Blueberry galaxies: local analogs of the faint-end LAEs

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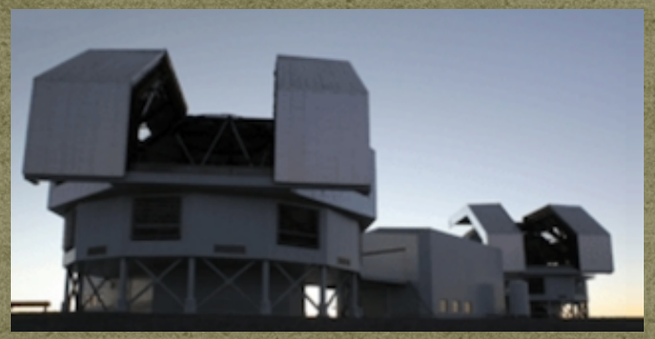

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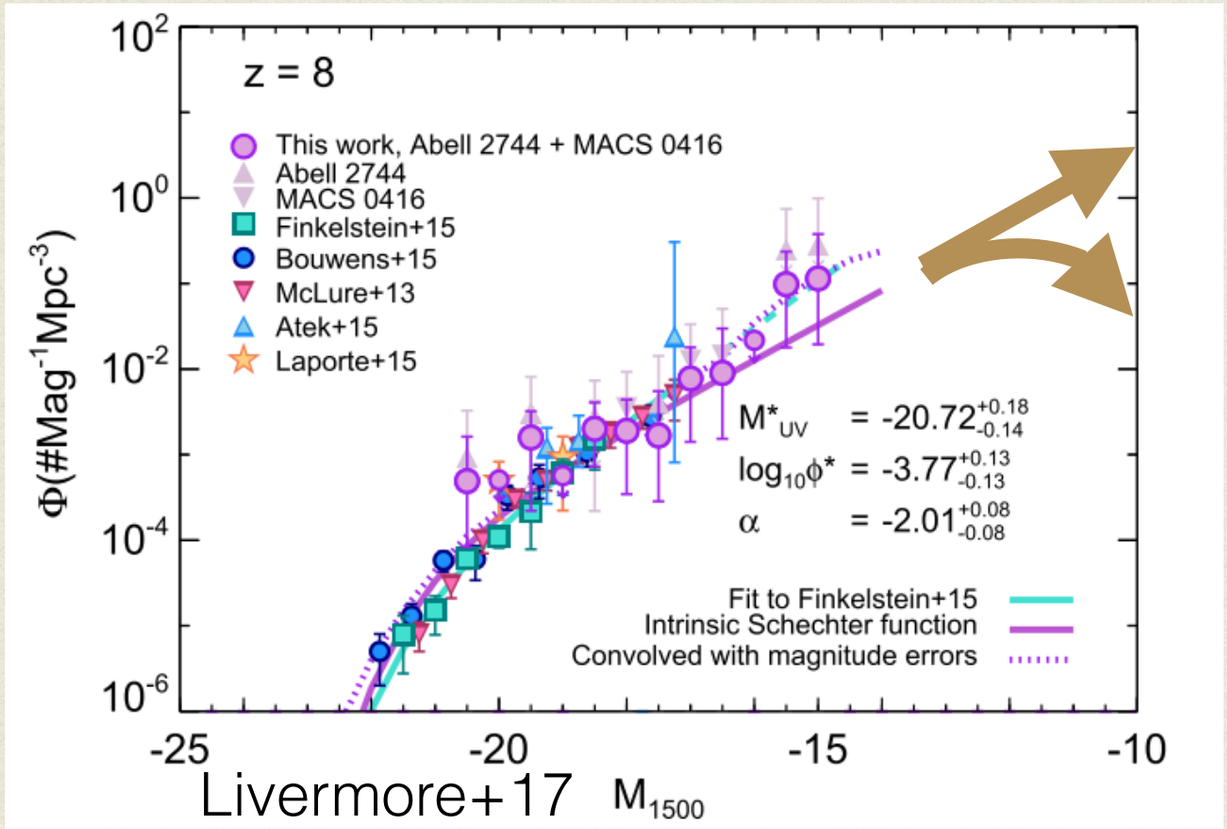
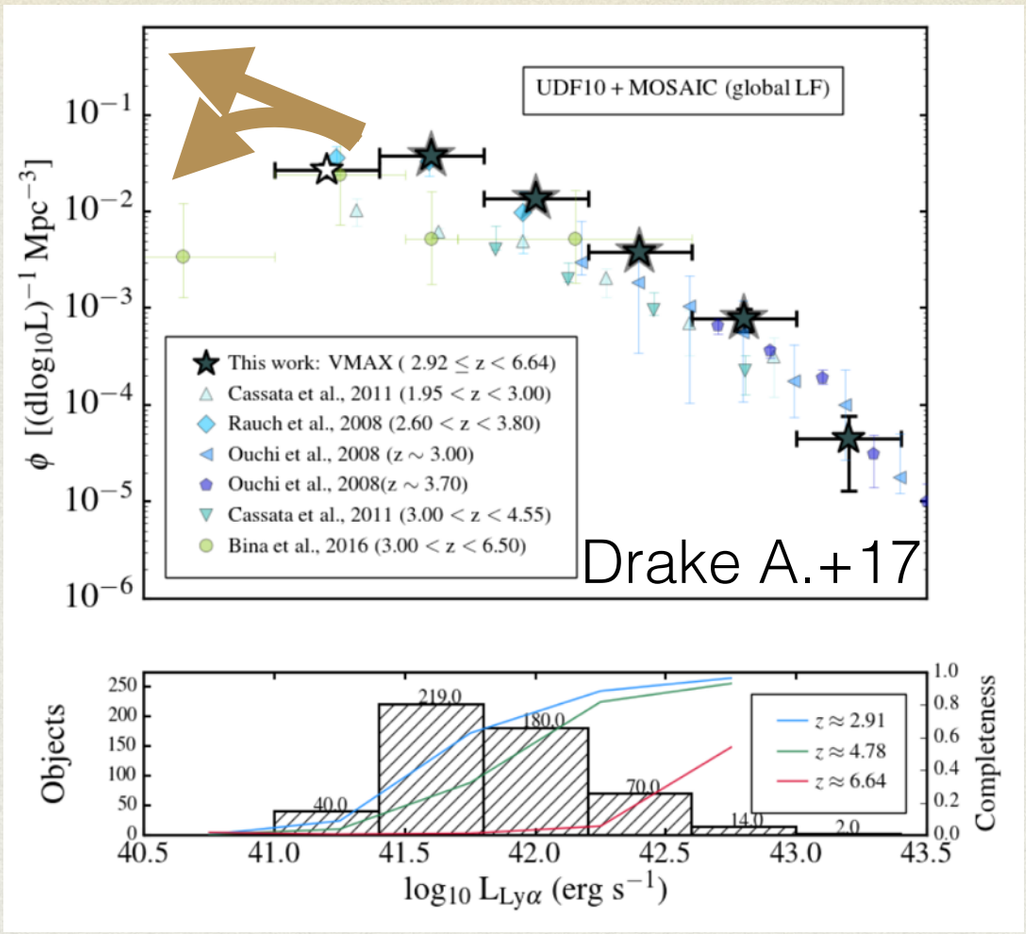
What are the roles of faint-end starbursts during reionization?





- What are the number densities, faint-end slopes and turn-over luminosities?
- What fraction of faint UV continuum selected galaxies are strong LyA emitters?
- What are the leaking Lyman-Continuum luminosities of these faint-end starbursts?

