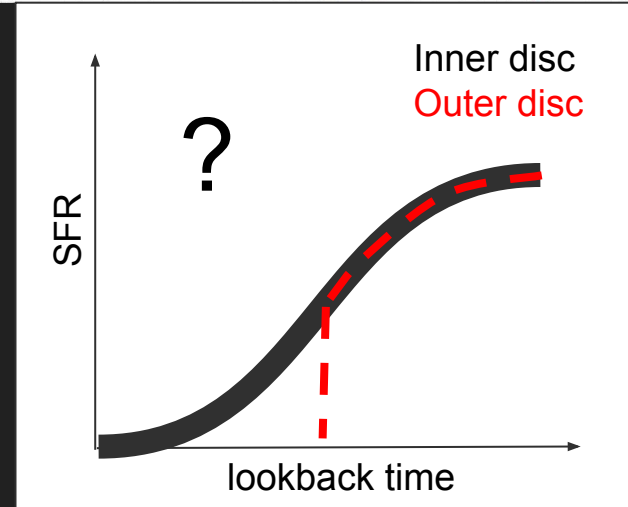
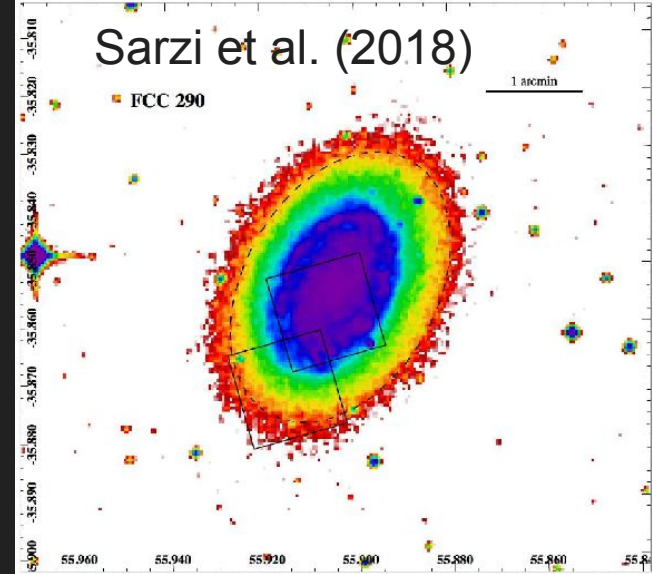


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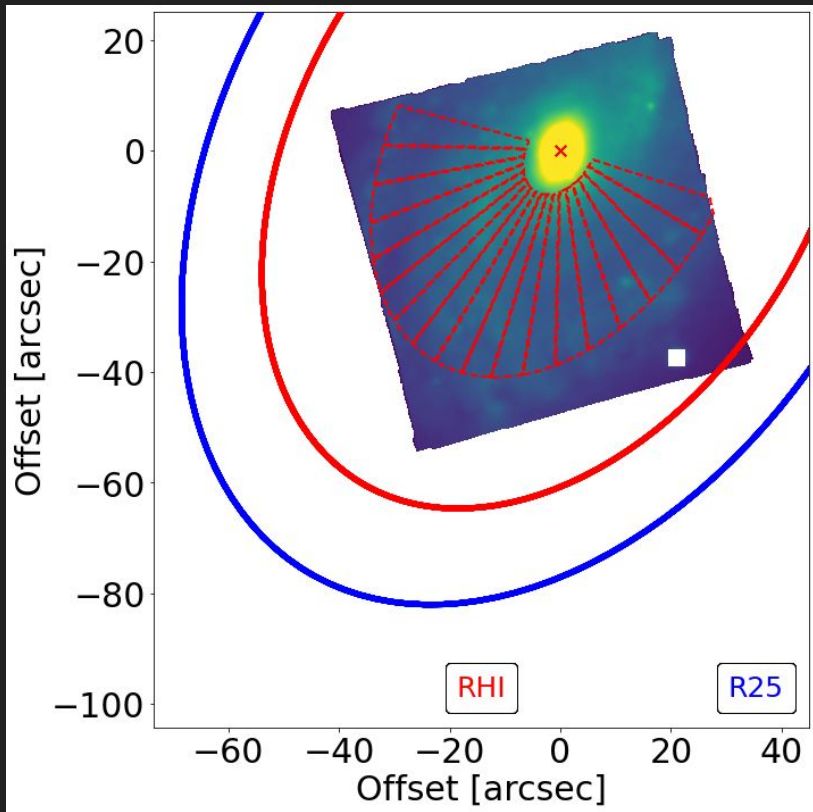
Muse

