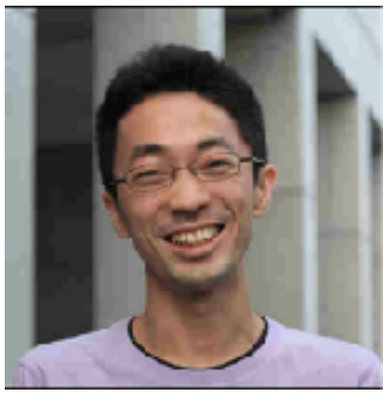
UV Luminosity Functions at z~4-7 Derived with the Half-million Dropouts on the 100 deg² Sky

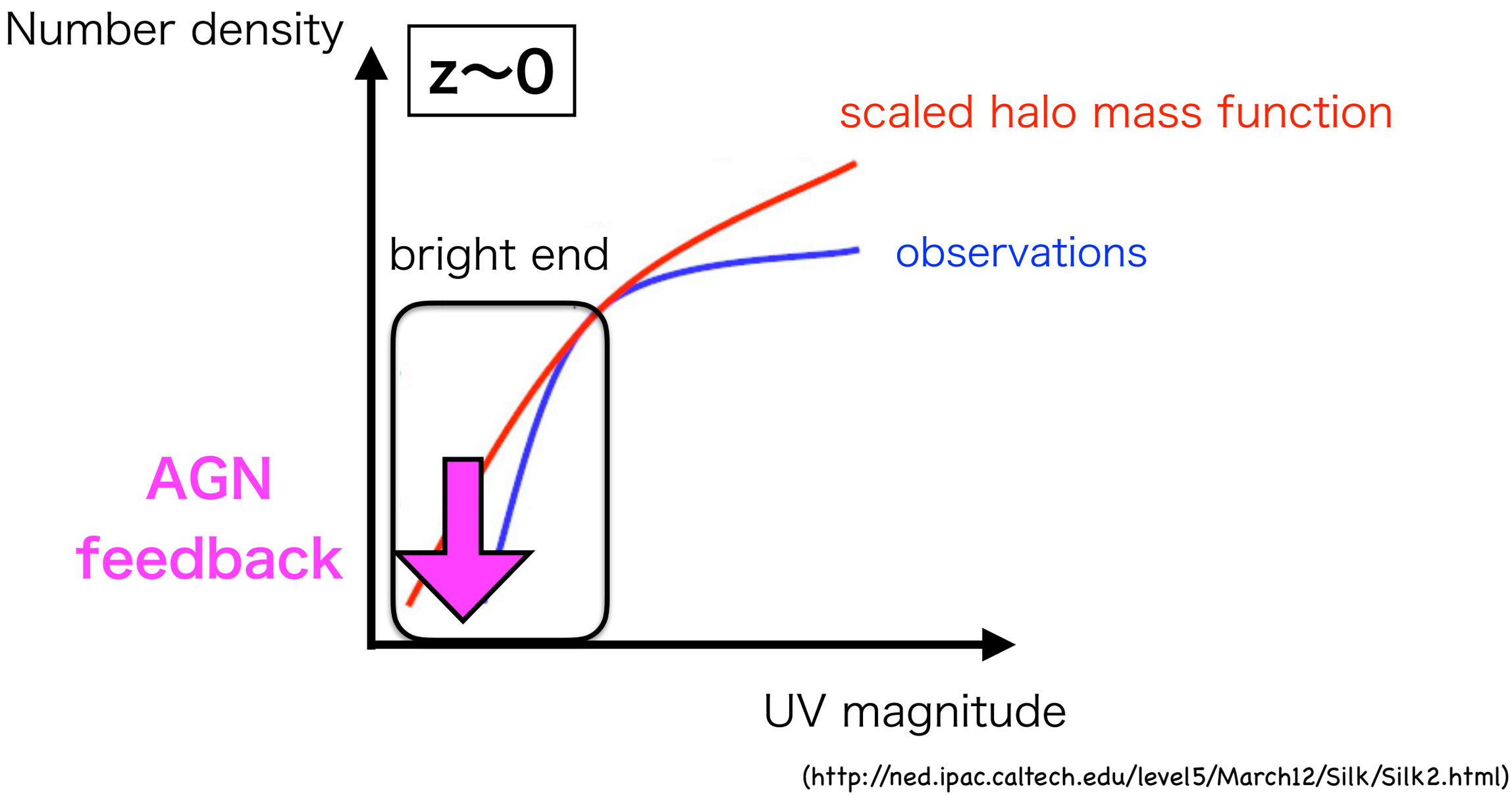


is in Hawaii for his observations …

Y. Ono, M. Ouchi, **Yuichi Harikane**, J. Toshikawa, M. Rauch, S. Yuma,
M. Sawicki, T. Shibuya, K. Shimasaku, M. Oguri, C. Willott, M. Akhlaghi,
M. Akiyama, J. Coupon, H. Furusawa, N. Kashikawa, Y. Komiyama,
A. Konno, L. Lin, Y. Matsuoka, S. Miyazaki, T. Nagao, K. Nakajima,
B. J. Silverman, M. Tanaka, Y. Taniguchi, S.-Y. Wan

Tokyo Spring Cosmic Lya Workshop (Sakura CLAW), 2018 March

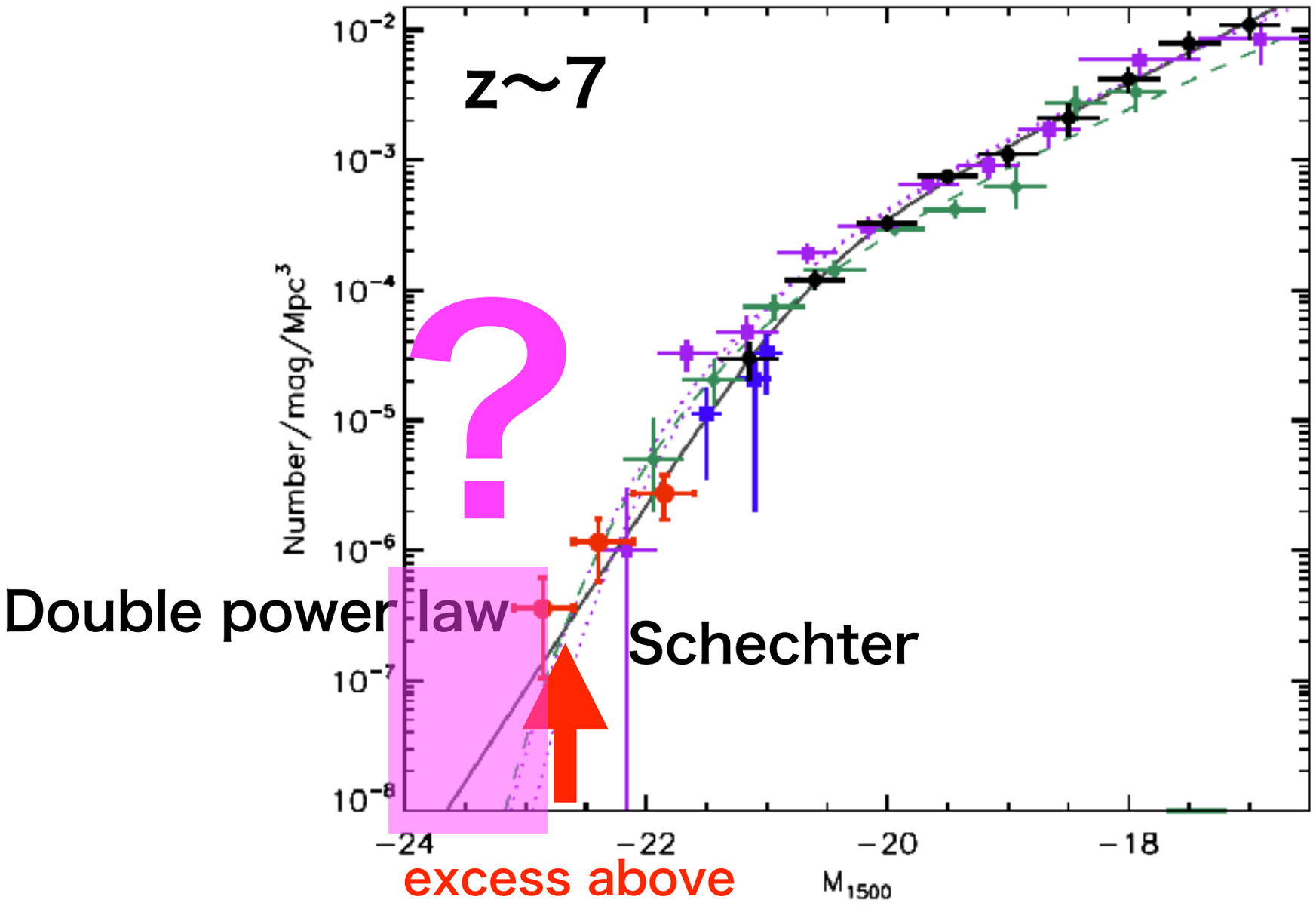
Luminosity Function at Low-z



(http://ned.ipac.caltech.edu/level5/March12/Silk/Silk2.html)

