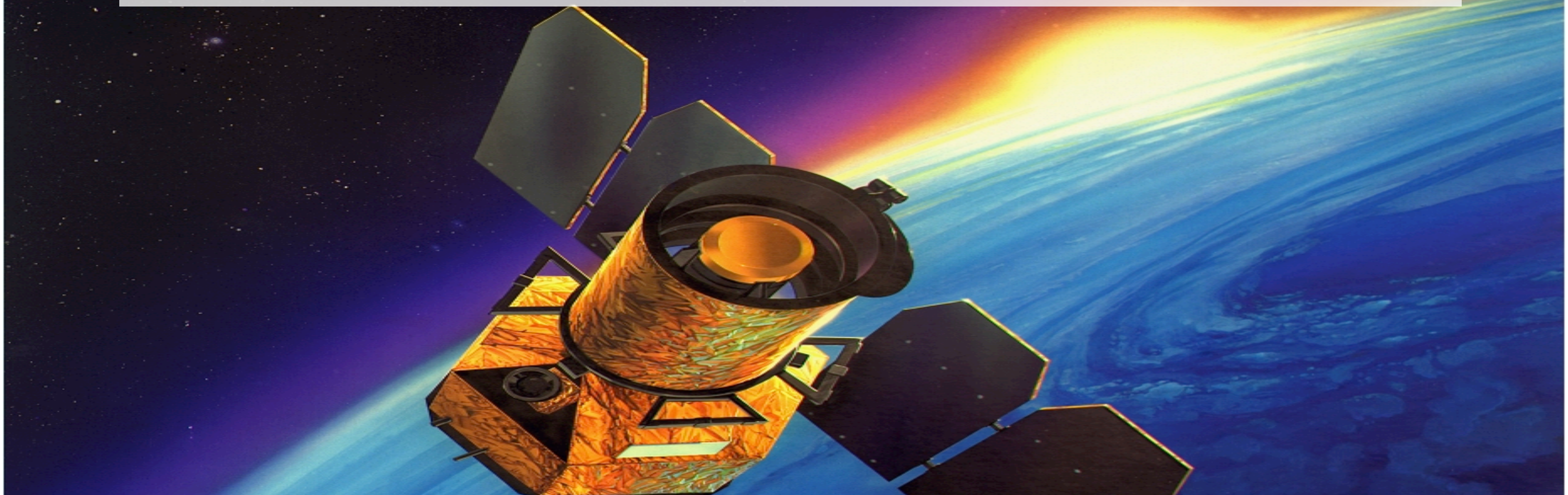
The Host Galaxies of GALEX Lyman Alpha Emitters



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R. M Rich (UCLA)

The Lyman Alpha Universe
IAP Paris France, July 6

Understanding LAEs & Lyα Escape

Questions:

1. What can/do we learn about Lyα emission from HII regions from the GALEX LAE sample?

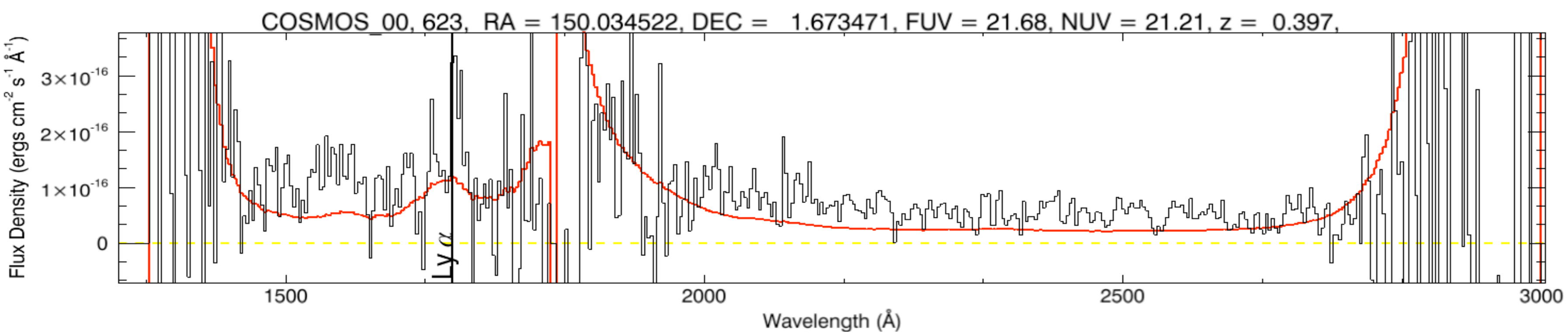
   Can this sample probe the relative role played by

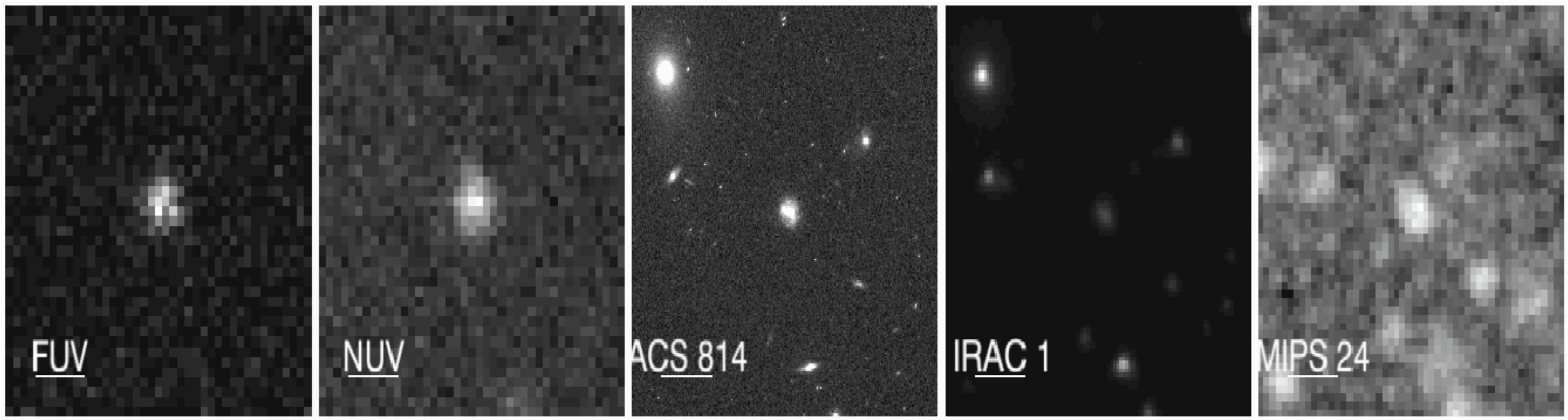
   - gas kinematics
   - gas geometry/distrubtion
   - Dust

2. What are the properties of the GALEX LAEs: morphology, L_{IR}, L_{uv}
3. Do LAE host galaxies differ from other galaxies?

