Asymmetric XUV disks: evidence of ram pressure stripping?

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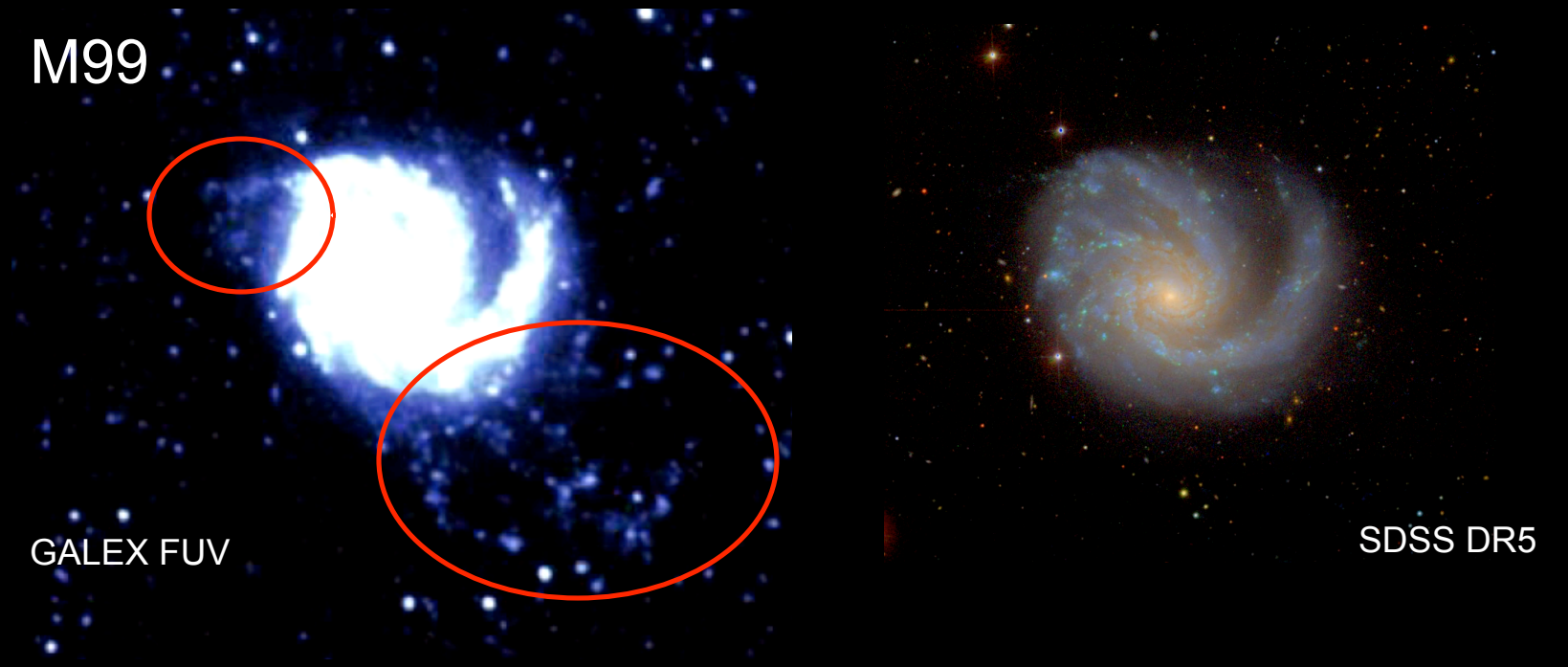
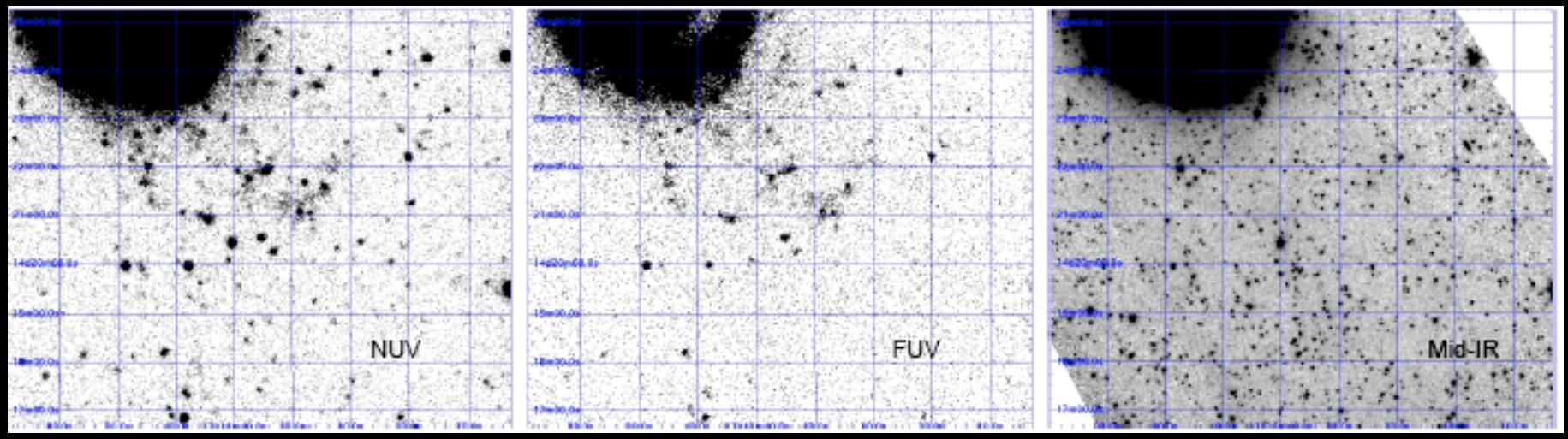
Harvard-Smithsonian CfA