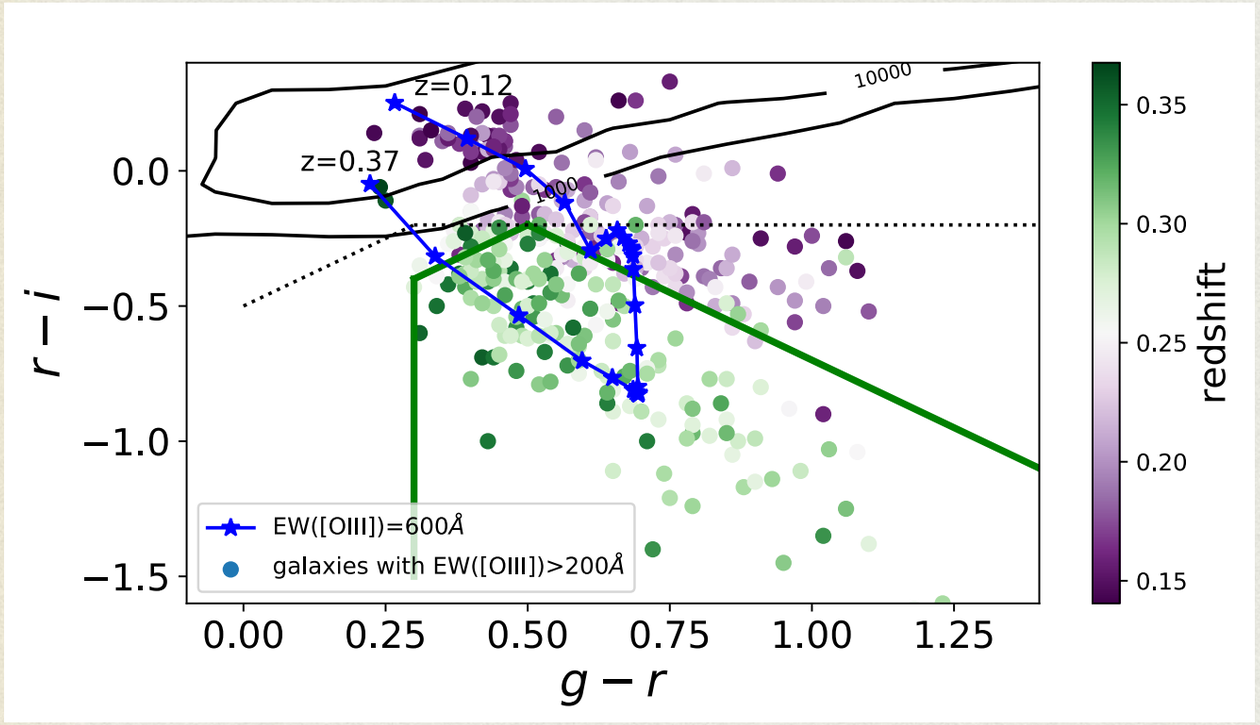
How can we study these faint-end LAEs?

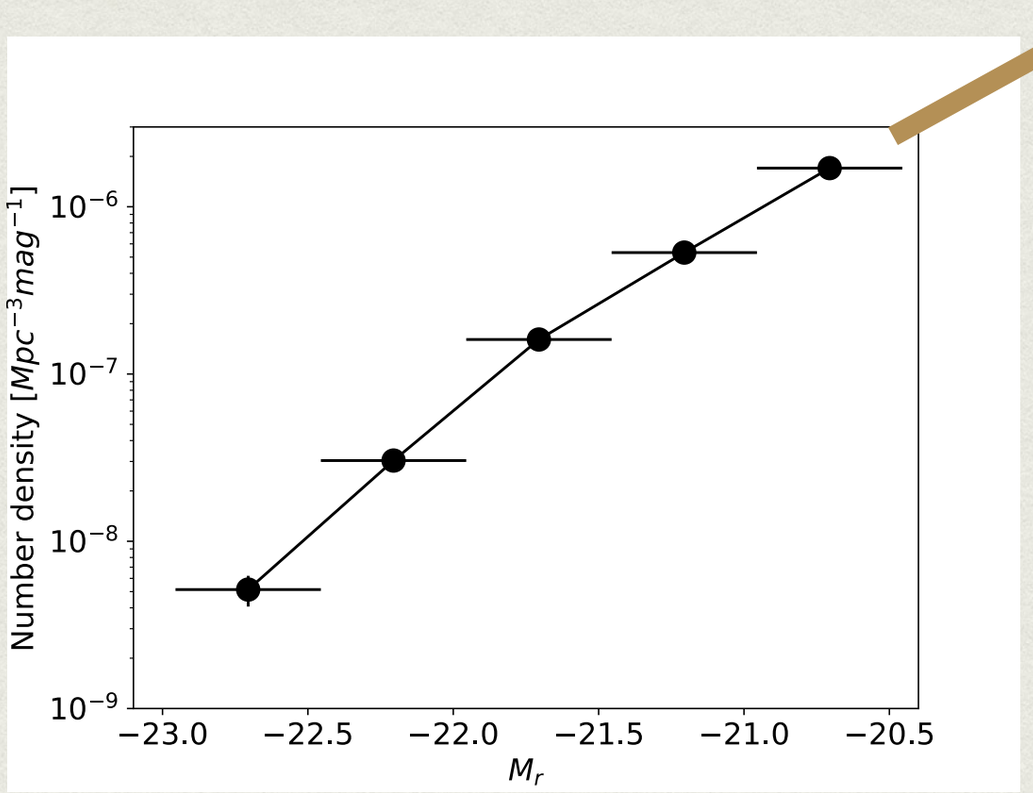
- HST / JWST / MUSE / KCWI / Narrow-bands (HSC/ DECam) ultra-deep surveys …

- Are there local analogs of faint-end LAEs?

green peas: local analogs of normal/bright LAEs

Green pea luminosity function at z~0.25-0.35





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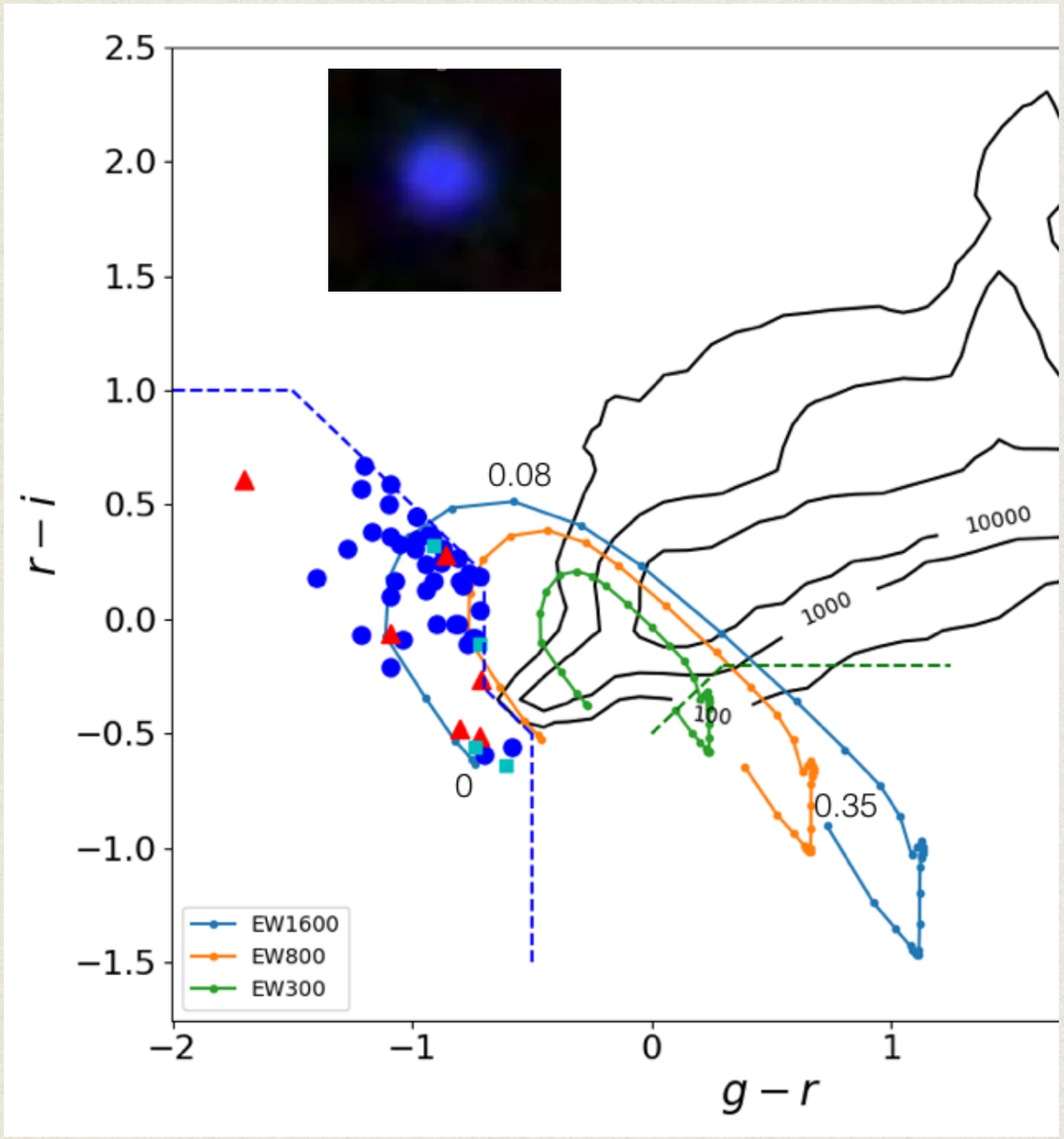
very steep slope α ~ -3.3

fainter counterparts of green peas — blueberry galaxies



color criteria to select strong [OIII] emission line galaxies at redshift smaller 0.05.