GALEX Grism Spectroscopy

- 1 degree diameter FOV
- Resolution ~ 1 nm
- $\lambda \sim$ 140-280 nm
- FUV/NUV < 21 AB



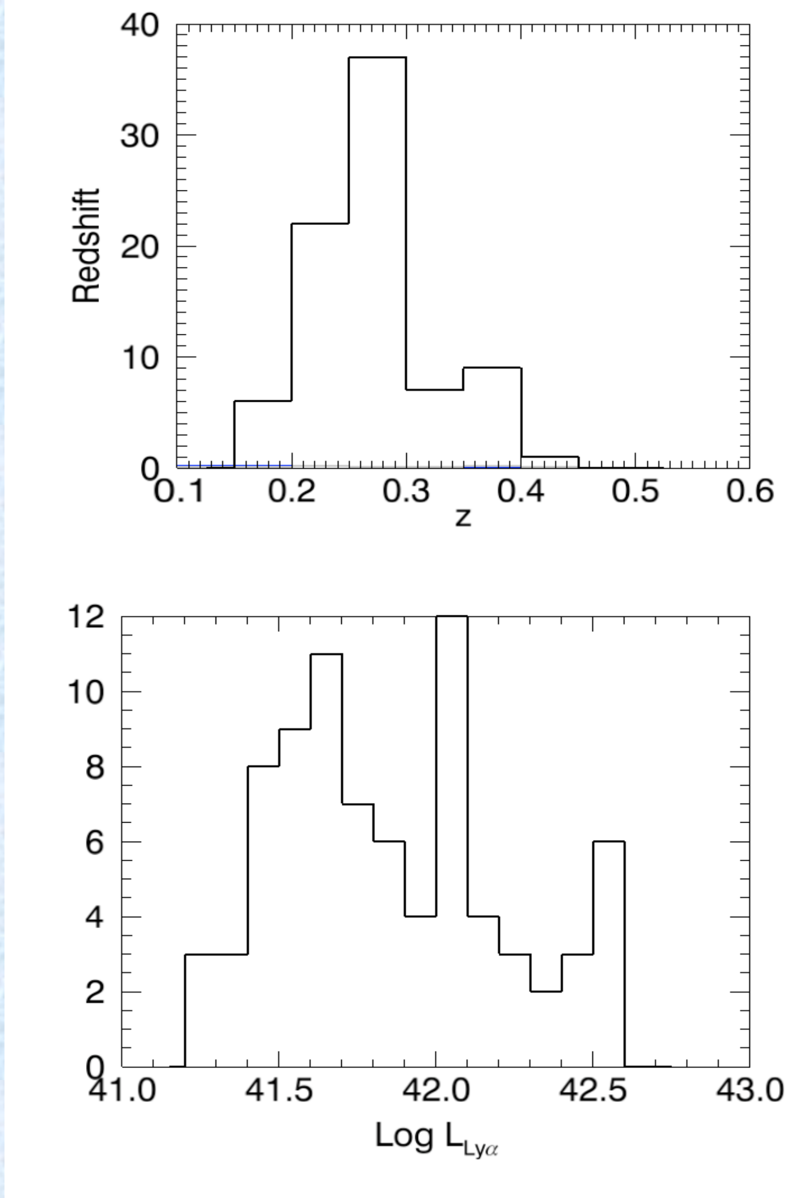


THE GALEX LAEs

Discovered by Deharveng et al. 2008
- 115 galaxies at z~0.3
- Lyα S/N ~3-25
- In fields (AEGIS, COSMOS, CDFS) with HST, Spitzer, etc.

GALEX LAEs: ideally suited to study the effects of dust and geometry on Lyα escape.

The low resolution of the GALEX grism limits the study role of kinematics on Lyα escape.



Bimodal Luminosity Distribution

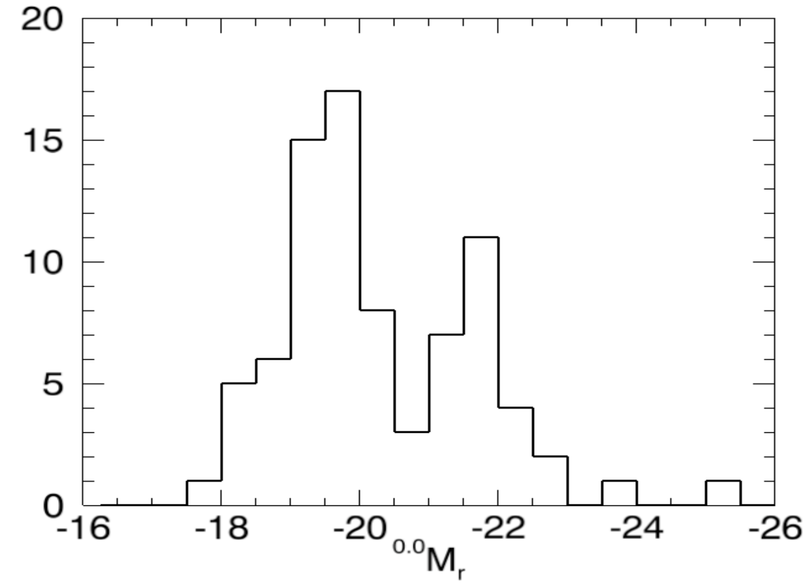
Bimodal stellar population age distribution for GALEX LAEs IN AEGIS (Finkelstein et. al 2008)

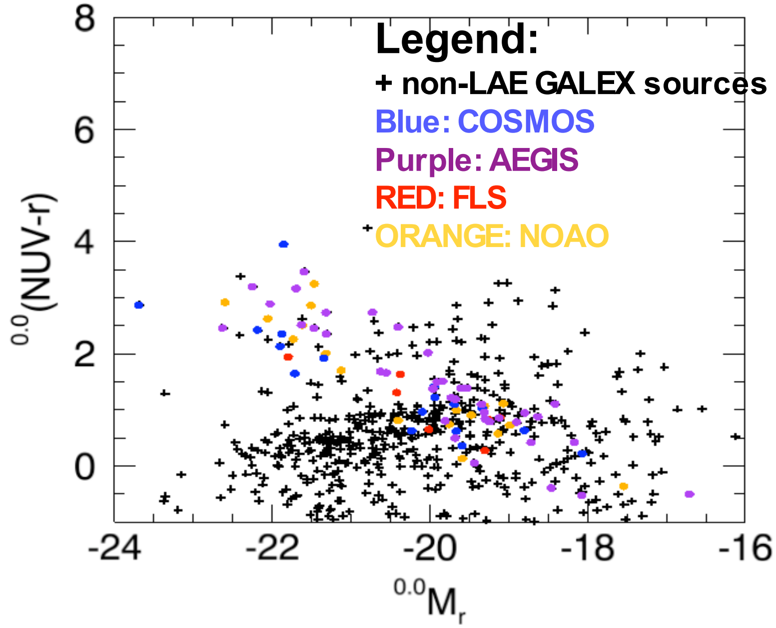
age < 15 Myr

age > 450 Myr

The more luminous LAEs are red.

Why bimodal distribution?





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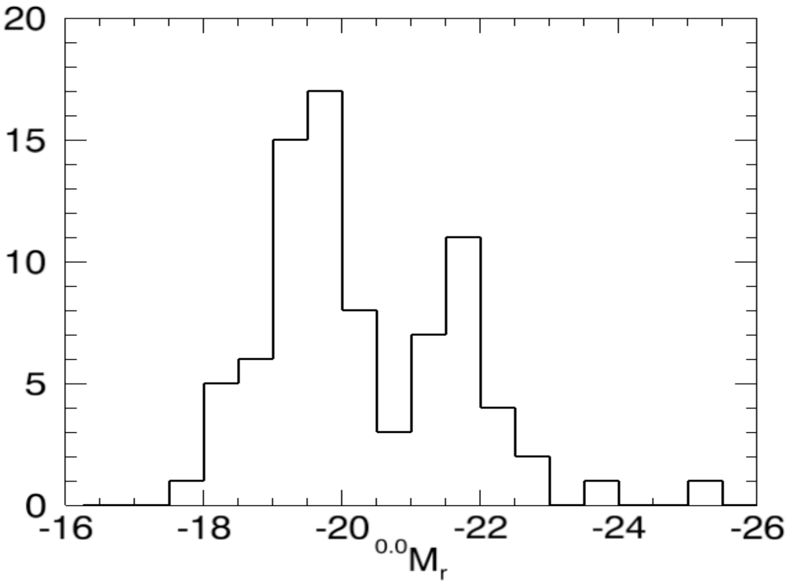

