Constraining UVLF at z>7 with WISH-UDS

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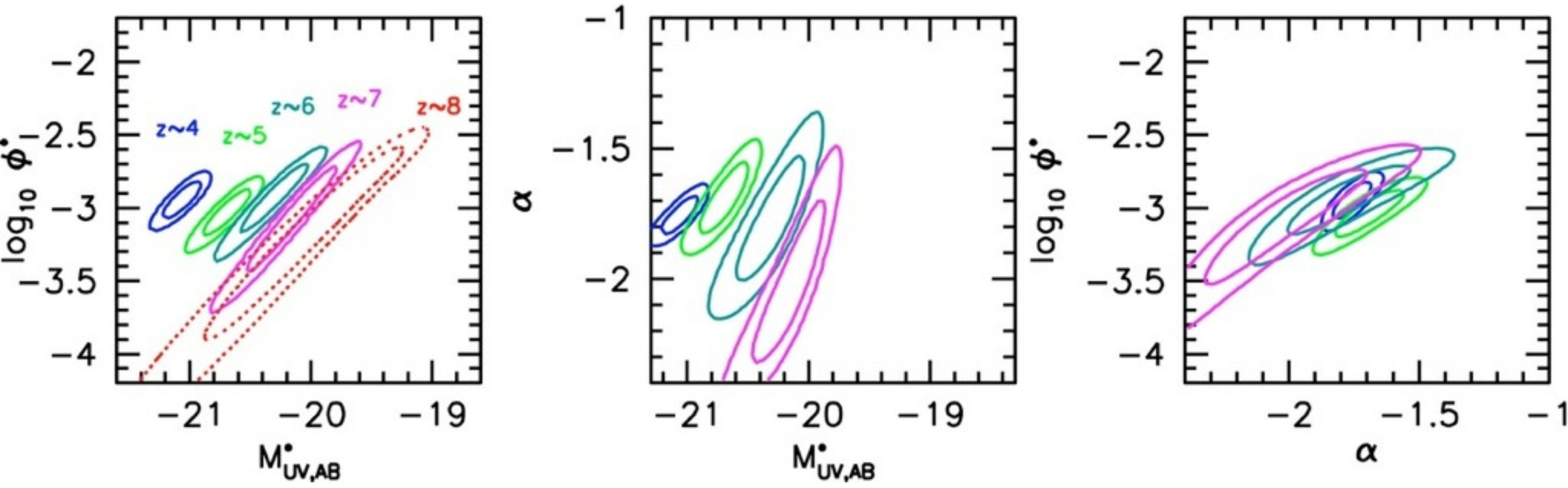
- Question:

  Are WISH Ultra-Deep Survey (UDS) Sensitivity (28 AB) and Area (100 deg.^{2}) Sufficient to Detect z>7 Galaxies and to Constrain UV Luminosity Function (UVLF)?

UVLF Evolution (Schechter function parameters)

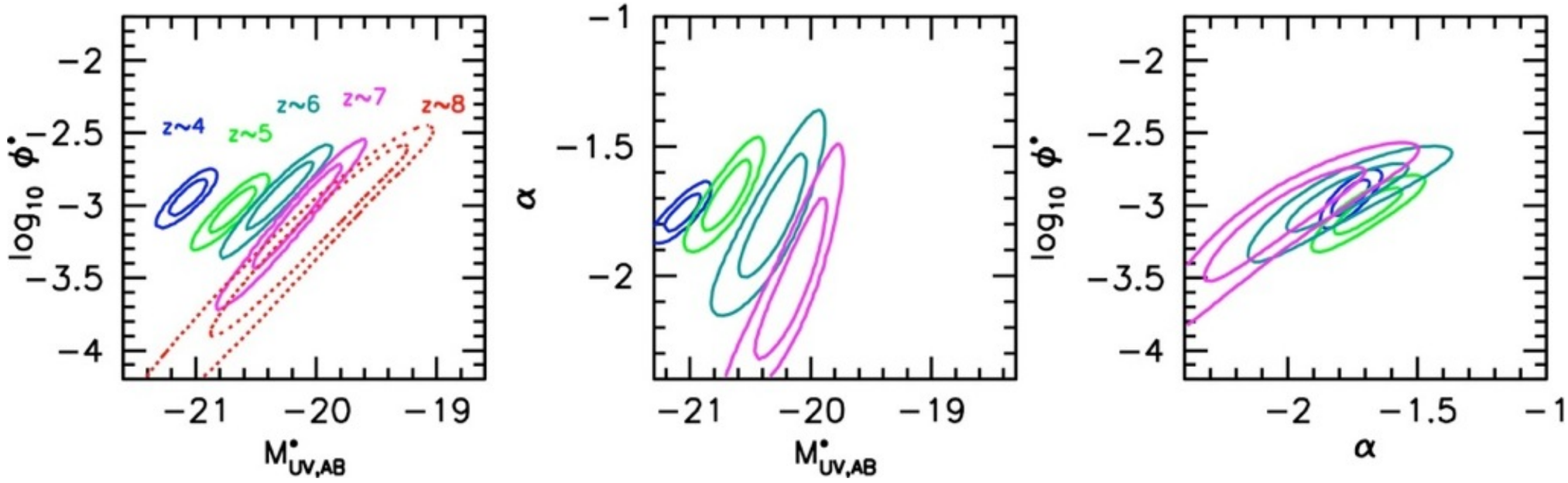
- Hubble Space Telescope ACS and WFC3/IR observations



