Technical Notes: Examples of issues with the COSMOS mock catalog

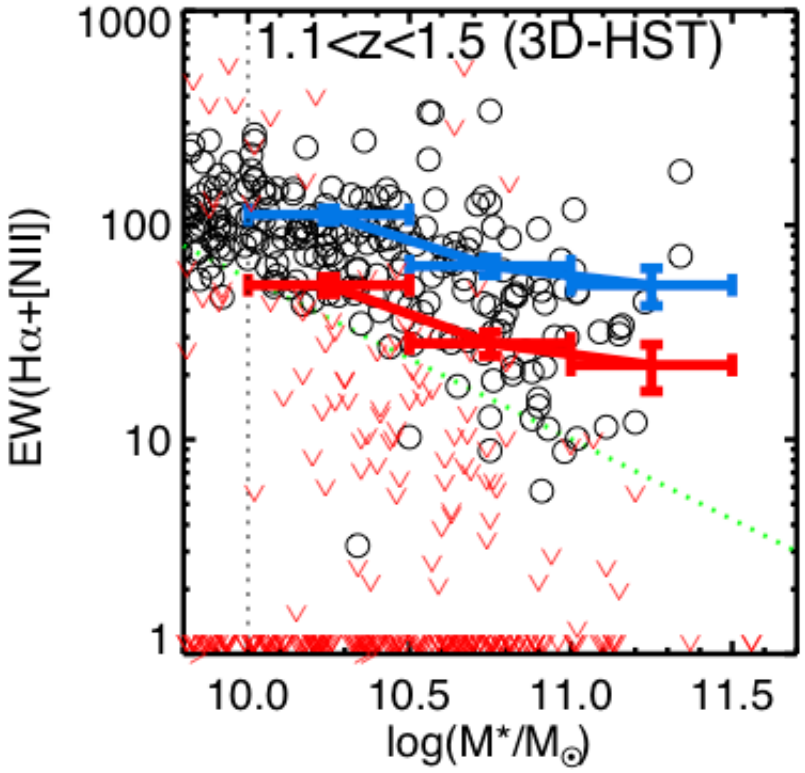
- Line strength predictions are made in a wide variety of ways in the COSMOS mock catalog, and as a result they are frequently unphysical.
- Example: the ratio of line strengths for the [OIII] doublet varies significantly, which is physically impossible (both represent random transitions from the same atomic state).
- There are many objects at z=2 with NII/Hα ratio above -0.5, which should only happen for AGN.
- Reverse engineering how line strengths were assigned:

- Fixed ratio vs Hα: Hγ
- Ratio determined solely by stellar mass: Hδ
- Ratio strongly determined by stellar mass: Hβ, [OIII]a, [OIII]b, [SII]a
- Ratio based on spectral type: Lyα, [SII]b
- Determinant of ratios unknown: [NII], [OII]

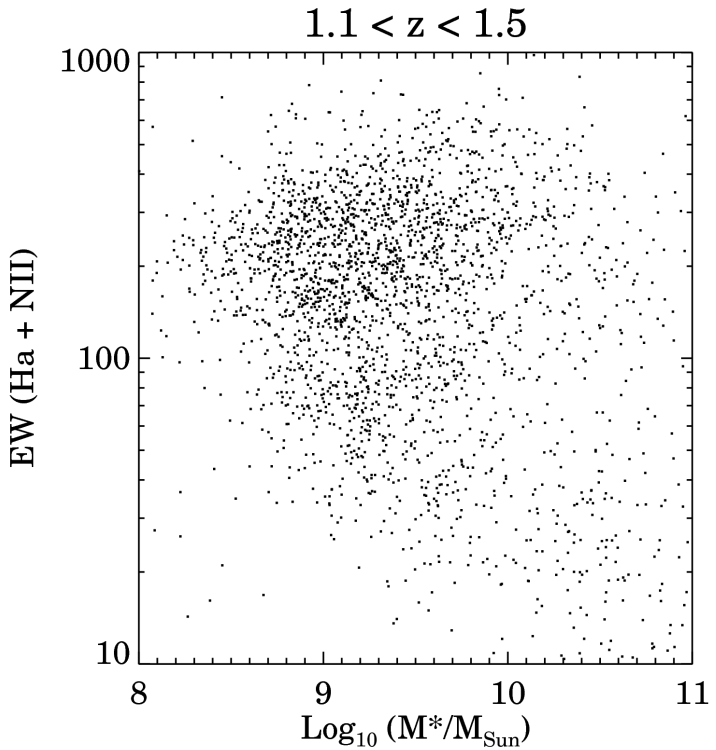
Flux overprediction in COSMOS mock catalogs

• Revised COSMOS mock catalogs are being used for many spectroscopic survey predictions, but current version (Zoubian et al.) appears to have significant issues.