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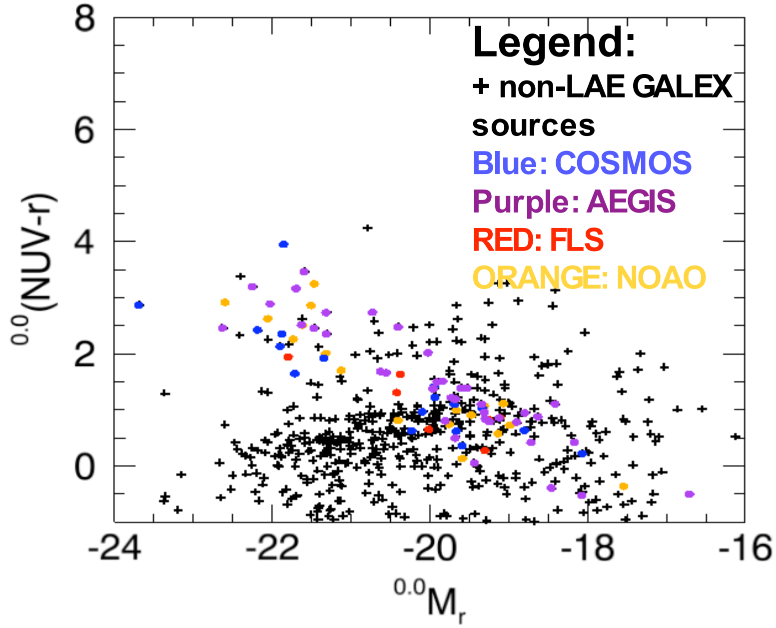
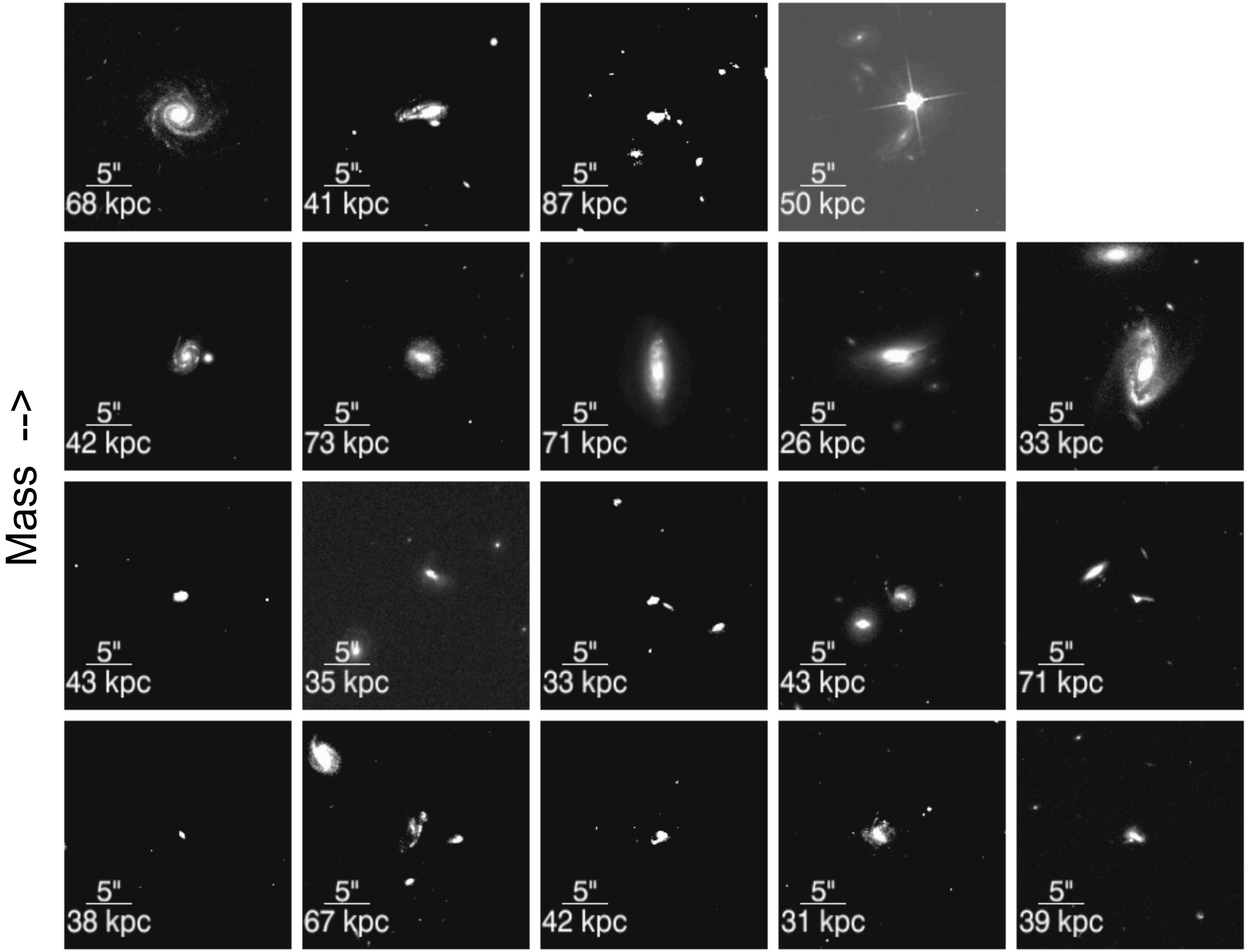
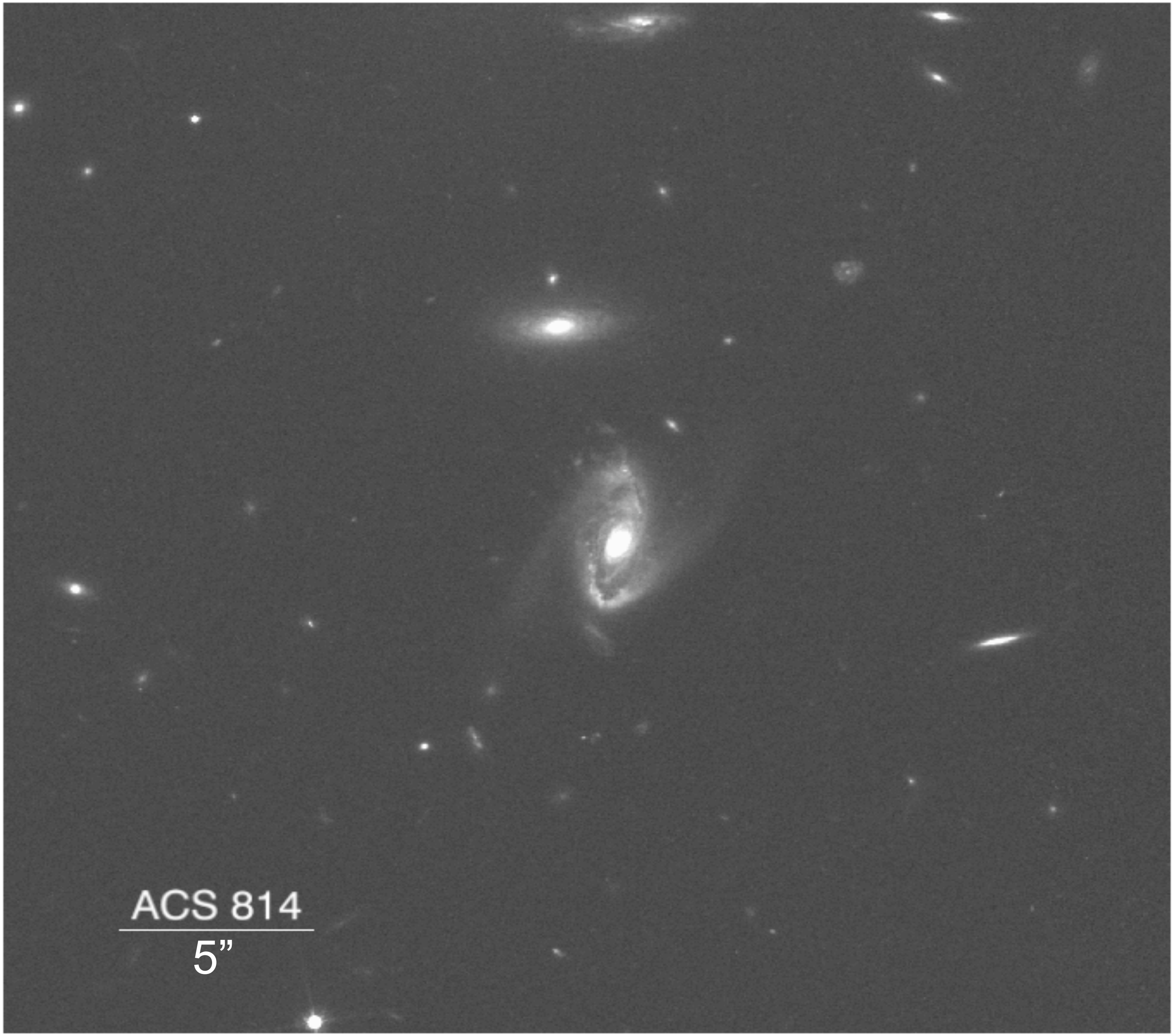