Stephanie Bush, Lars Hernquist, Zhong Wang,
Chris Hayward, T.J. Cox, Dusan Keres

SFR@50 2009

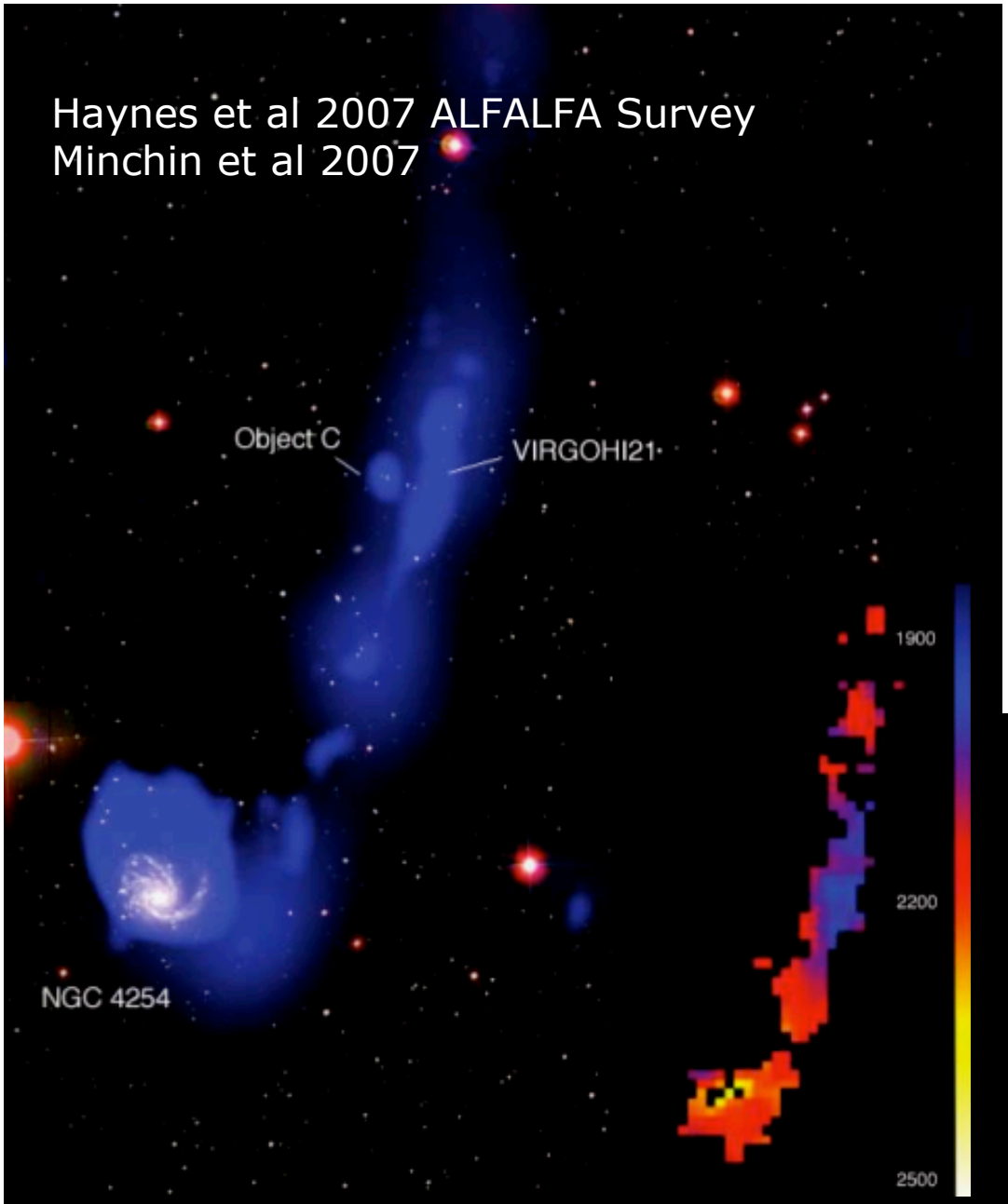
Wang et al 2009

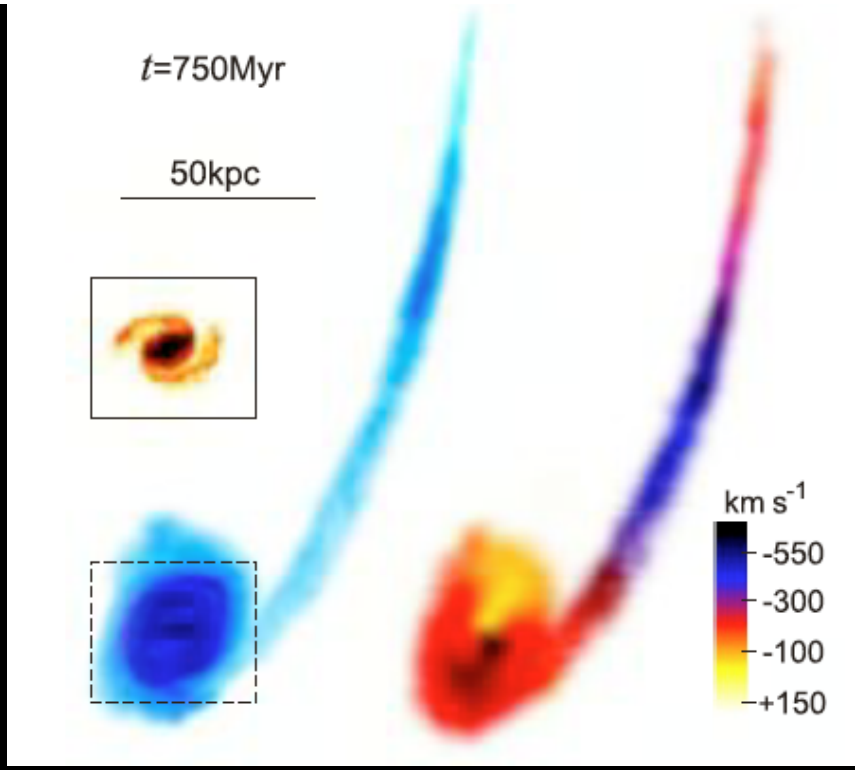


Galex NUV Galex FUV Spitzer 3.6μm

