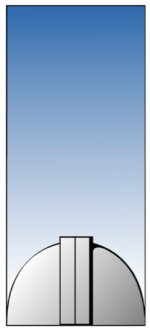


The Evolution of the Cosmic UV Background at High Redshift

Aldo Dall'Aglio
Astrophysikalisches Institut Potsdam

G. Worseck (UCO/Lick) & **L. Wisotzki** (AIP)

Dall'Aglio et al 2008b, A&A 491,465;
Dall'Aglio et al 2009a, astro-ph: 0906.1484

Paris, 09-07-2009

The methods of estimating the UV background

The methods of estimating the UV background

- **Integrating the source (QSOs and galaxies) luminosity functions: Haardt&Madau 1996...2009, Fardal et al. 1998, Faucher-Giguere et al 2009 ...**

The methods of estimating the UV background

- Integrating the source (QSOs and galaxies) luminosity functions: Haardt&Madau 1996...2009, Fardal et al. 1998, Faucher-Giguere et al 2009 ...

- Matching the simulated and observed properties (flux distribution, opacity evolution...) of the HI Ly Forest: Rauch et al 1997, Theuns et al. 1998, Tytler et al. 2004, Bolton et al. 2005-2009, Faucher-Giguere et al 2008 ...

The methods of estimating the UV background

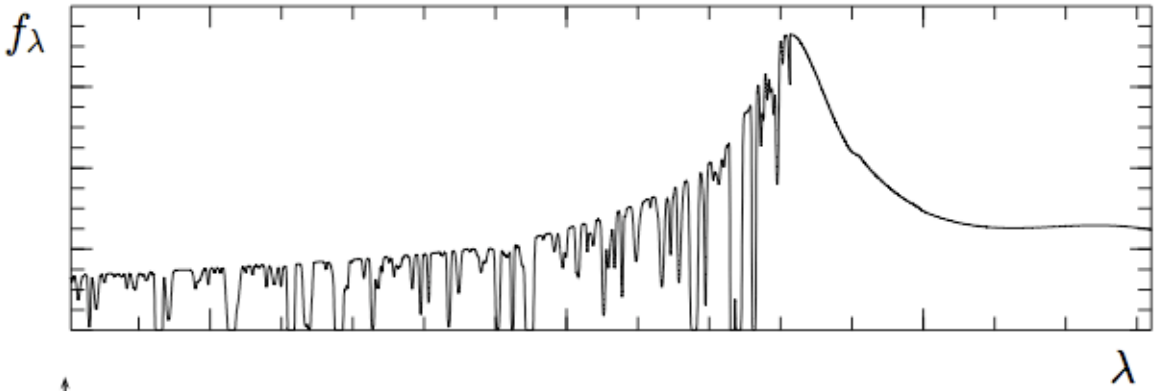
- Integrating the source (QSOs and galaxies) luminosity functions: Haardt&Madau 1996...2009, Fardal et al. 1998, Faucher-Giguere et al 2009 ...

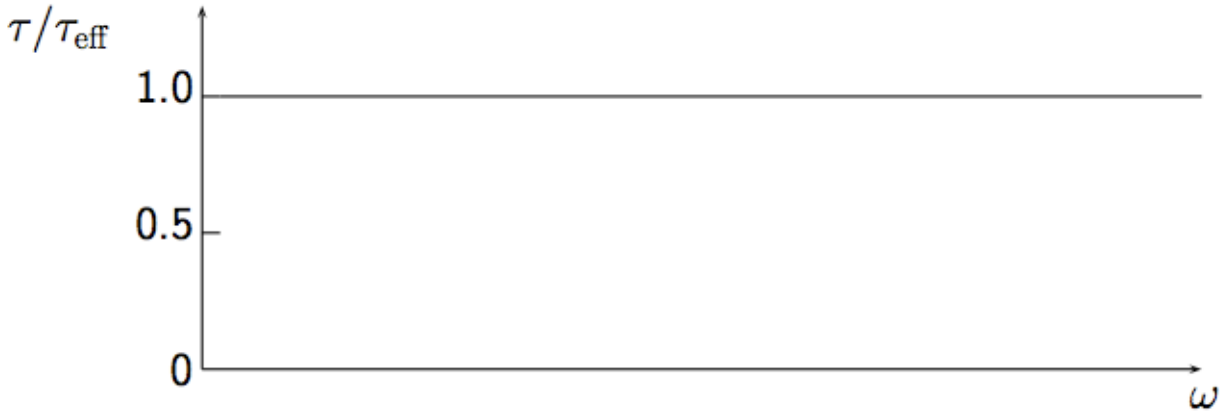
- Matching the simulated and observed properties (flux distribution, opacity evolution...) of the HI Ly Forest: Rauch et al 1997, Theuns et al. 1998, Tytler et al. 2004, Bolton et al. 2005-2009, Faucher-Giguere et al 2008 ...

- Determining the signature of the so-called "Proximity Effect", typically combining the signal of many QSOs: Baijtlik et al 1998, Giallongo et al. 1996, Scott et al. 2000, Liske&Williger 2001 ...