- 2 pointings
- Stellar population depends on the distance from the center
- Idea: measure the SFH in the inner star forming disc and outer quiescent disc of NGC 1436
- Is there a sharp drop in the SFH of the (today) quiescent disc?

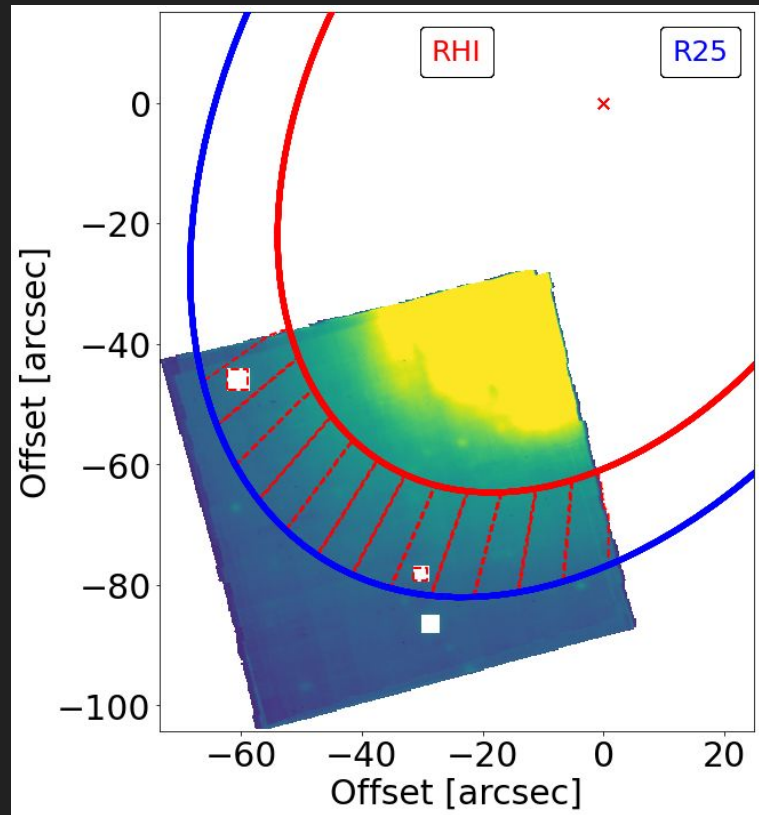


Apertures