• Catalog-derived restframe Hα EW is 3x higher for star-forming galaxies than observed by 3D-HST (Fumagilli et al. 2012). Perhaps due to calibration to match Geach et al. 2010 (which overpredicts flux compared to most z~2 samples; see their Fig. 1).

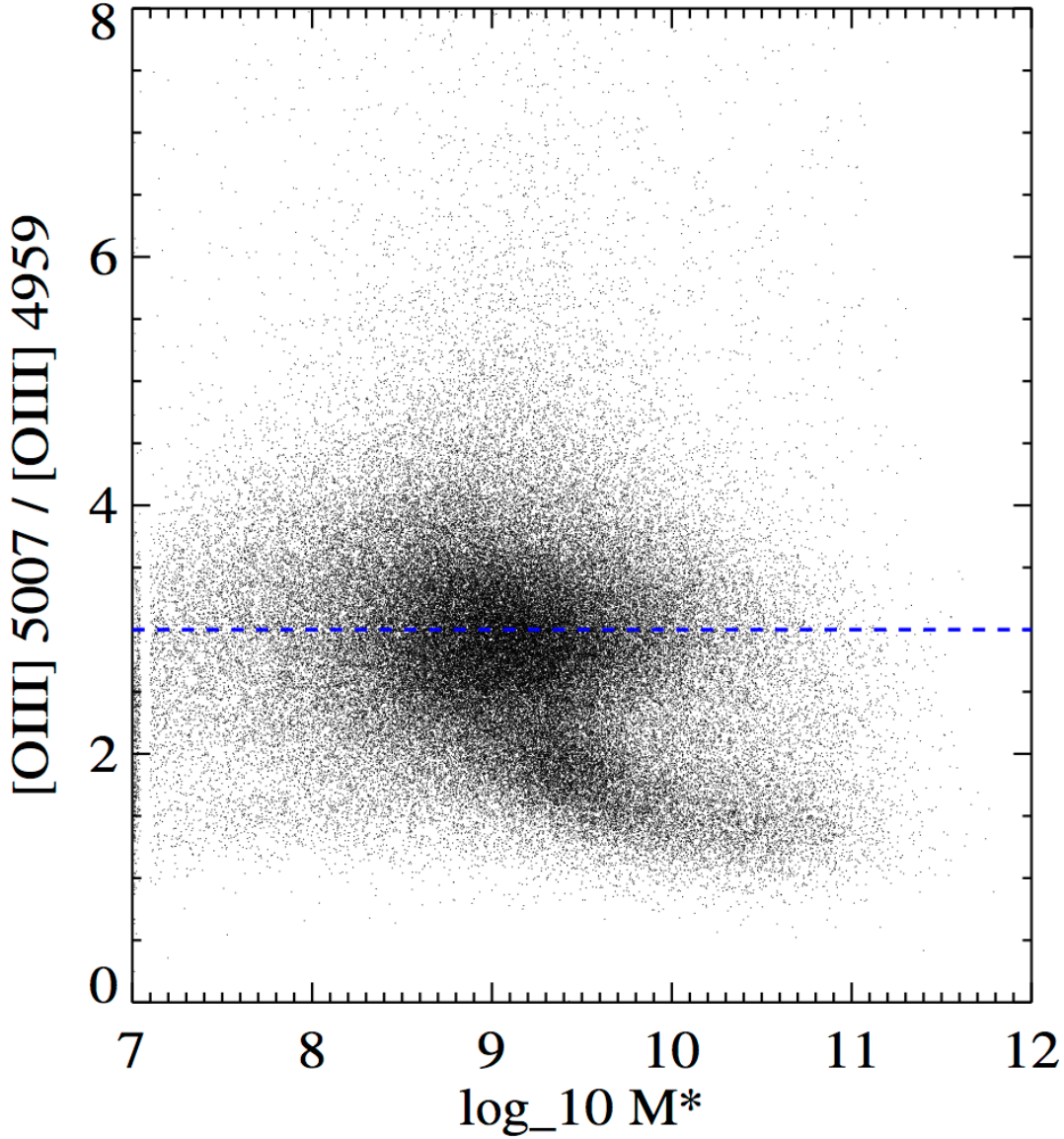


Fumagilli et al. 2012

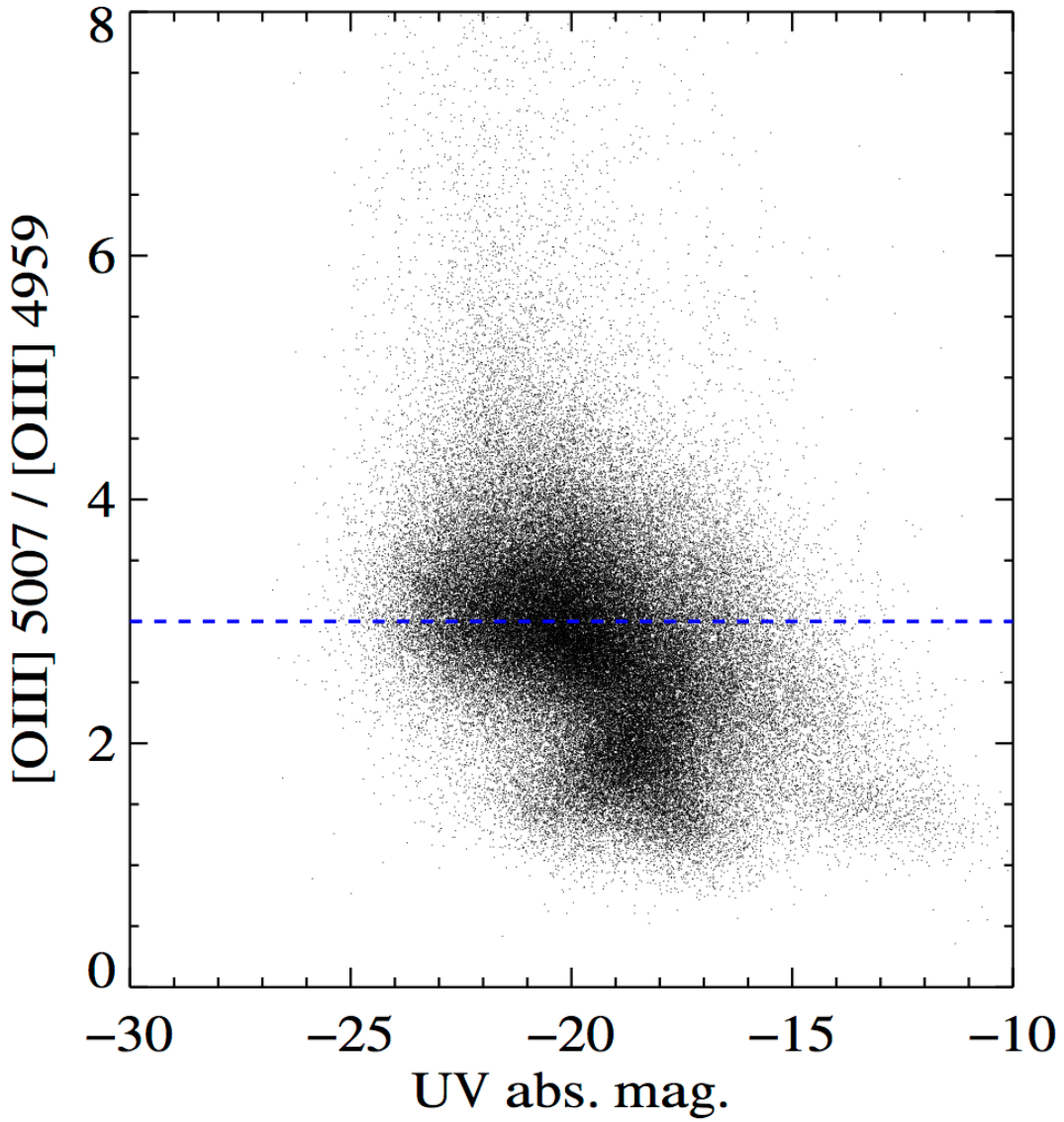


Zoubian et al. (in prep.) catalog (Figure from J. Newman)