No obvious IR counterpart

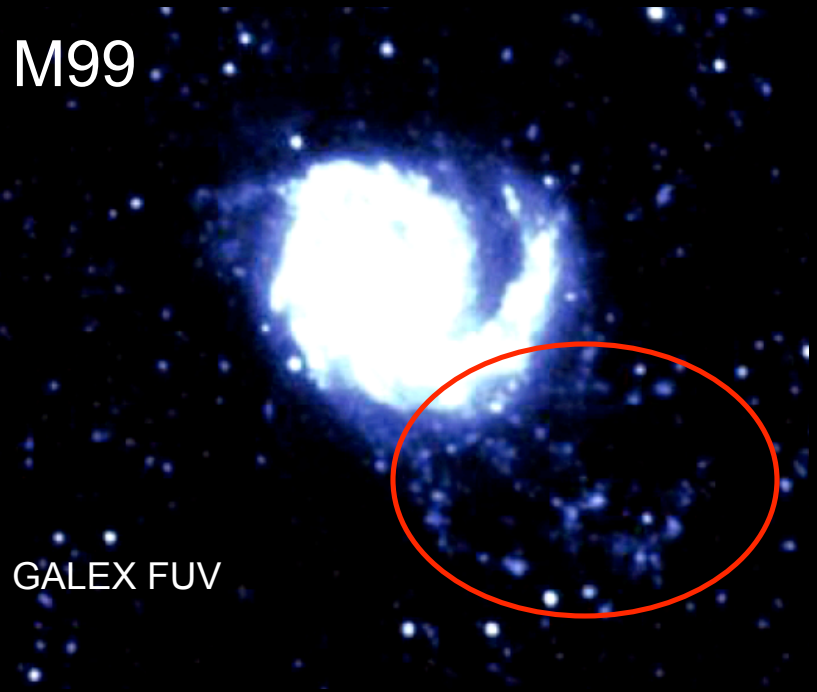
The age of the stellar population in this quadrant must be relatively young.





Duc & Bournaud 2008
Tidal Model
t=750 Myr

Arguments for ram pressure:

