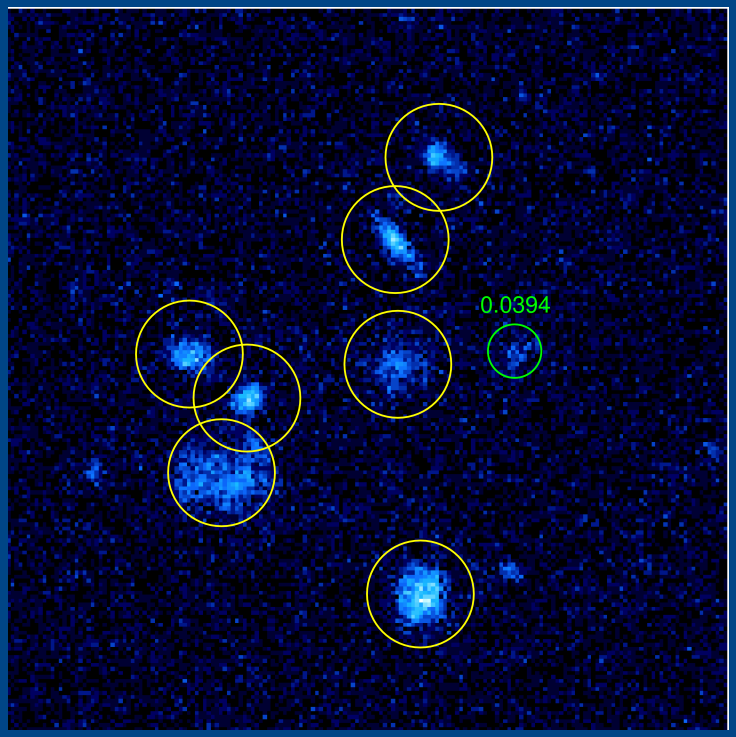
Star-Forming Compact Groups: An A-PLUS search for an intermediate-z sample



Jonathan D. Hernandez-Fernandez

1º Encontro brasileiro do A-PLUS
23-24 Fevereiro

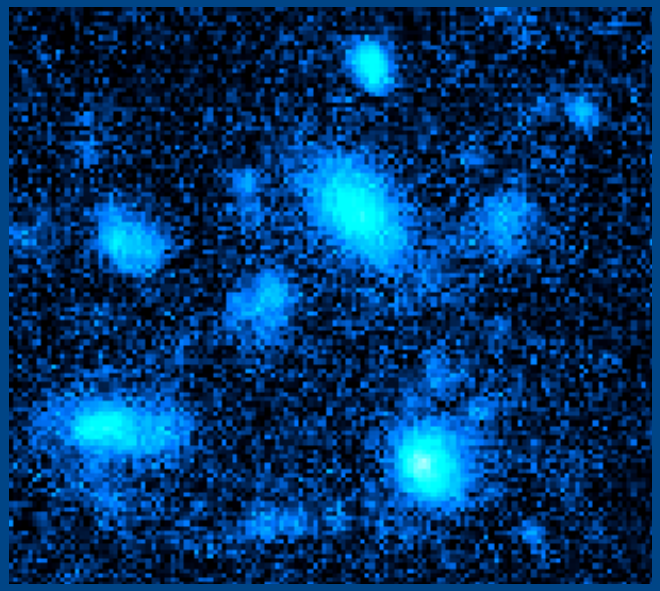
(1) Presentation and description of the SFCG sample in the Local Universe

(2) An A-PLUS search of similar examples at intermediate redshifts

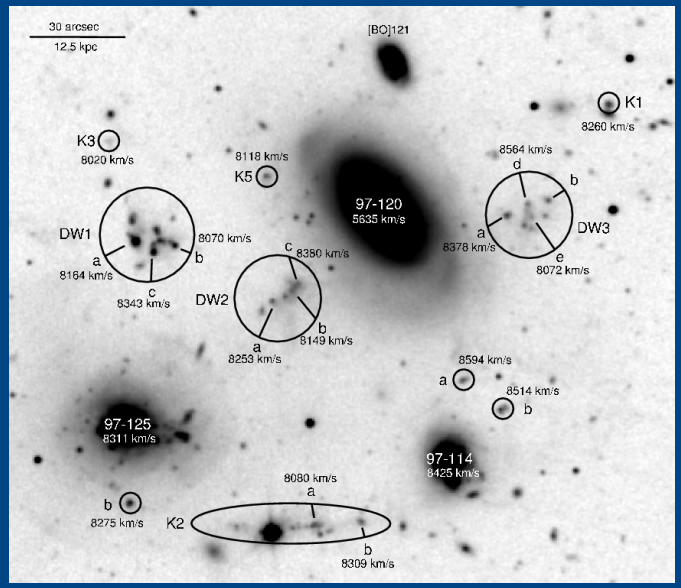
A compact group of galaxies infalling into the dynamically young cluster Abell 1367

BIG is "the region with the highest density of star forming systems ever observed in the Local Universe" (Cortese et al 2006).

GALEX



Hα



SDSS coloured

GALEX catalogues are the place to search for this kind of groups...

SEARCH STRATREGY

(1) Compilation of an all-sky sample of UV bright sources

(2) Search for groups in the UV sample

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- UV sources from **All-sky Imaging Survey (AIS)**
  the largest sky area coveraged by GALEX in a homogeneous way

- FUV (1530 A) selection: **17 < FUV < 20.5**
  FUV is even more biased toward star-formation than the NUV.
  The brightest UV galaxies in BIG are approx. in this range

– lower limit: Avoiding bright galaxies wich photometry shredded in parts.
– upper limit: Reliable sources, avoiding oversize the sample of UV sources.

- UV color selection: **$-1.50 < (FUV-NUV)_{dered} < 2.75$**
  Avoiding blue artifacts, red stars, etc.