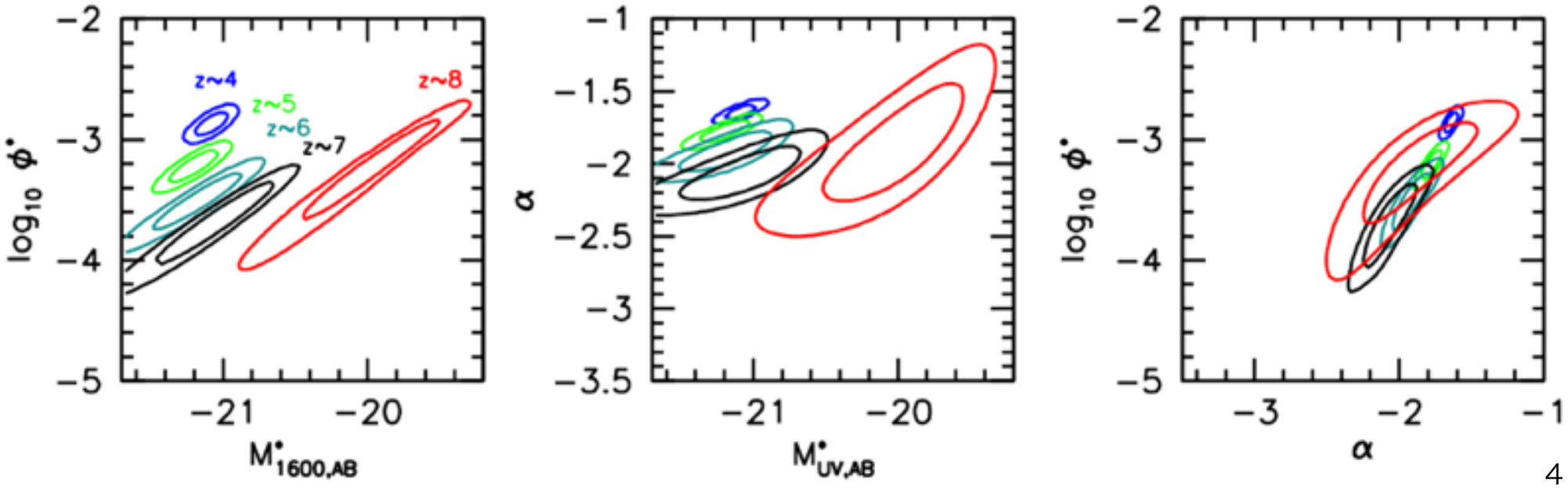
Bouwens+2011, ApJ 737:90

UVLF Evolution (Schechter function parameters)