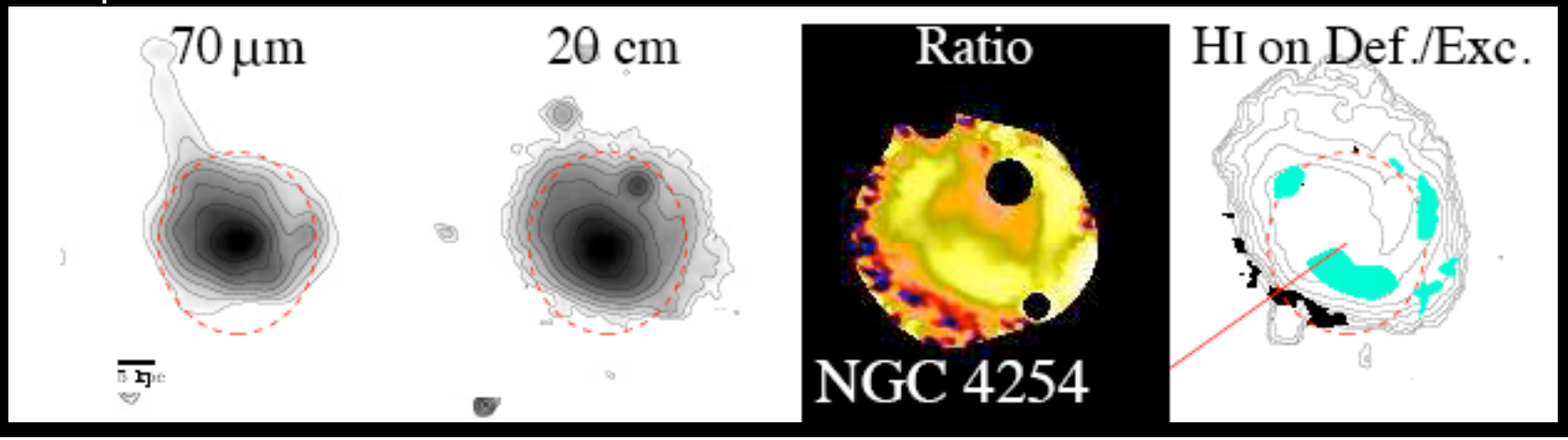


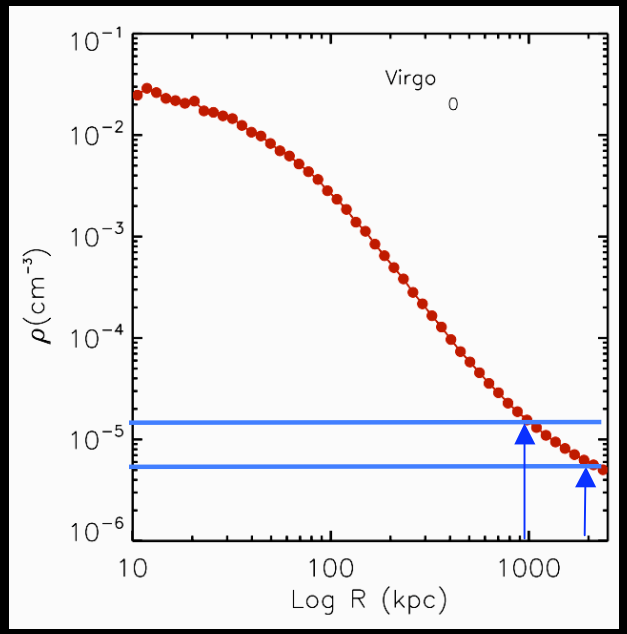
Galex UV data: Tidal interaction timescale is too long (> 750 Myr).

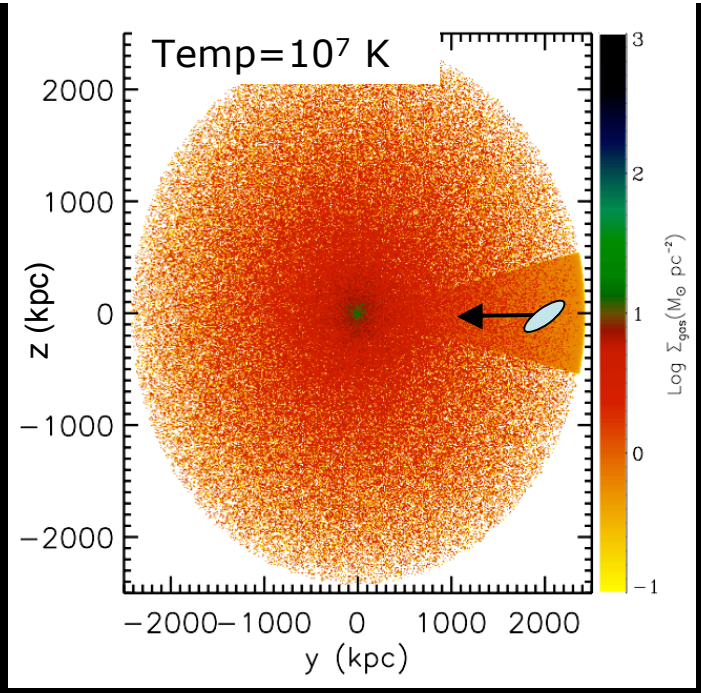
Murphy et al 2008: Radio deficit exists at the leading edge of the disk.