- nuv_artifact <=1 ~ good quality detections

- We avoid the Milky Way disk: galactic latitude modulus |b|>15°

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925,428 UV-emitting sources

(2) Search for groups in the UV sample

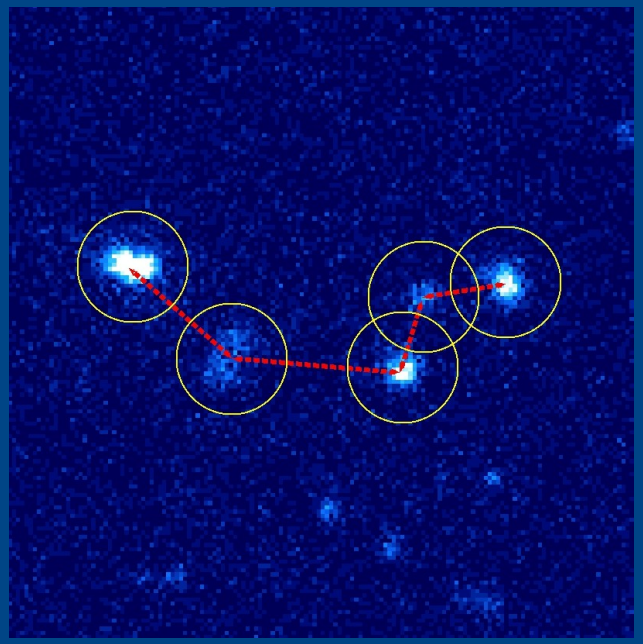
- Friends-of-Friends Algorithm applied to sky positions grouping elements with a sky separation equal or less than a **linklength = 1.5 arcmin**
  This corresponds to a physical distance of **88 kpc at z=0.05**

- **n_{UV} >= 4** UV brigth members

- Constraints over UV group members:

  - At least **three** UV brigth sources classified as **'galaxy'** by NED

  - At least **two** galaxies with a **redshift** separation **Δz<0.004**



This final output of the search is
a sample of Compact Star-forming Groups of galaxies of

280 groups of UV-emitting galaxies!!

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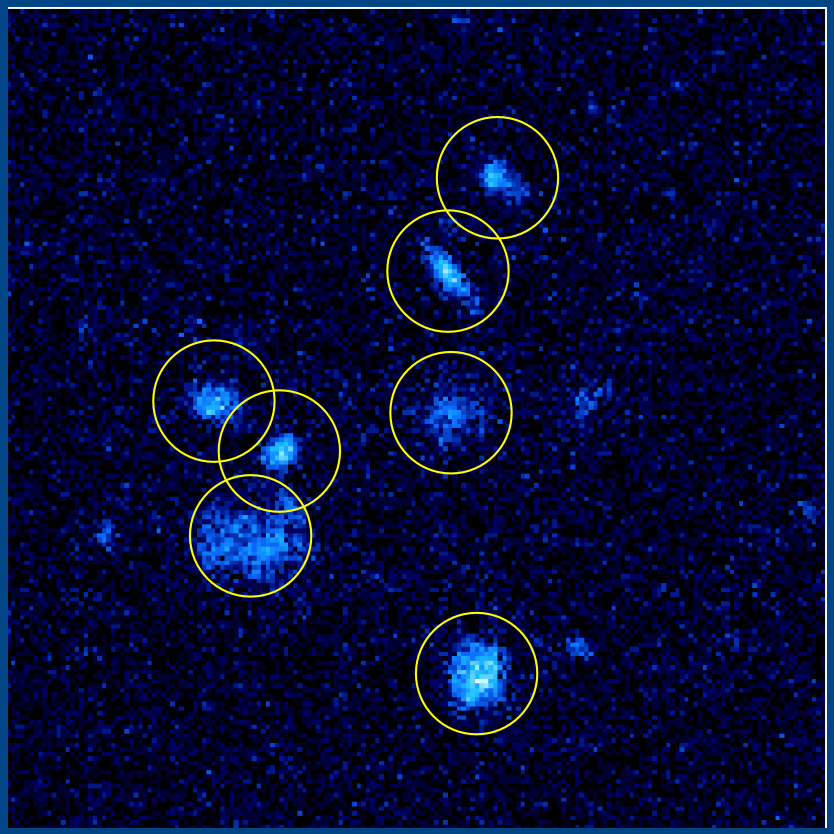
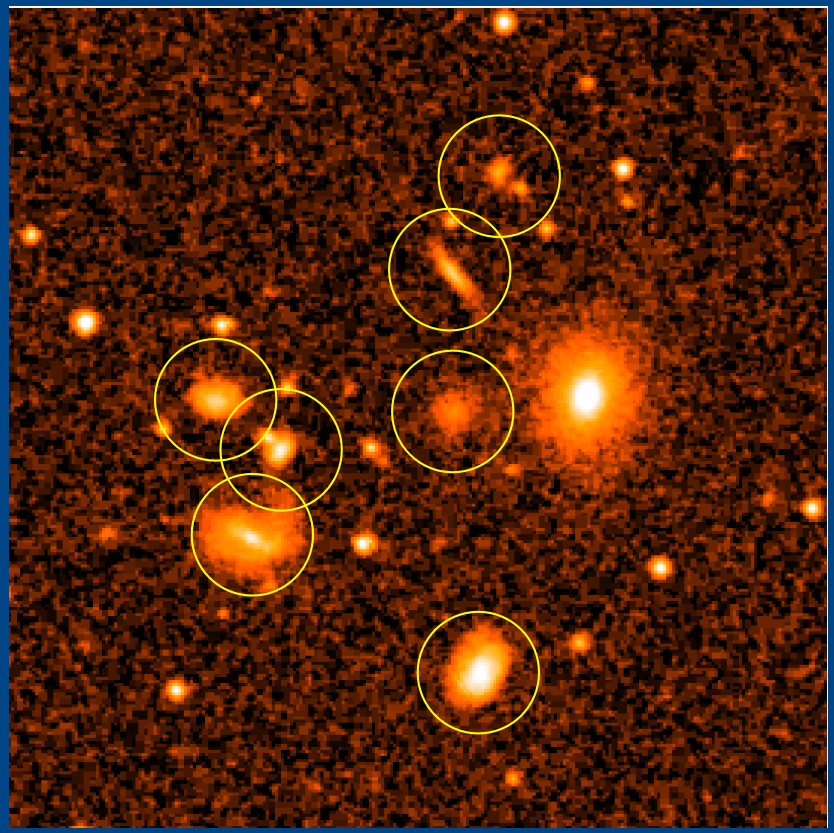
- n_{UV} "UV richness" distribution:

