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A MULTI-BAND SURVEY FOR LBGS AND $Z < 2$ QUASARS IN THE EXTENDED HDF-S

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Abstract. We present new observations in the UV and R-band of the extended (E)HDF-S, to enable searches for Lyman break galaxies (LBGs) at $z \sim 1-2$ and quasars at $z \lesssim 2$. This will pave the way for tracing large scale structure (LSS) in the region via galaxy filaments and also permit tomography via quasar absorbers. The EHDF-S is the southernmost public deep field: (1) the mostly easily accessible from planned Antarctic facilities, and (2) one of the few in the HST continuous viewing zone (CVZ). Continued surveys in the region will also prepare for future exploitation with ALMA, SKA etc.

Keywords: quasars, deep fields, Lyman break galaxies, surveys

1 Introduction

The HDF-S was chosen to complement the HDF-N, to help characterise cosmic variance, and to provide a deep field for southern observatories. ADS in June 2012 shows at least 339 refereed papers with HDF-S in the abstract. HST coverage spans a few arcmin each for STIS, NICMOS, WFPC2 etc. A number of wide-field imaging observations have been done of the EHDF-S, from *FUV* to 20 cm (Table 1). In addition, there are ~ 500 spectroscopic or photometric redshifts available e.g. Sawicki et al. (2003) and Glazebrook et al. (2006), which show redshift spikes at $z \sim 0.50$ and 0.57.

Table 1. Selected Wide-field Observations: EHDF-S

study	size	bands	depth	ref
BTC	$45'$	UBVRI	AB$\sim 24-26$	Palunas et al. (2000)
MUSYC	$35'$	UBVRIz	AB$\sim 24-26$	Gawiser et al. (2006)
MUSYC	$10' \times 20'$	JHK	$\sim 21-22.5$ Vega	Quadri et al. (2007)
MUSYC	$10' \times 20'$	$3.6-8$; 24 μm	$\sim 22-25$ AB; $12-30$ μJy	Huynh et al. (2010); Marchesini et al. (2009)
GALEX	$70'$	FUV, NUV, NUV-grism	AB~ 24	Haberzettl et al. (2009); prop GI5-041
ATCA	$68'$	3,6,11,20 cm	$11-16$ μJy	Norris et al. (2005)

2 Observations

GALEX: We combined GALEX EHDF-S data from our program with images from MAST. Altogether, we have 12 ksec of *FUV* images, 25 ksec of *NUV* images and 45 ksec of *NUV* slitless spectroscopy. We find 17 *NUV*-bright quasars with $0.4 < z < 1.3$ (see Fig. 1 for an example).

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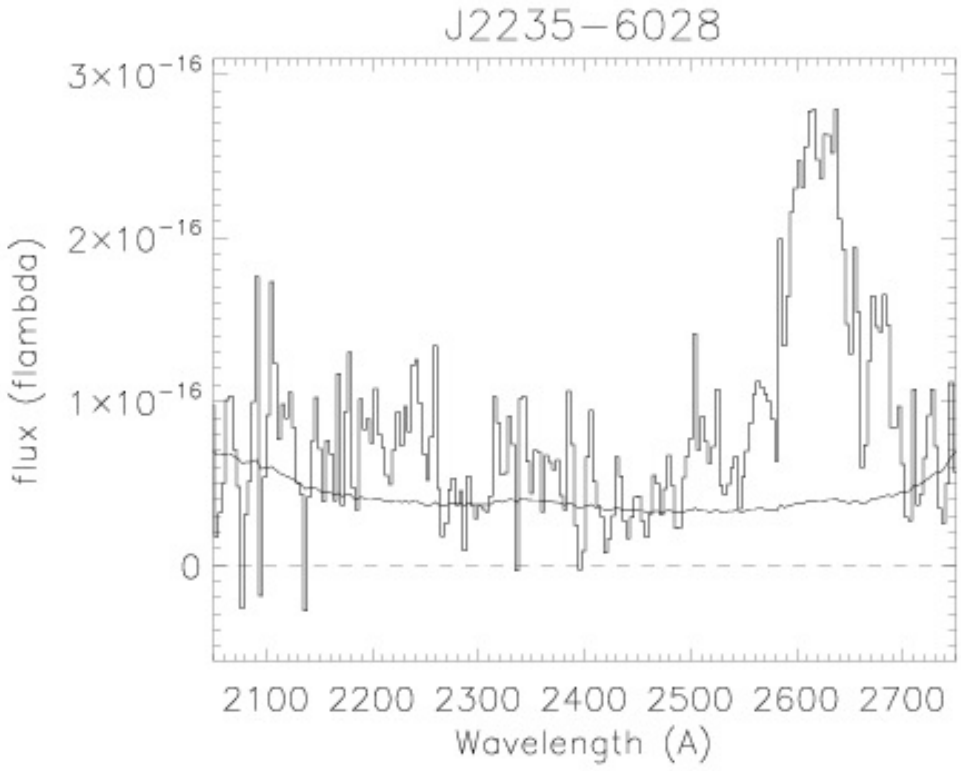

Fig. 1. Sample NUV slitless spectrum from GALEX for quasar with $z = 1.16$. Note strong absorption at 2290 Å, possibly damped Lyα at $z = 0.88$.