The Proximity Effect

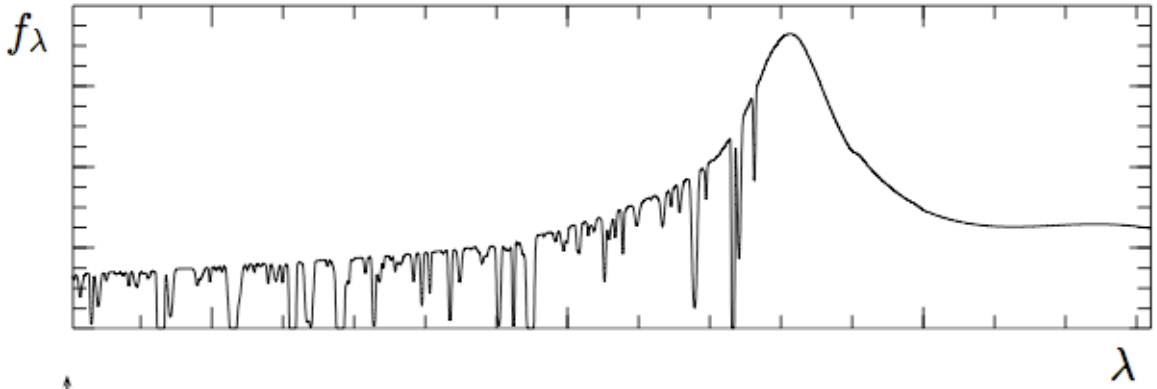
Credit: L. Wisotzki

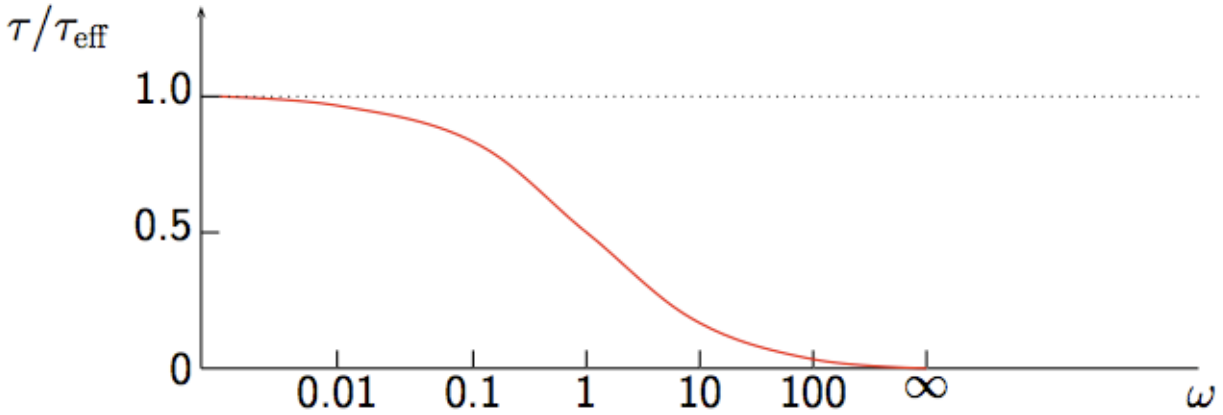




The Proximity Effect

