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GALEX NUV LYMAN BREAK GALAXIES

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Abstract. Lyman Break Galaxies (LBGs) have been the benchmarks against which other samples of high redshift galaxies have been compared for the last 2 decades. They are unique in that no other selection mechanism allows us to study galaxies selected in a consistent manner over redshifts $0.5 \lesssim z \lesssim 7$. An important remaining gap is the redshift range $z \sim 1.5 - 2.5$, which includes NUV-band dropouts. We searched for LBGs at this epoch using very sensitive multi-wavelength data from the FUV to mid-IR in the GOODS-S. We combined the dropout technique with color selection to identify star-forming galaxies at $1.5 \lesssim z \lesssim 2.5$. We find only a small overlap with the BM/BX selection method (Adelberger et al. 2004), and our sample of ~ 200 $z \sim 2$ LBG candidates includes a significant number of relatively redder LBGs. By comparing our results to other selection methods for star-forming galaxies at $z \sim 2$ (BM/BX, BzK), we can show that the use of true dropout selection results in a cleaner, more efficient sample of LBG candidates. Our selected $z \sim 2$ LBG candidates are more consistent with LBG samples at $z \leq 3$ than BM/BX and BzK galaxies, despite our sample including relatively younger, lower mass systems.

Keywords: galaxies: star formation, galaxies: high redshift, galaxies: evolution

1 Selection criteria

Our optical color selection criteria (Haberzettl et al. 2010, in prep.) for LBGs at $1.5 \lesssim z \lesssim 2.5$, combined with the NUV dropout technique, are analogous to the Steidel et al. (1996) method, used for $z \sim 3$ LBGs. Until recently, only proxies which are based solely on optical colors like the BM/BX and BzK methods (Adelberger et al. 2004; Daddi et al. 2004) have been used to identify star-forming galaxies at this epoch. The BM/BX color criteria were derived from $z \sim 3$ template SEDs, and are optimized to identify samples of very blue star-forming galaxies (Fig. 1). We consider both true NUV dropouts ($2 < z < 2.5$) and, to probe to as low redshift as possible with the available data, partial NUV dropouts (NUV selected, $1.5 < z < 2$).

2 NUV dropouts and NUV selected vs. the BM/BX and BzK methods

While the BzK-selection is able to pick out redder, dustier, more massive star-forming galaxies, it has difficulties to distinguish between star-forming and evolved galaxies at faint ($K_s \gtrsim 20$) magnitudes. A comparison of model SEDs with the BM/BX color-selection box (Fig. 1), shows that the BM/BX selection has only slight overlap with the template SEDs of moderate star-forming galaxies at $1.5 \lesssim z \lesssim 2.5$. We created the template SEDs using the single stellar population models of Bruzual & Charlot (2003, red+black diamonds) and the chemically consistent evolution models from PEGASE (Fioc & Rocca-Volmerange 1997, green+blue diamonds). We included in our models a variety of star formation histories from starbursts to exponentially decreasing star formation rates, and cases with and without dust extinction. We devised color selection parameters to not only include the BM/BX selected galaxies, but also our template SEDs with redshifts $1.5 \leq z \leq 2.5$ (Fig. 1).

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3 LBG samples

We calculated photometric redshifts for our NUV-dropout and NUV-selected samples for those cases where no spectroscopic redshifts were available, then performed SED analyses. We eliminated stellar interlopers by cross-correlating a stellar catalogue for the CDF-S from Groenewegen (2001), and did consistency checks with a subsample with spectroscopic redshifts. Given the selection boxes from Fig. 1, we found 157 candidates from the NUV dropout method and 44 NUV selected systems. See Haberzettl et al. (2010, in prep.) for details and results of SED analyses.