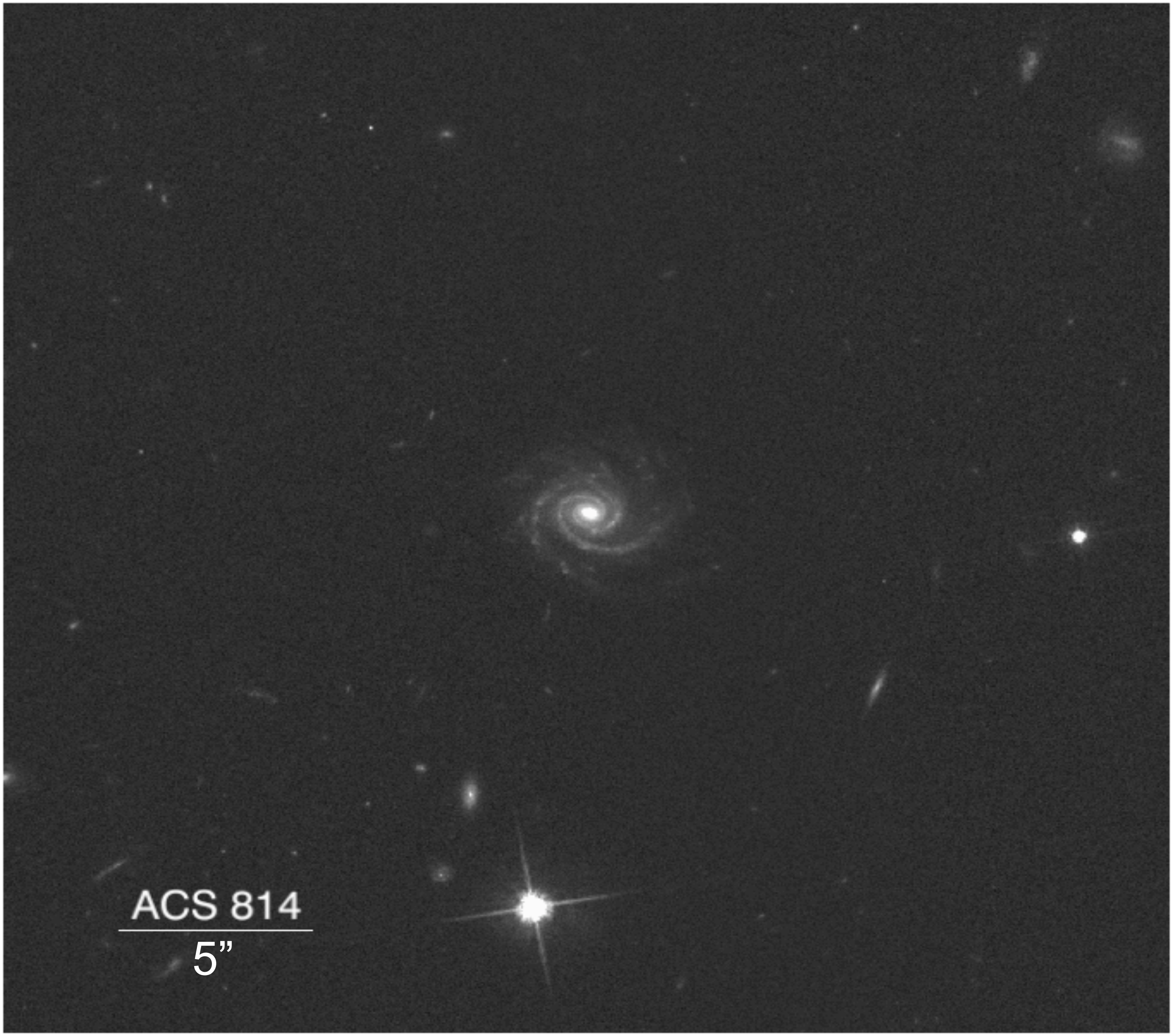
Why bimodal distribution?

Morphology



Mass -->
5"
68 kpc
5"
41 kpc
5"
87 kpc
5"
50 kpc
5"
42 kpc
5"
73 kpc
5"
71 kpc
5"
26 kpc
5"
33 kpc
5"
43 kpc
5"
35 kpc
5"
33 kpc
5"
43 kpc
5"
71 kpc
5"
38 kpc
5"
67 kpc
5"
42 kpc
5"
31 kpc
5"
39 kpc