Inner SF disc

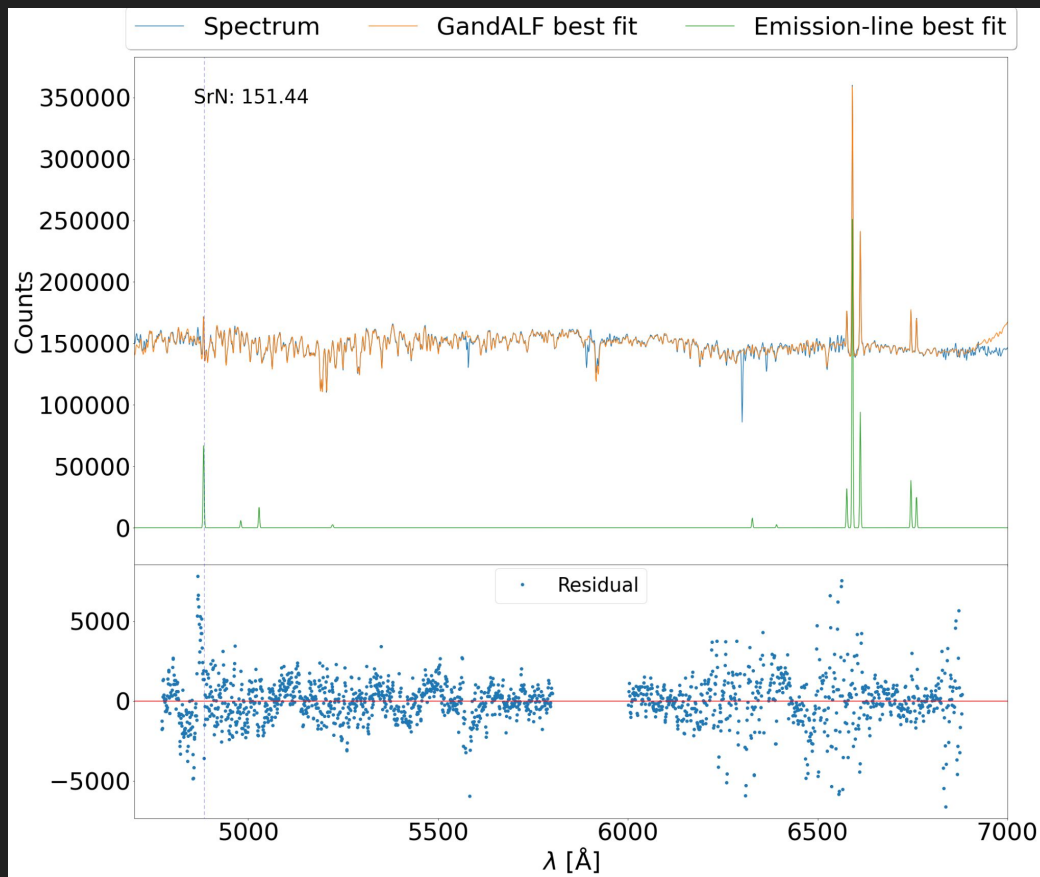


Outer quiescent disc



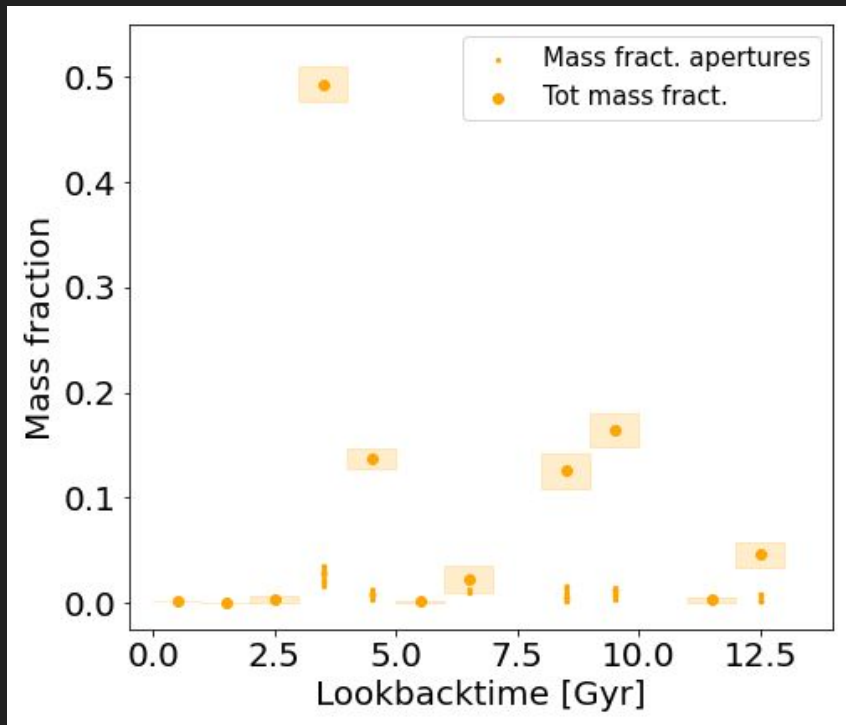
Spectral fit

- SFH leaves a footprint in the spectrum
- MILES Single Stellar Population (SSP)
- Fit pPXF and GandALF (Cappellari & Emsellem, 2004; Sarzi et al., 2006)