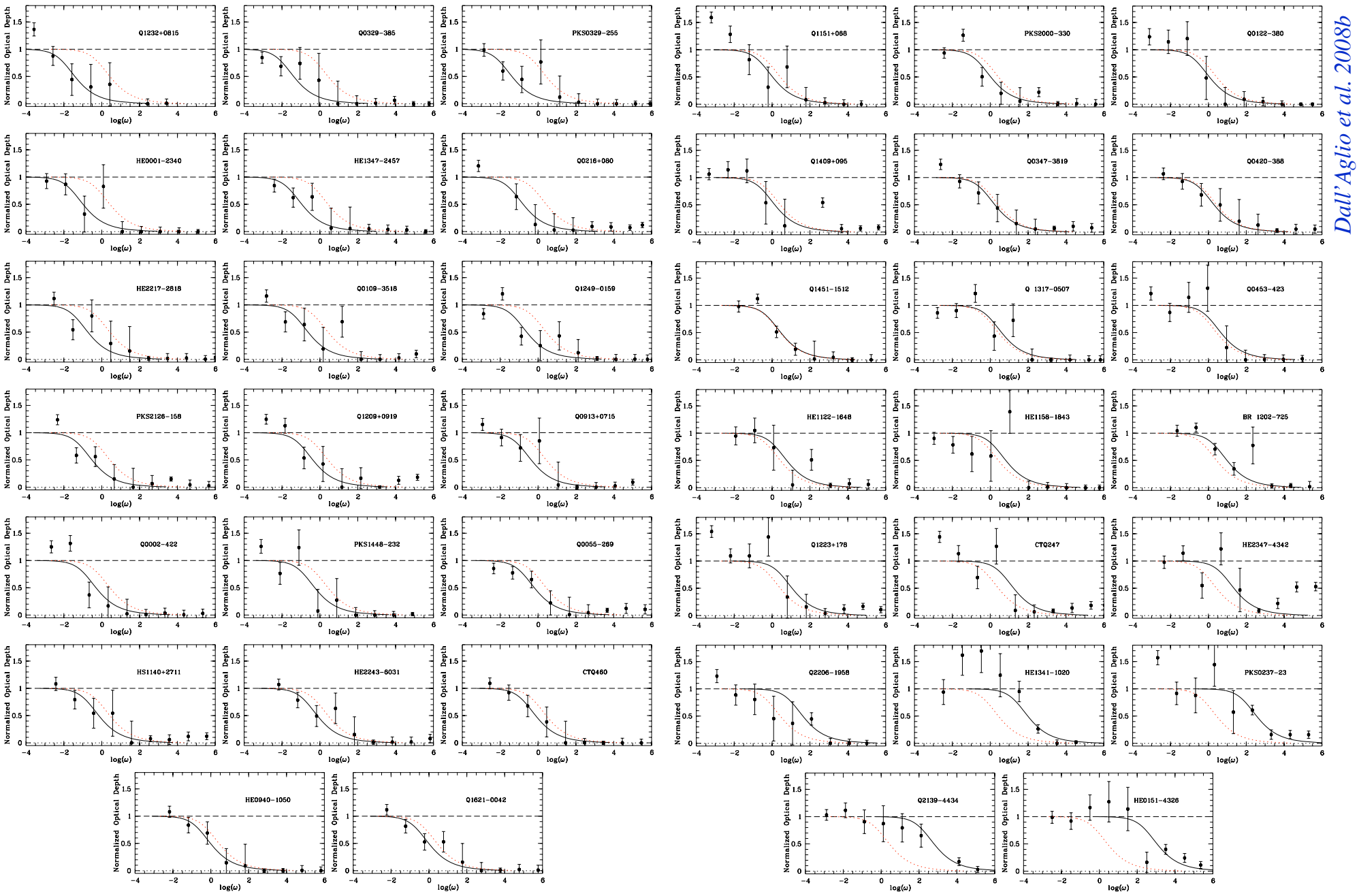
Credit: L. Wisotzki





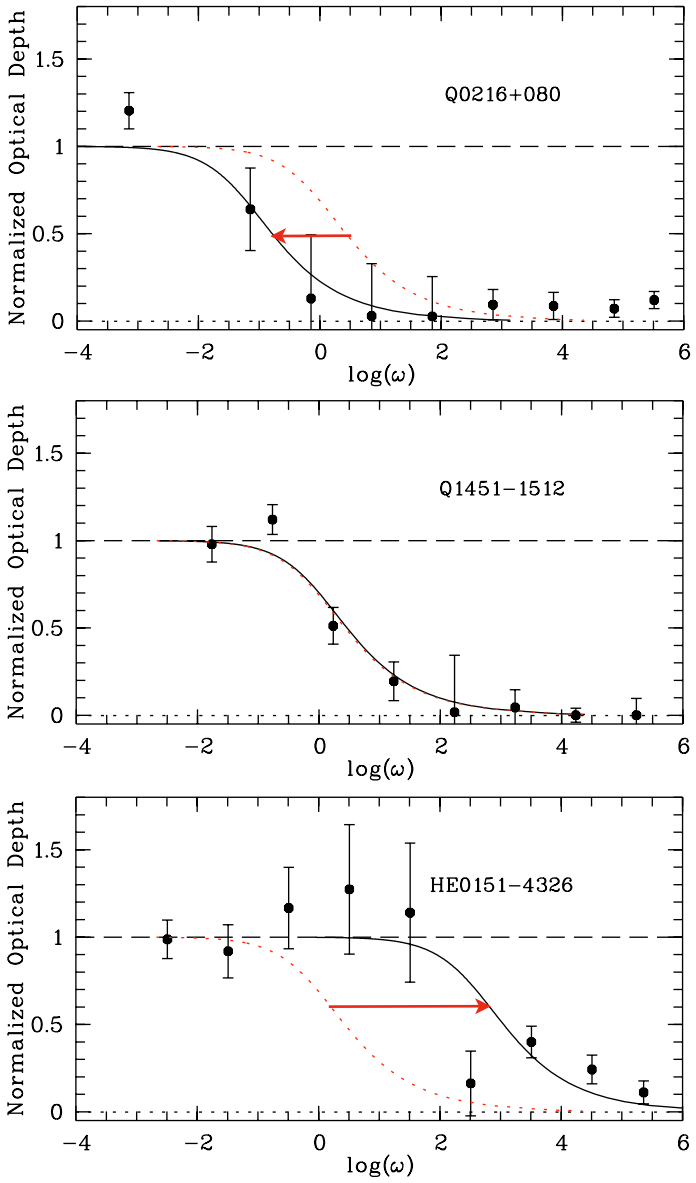
$$\omega(z) = \frac{\Gamma_{\rm q}(z)}{\Gamma_{\rm b}(z)}$$