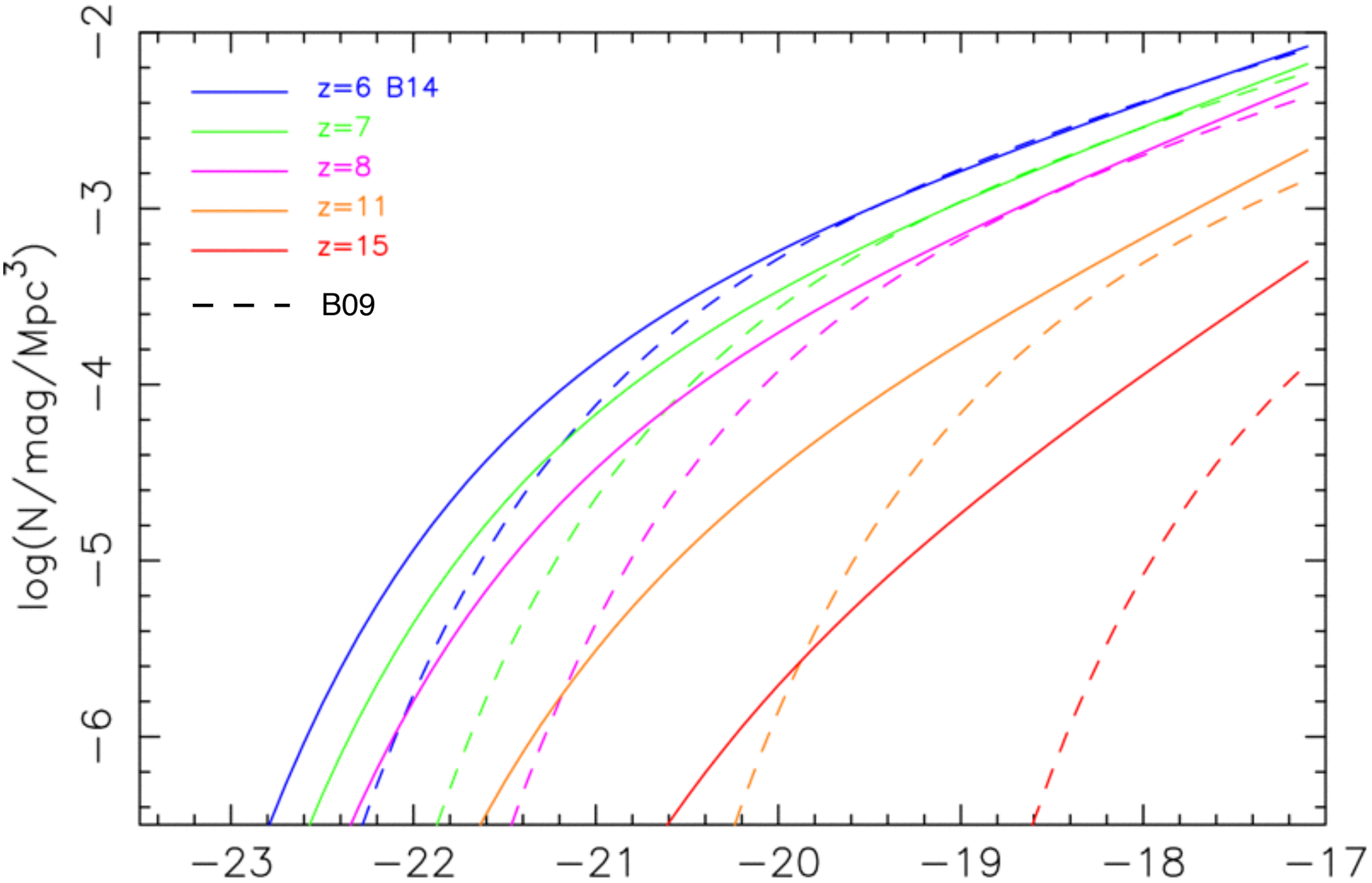
Bouwens+2011



Bouwens+2014
arxiv:1403.4925

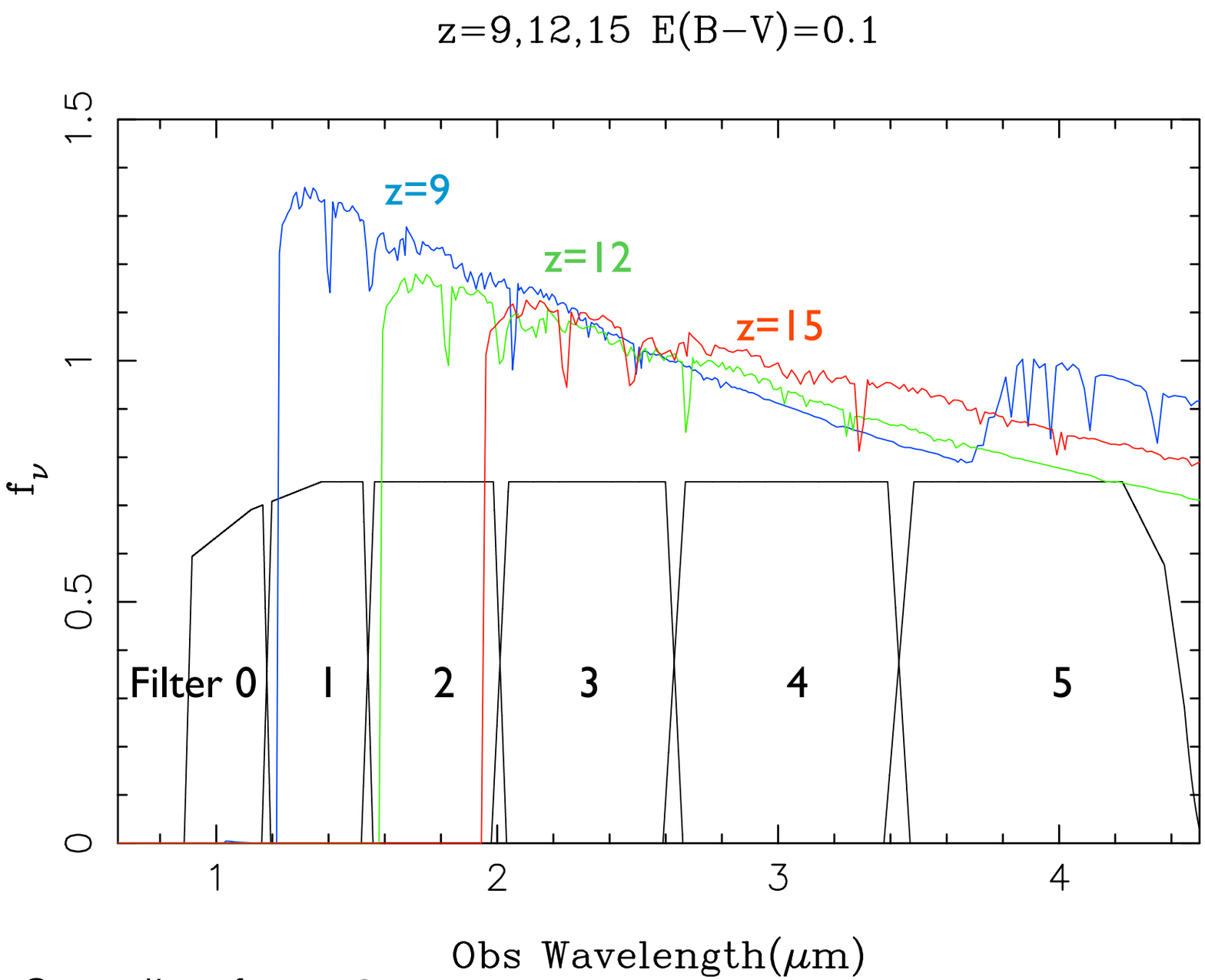


Empirical UVLF Evolution - Bouwens 2009/2011 vs. 2014