・Bright end of the UV luminosity function at **low-z**
  - **exponential cutoff** due to **AGN feedback** (e.g., Croton+06, Loveday+12)

Luminosity Function at High-z



(Bowler et al. 2017; see also Bouwens et al. 2015, Finkelstein et al. 2015)

- Bright end of the UV luminosity function at high-z
  - Schechter (exponential cutoff)? or power law?
  - inefficient star-formation quenching feedback at high-z?

Data

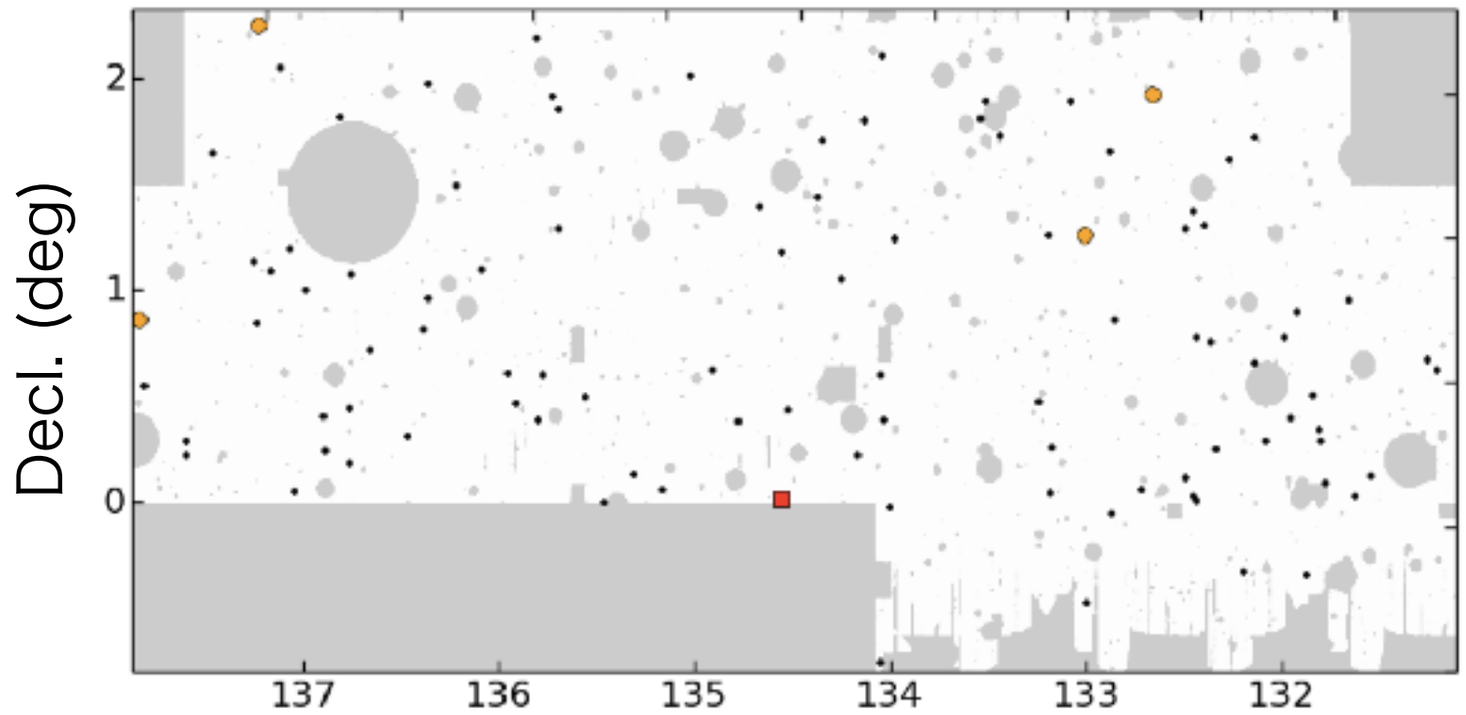
■ Data: S16A internal release of the Subaru HSC Survey (Aihara et al. 2018)

- Ultradeep (UD)
- Deep (D)
- Wide (W)

■ Effective area for our study

= **102.7 deg²**

Example:
W-GAMA09H

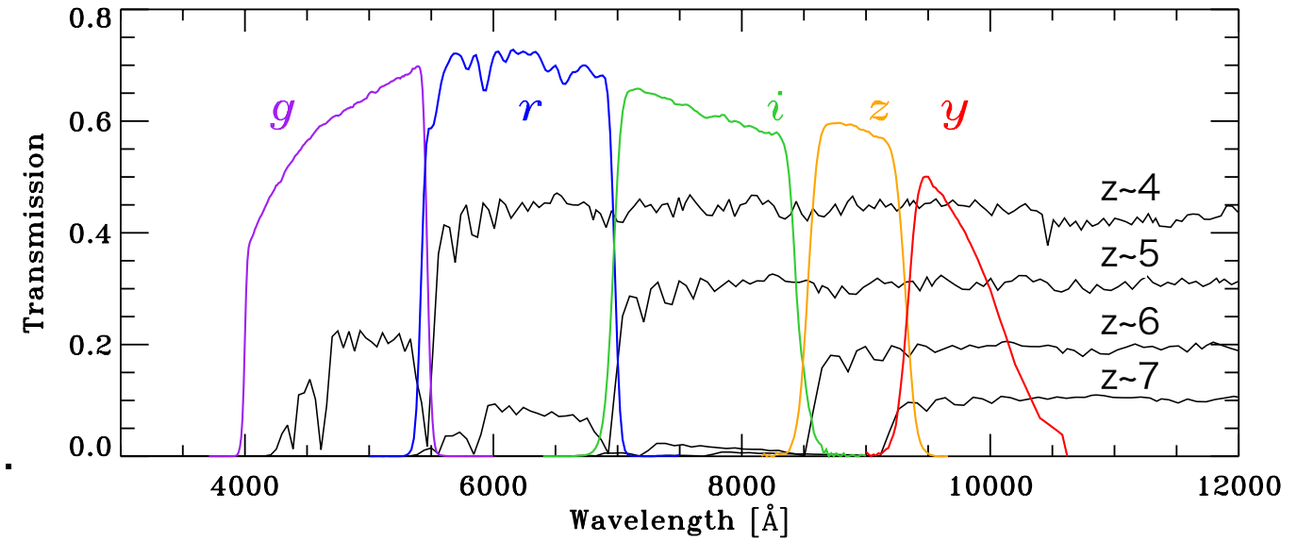


(Harikane et al. 2018)

■ Limiting magnitude (5-sigma ABmag)

- UD: g∼27, r∼27, i∼26.5, z∼26, y∼25
- D: g∼26.5, r∼26, i∼26, z∼25, y∼24.5
- W: g∼26, r∼26, i∼26, z∼25, y∼24

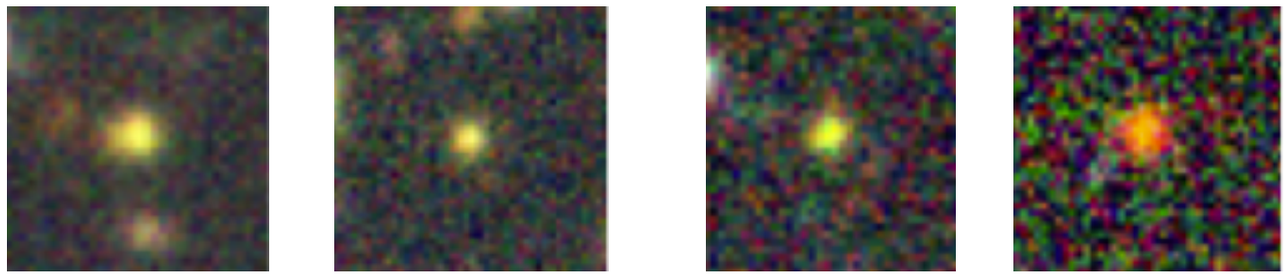
→ select high-z galaxy candidates
by using the Lyman break technique.