The proximity effect on single sight lines



Dall'Aglio et al. 2008b

The strength of the proximity effect

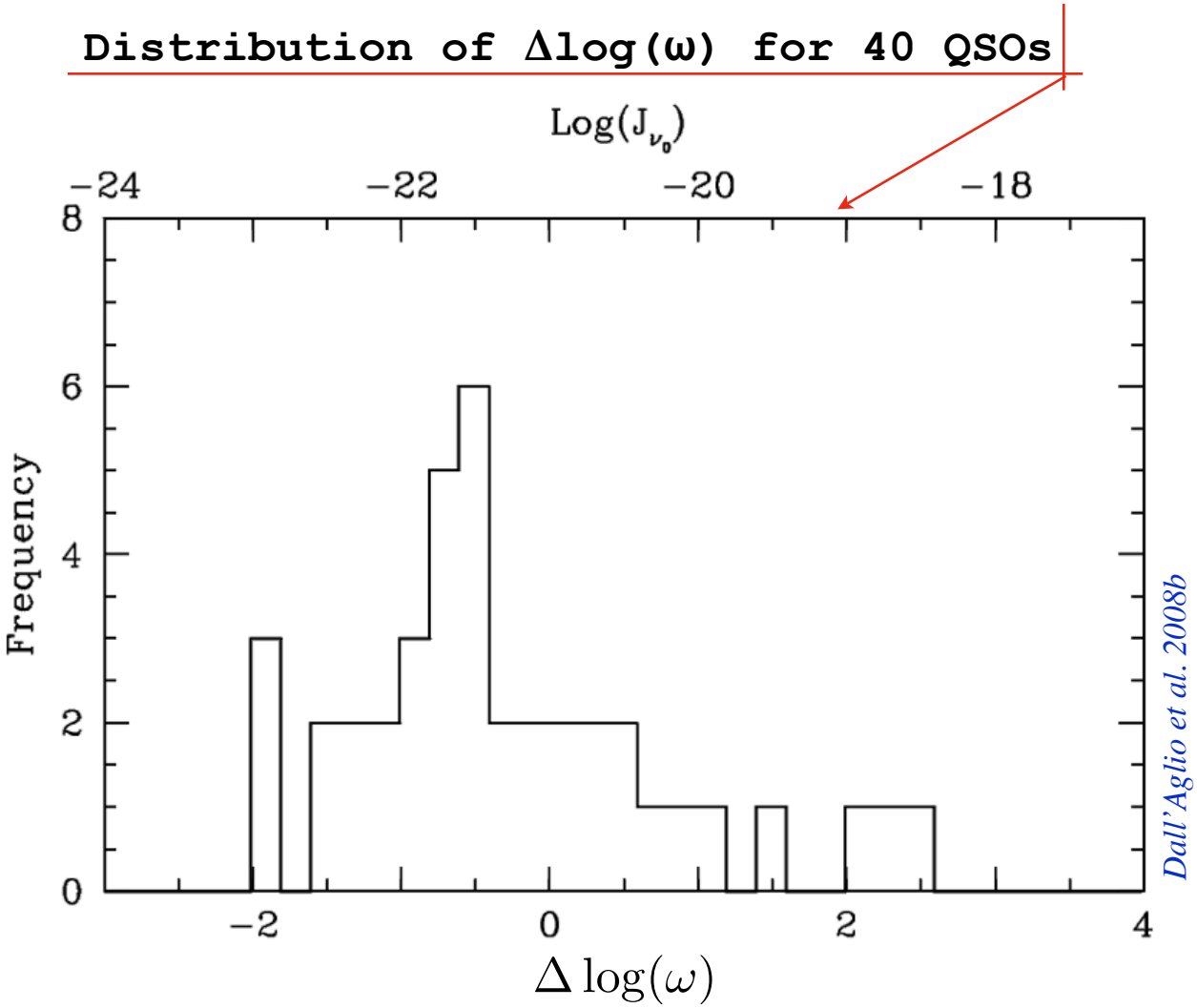


$\Delta \log(\omega) < 0$ **Strong proximity effect**

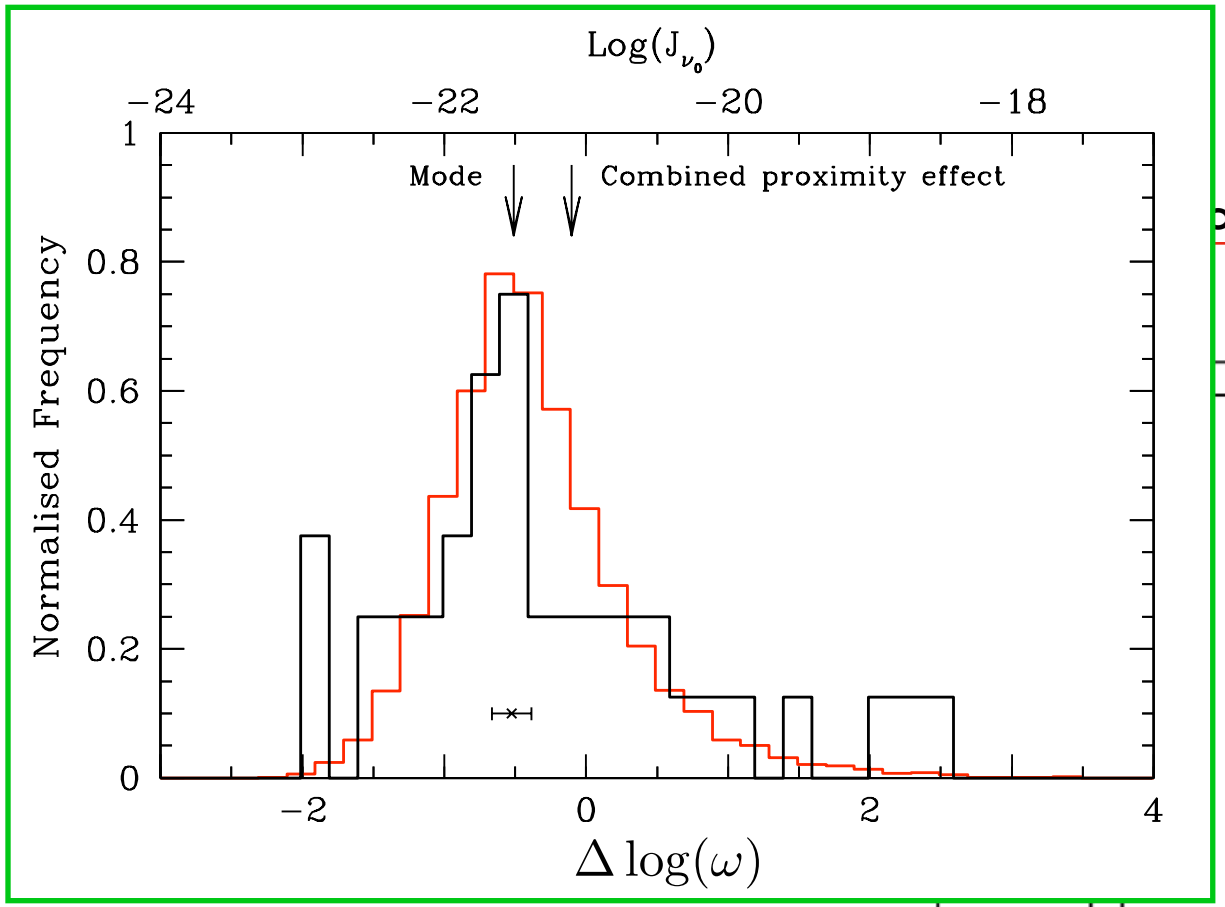
$\Delta \log(\omega) \simeq 0$ **Average proximity effect**