ACS 814
5”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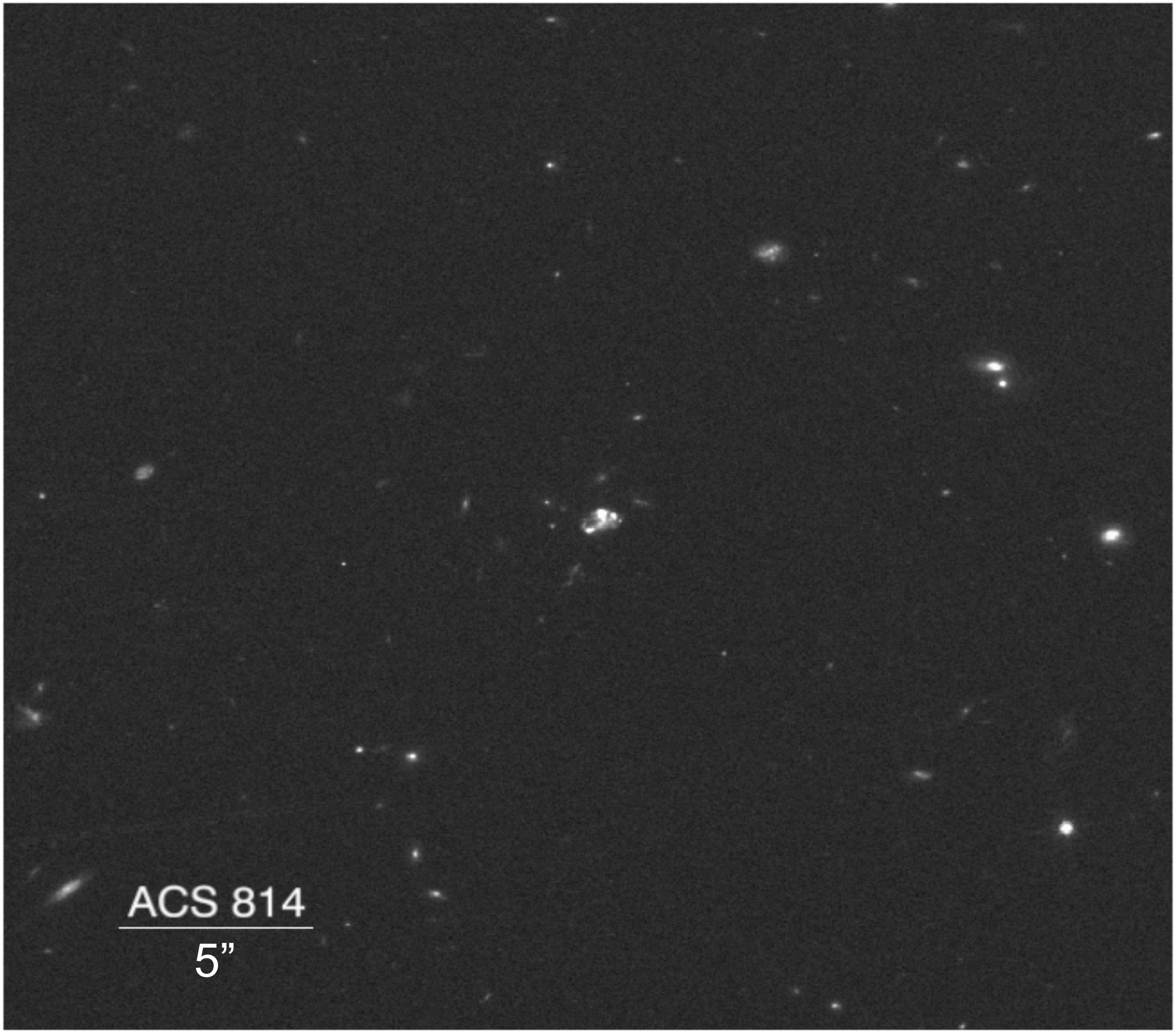
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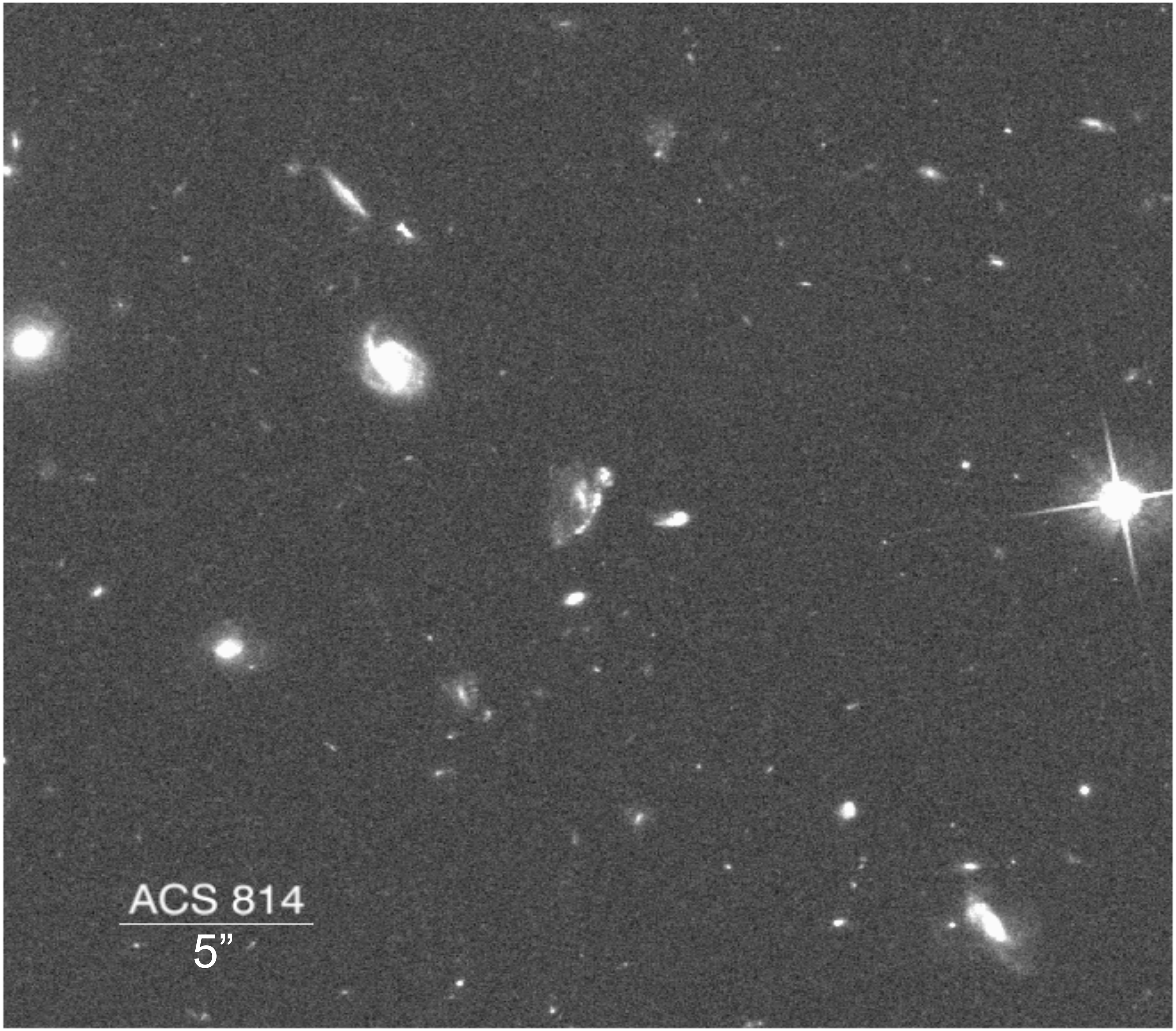
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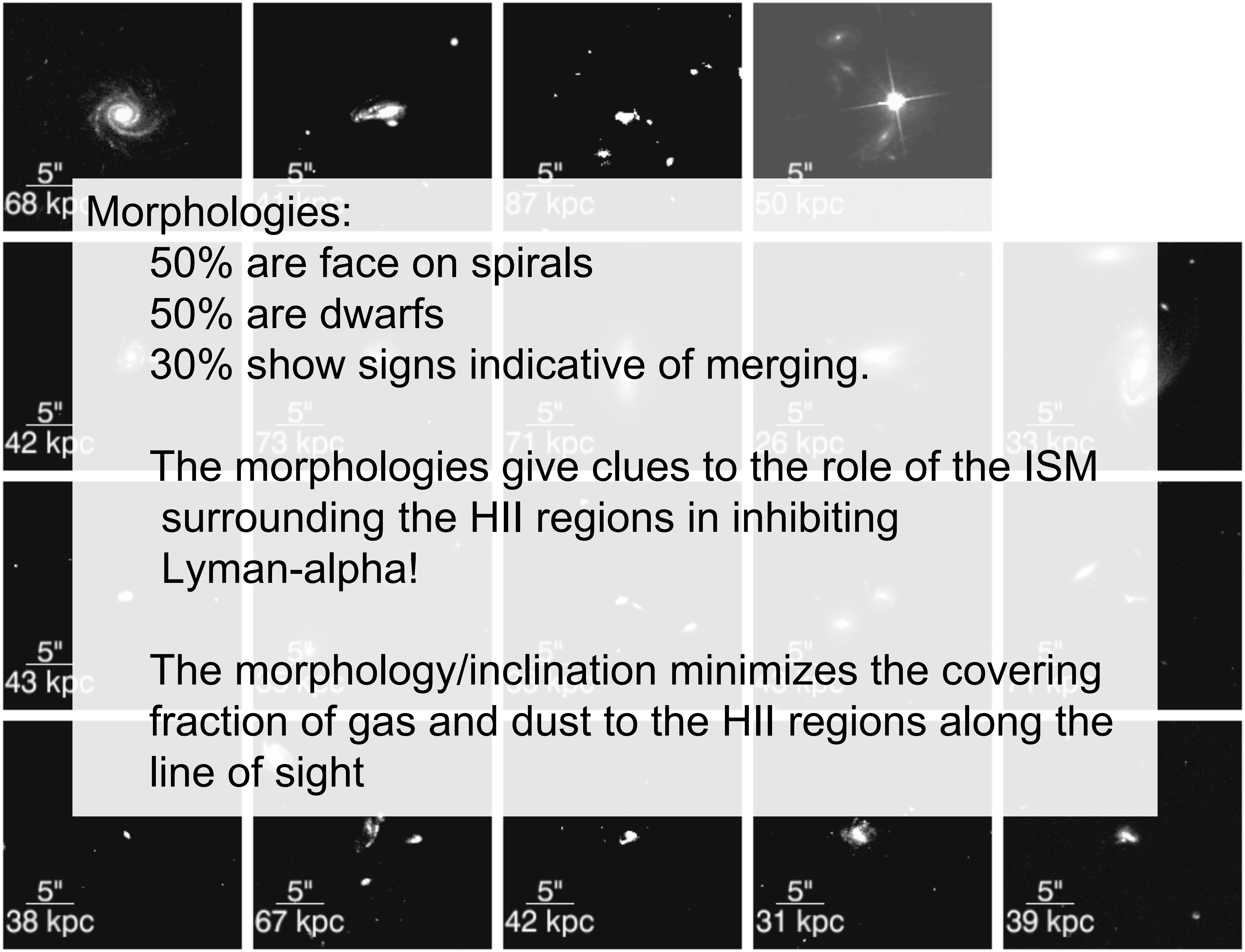