  226 groups with 4 members,
  39 groups with 5 members,
  11 groups with 6 members and
  4 groups with 7 members

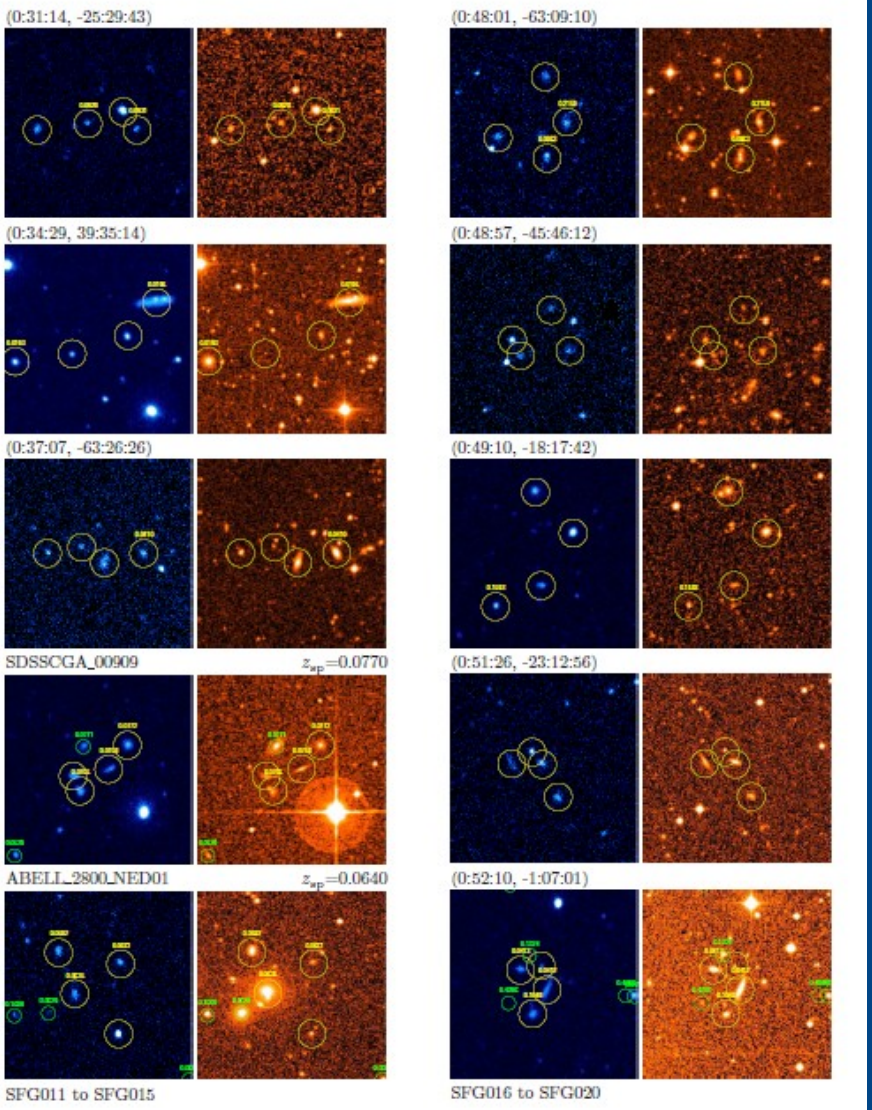
$$\mathbf{N_{groups}(n_{UV}) \sim (n_{UV})^{\alpha} \ with \ \ \alpha \approx -7.53}$$

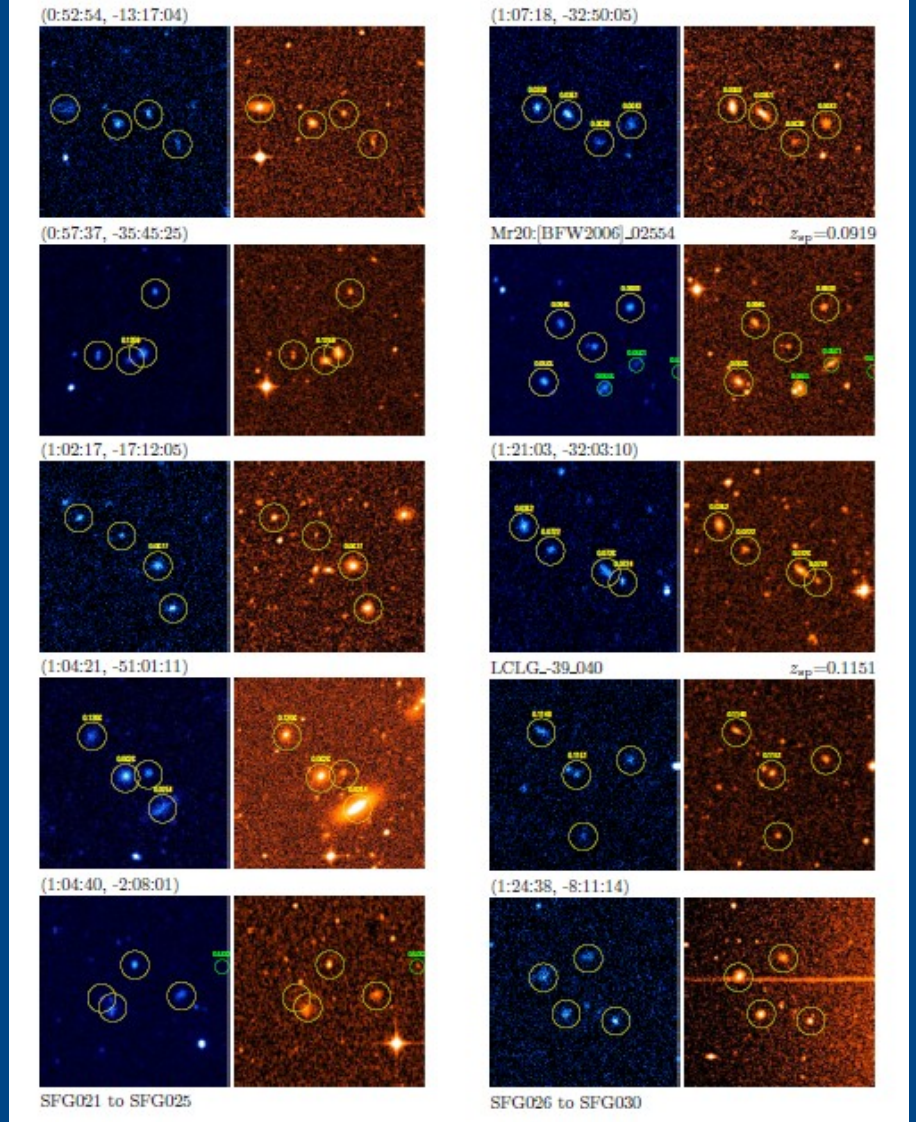
Just one example of the groups that we found...