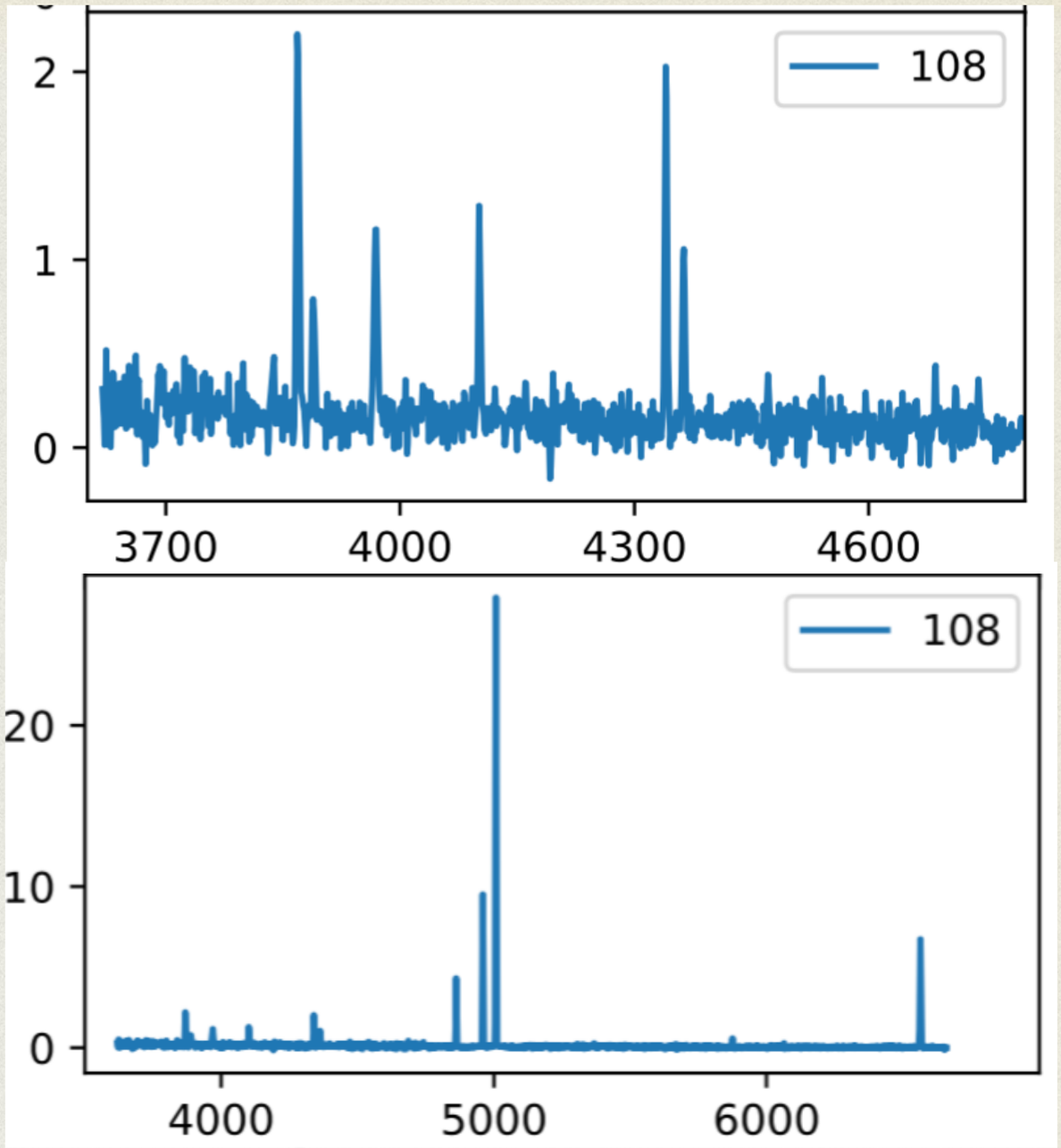
Blueberries have 5-10 times smaller distances, therefore at similar apparent magnitudes, blueberry galaxies reached 100 times lower luminosity than green peas.

Yang,H.+2017 arXiv:1706.02819

fainter counterparts of green peas — blueberry galaxies

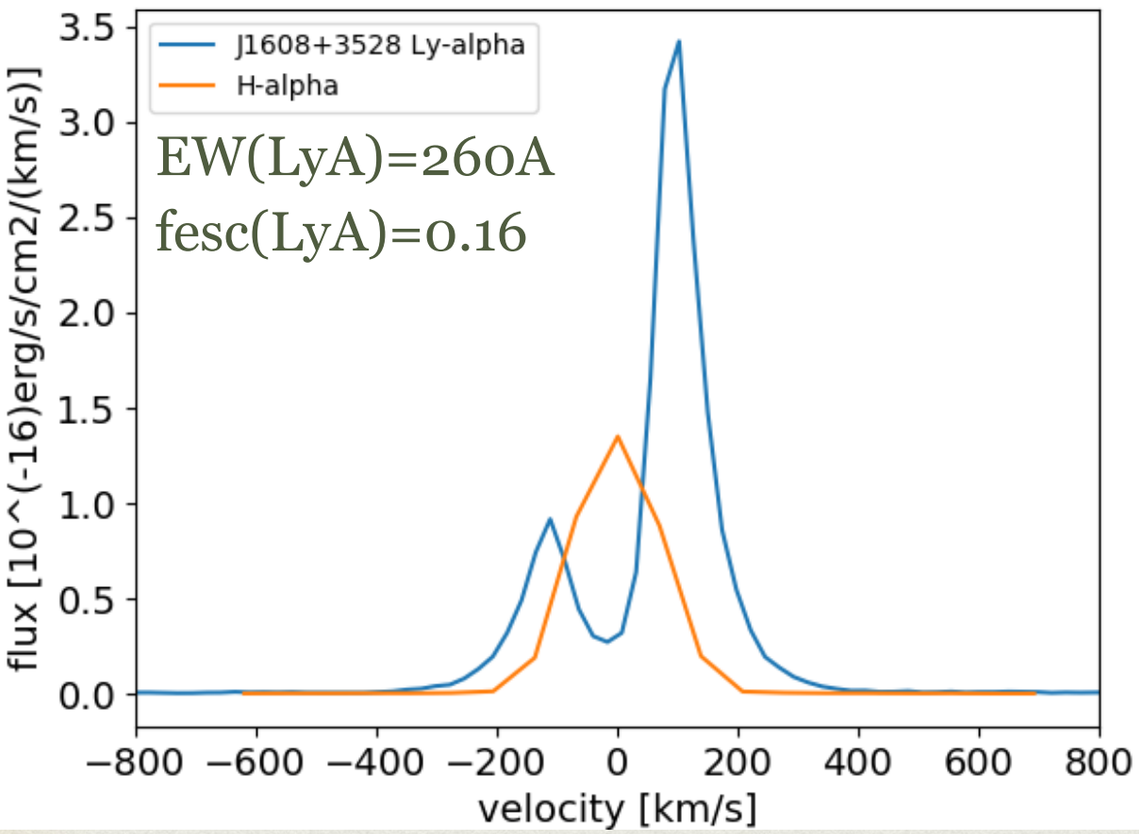
a typical optical spectra.