Bouwens+2009 and 2011: only M* evolution
Bouwens+2014: (M*), Φ*, α evolution

WISH Broad-band Filter Set



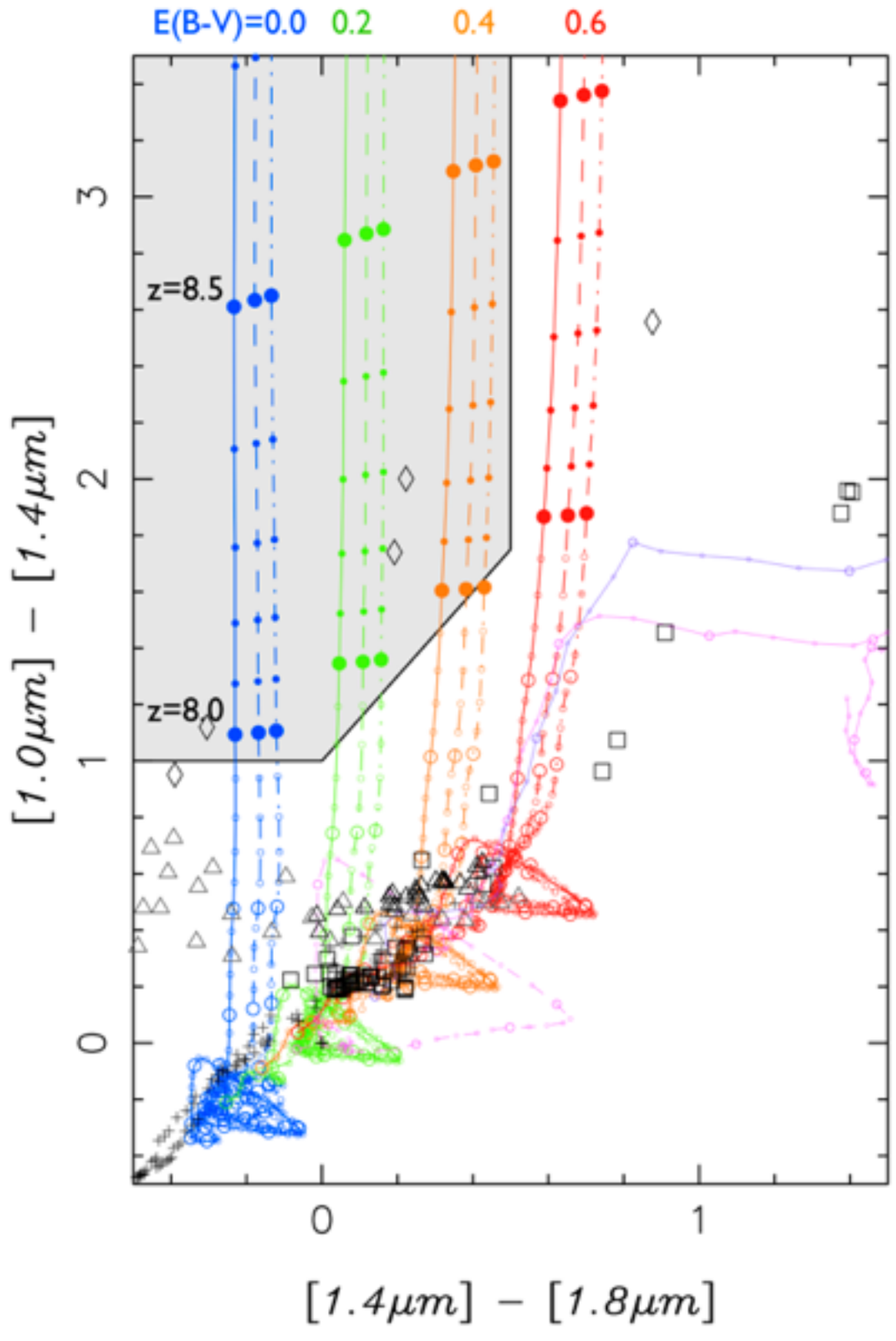
- Continuous Sampling for z>8
- Determine UV Slope