$\Delta \log(\omega) > 0$ **Weak proximity effect**

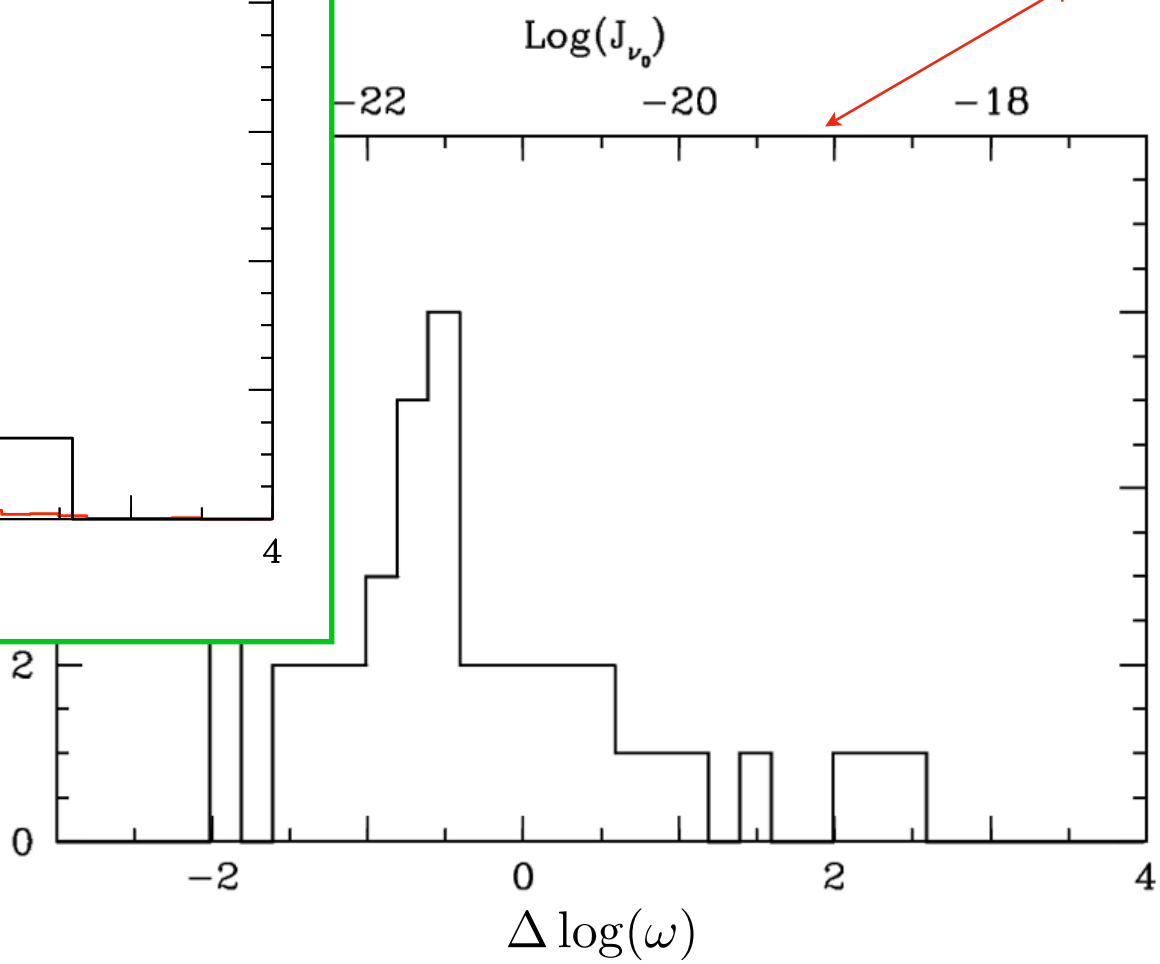
Proximity Effect Strength Distribution (PESD)



Proximity Effect Strength Distribution (PESD)