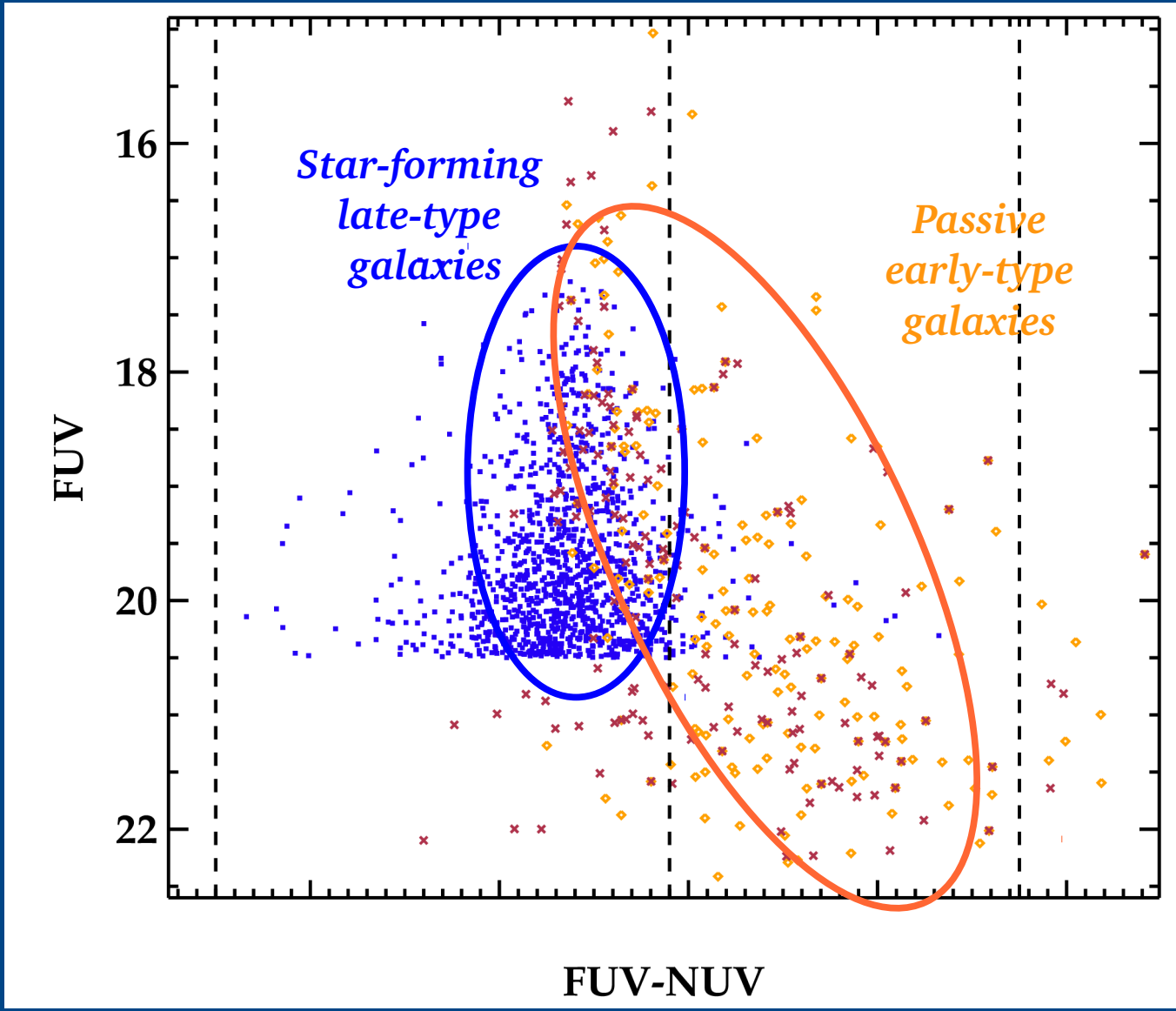




SFCG: An A-PLUS search



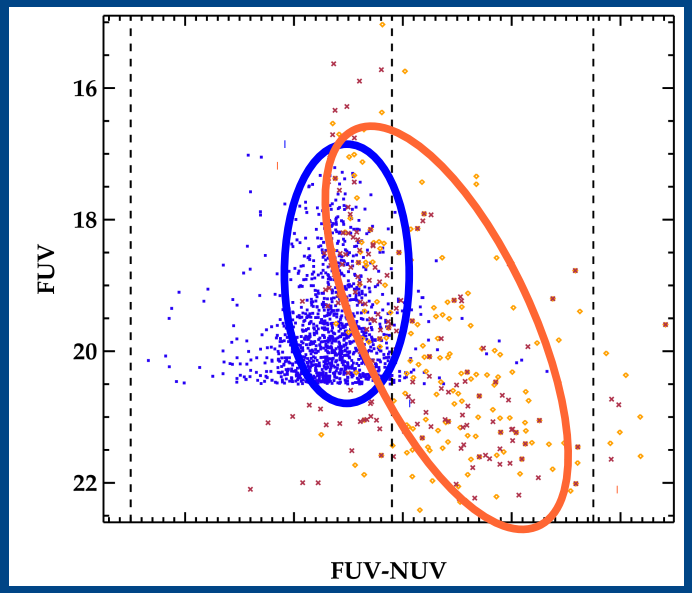




Brigh blue galaxies

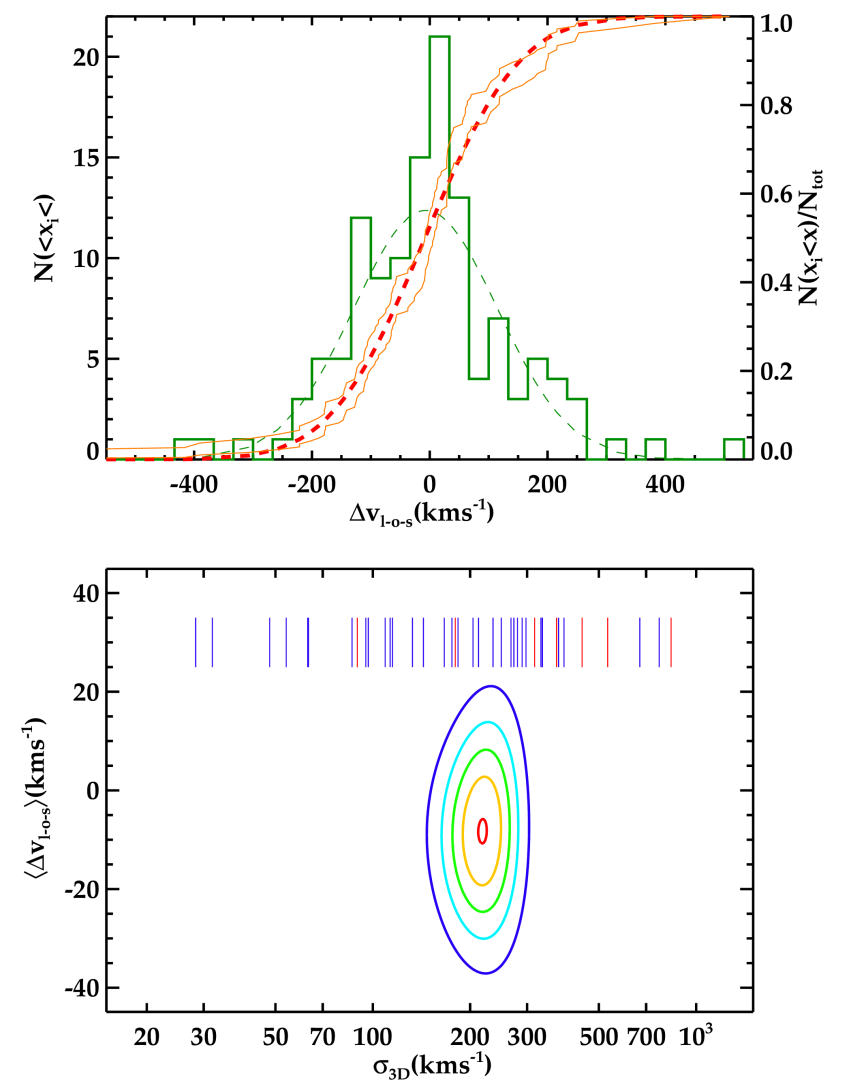
versus

Red galaxies



There is a limitation of optically and near-infrared selected group samples in being dominated by star-forming galaxies.

This shows the interest of building a SFCG sample because of searching over ultraviolet catalogues.