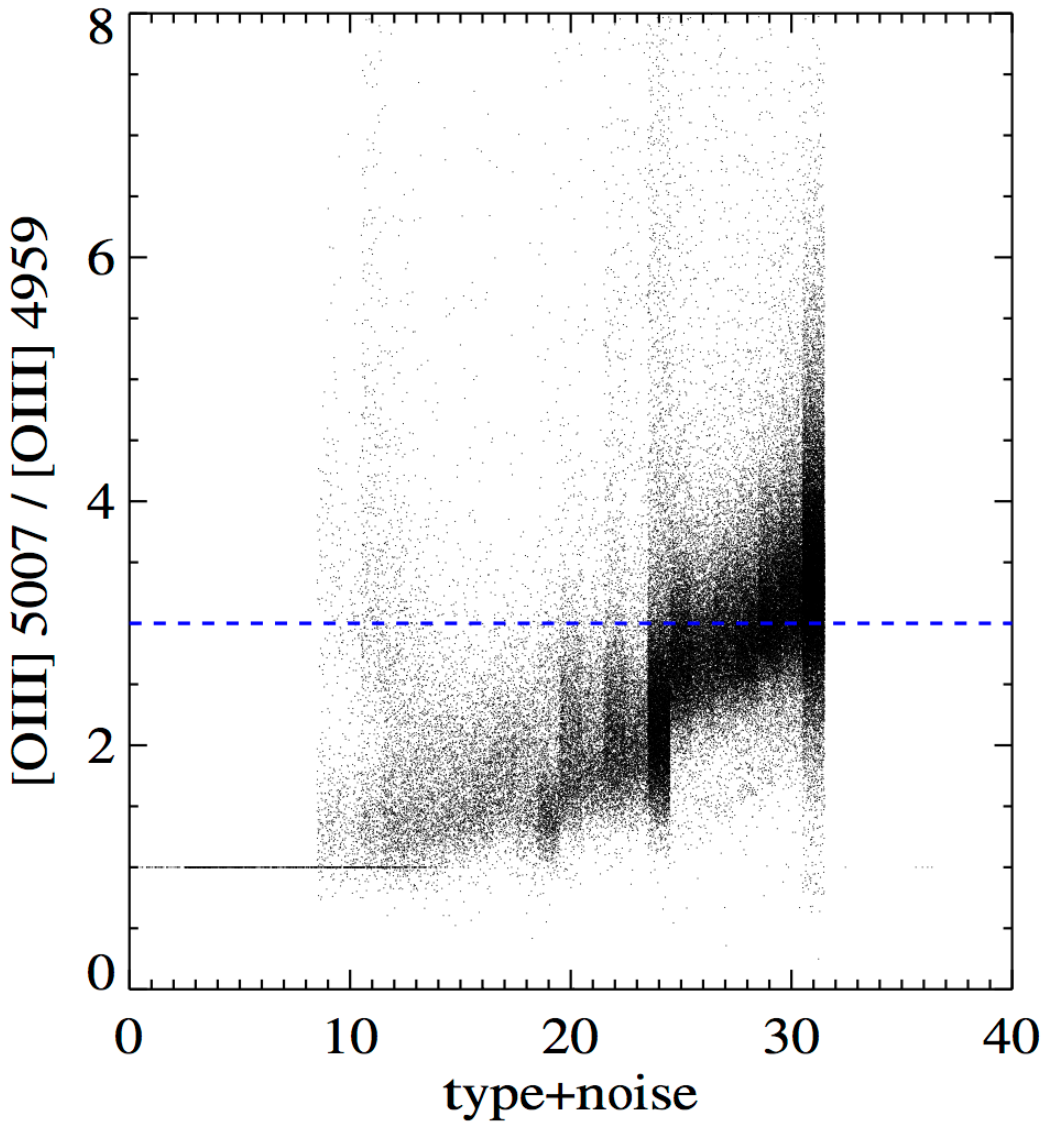
Examples of issues: [OIII] doublet ratio



Examples of issues: [OIII] doublet ratio



Examples of issues: [OIII] doublet ratio



Technical Notes: Examples of issues with the COSMOS mock catalog

- For WFIRST IFU simulations, we (Carlos Cunha, Saul Perlmutter, and I) used predictions based on the revised COSMOS Mock Catalog (Zoubian et al., in prep.), but based on comparisons to DEEP2 and 3D-HST data we made a few changes to at least be in the correct neighborhood:
    - Used velocity dispersion 65 km/sec for all objects (catalog values were unrealistic). DEEP2 95% range is 40-100 km/sec.
    - Used a fixed [OII] doublet ratio of 1:1.3 (catalog values were unrealistic)
    - For all Hα-based lines (all but [OII]), catalog line fluxes were divided by 3 (the factor by which mock catalog overpredicts z~1-2 Hα EW-mass relation from Fumagilli et al. 2012); dropped Lyα (predictions are very rough at this point, based on a paper from the 1980s)
    - Note: redshift distribution has more objects at z>2.3 than would expect from other sources