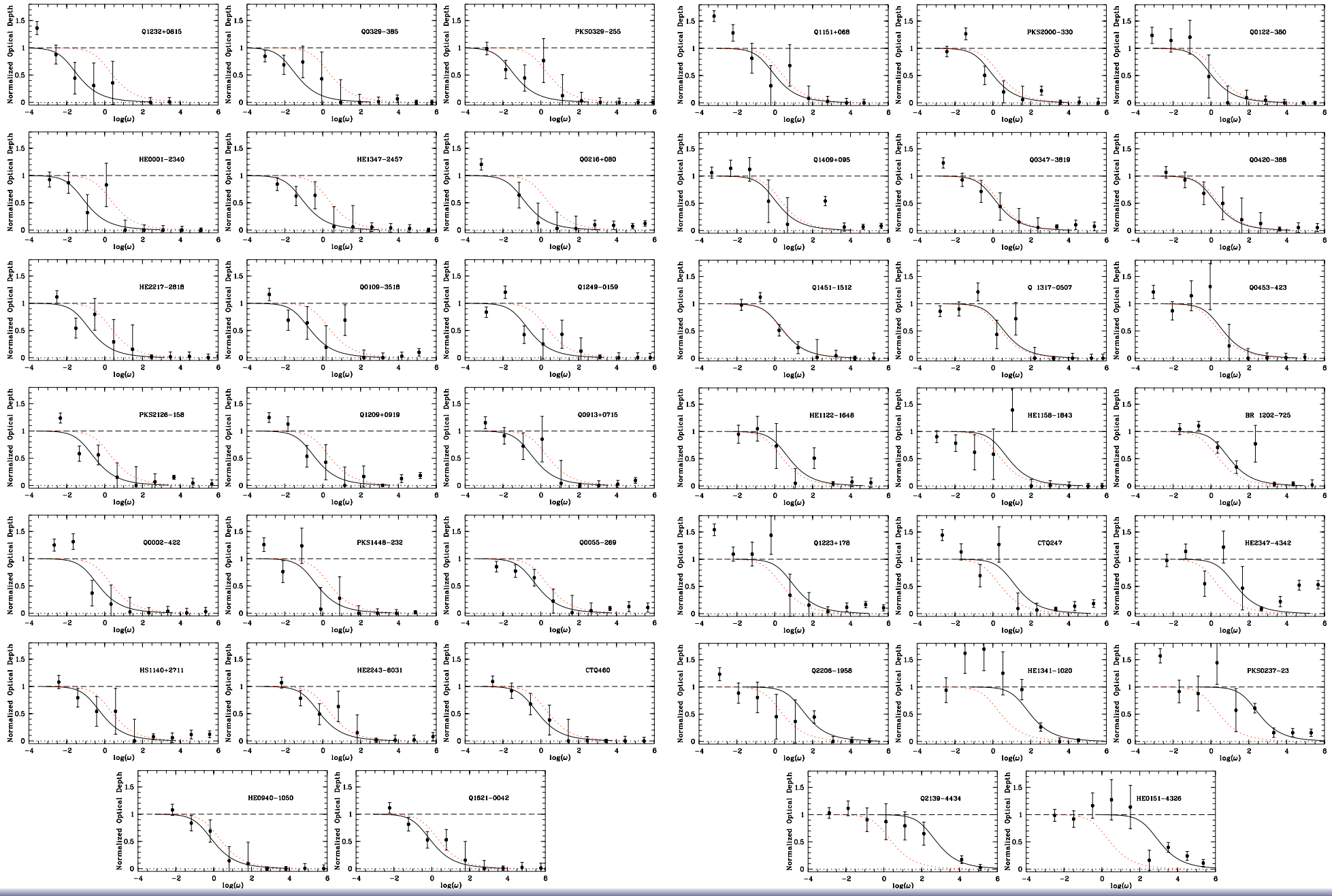


…on of Δlog(ω) for 40 QSOs



Dall'Aglio et al. 2008b

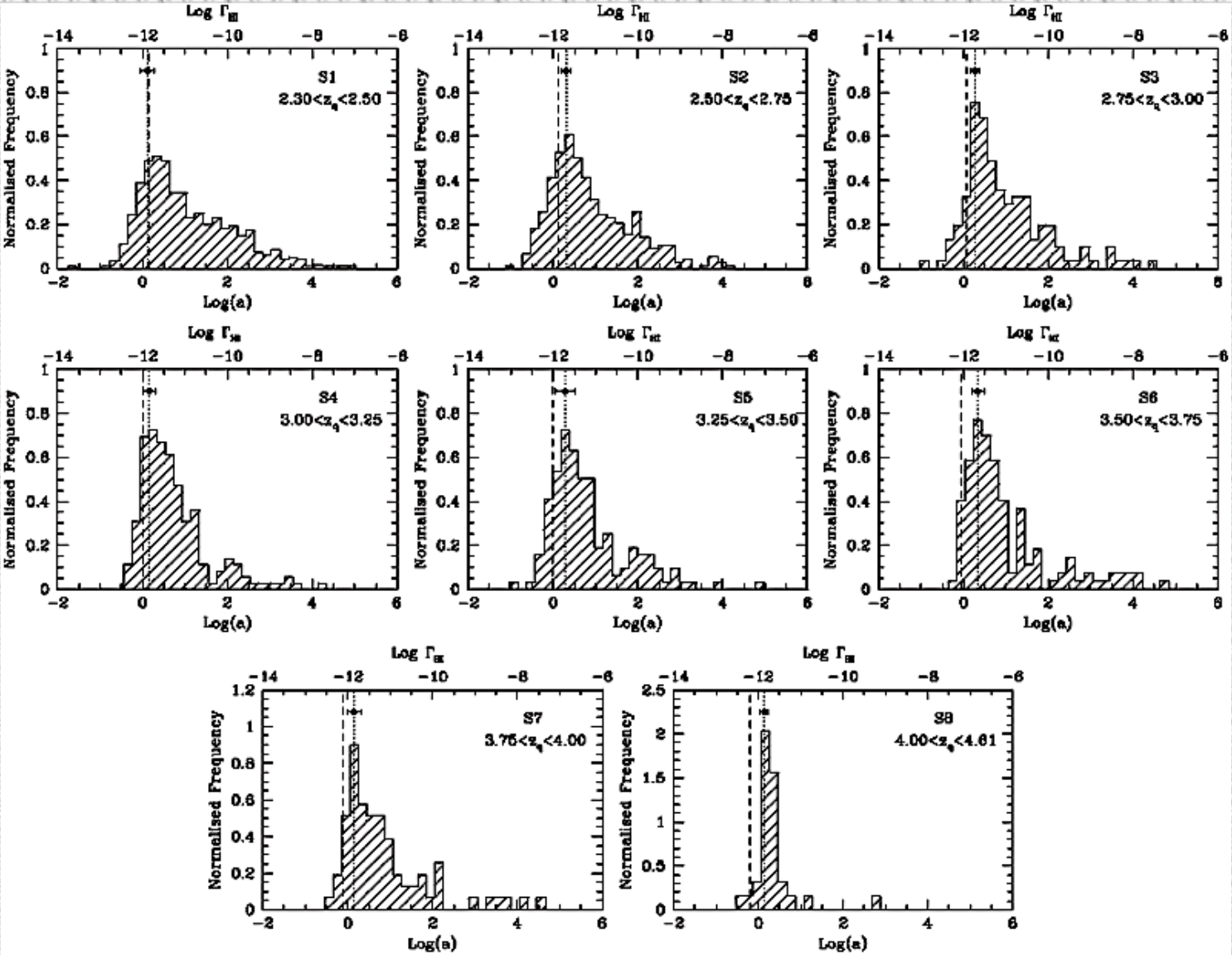
How to enlarge the sample of QSOs?