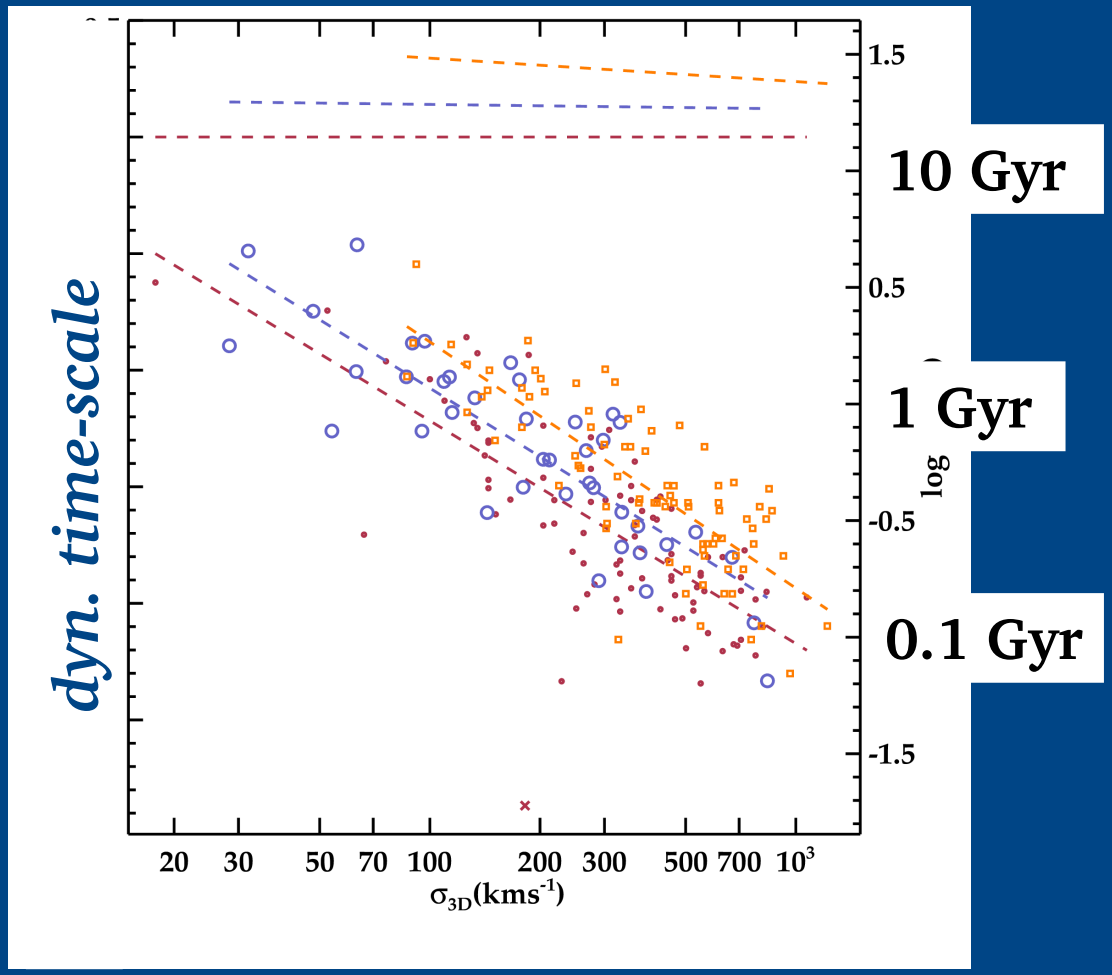
Stacked sample

$\sigma_{3D} \approx 230$ km s^{-1}

$\sigma_{los} \approx 125$ km s^{-1}

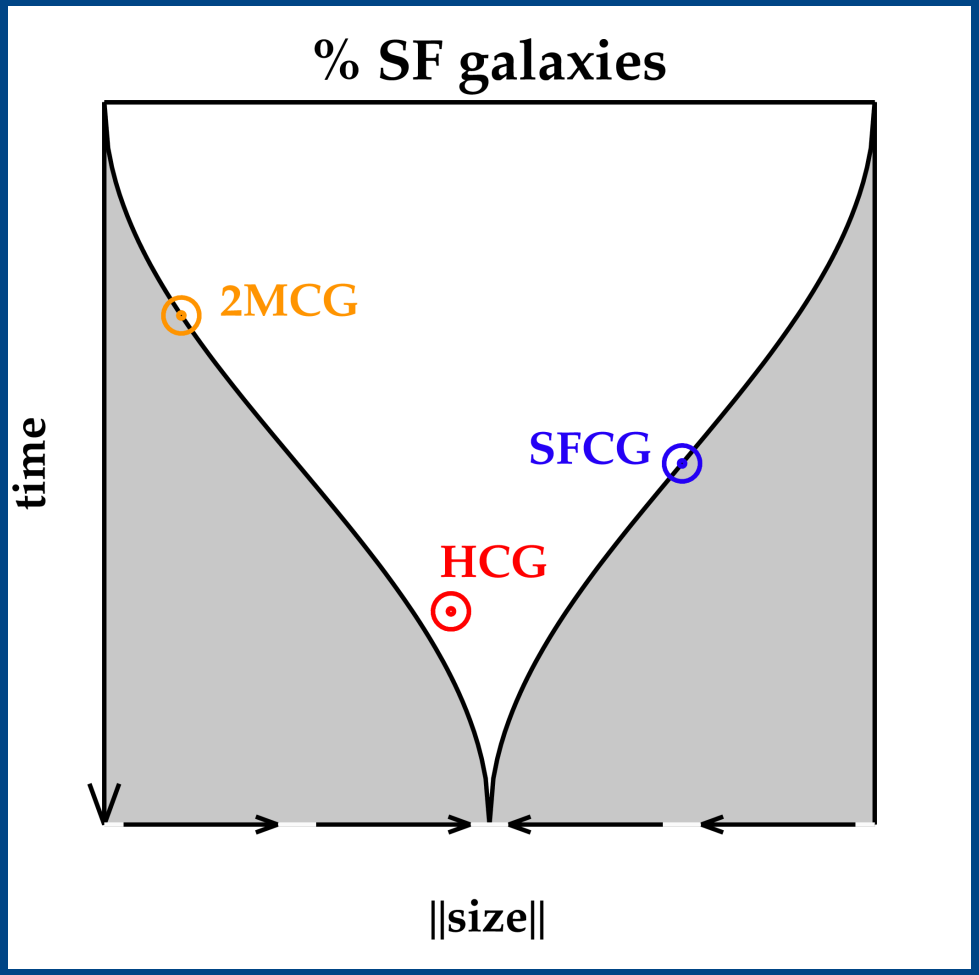
σ_{los} lower than the early-type dominated Hickson groups

more evolved <---> less evolved



velocity dispersion

They are in a intermediate evolutionary stage between 2MASS groups and Hickson groups



- Low velocity dispersions σ_{los} ~ 125 kms-1
- rel. small time-scales $H_0 t_c$ ~ 0.05
- High star-forming fraction f_{sf}~95%

Star-Forming Compact Groups: An ultraviolet search for a local sample

Hernandez-Fernandez, J. D. and Mendes de Oliveira C. L., 2015, MNRAS

Star-Forming Compact Groups: An A-PLUS search for an intermediate-z sample

- First approach -

Reproduce the search in the rest-frame ultraviolet range?

rest-frame NUV corresponds to
the observed u´-band at z~0.5

diff. in μ between z~0.05 and z~0.5 is μ≈6 mag.

$FUV_{z\sim0.5} \sim [\ 17, 20.5\ ] \Rightarrow u' \sim [\ 23, 26.5\ ]$ *!?*

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There is no option to do a search
in the rest-frame GALEX ultraviolet bands
(FUV or NUV)