(Ono et al. 2018)

Dropout Sample

z~4 z~5 z~6 z~7

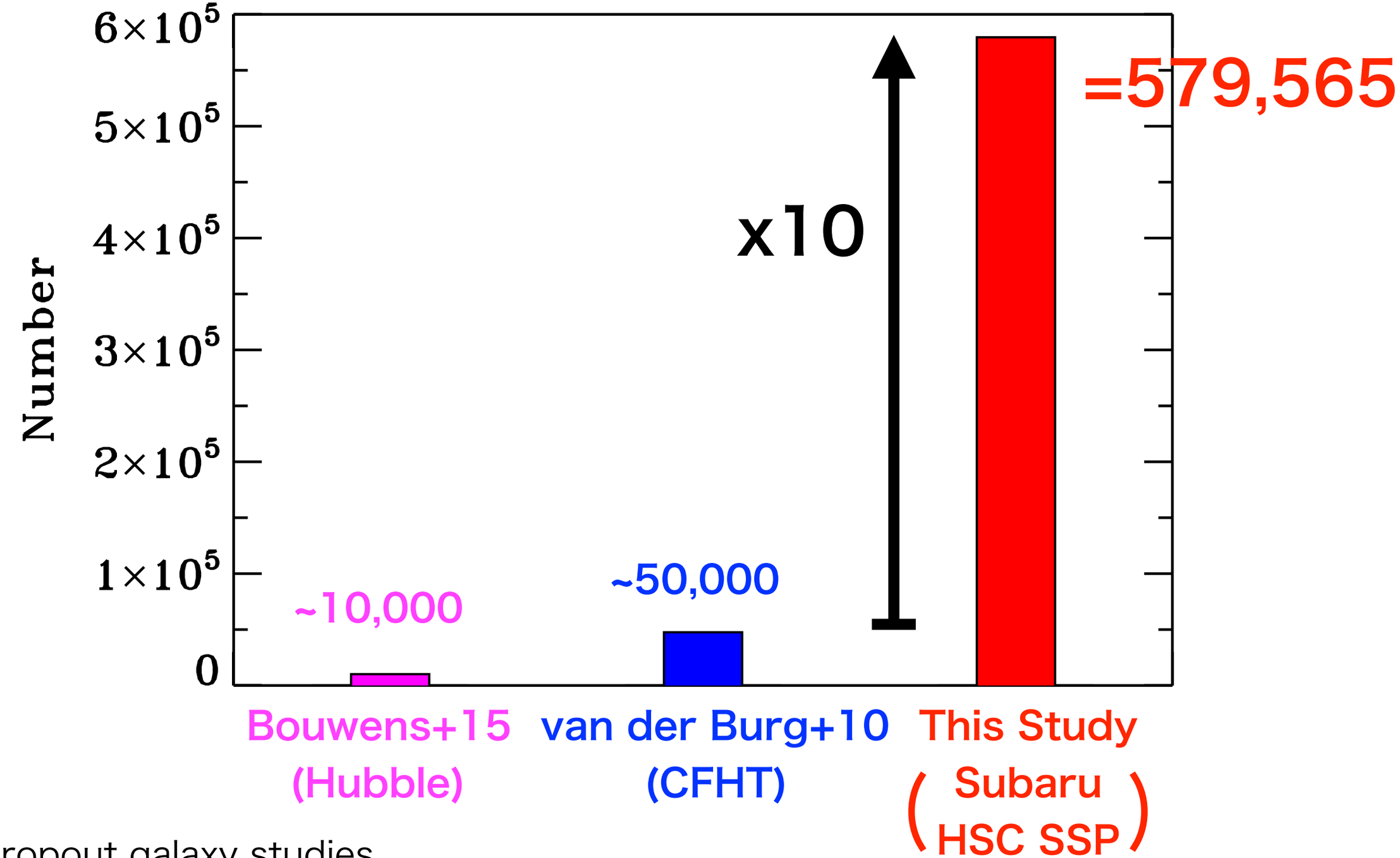


Field	# of g-drops	# of r-drops	# of i-drops	# of z-drops
UD-SXDS	9916	1209	36	—
UD-COSMOS	10644	1990	50	—
D-XMM-LSS	6730	711	6	0
D-COSMOS	45767	6282	64	4
D-ELAIS-N1	19631	612	15	1
D-DEEP2-3	35963	1498	47	5
W-XMM	113582	6371	81	7
W-GAMA09H	44670	5989	98	16
W-WIDE12H	94544	5243	36	8
W-GAMA15H	104224	6457	73	14
W-HECTOMAP	30663	1082	11	7
W-VVDS	23677	1500	20	11
Total	540011	38944	537	73

 # in total

579,565

Dropout Sample



■ dropout galaxy studies

・clustering analysis: **Harikane et al. (2018) → Next slide**

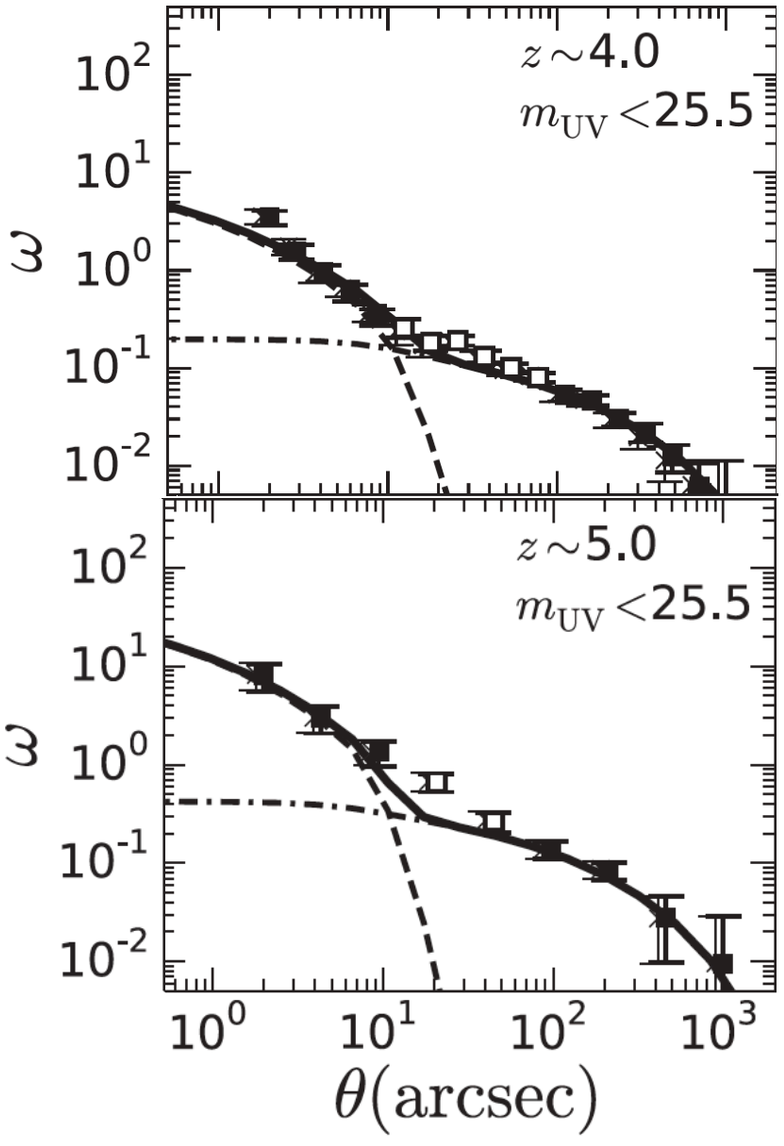
・protocluster study: **Toshikawa et al. (2018) → Jun's poster**