Morphologies:

50% are face on spirals
50% are dwarfs
30% show signs indicative of merging.

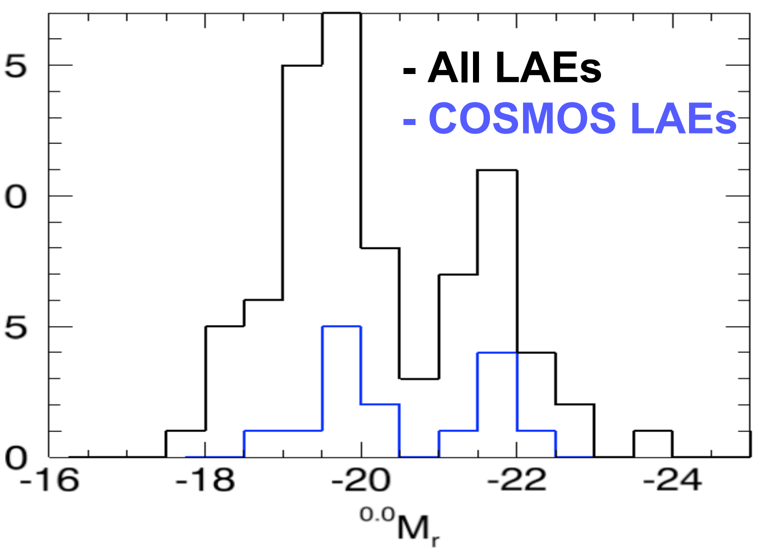
The morphologies give clues to the role of the ISM surrounding the HII regions in inhibiting Lyman-alpha!

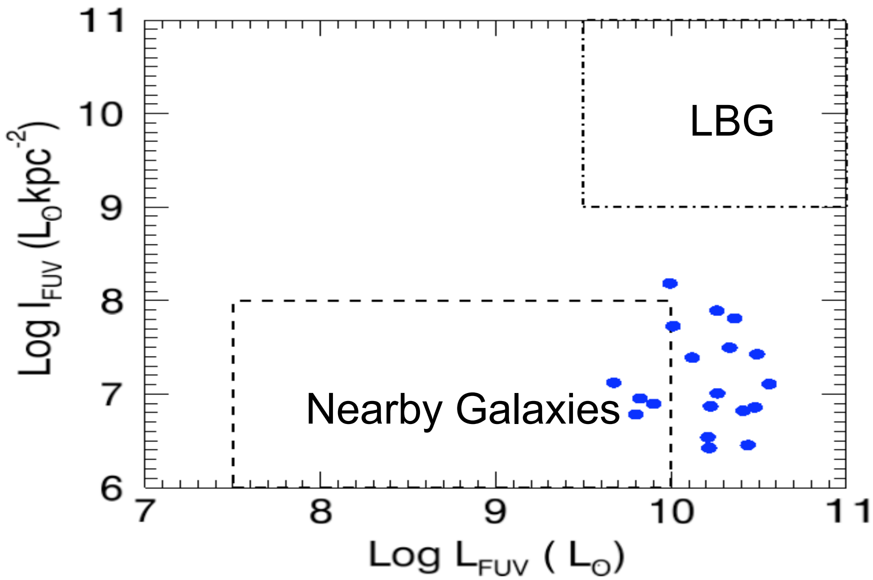
The morphology/inclination minimizes the covering fraction of gas and dust to the HII regions along the line of sight

GALEX LAEs in COSMOS

Large overlap between GALEX FOV and COSMOS

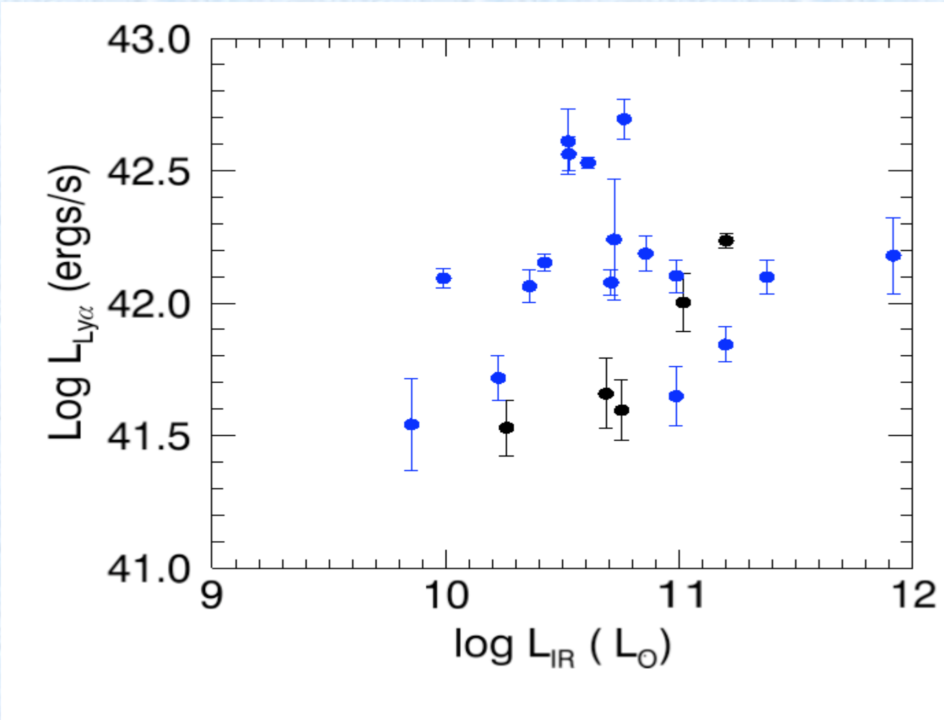
- 19 LAEs detected in GALEX/COSMOS FOV
- GALEX Exptime ~ 39 hrs
- Lyα S/N ~ 3 - 10.
- 19 with ACS imaging
- 19 with IRAC detections
- 17 with MIPS detections





Dust in LAE Hosts

- IR emission of varies by 2 orders of magnitude.
- Several LAEs are LIRGs (1 ULIRG)
- Lyα luminosity uncorrelated with IR emission from the host.