Murphy et al 2008

Spitzer FIR VLA radio continuum



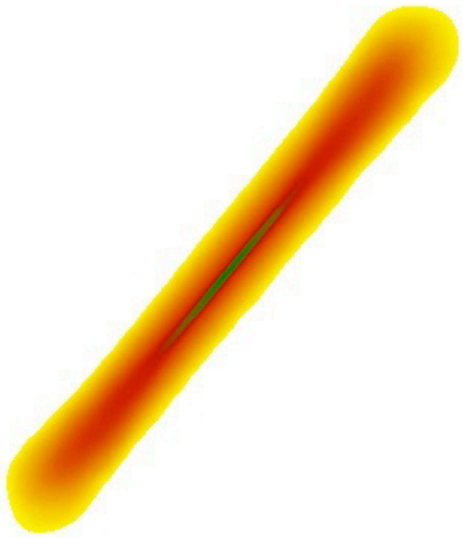




Gaseous disk extends 3x the optical scale length

v = 1500 km/s

Gas Density

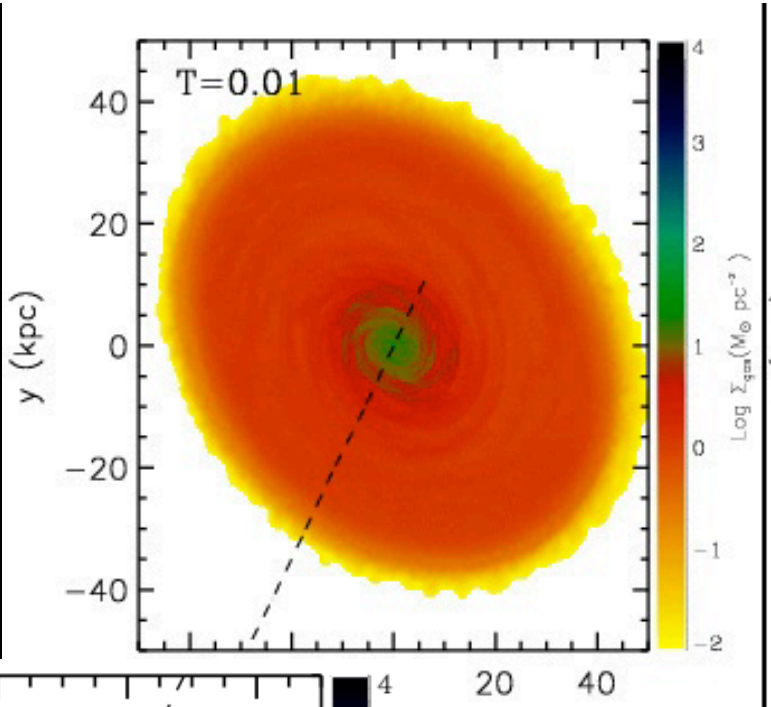


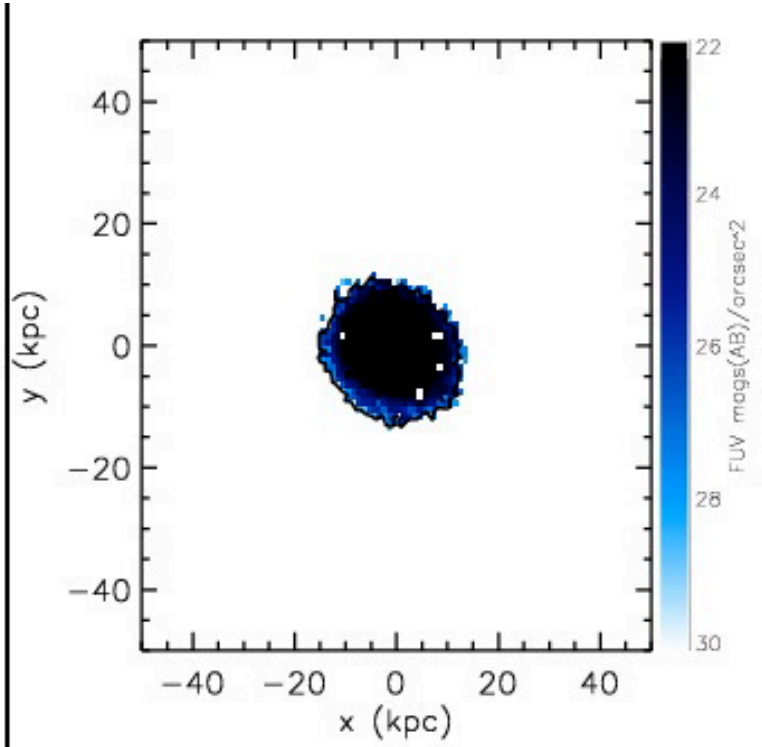
SFR Density

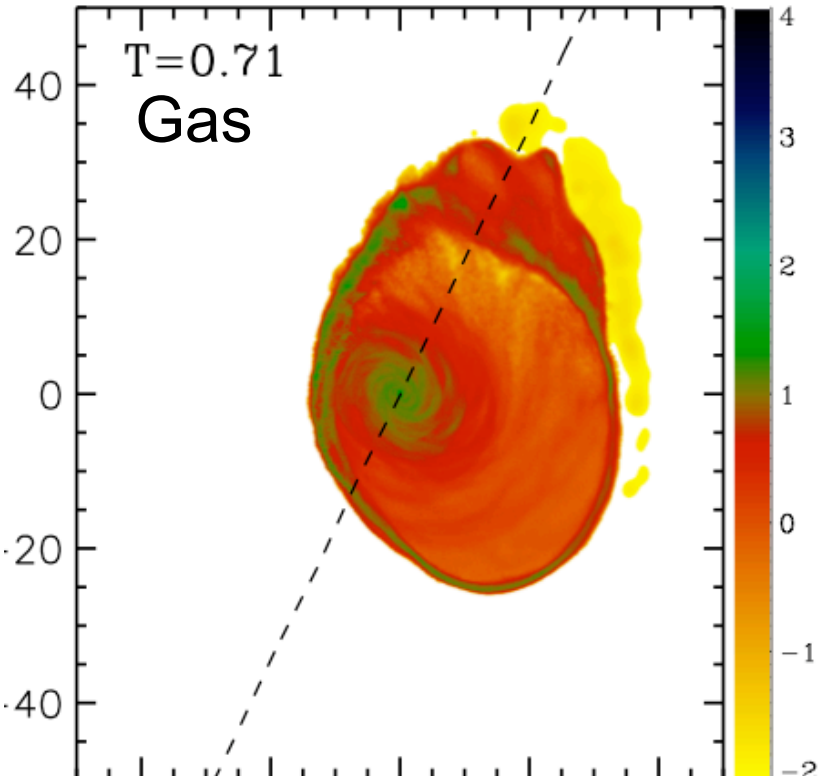
M99

v=1300 km/s
i = 10^0

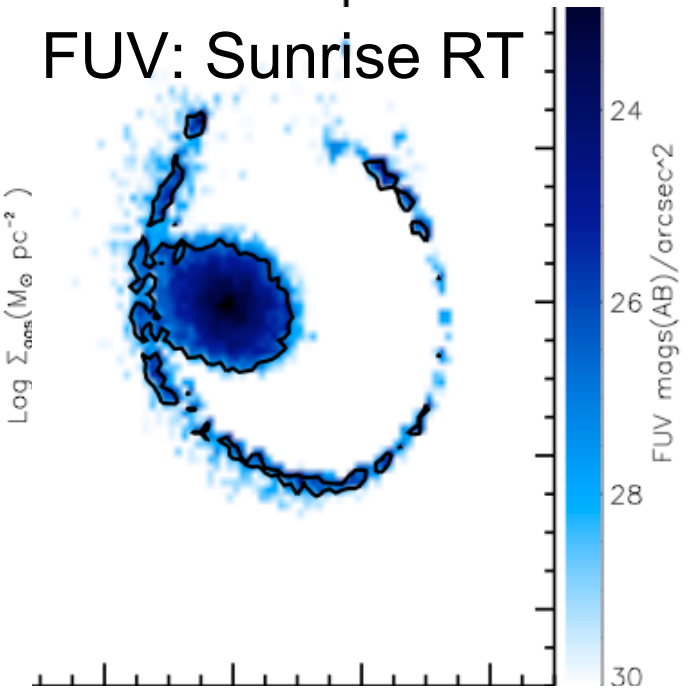
Vrad = 1000 km/s
i = 40^0

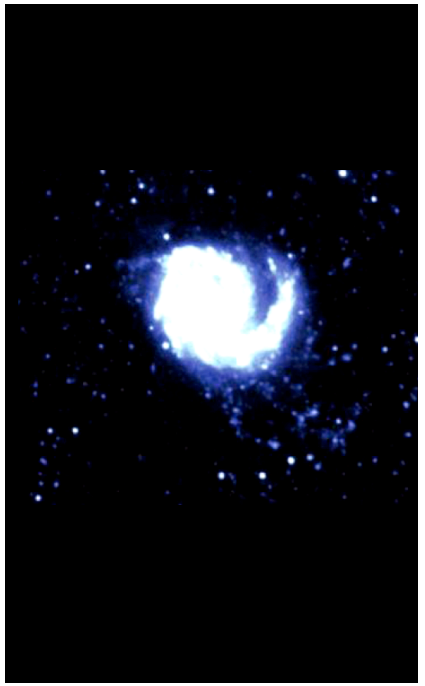