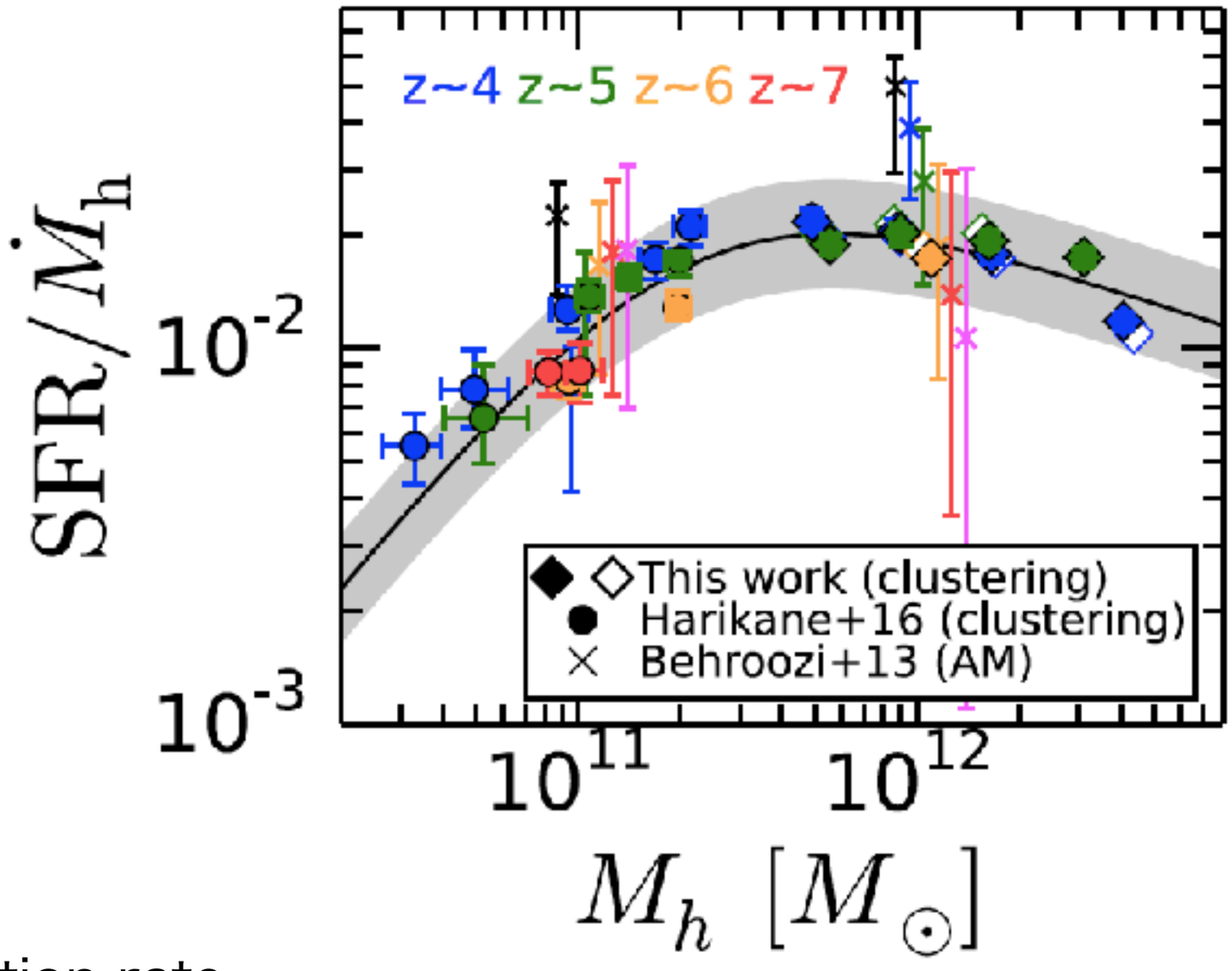
・UV luminosity function: **Ono et al. (2018) → This talk**

and others …

Clustering Analysis of Dropouts

Harikane et al. 2018

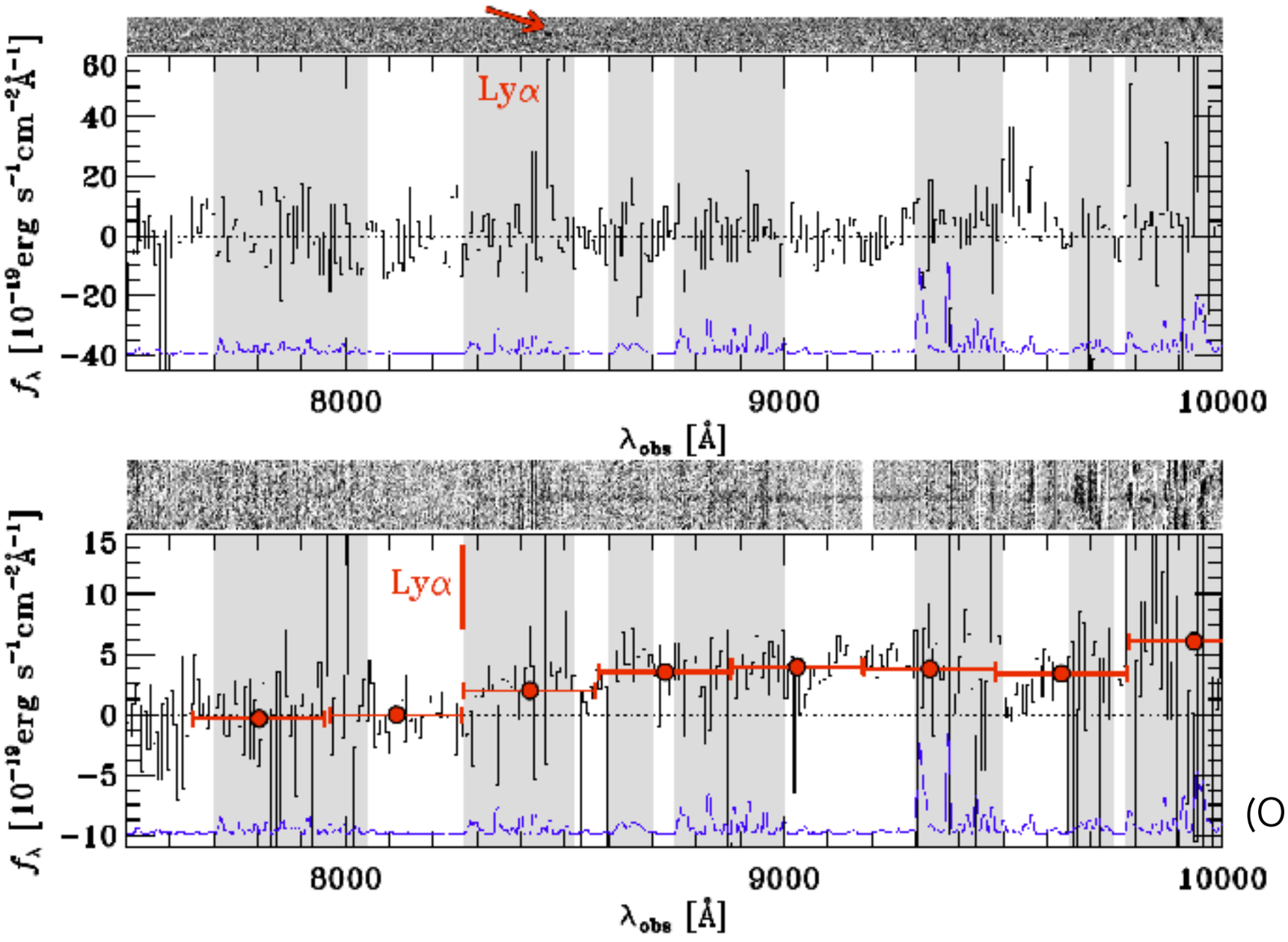




Measuring M_h and accretion rate

- Angular correlation functions with unprecedentedly high statistical accuracies
- **Redshift-independent relation between SFR and dark matter accretion**
- See Harikane et al. 2018 for more details