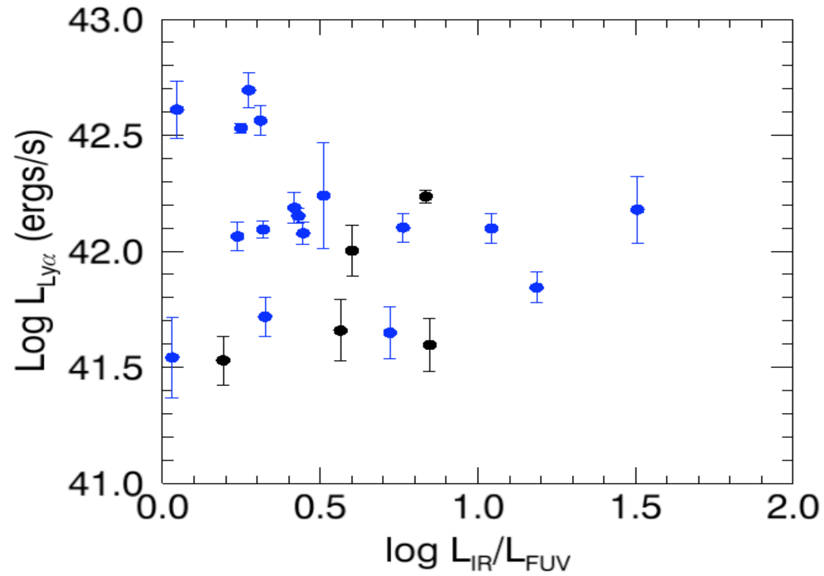
Legend:

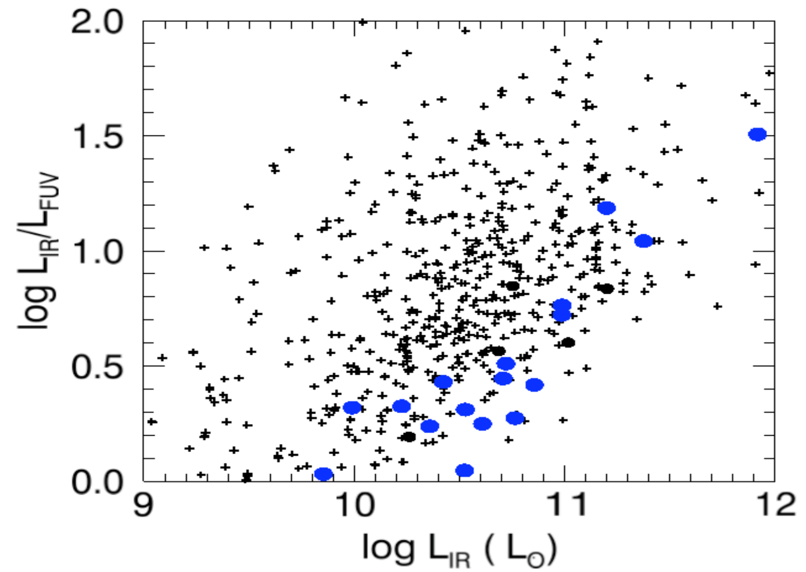
- BLUE - COSMOS LAEs
- BLACK -Other LAEs

IRX and Lyα

Lyα is uncorrelated to global Infrared excess IRX(L_{ir}/L_{fuv}), and the UV extinction of the host galaxy.

LAEs tend to have lowest infrared excess compared with galaxies of similar IR luminosity.





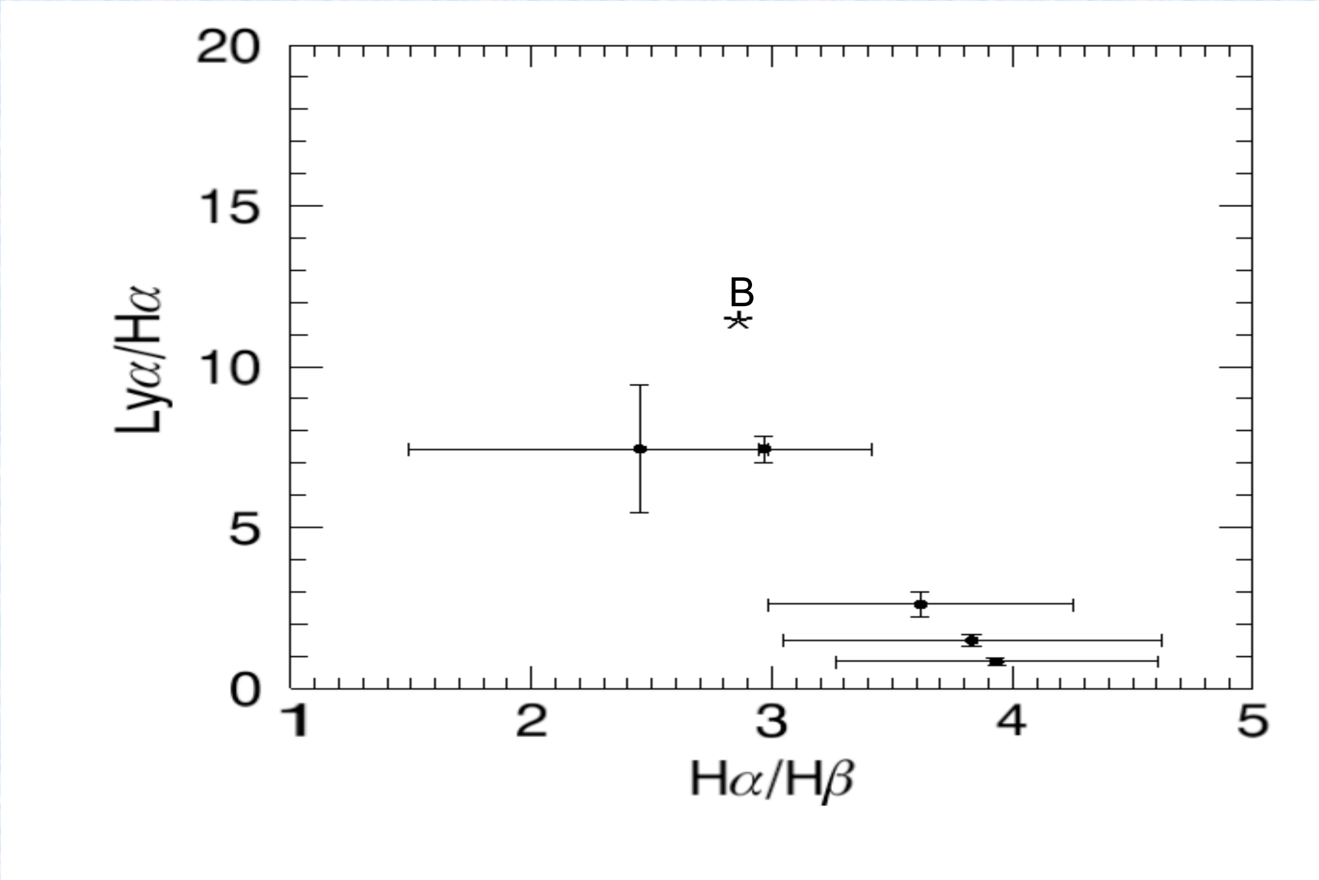
Why are only some GALEX sources LAEs?

The dominant effect inhibiting Lyman-alpha emission for dwarf star forming galaxies is dust extinction: LAEs have low IRX, and low UV extinction, compared to galaxies with similar IR luminosities.

The dominant effect for massive spiral galaxies is inclination. Lyα is detected for only face on spiral galaxies. IRX is a secondary effect.

Lyman-alpha Escape Fraction

- Small but growing sample of optical spectra of dwarf LAEs in AEGIS/COSMOS/NGPDWS/FLS
- Global escape fraction correlated with Hα/Hβ.