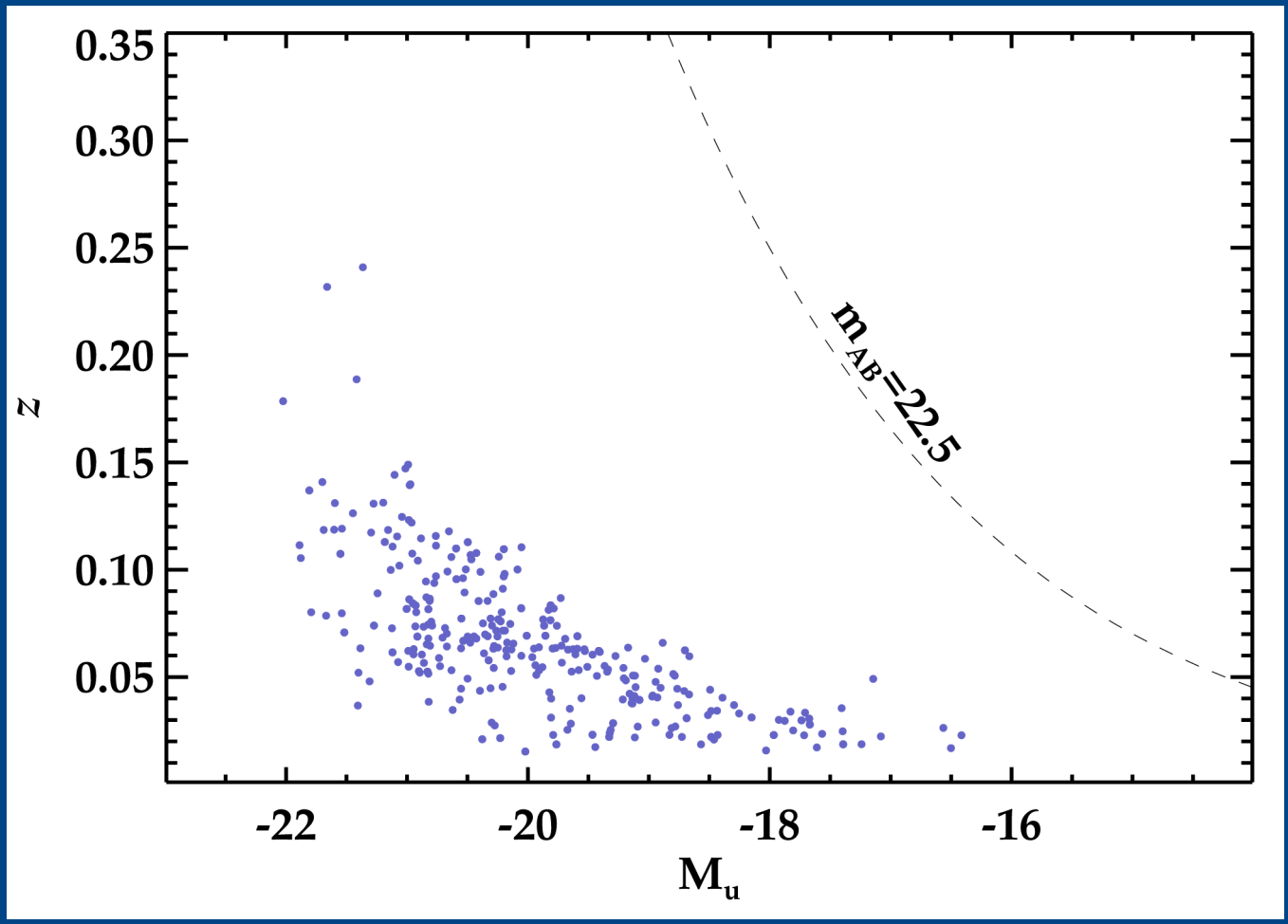
- Second approach -

(1) Segregate a sample of star-forming galaxies
(Walter and Paula's talks)
or a sample of late-type galaxies?

(2) including the flux constraints
in the bluest spectral band.

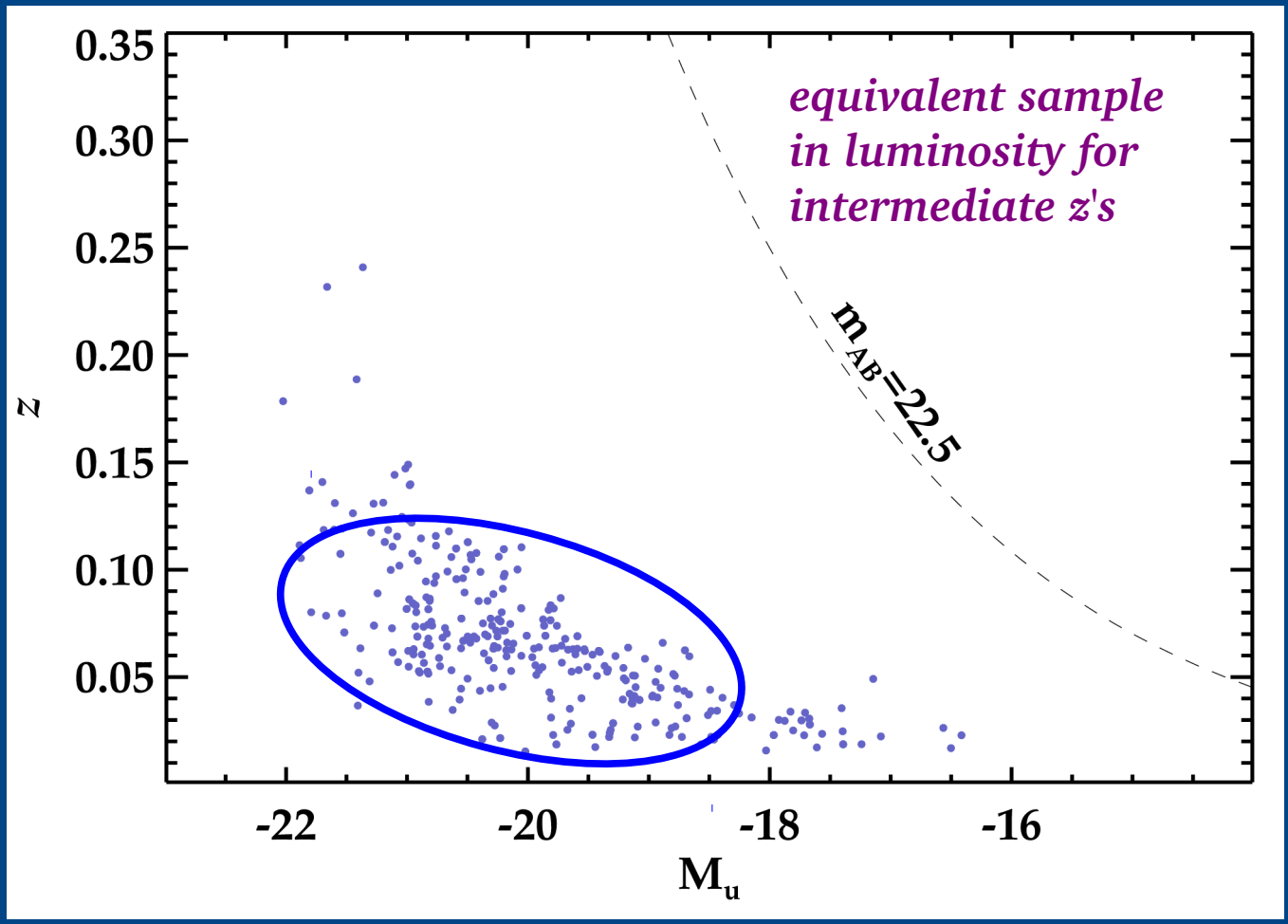
We do a test here with the u' band...