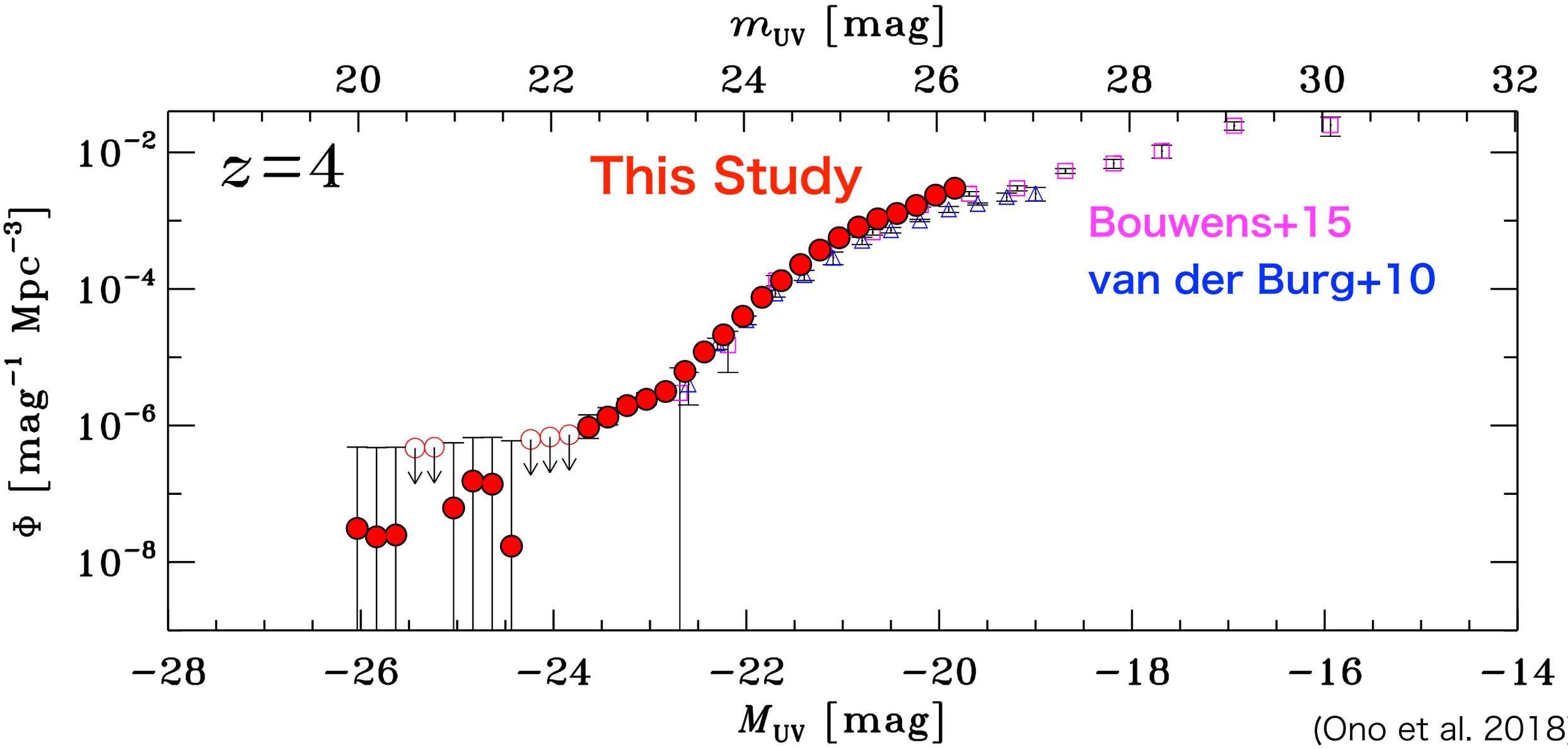
Comparison with Spectroscopic Results



(Ono et al. 2018)

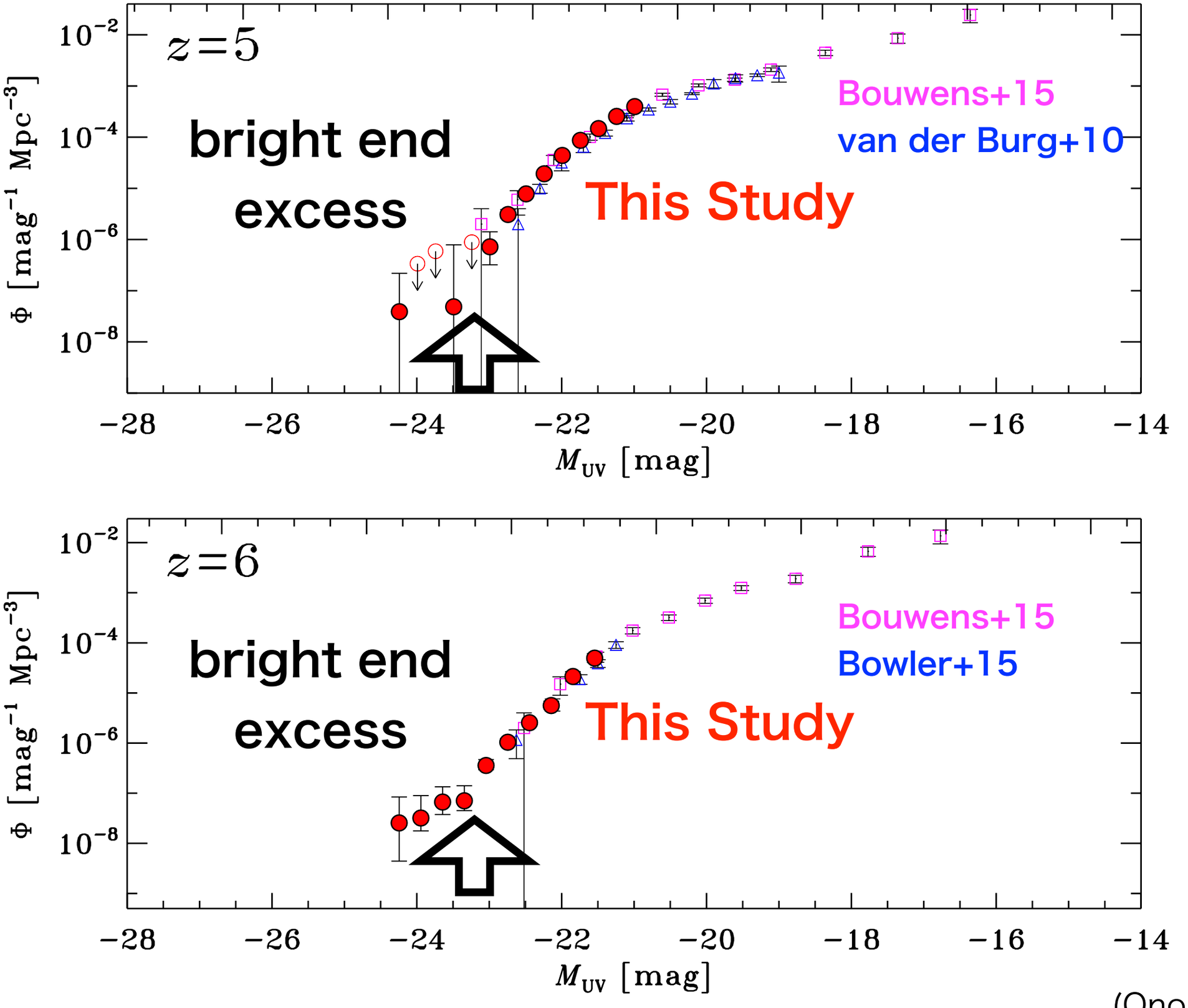
- In total, **358 dropouts** in our sample **have been identified at z>3.5**.
  + Five high-z galaxies are from our Subaru and Magellan follow-up.
  + Our previous spec. obs. results are incorporated.
  + Spec-z catalogs obtained by other studies are also checked.
- Contamination rates ~10% based on previous spectroscopy results.