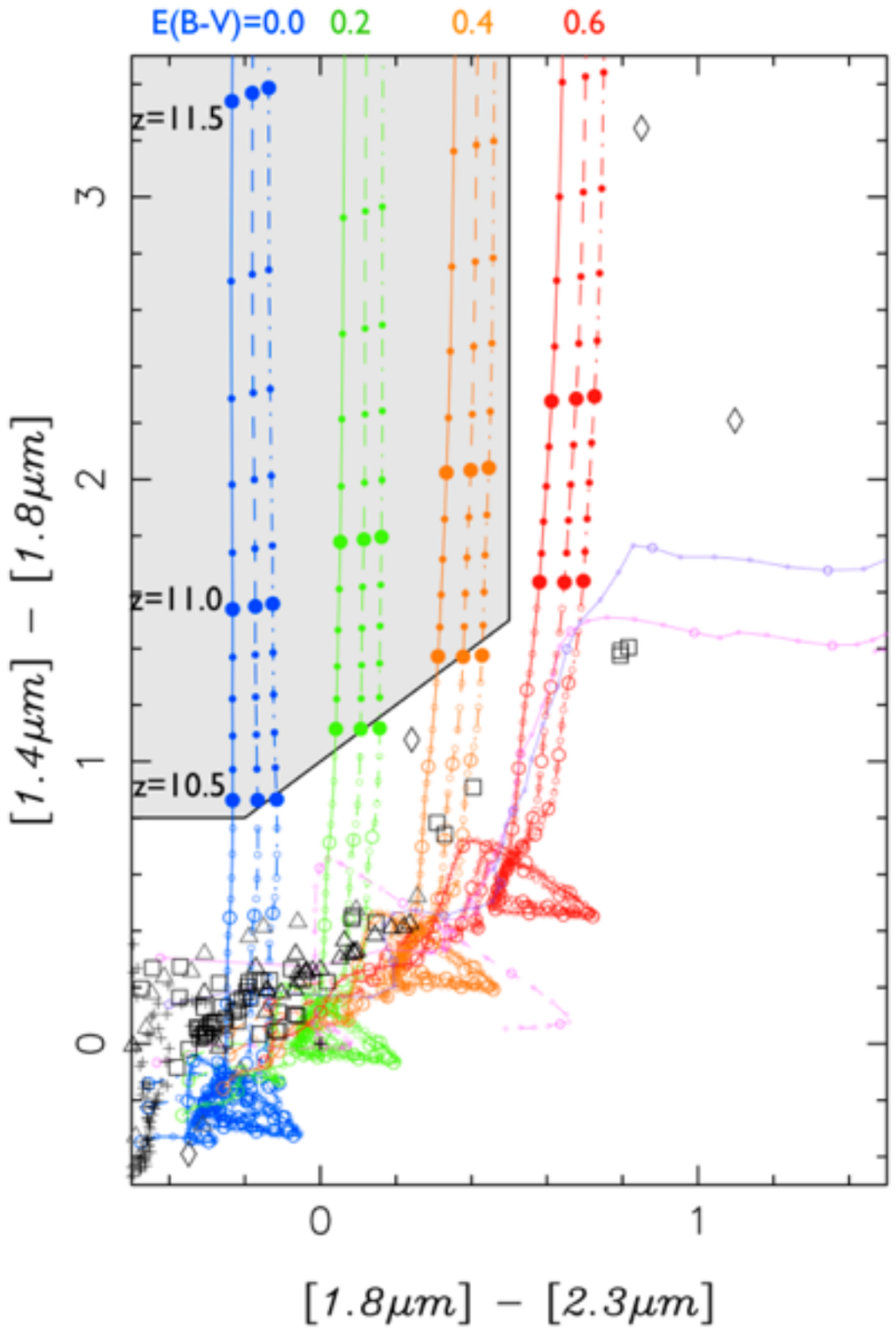
Ultra-Deep Survey Baseline Plan

Filter	λc [μm]	Lim. Mag.	Days
0	1.04	28.0	183.4
1	1.36	28.0	211.3
2	1.775	28.0	271.8
3	2.32	28.0	346.2
4	3.03	28.0	485.6
total			1498.3

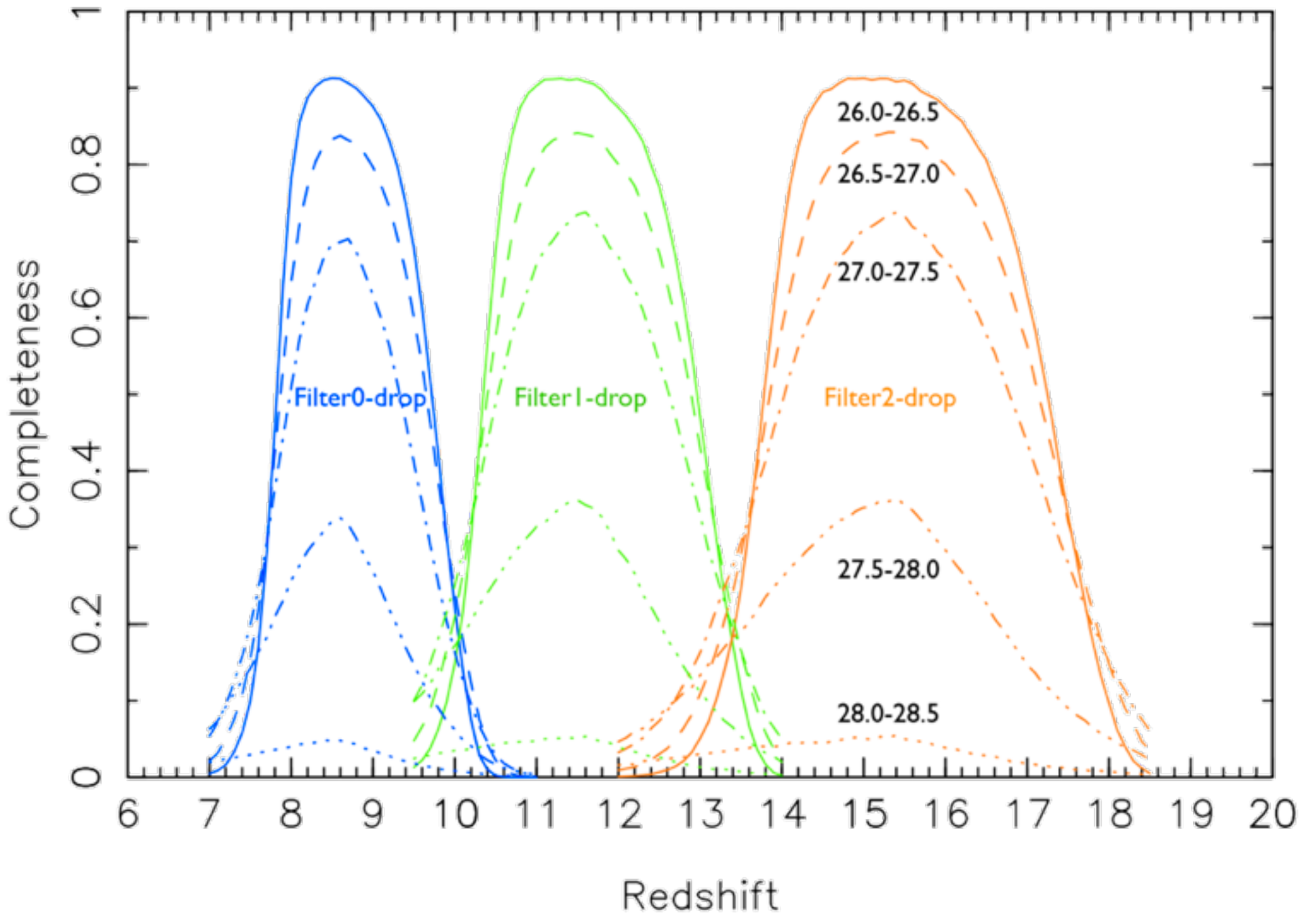
- 100 sqdeg. with 5 filters
- Lim. Mag. 28AB with 3σ (aperture=2xFWHM)
  - Assumes zodiacal light 3x of equatorial poles
- We may be able to tweak survey design to achieve 28AB mag. with 5σ by adjusting total integration time based on background brightness. (see Yabe-san's talk)