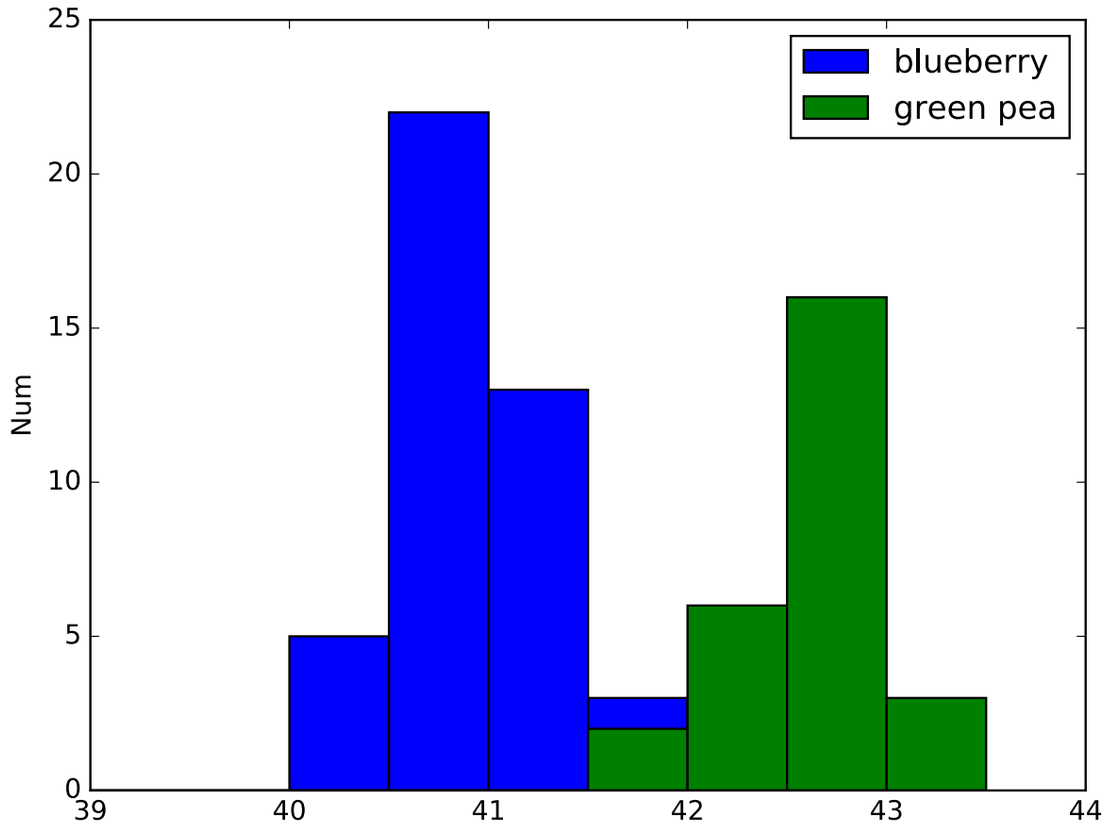
The spectra is similar to green peas's, showing strong [OIII] emission lines. [OIII]/Hbeta and [OIII]/[OII] ratios are also very large.



Yang,H.+2017 arXiv:1706.02819

Are blueberries LyA emitters?





One blueberry galaxy has HST UV observation and it shows a strong LyA emission line (also see Jaskot+2017).

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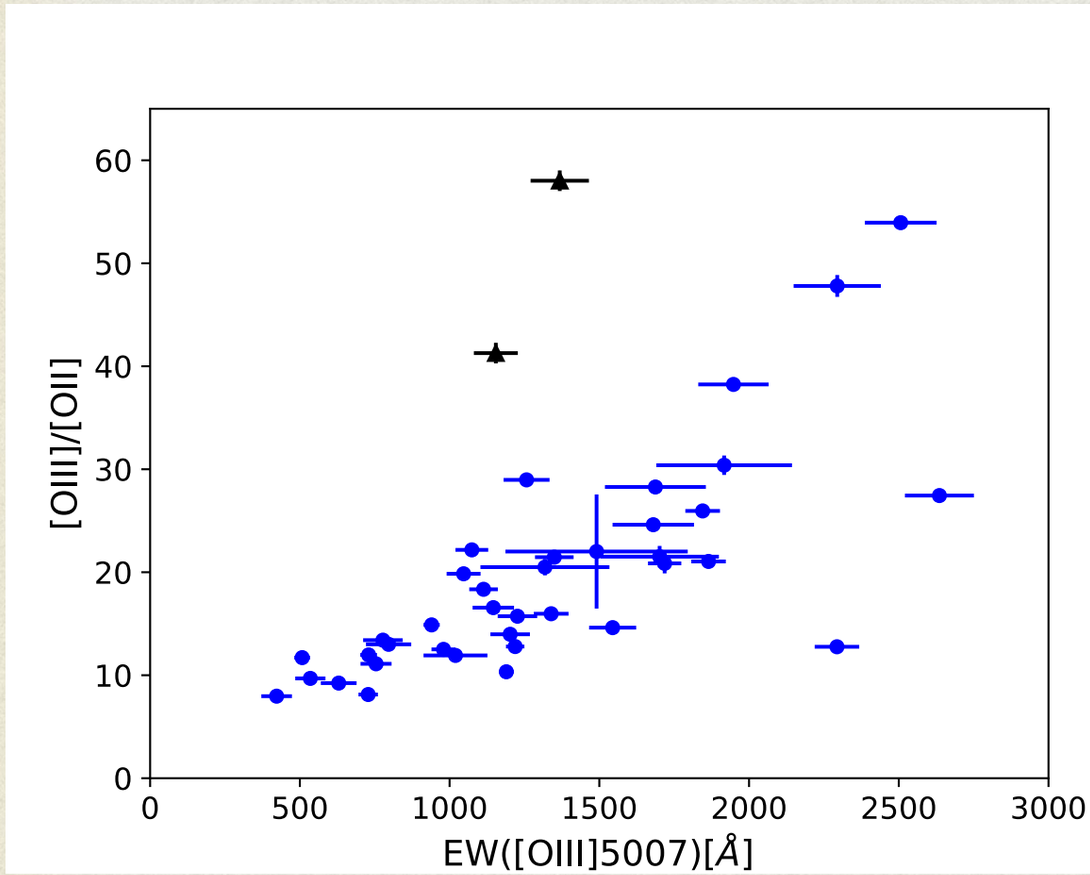
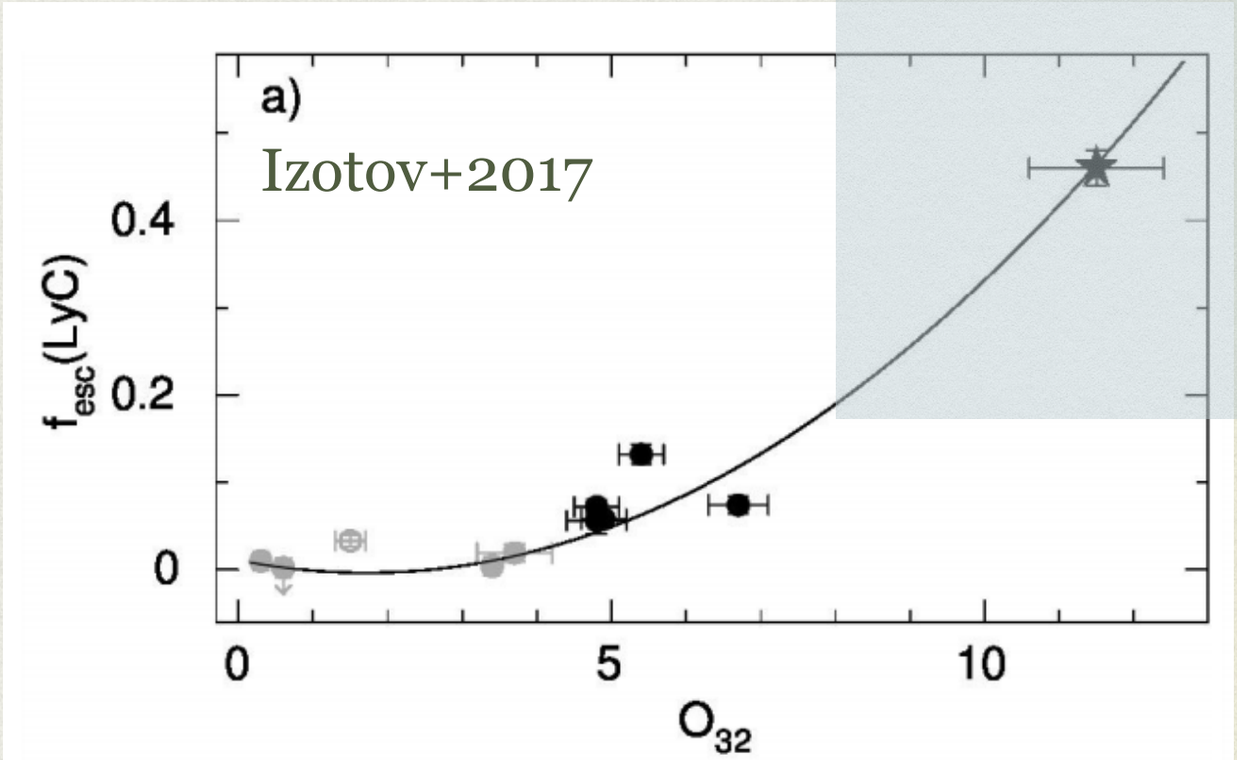
Are blueberries LyC leakers?

[OIII]/[OII] of blueberries are ~ 8 - 60.