The Proximity Effect toward ~2000 SDSS Quasars

Dall'Aglio et al. 2009; astro-ph 0906.1484

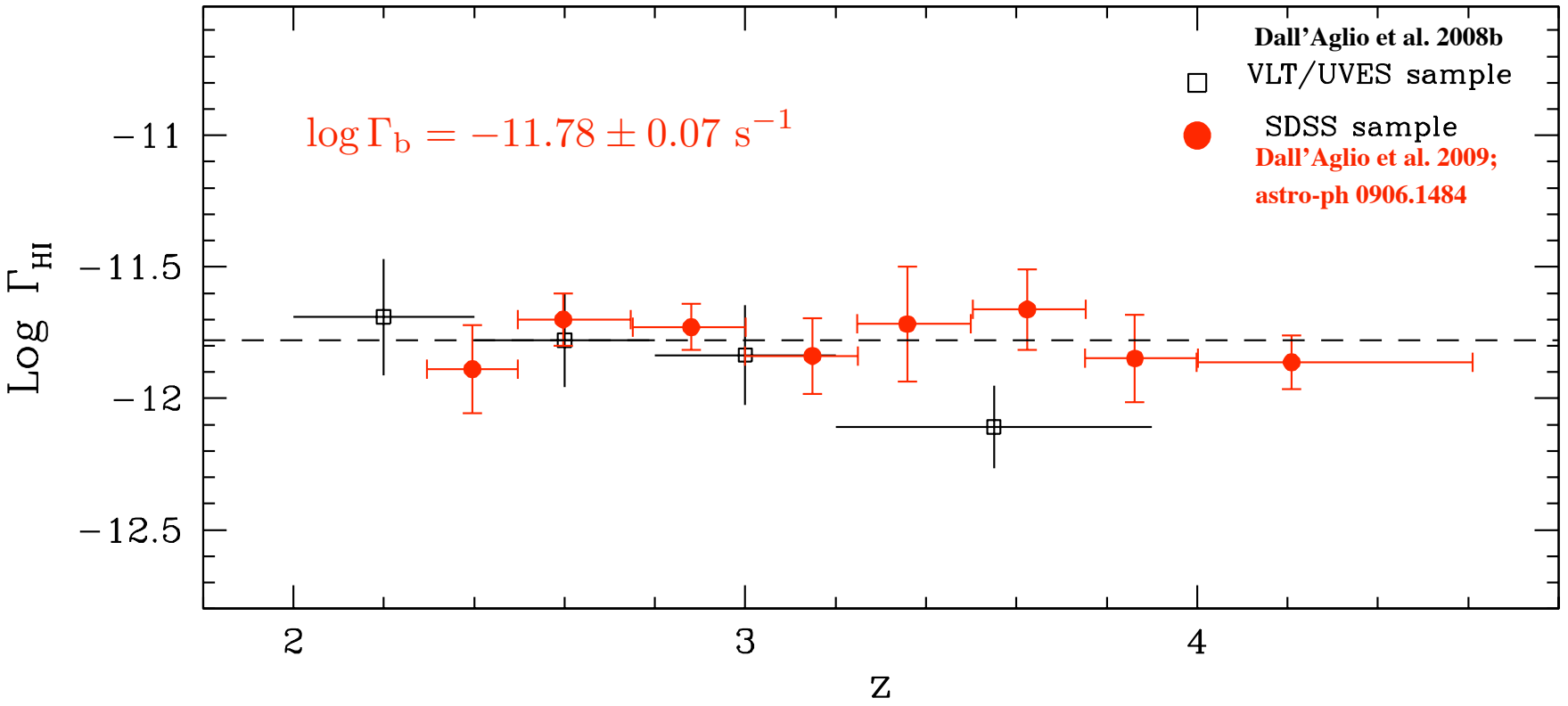
The Proximity Effect along ~2000 SDSS Quasars