UV Luminosity Function at z=4



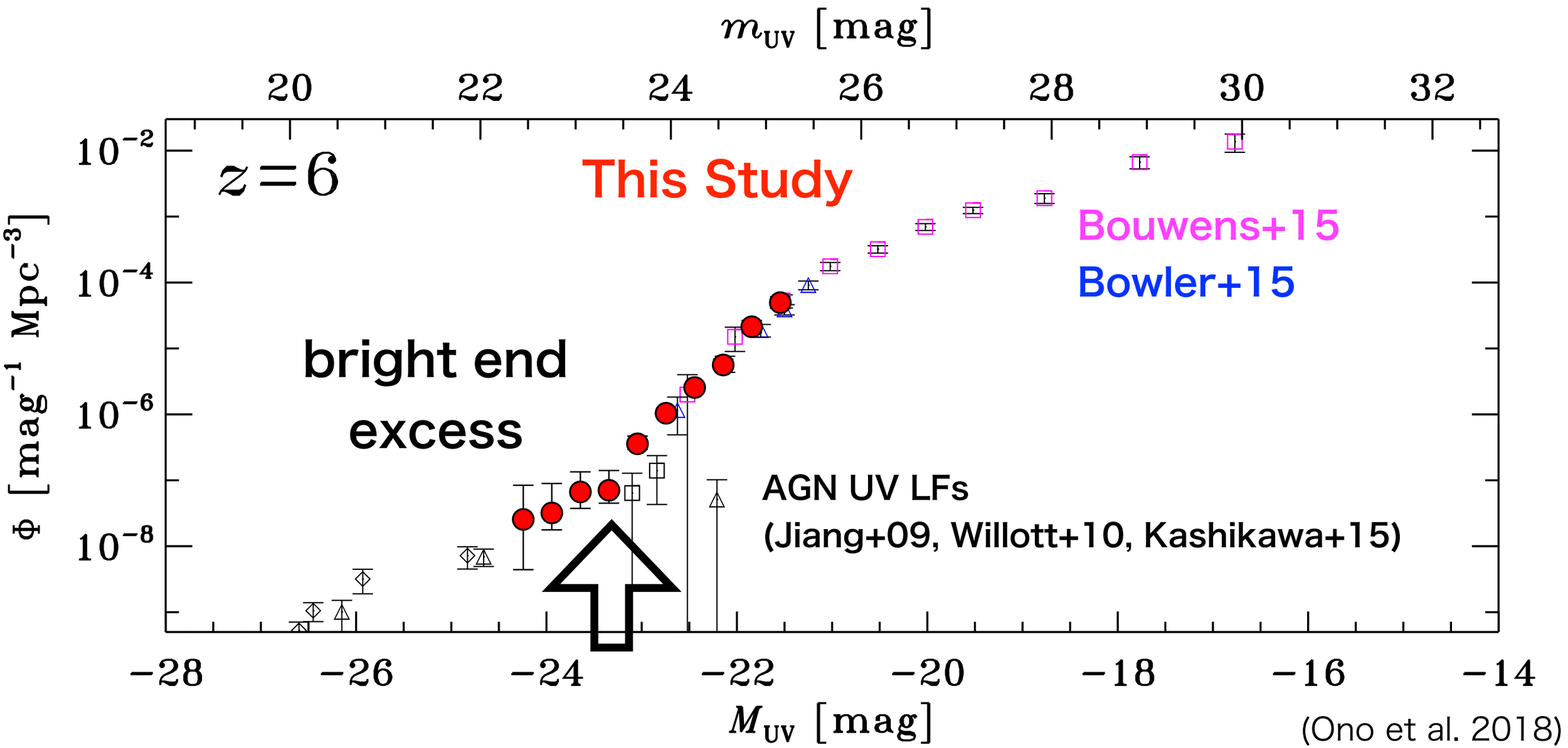
(Ono et al. 2018)

UV Luminosity Functions at z=5-6



(Ono et al. 2018)

AGN Contamination

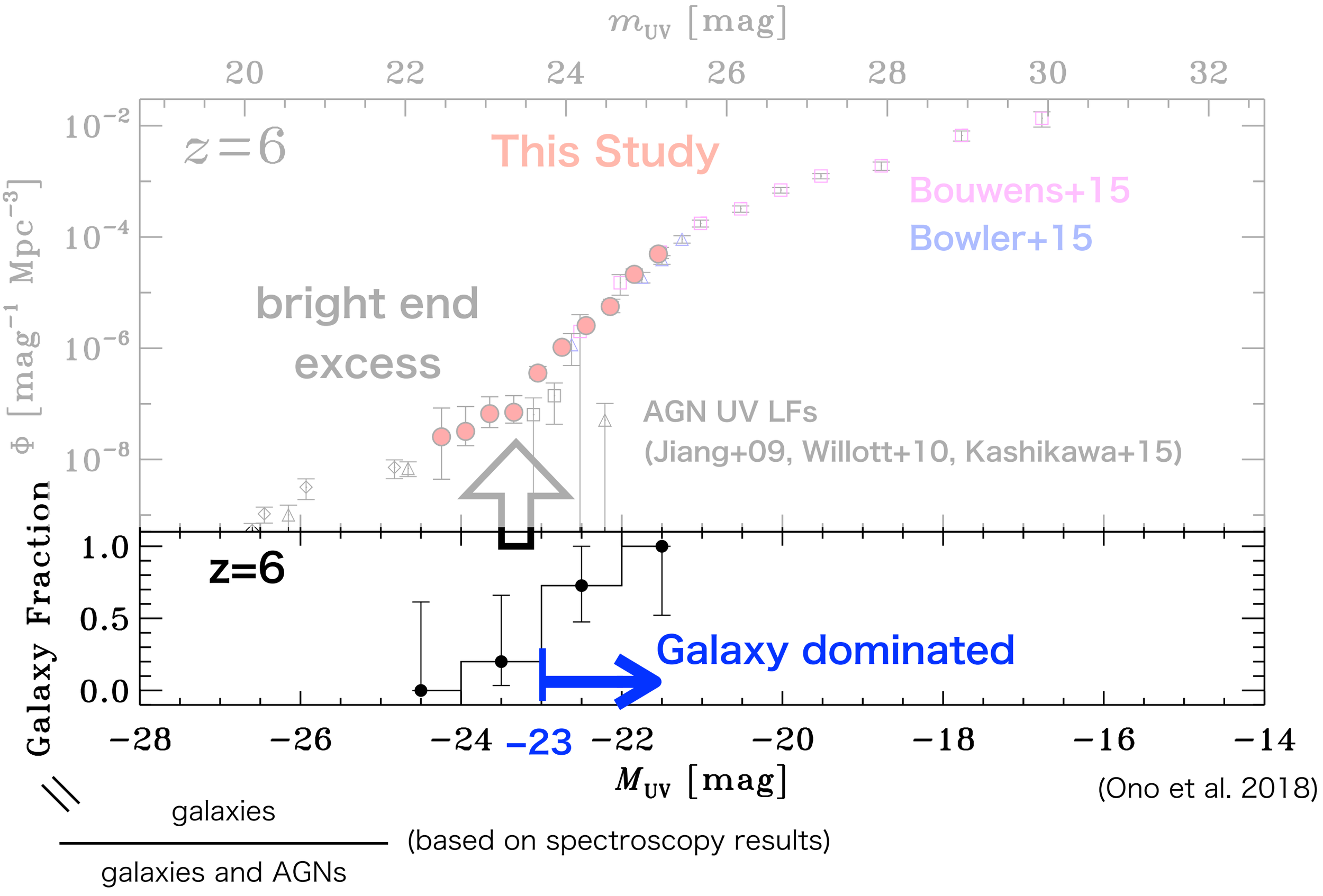


(Ono et al. 2018)