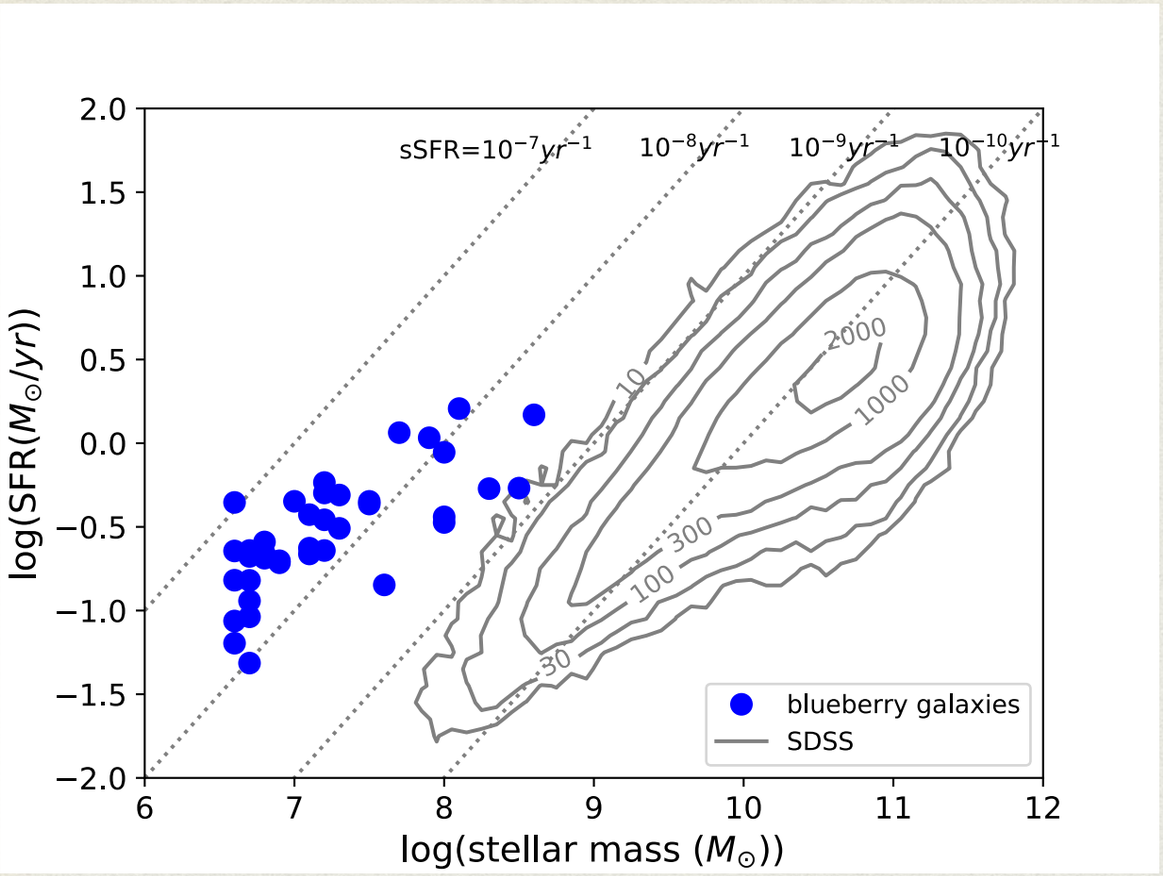


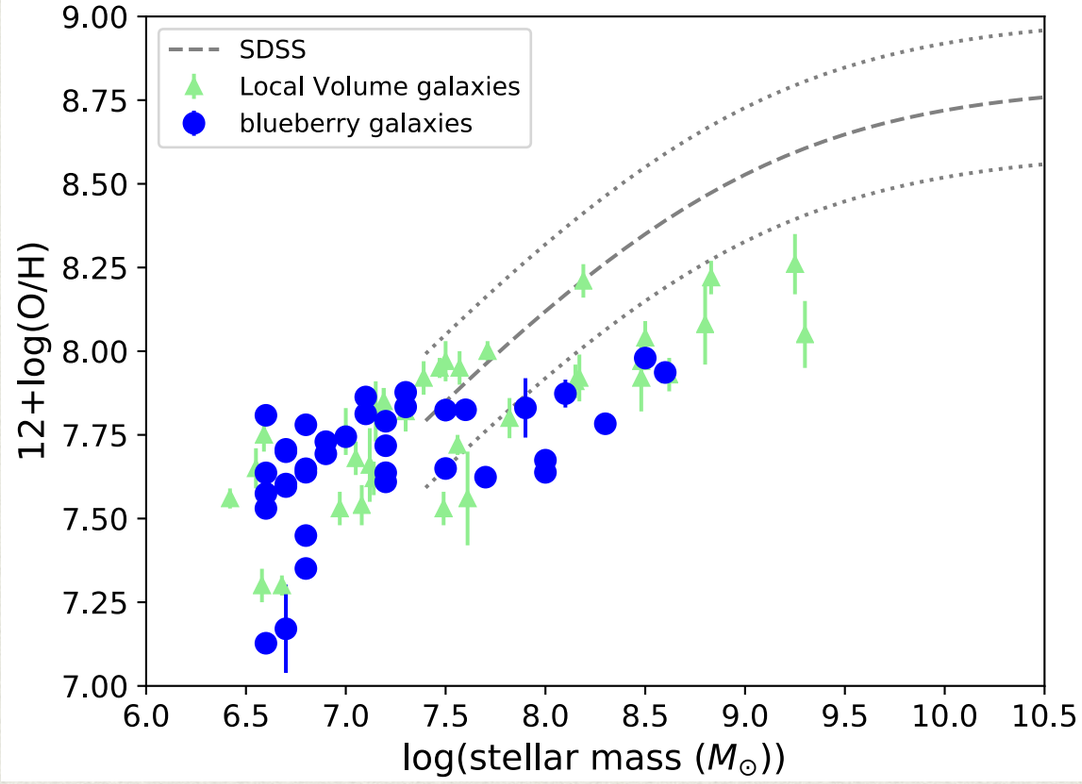
expected fesc(LyC) >~ 15%



Yang,H.+2017 arXiv:1706.02819

(1): very young low-metallicity starbursts





stellar mass around 10^7 solar mass

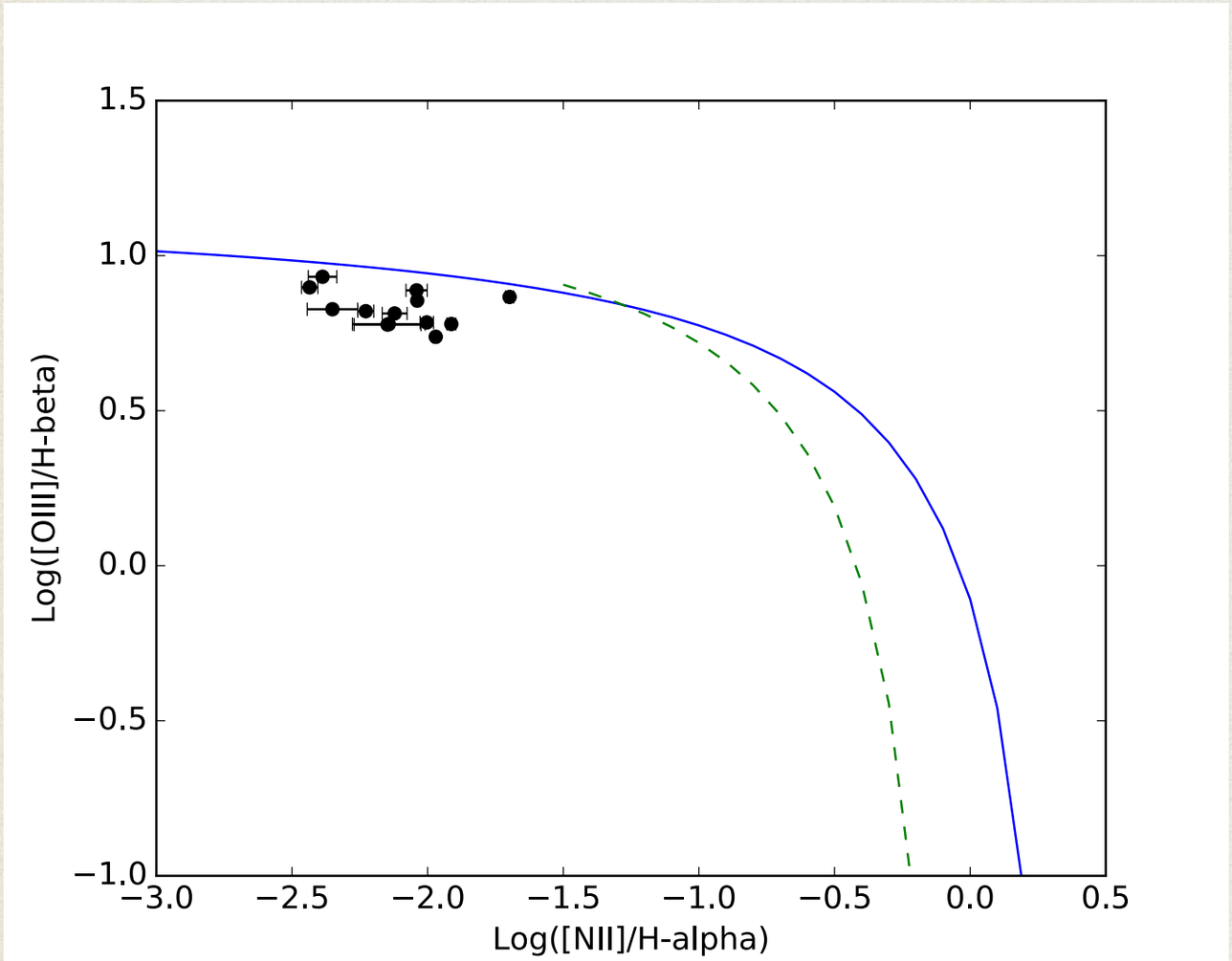
specific star-formation rates ~ 10-100 M yr^-1