Selection of High-z Galaxies with Two-Colors

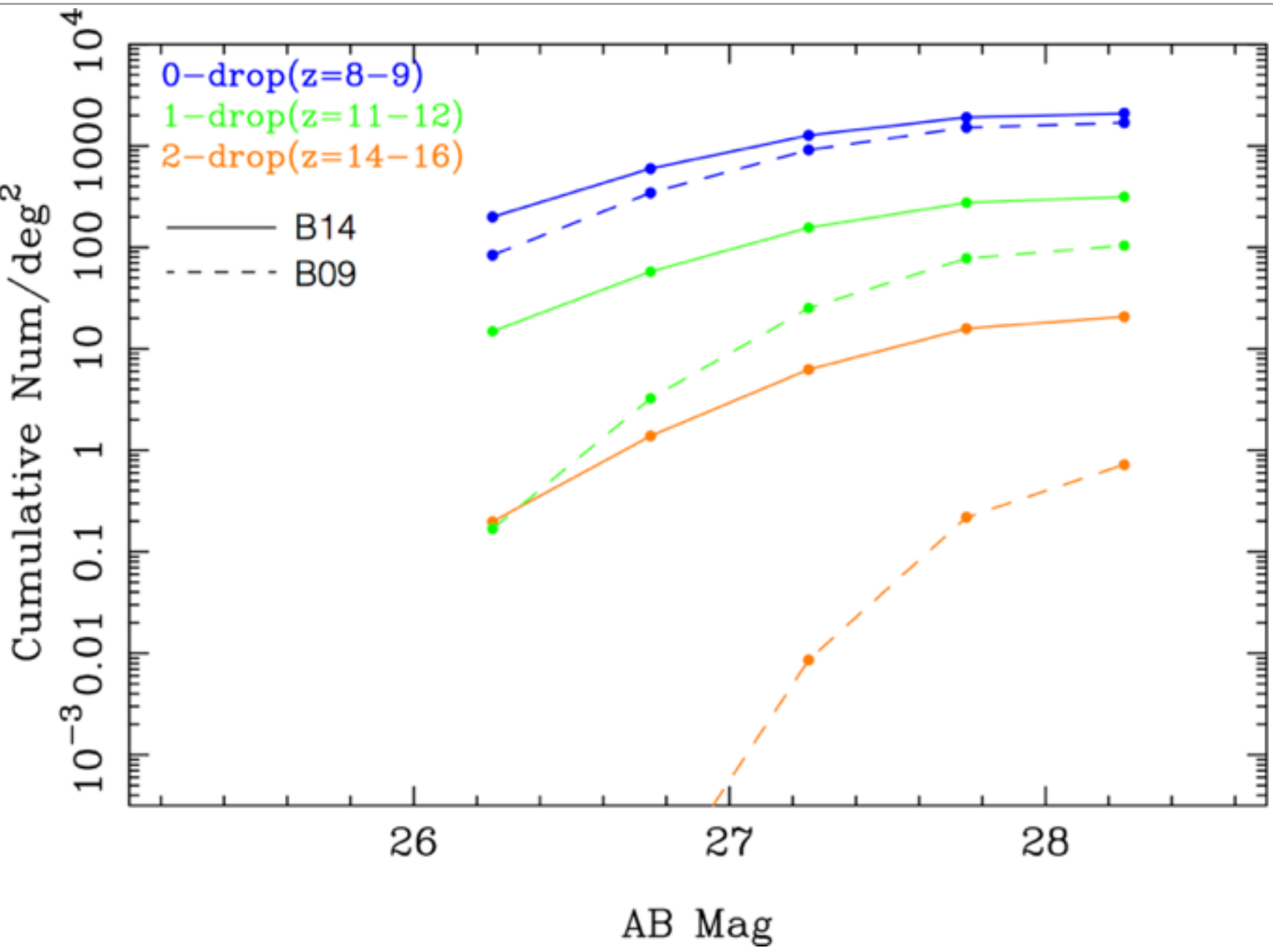




Completeness Estimates



Expected Number Densities of Detections



- Estimates based on new HST results (Bouwens+2014) have larger numbers, due to number density increase at bright end.
- May not be valid to extrapolate to z>>10?