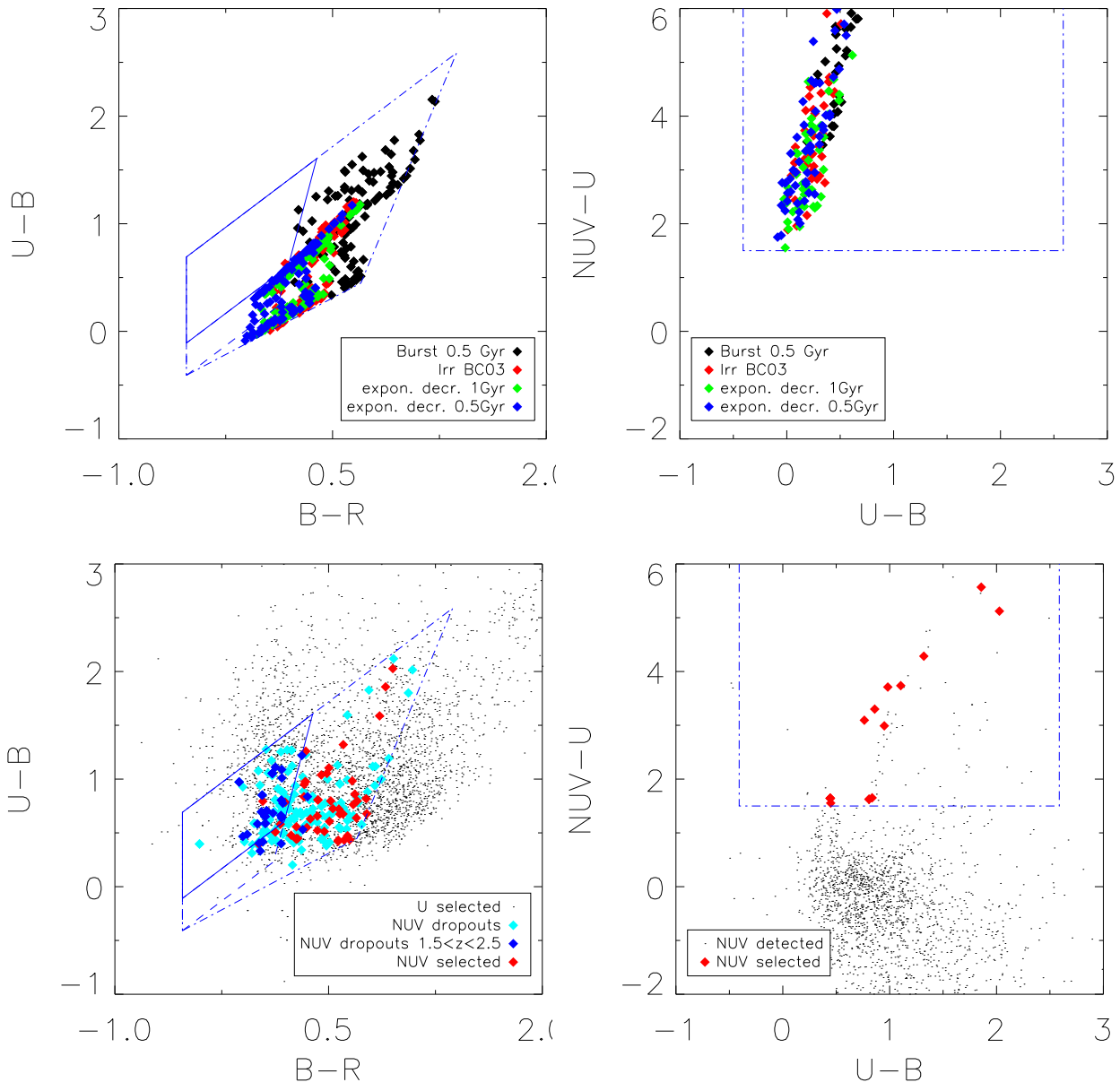

Fig. 1. Comparison of BM/BX vs. LBG color selection criteria for $1.5 < z < 2.5$ LBGs from the CDF-S. *Top panels:* large dot-dashed boxes show the locations of model colors of star-forming galaxies in the two color plane. *Upper left:* selection boxes for BM/BX galaxies (solid+small dashed boxes). We determined selection parameters from model colors of star forming galaxies at $1.5 < z < 2.5$ using the GaBoDS filter set (Hildebrandt et al. 2005). *Bottom panels:* the resulting samples of 157 NUV dropout ($2 < z < 2.5$, *cyan diamonds*, lower left) and 44 NUV selected ($1.5 < z < 2$, *red diamonds*, lower panels) LBG candidates. *Black dots:* other galaxies selected in U or NUV.

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