very low gas metallicities ~ 3 to 10 percent solar metallicity

Yang,H.+2017 arXiv:1706.02819

(2) Are there AGNs and black holes in blueberries?

We can not rule out AGN.



BPT diagram of Blueberry galaxies

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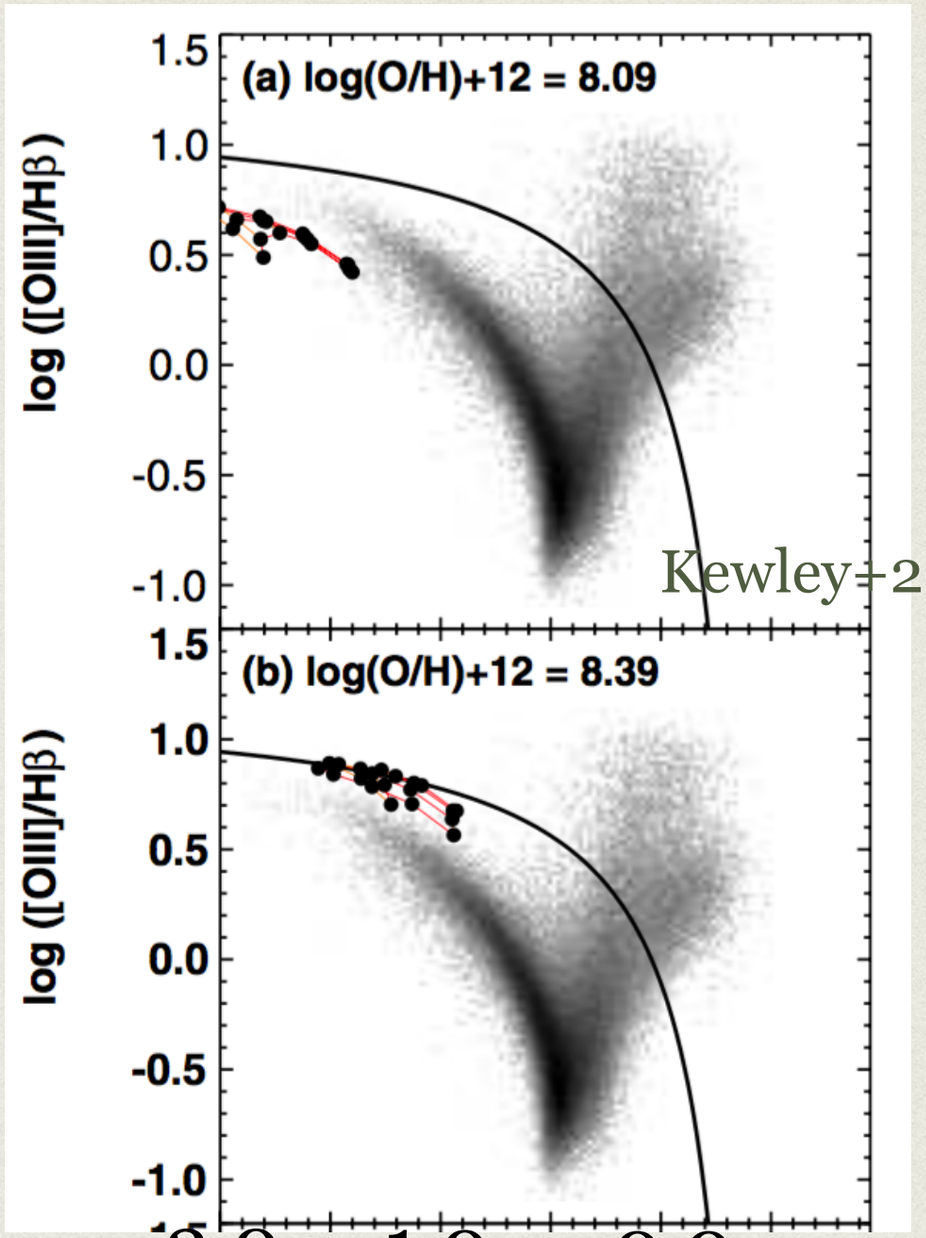
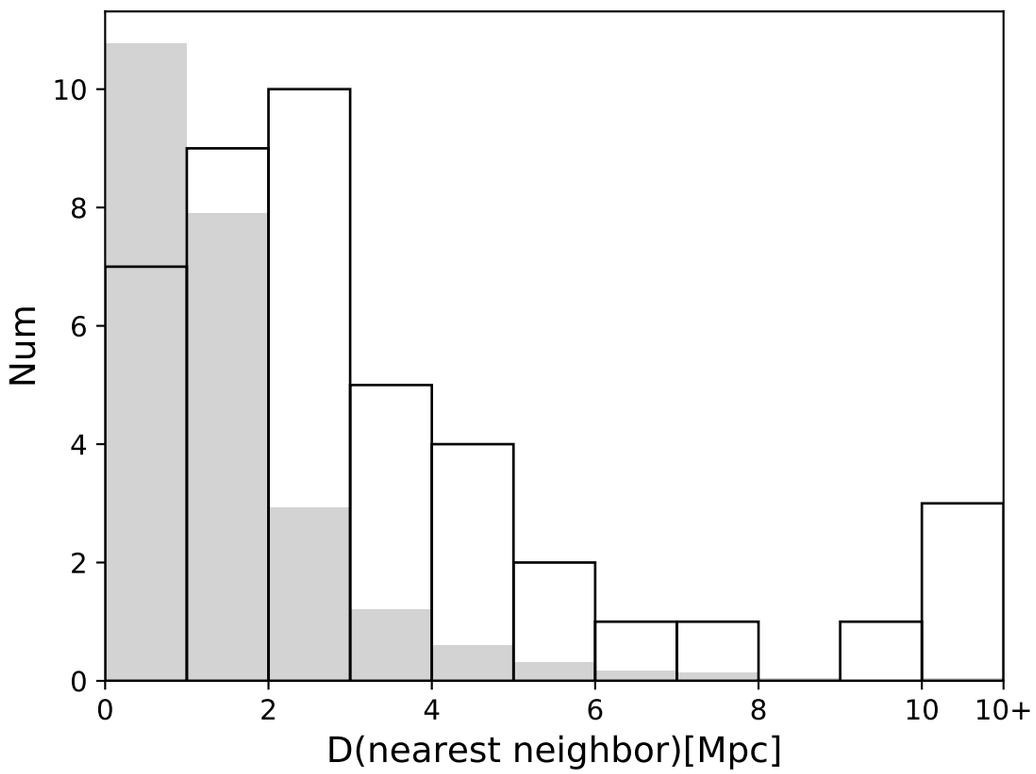