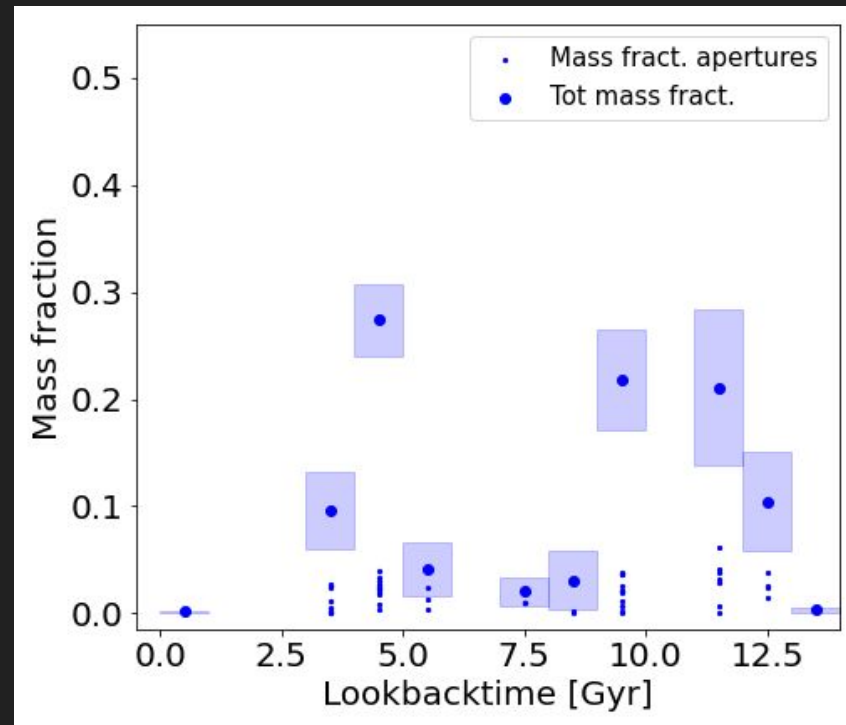


(preliminary) Mass fractions

Inner SF disc



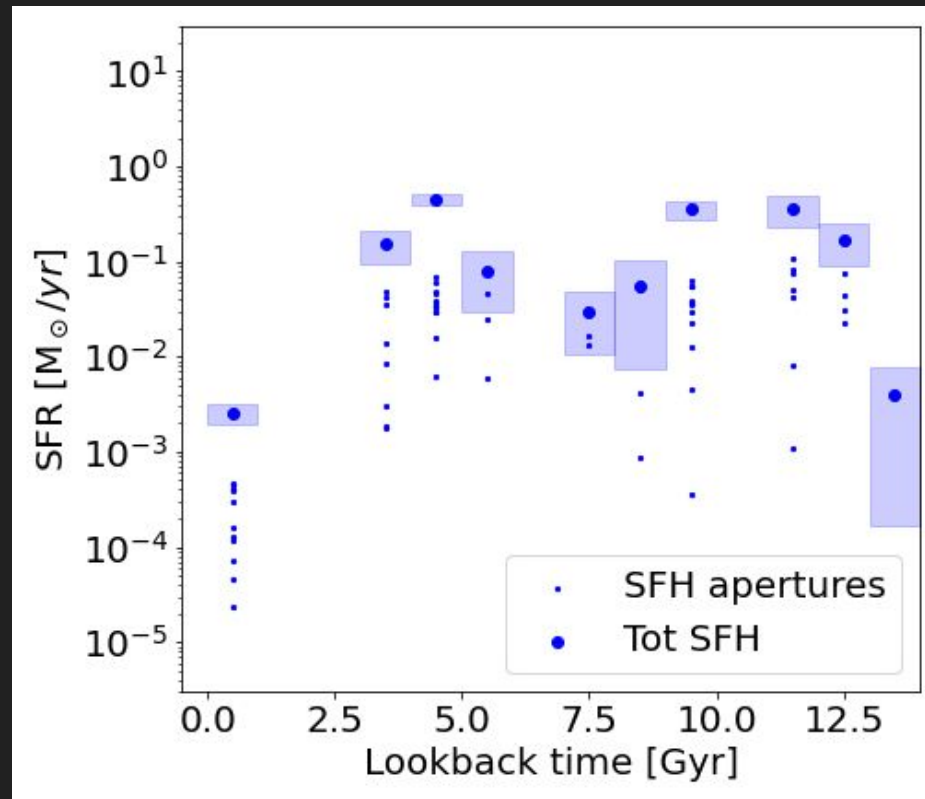
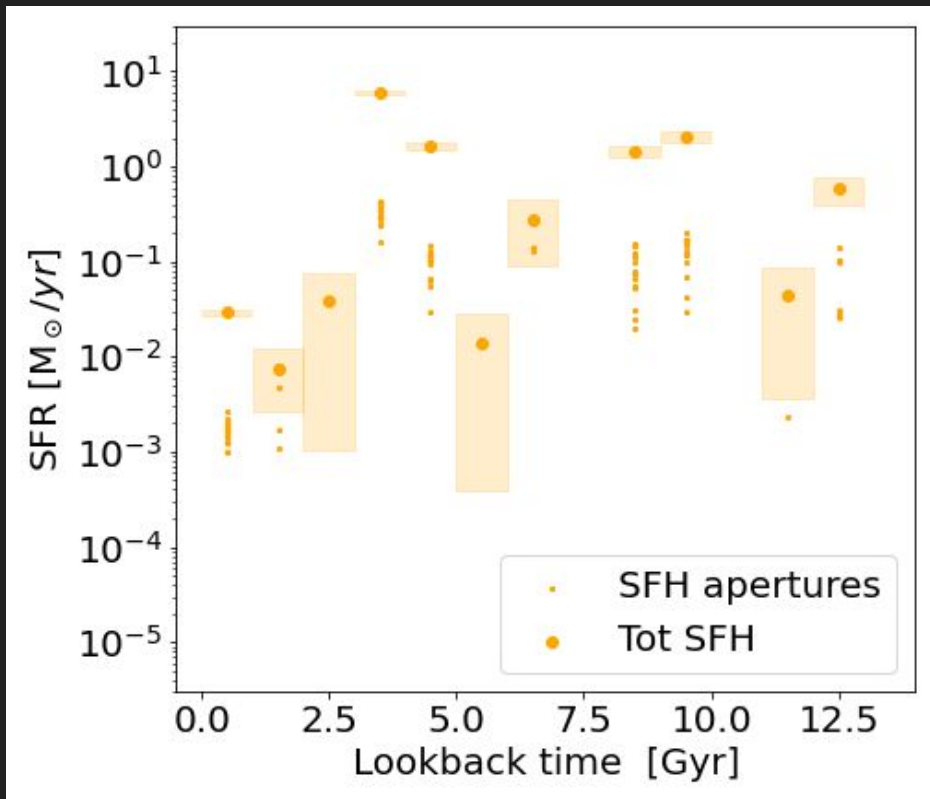
Outer quiescent disc



(preliminary) SFHs

Inner SF disc

Outer quiescent disc



Partial conclusions of a work in progress

- MeerKAT observations established NGC 1436 to be a truncated HI disc
- HI kinematics is consistent with that of H2
- SFHs within the inner and outer disc do not fit a simple idea of an outside-in morphological transformation



FDS images: (Iodice et al. 2016; Venhola et al. 2018; Peletier et al. 2020)

Thanks for your attention

MeerKAT: @ 10'' and 60''