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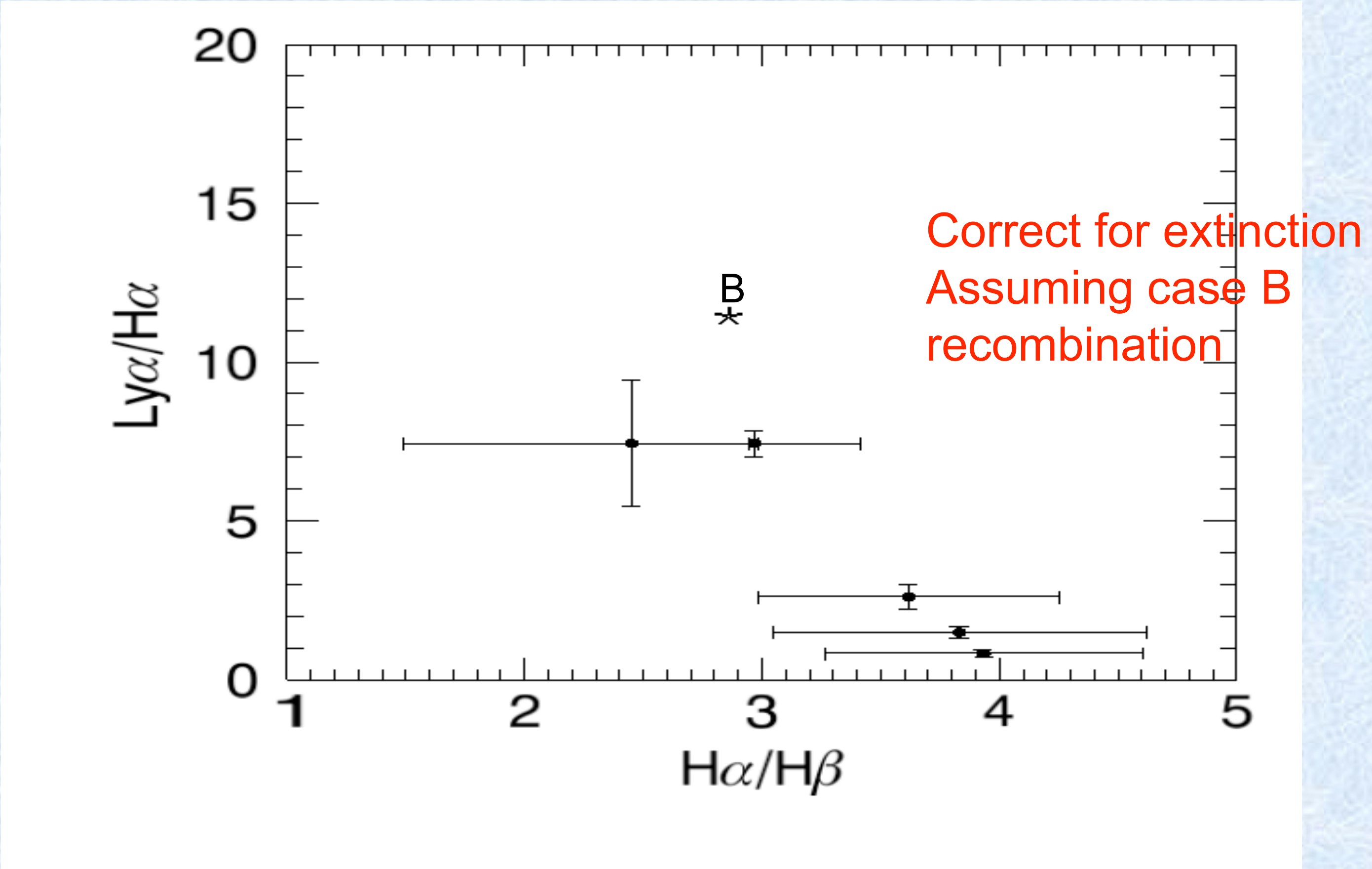
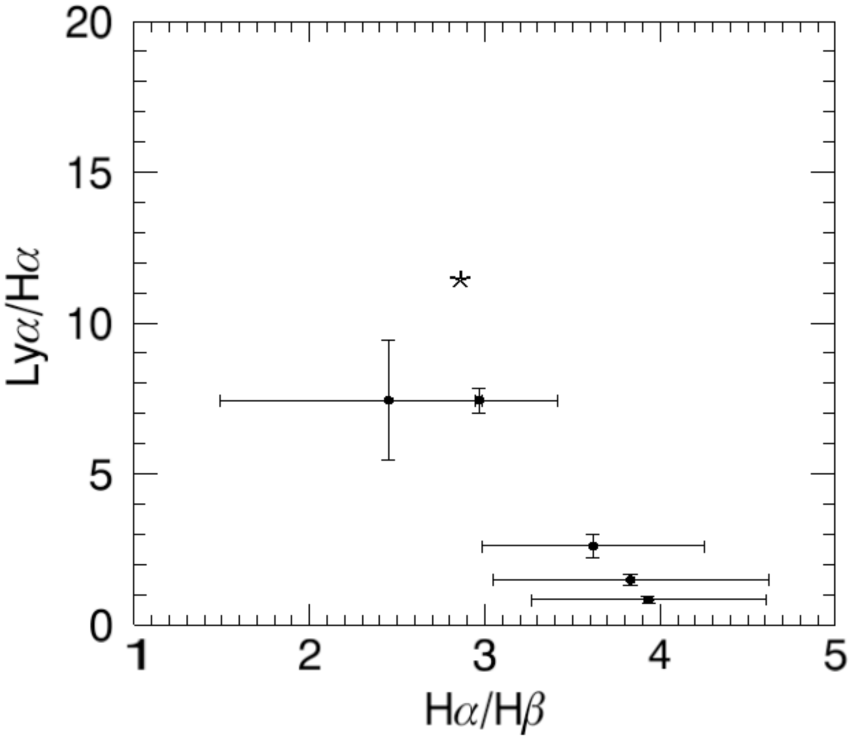
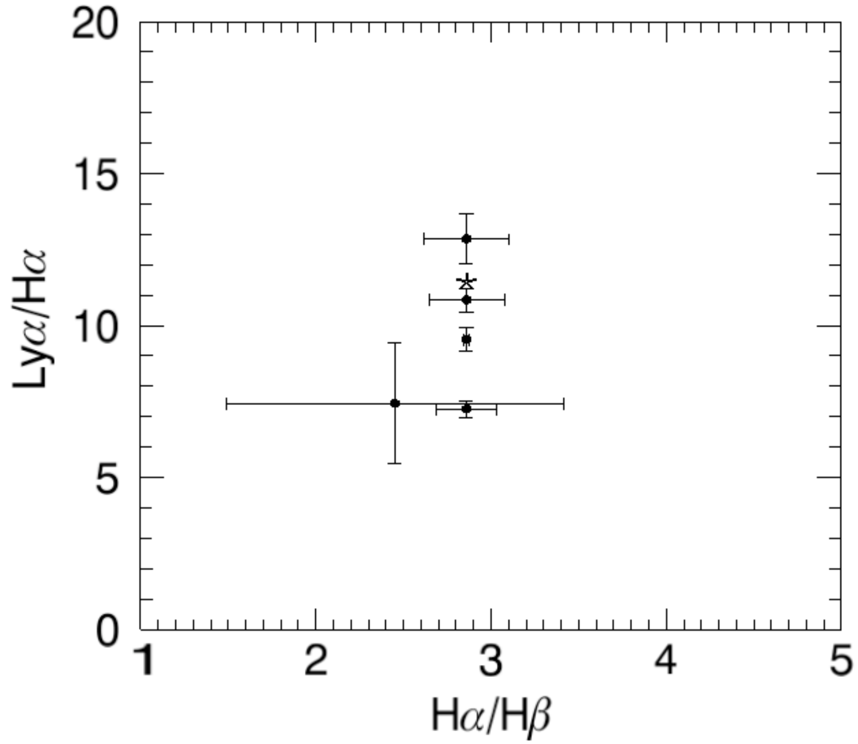


Lyman-alpha Escape Fraction

- IF Case B assumption extinction law is applicable then

  Lyα photons are scattered between 1-2 times.





Conclusions

- GALEX LAEs can uncover the effects of dust and gas geometry on regulating Lyα escape, but not the effect of gas kinematics.
- GALEX LAEs show a bimodal luminosity distribution due to an inclination effect
- Global IR and IRX is uncorrelated with Lyα emission.
- IR and IRX of LAEs is correlated.
- Lyα/Hα vs Hα/Hβ shows that the Lyα escape is correlated with extinction.