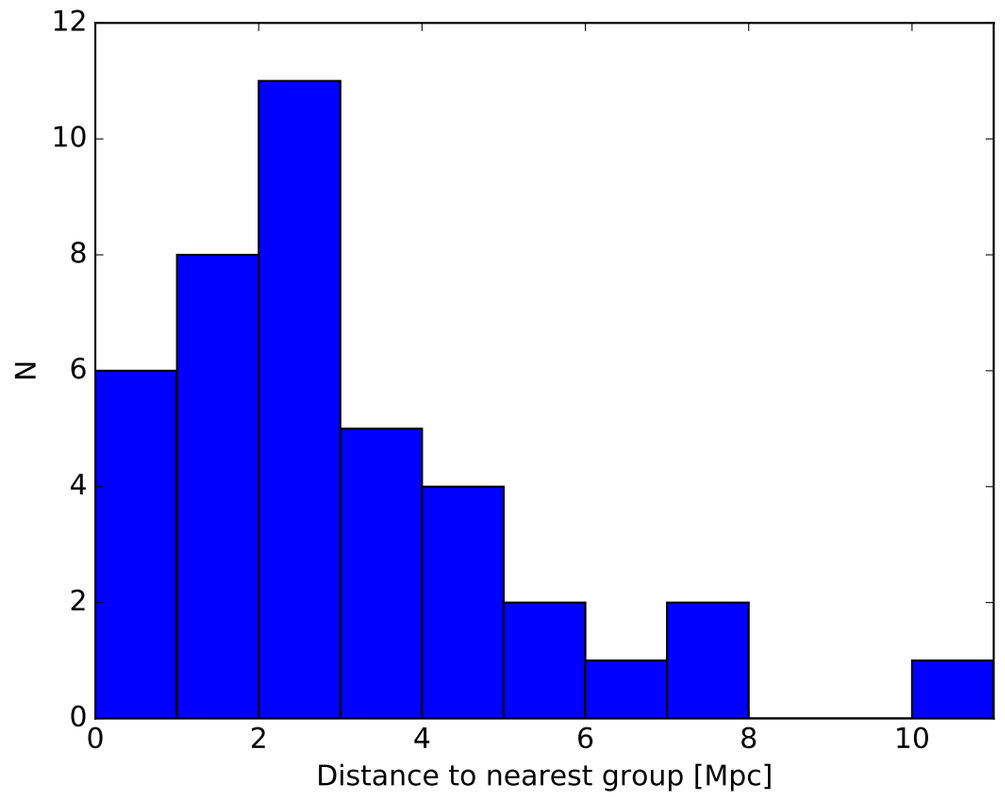
Kewley+2013

(3):Environment — outskirts of galaxy groups

Blueberry galaxies are at the very out skirts of galaxy groups.



Distance to the nearest galaxy ~ 1 - 4 Mpc



Distance to the nearest group center ~ 1 - 4 Mpc

Yang,H.+2017 arXiv:1706.02819

(4): HST images

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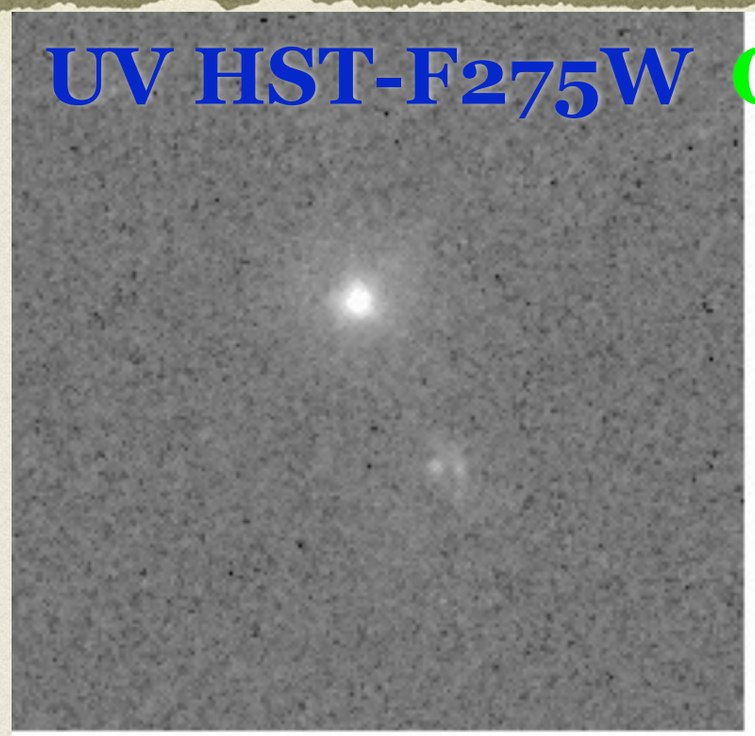
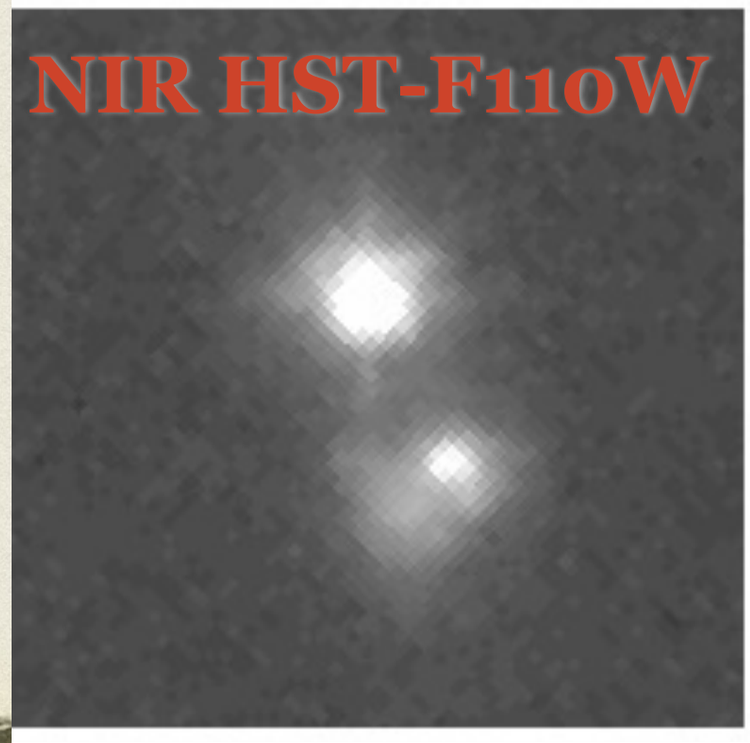
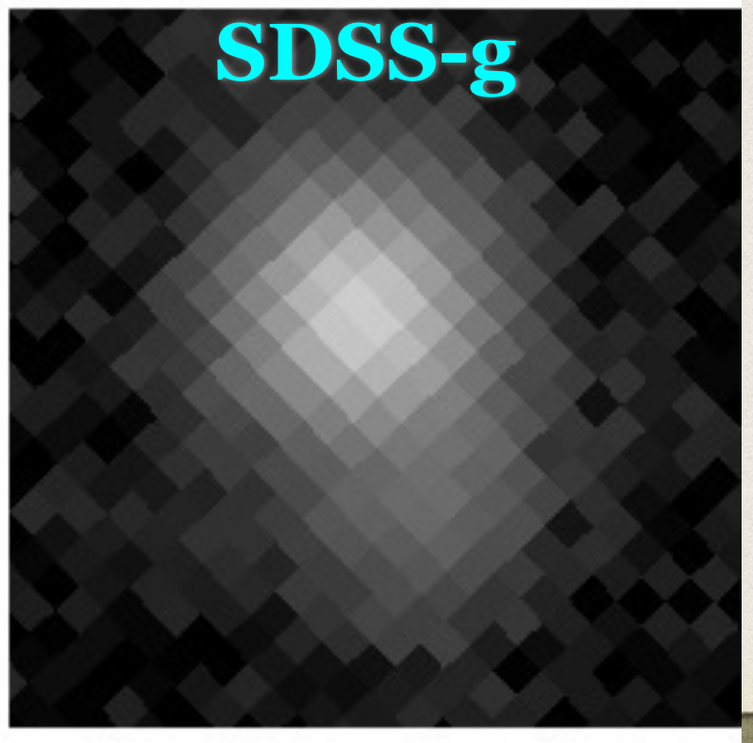