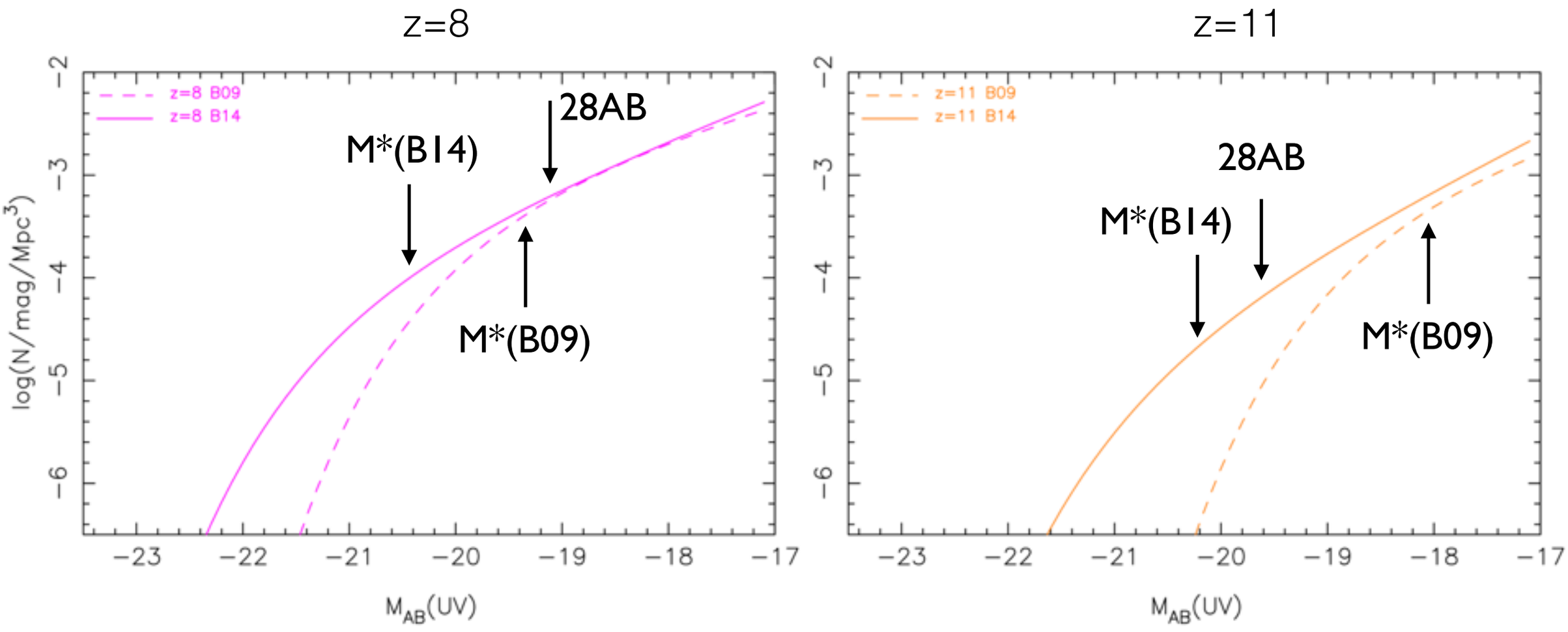
Expected Numbers with WISH Ultra-deep Survey

- 100 sq. deg survey with 5 filters from 1.0μm to 3.0μm
  - Limiting magnitudes 28AB (point source, 3σ)
  - Total 1,500 days

N/100deg	z=8-9	z=10-12	z=13-17
Empirical Ev. (prev)	169,000	10,400	72
Empirical Ev. (new)	208,400	31,500	2,080
SAM	63,100	4,970	107
DMH	85,200	412	0.3

WISH Can Determine
How Bright-End of UVLF Evolves at z>8

Constraints on z=8 and z=11 UVLFs



WISH-UDS limit > M*

WISH-UDS limit ~ M*

- Question:

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- My Answer:
  - Yes.
  - 28 AB (5σ) should be sufficient to constrain Bright-End of UVLF at z<12.
  - 100 deg.^{2} is required to constrain Bright-End UVLF at z>12.
  - Excellent match with Spectroscopy with ELTs.
  - WISH ExDS (29.5) well connects WISH-UDS and JWST.