The Galaxy Environment of z~6 Quasars

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B. Venemans, F. Walter, J. Kurk, R. Overzier, M. Ouchi
Motivation

$z = 0$

Springel et al. 2005

$z = 1.4$

$z = 5.7$

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Galaxy Environment of $z \sim 6$ QSOs
Motivation

- Galaxy overdensities or protoclusters around radio galaxies (see Venemans et al. 2007)
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- Ambiguous results based on $i$-dropout galaxies around $z \sim 6$ QSOs. $\Delta z \approx 1$
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- Ambiguous results based on $i$-dropout galaxies around $z\sim6$ QSOs. $\Delta z \approx 1$
  - Willot et al. 2005 no-overdensity
  - Stiavelli et al. 2005 overdensity
  - Kim et al. 2009 find both over/under-densities
i-dropouts

SDSS 1306+0356 at z=5.99

SDSS 1030+0524 at z=6.28

(Bañados+, in prep)
i-dropouts

SDSS 1306+0356 at $z=5.99$  
SDSS 1030+0524 at $z=6.28$

(Bañados+, in prep)
i-drop 5 hours FORS2@VLT spectrum

Flux

Wavelength (Å)
i-drop 5 hours FORS2@VLT spectrum

Ly$\alpha$ at QSO redshift

Flux

Wavelength (Å)

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Ly$\alpha$ at QSO redshift

Nothing Clear!

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Lyman Alpha Emitters (LAEs)
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- Narrower redshift range $\Delta z \approx 0.1$
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OH night sky emission bands

Dunlop 2012
ULAS J0203+0012 at z=5.72

FORS2@VLT

Galaxy Environment of z ~ 6 QSOs
Candidates Selection

FORS2 Filters

![Graph showing transmission vs. wavelength for different filters (NB, R, Z) and a synthetic LAE.](image-url)
Candidates Selection

FORS2 Filters

LAEs between $5.66 < z < 5.75$

![Graph showing the transmission of different filters across wavelengths for LAEs between $5.66 < z < 5.75$.]
Candidates Selection

FORS2 Filters

LAEs between $5.66 < z < 5.75$

![Graph showing transmission vs. wavelength and Z-NB vs. R-Z plots for LAEs and QSOs.]

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Galaxy Environment of $z \sim 6$ QSOs
Blank Field Comparison
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![Graph showing the relationship between number (less than NB) and NB magnitude. The data points are from Ouchi et al. 2008.](image)
Blank Field Comparison

Overdensity?

![Graph showing the number of QSOs as a function of NB magnitude]

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Galaxy Environment of z ~ 6 QSOs
Blank Field Comparison

Overdensity?

![Graph showing the number of galaxies per magnitude bin for two datasets: Ouchi et al. 2008 and This Work. The graph plots the number of galaxies less than a given magnitude (NB) divided by 0.5 magnitude bins against magnitude. The data points are marked with error bars, and a line shows the trend. The graph also indicates a 4σ limit.]
No clear enhancement of LAEs (LBGs) in the QSO vicinity in comparison with blank fields
Discussion

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THANKS!