8x8 arcsec cutout

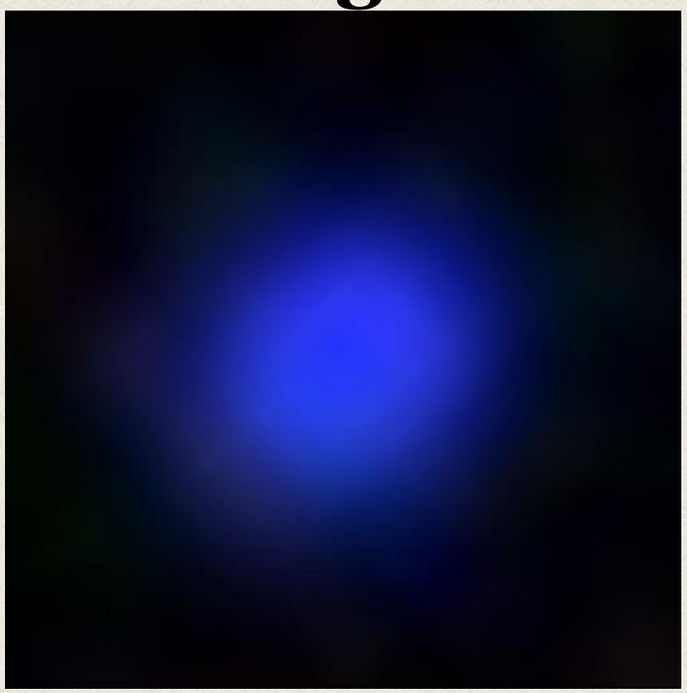




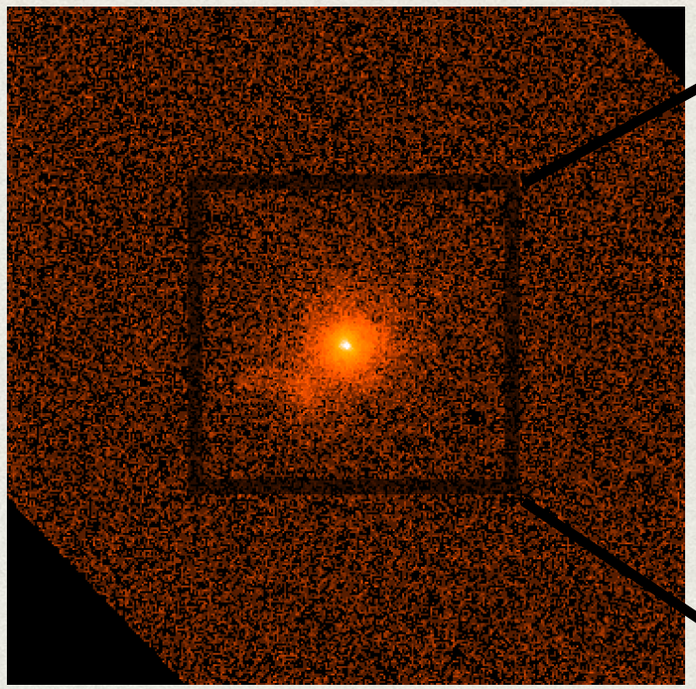
SDSS g-r-i

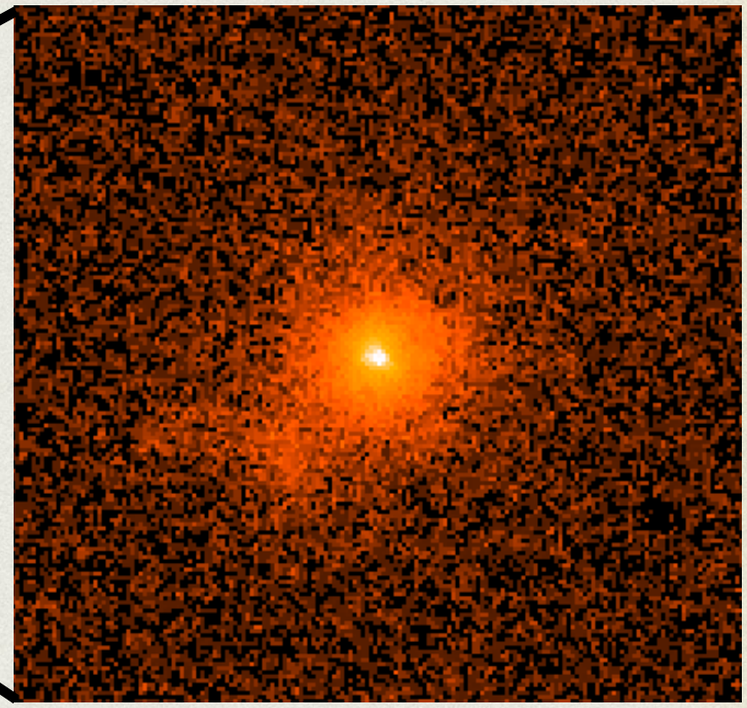
(4): HST images

SDSS g-r-i



UV HST





8x8 arcsec cutouts

Some blueberry galaxies may be mergers of two dwarf systems (galaxies or dark gas clumps).

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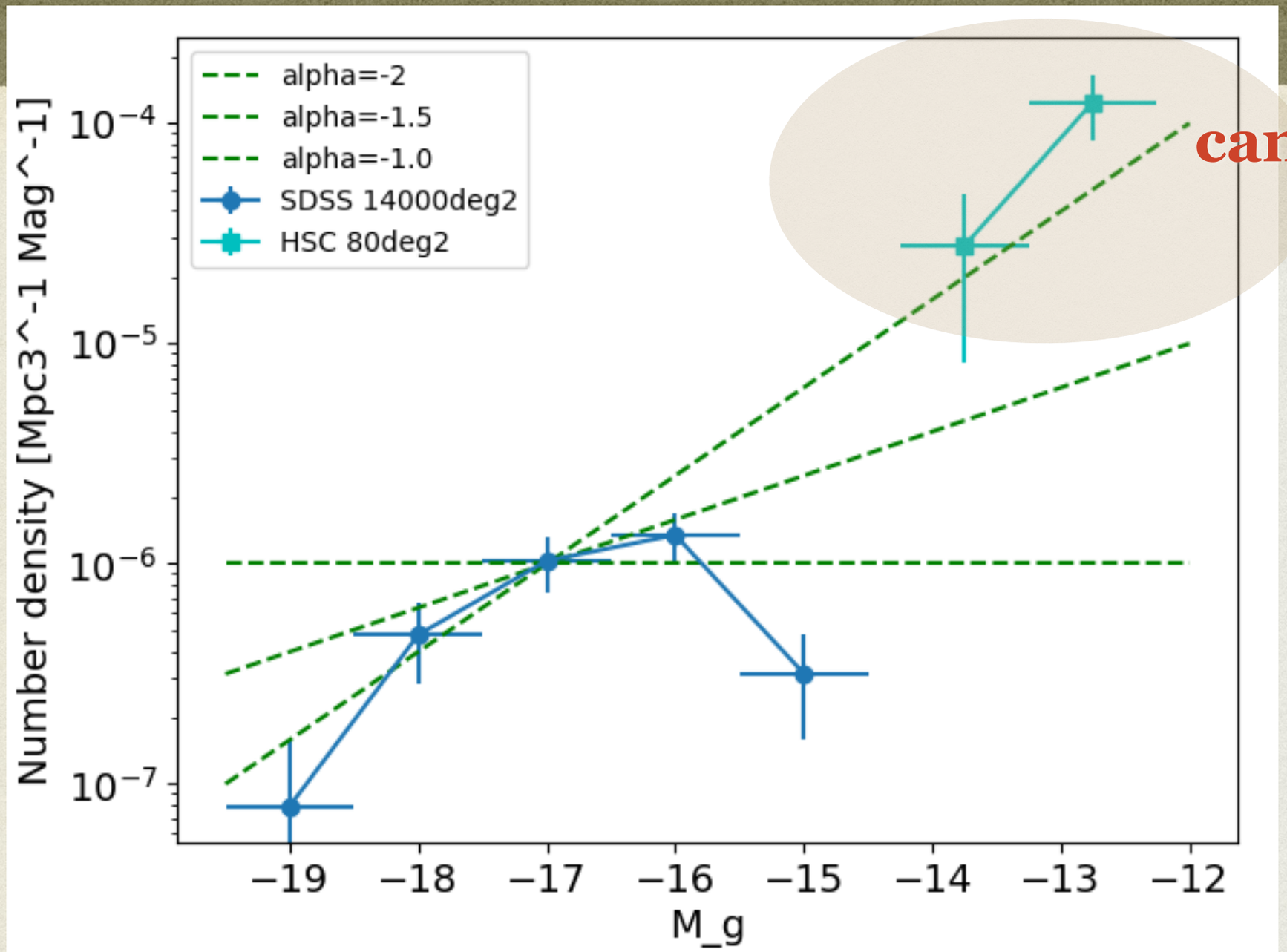
Number densities of blueberries in SDSS and HSC



candidates!

Assuming a model spectra -> M_UV of HSC blueberries ~ -13 to -12.

Yang,H.+ in-prep.

Are these HSC blueberries faint dwarf galaxies? Or intergalactic star formation regions without underlying dark matter halos?

Summary

- We calculated the number densities of green peas.
- We selected blueberry galaxies, which are the local analogs of faint-end LAEs.
- These blueberries are metal-poor young starbursts in the outskirts of galaxies groups.
- We selected blueberries in HSC images and are working on the faint-end luminosity function down to Mag ~ -12.