redshift



u' band absolute magnitude

redshift



u' band absolute magnitude

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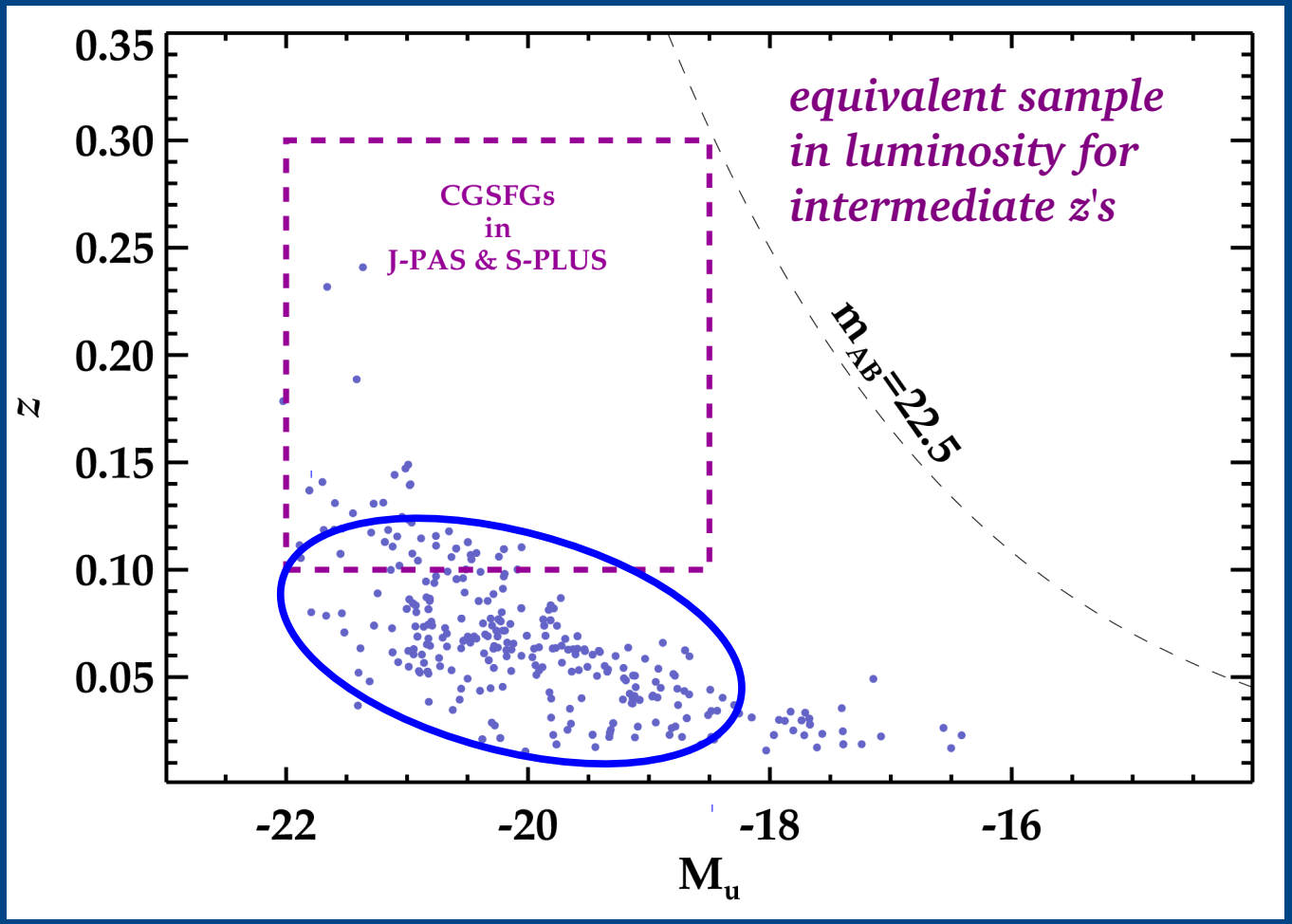

u' band absolute magnitude

Caveat!
Samples of compact groups selected in projection
used to have around half of the groups
resulting from a chance alignment
(Diaz-Gimenez & Mamon 2010, Mendel et al. 2010)

* *Standard definition of "real group":*
4 galaxies within a 2000 kms^{-1} interval
(Hickson et al. 1992, Diaz-Gimenez & Mamon 2010)

Value-added by A-PLUS in the construction of samples of compact groups:

* *Photometric redshifts* **A-PLUS**
$\Delta z/(1+z) \sim 0.007$ *(Alberto's talk)* $\Rightarrow \Delta v_{los} \sim 2100$ kms^{-1}

SUMMARY

- *We have compiled a z~0.05 sample of 280 SFCGs*

- *The sample presents a combination of properties different from the group samples studied up to now, such as low σ_{los}~125 kms^{-1}, small $H_0 t_c$~0.05 and high fraction 95% of star-forming galaxies*

- *A-PLUS has enough depth and redshift accuracy to provide a sample of SFCG up to z~0.3*