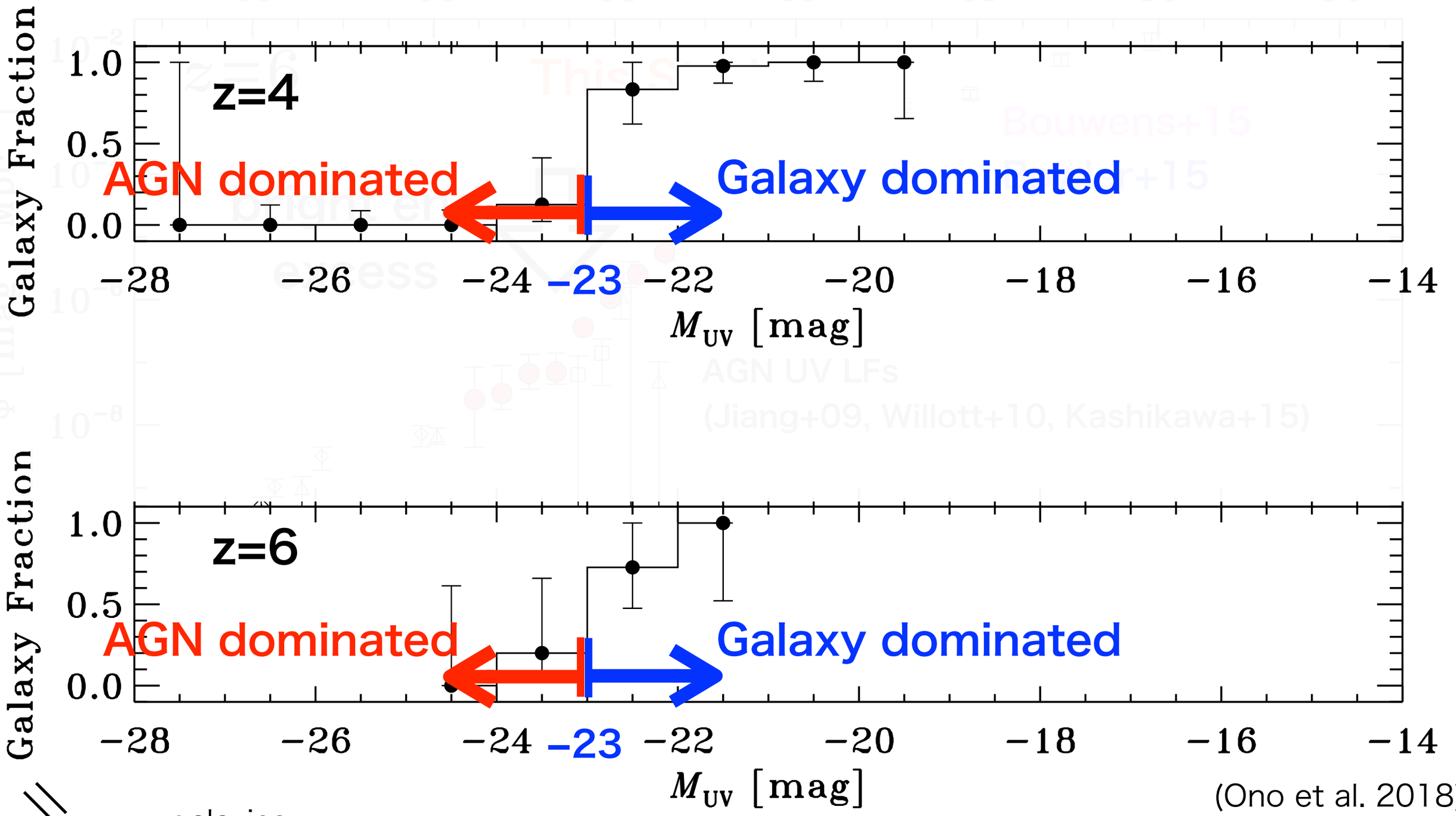
- consistent with previous results at $M_{UV} > -23$.
- appear to have an excess at $M_{UV} < -23$.

comparable to the number densities of AGNs

AGN Contamination



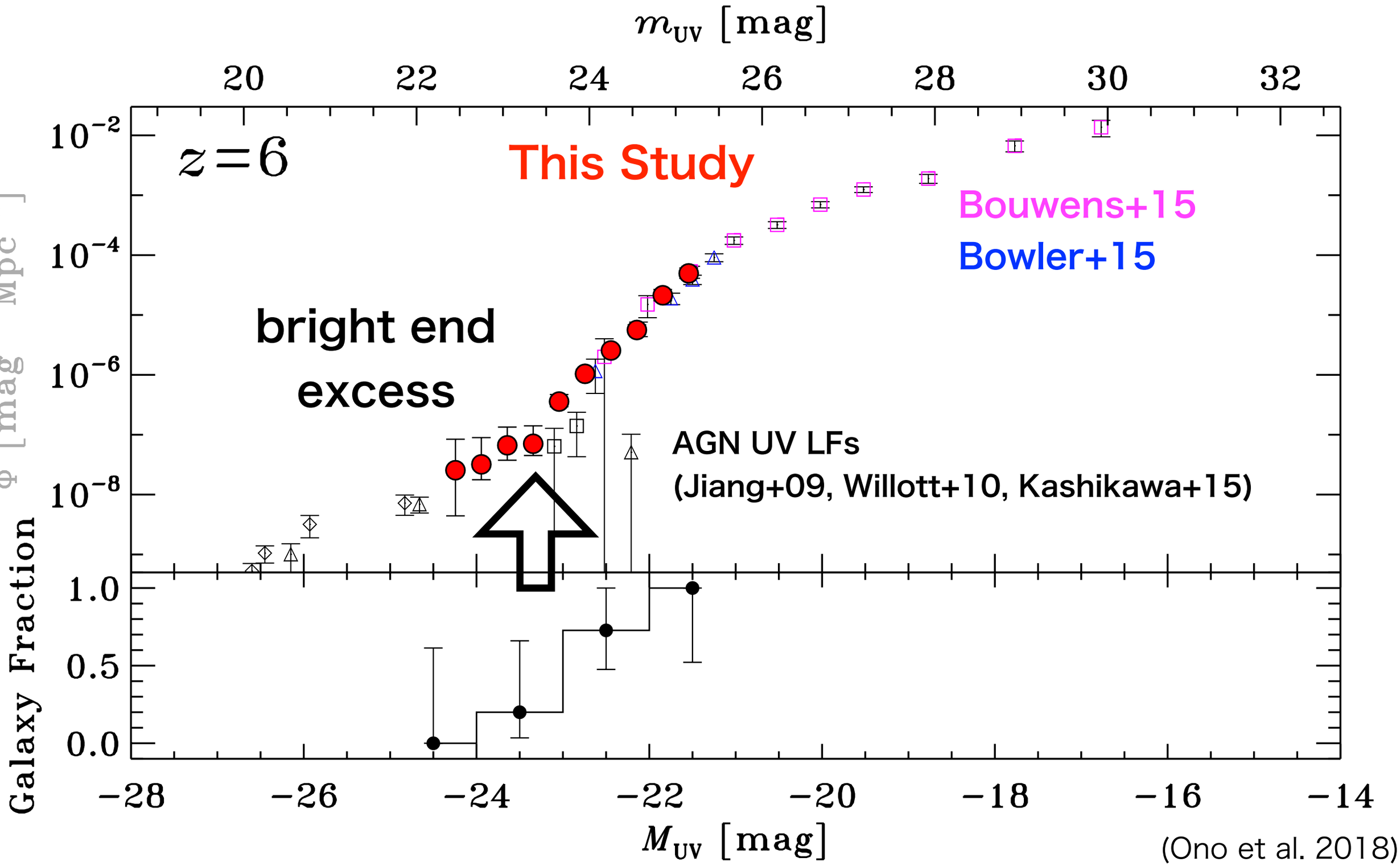
AGN Contamination



(Ono et al. 2018)