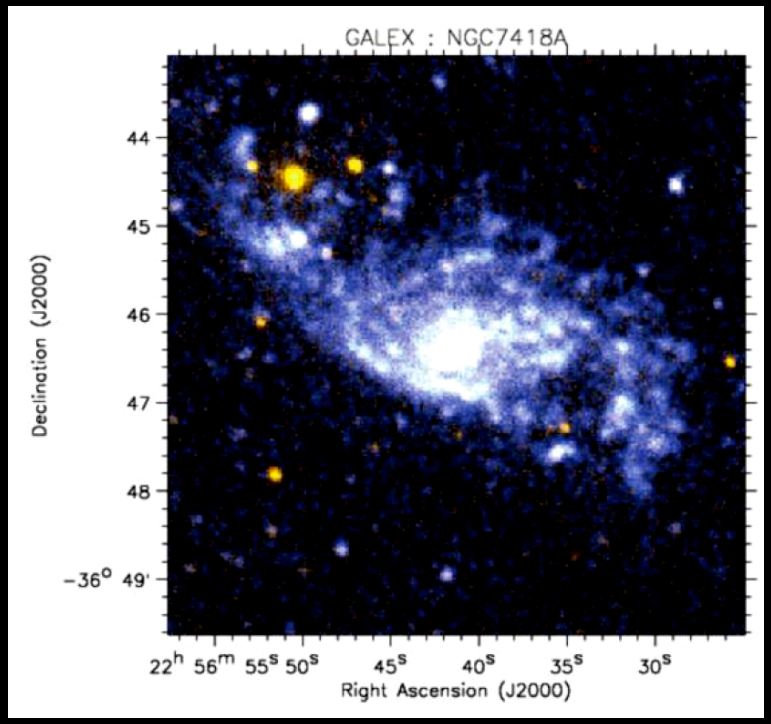
FUV: Sunrise RT

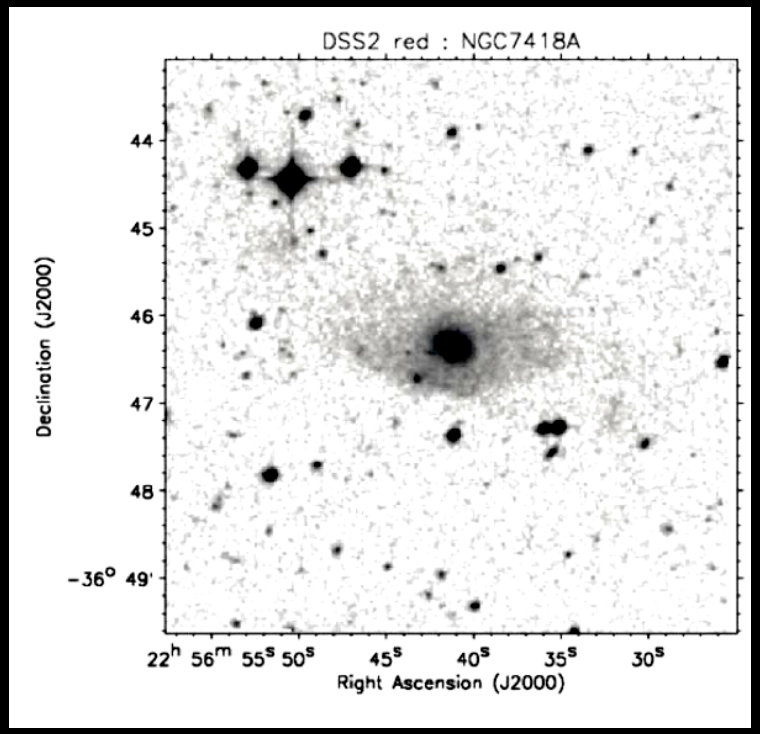




Other Examples: NGC 7418A?

Thilker et al 2008





Is an isolated spiral in the loose group IC 1459.

Osmond & Ponman (2004) found that this group has extended intragroup x-ray emission.

Example of sharp UV edges owing to the compression of the leading disk edge.

Conclusions

- Ram pressure owing to a galaxy's motion through a gaseous medium of modest density can induce star formation at the leading edge of its gaseous disk.
- These stars will likely be extra-planar, but should retain kinematic signatures of the disk.
- This process may explain the origin of highly asymmetric XUV disks in isolated disk galaxies.
- Reproducing the UV emission in M99 will allow us to quantify the significance of ram pressure stripping in the formation of its 250 kpc long HI stream and place constraints on the gas density in the outskirts of the Virgo cluster.