LCO R-images: About half our NUV-bright quasars are outside the BTC/MUSIC fields. We used the Las Campanas 2.5 m Dupont + WFCCD to image 4x25′diameter fields in R-band over 2011 Dec 28–30 to $R \sim$25 ($\sim$ 1.1 Å FWHM).

SALT, Warsaw Telescope Observations: We have obtained $\sim$ 8 hours on SALT multi-object spectroscopy for quasar confirmation, and 3 nights of Warsaw 1.3 m telescope time for deep VI imaging over 1.2°, in 2012 Jun–Sep (Fig. 2).

3 Results and Discussion

UV-Optical Quasar Candidates: We used $FUV - NUV - u - g - r$ transformed colours from Hutchings & Bianchi (2010) and Hutchings (2012 private comm.) to isolate on the order of at least 1000 $z < 2$ quasar candidates with $R < 22.5$ from the stellar and galactic loci in the BTC and MUSYC fields.

***z* $\sim$ 1 Lyman Break Galaxies:** We identified $\sim$ 1900 FUV dropouts ($FUV - NUV \gtrsim 1.5$, $R <$ 22.5) in the BTC and MUSYC fields. We are calculating their 7-band photometric redshifts to identify any concentrations/indications of structures, similar to Haberzettl et al. (2009).

Future Exploitation: A number of southern/Antarctic facilities are coming online in the near future. ALMA and SKA will revolutionise mm and radio astronomy. Several Antarctic observatories are proposed/planned to profit from the superior seeing and low water column:

- China: 4 m KDUST IR and 10 m submm
- France/Italy: 2.5 m Polar Large Telescope
- Japan/China: 2.5 m PLATO-type telescope

See Burton (2010) for details. The HDF-S remains a field with unique potential due to its accessibility from Antarctica, and its potential for doubly efficient HST observations in the CVZ.

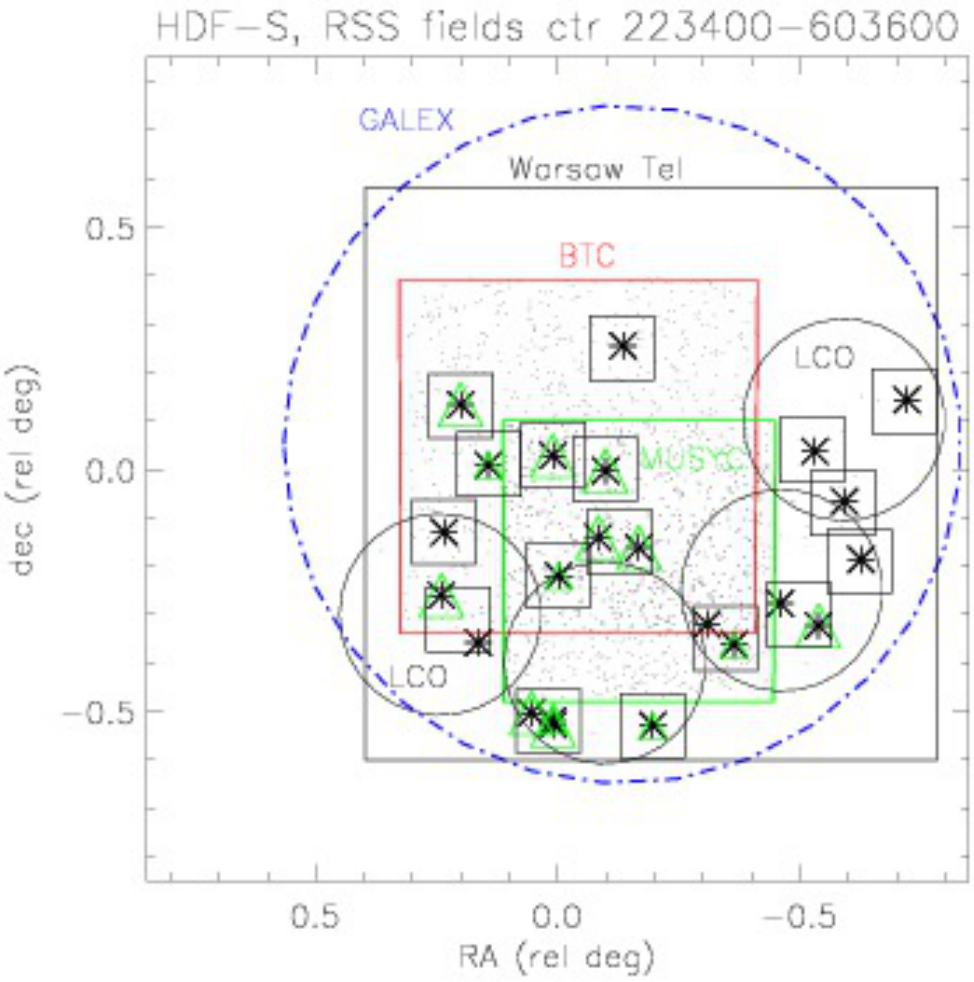

Fig. 2. Map of the EHDF-S labelled with fields for GALEX (large circle), the Warsaw Telescope, BTC, MUSYC fields (large boxes), the LCO Dupont 2.5 m (4 medium circles), 17 SALT RSS multislit spectroscopic fields (small boxes), NUV-bright quasars (asterisks), $z < 1.5$ Lyα absorbers (green triangles, large=high probability, small=candidate) and FUV dropouts (black dots).

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