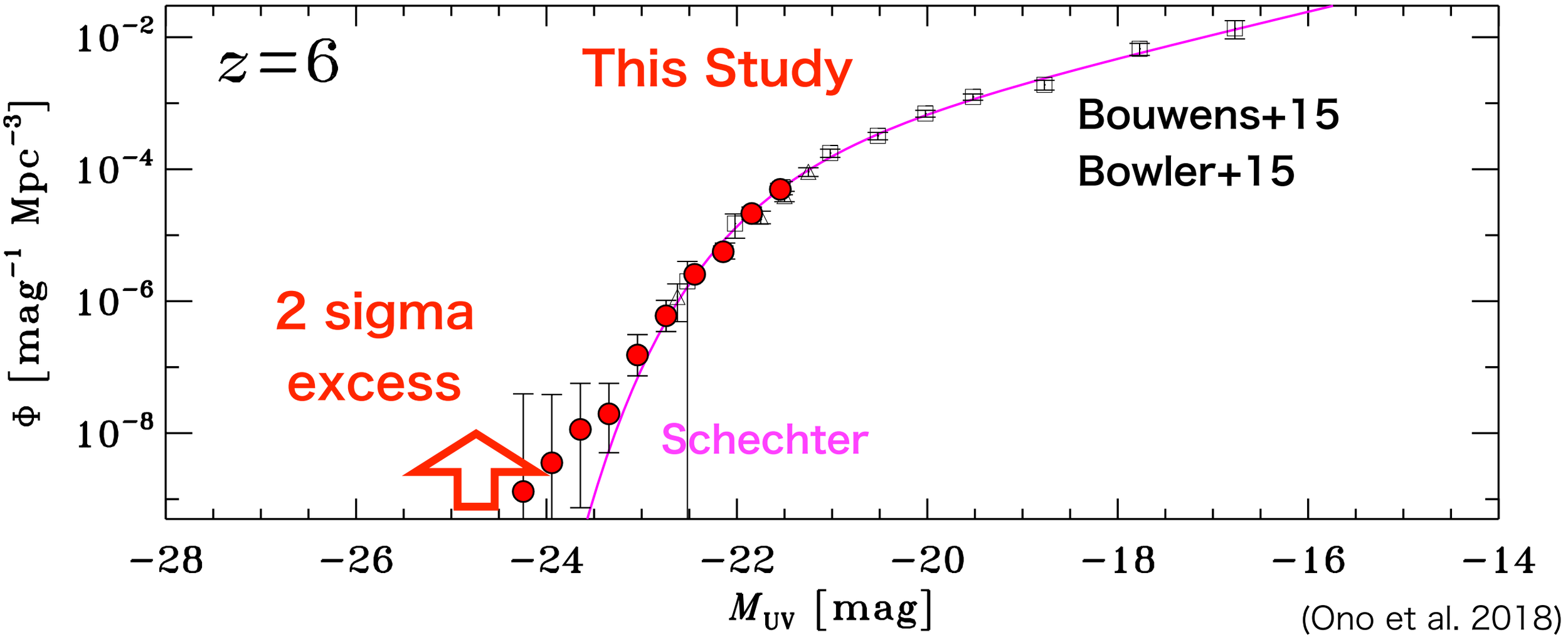
$$\frac{\text{galaxies}}{\text{galaxies and AGNs}}$$

UV Luminosity Function at z=6



(Ono et al. 2018)

Galaxy UV Luminosity Function at z=6

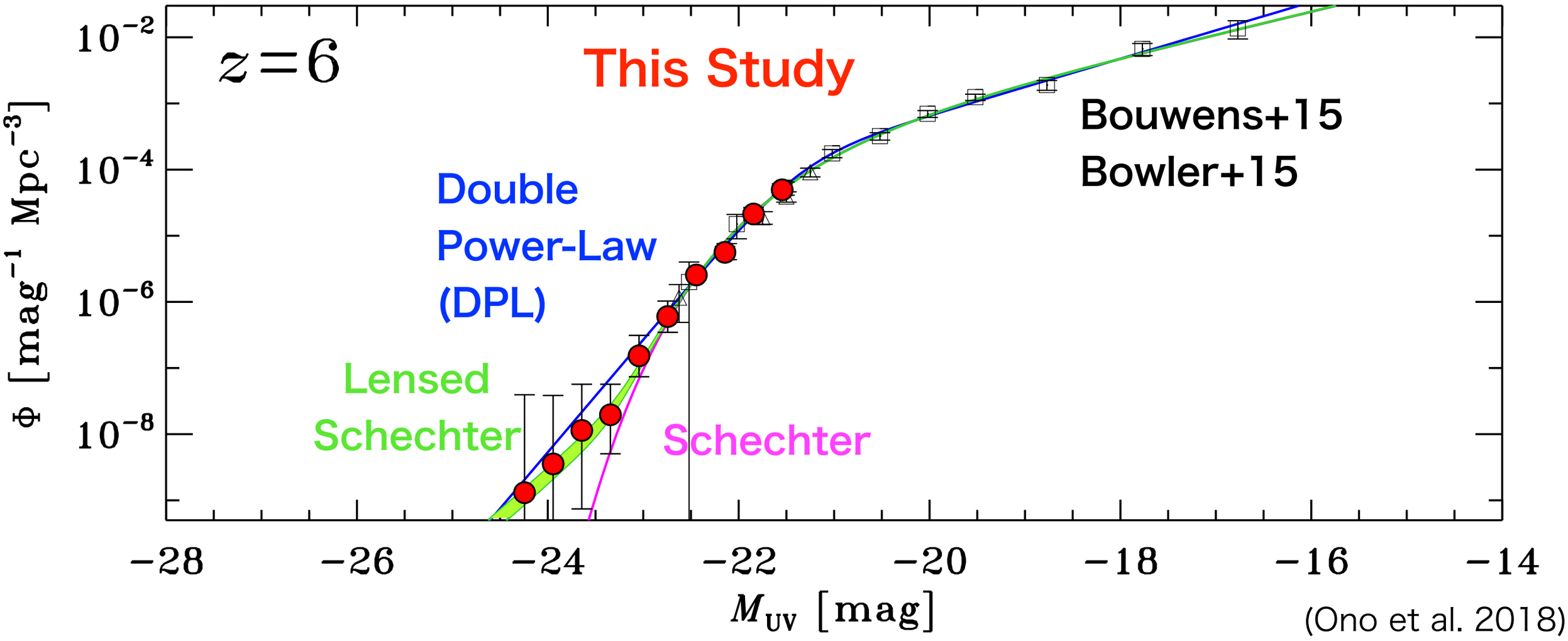


(Ono et al. 2018)

・Red circles: galaxy UV LFs
derived by subtracting the AGN contributions based on the galaxy fraction.

・The bright end shape cannot be explained by the Schechter function.

Galaxy UV Luminosity Function at z=6



(Ono et al. 2018)

・Red circles: galaxy UV LFs
derived by subtracting the AGN contributions based on the galaxy fraction.
・The bright end shape cannot be explained by the Schechter function.
・DPL and lensed Schechter provide better fits.

Summary

- **~500,000 dropout candidates at z=4-7** are identified based on the HSC SSP.
- Among them, **358** dropouts have **spec-z**.
- The obtained z=4-7 UV LFs span a very wide range of **−26 < Muv < −14 mag**, which combine our results with those from the Hubble legacy surveys.
- The bright end shapes of UV LFs **cannot be explained by the Schechter** functions at $>2\sigma$, and **require either DPL or lensed Schechter**.