Dall'Aglio et al. 2009; astro-ph 0906.1484

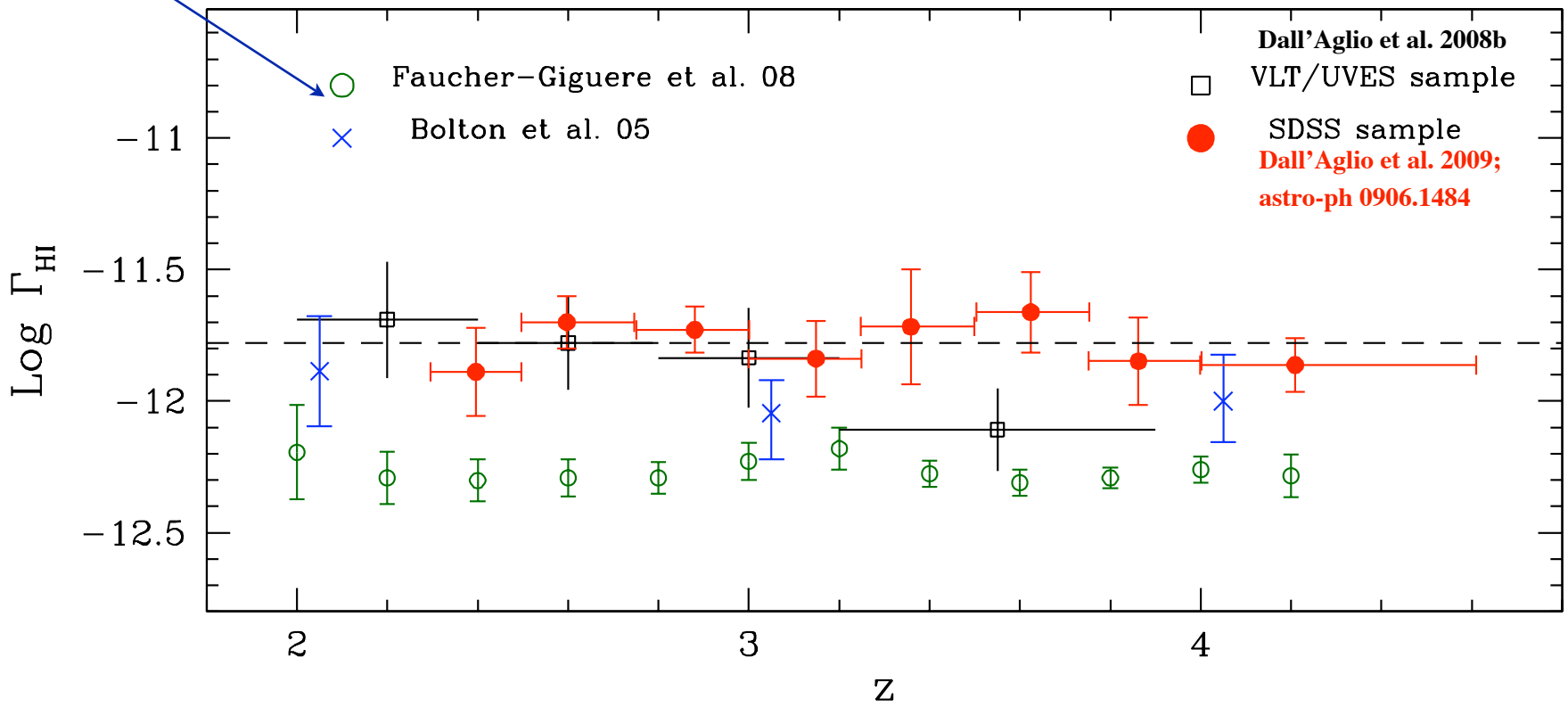
The evolution of the UV background

UVES: R~45000
SDSS: R~2000



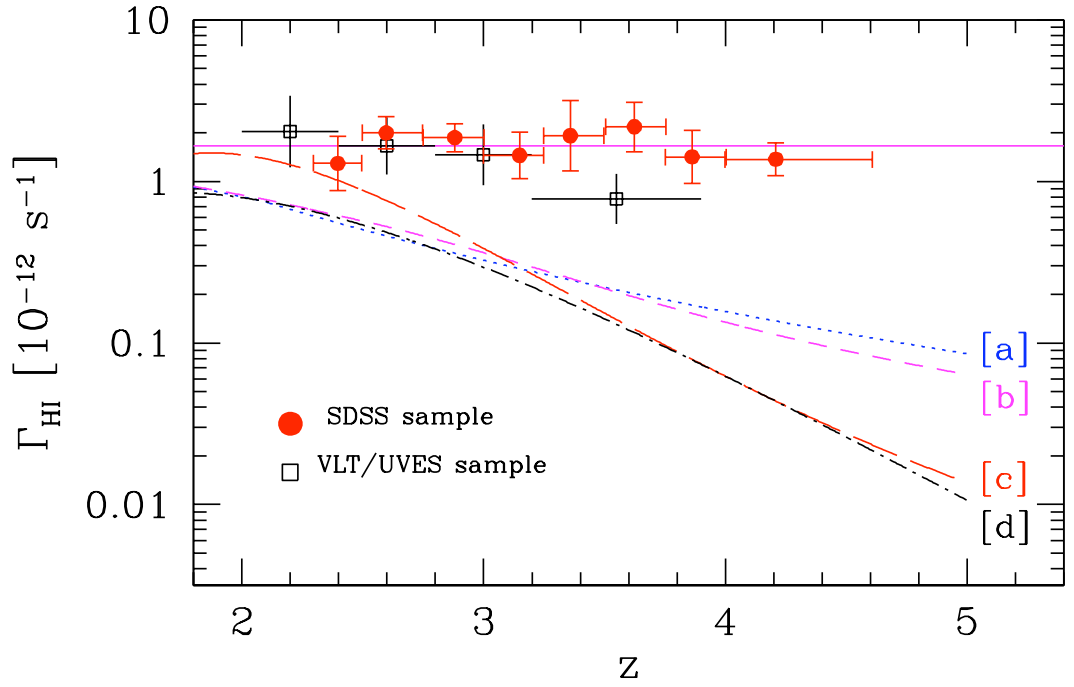
Placing our determinations into context

Modelling the IGM opacity with numerical simulations



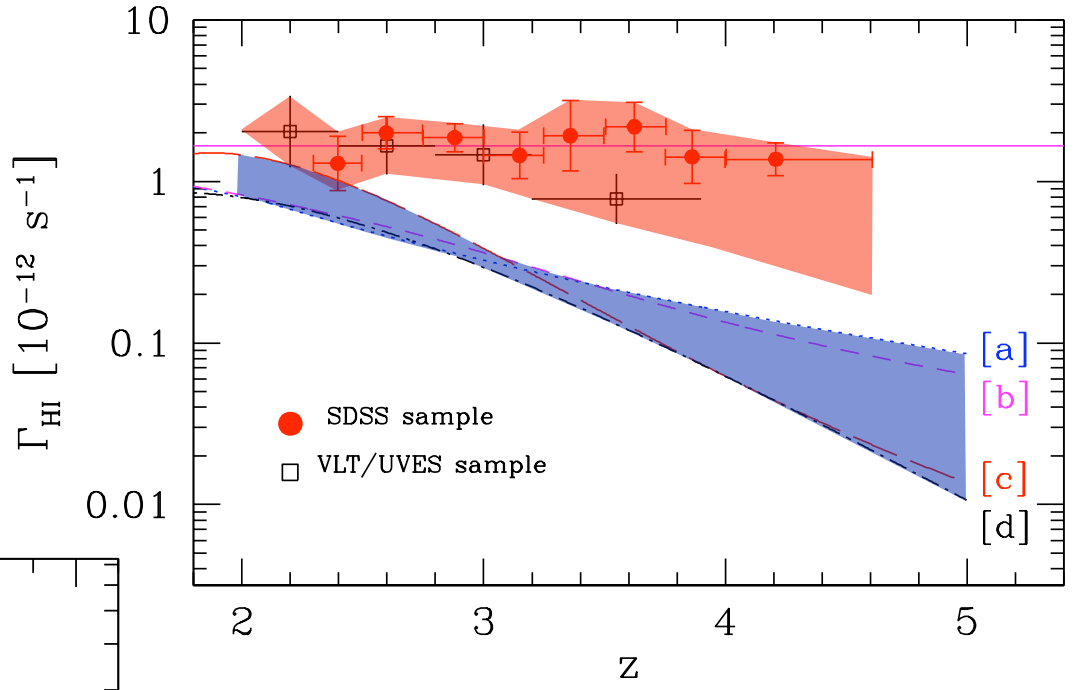
Decomposing the cosmic UV Background

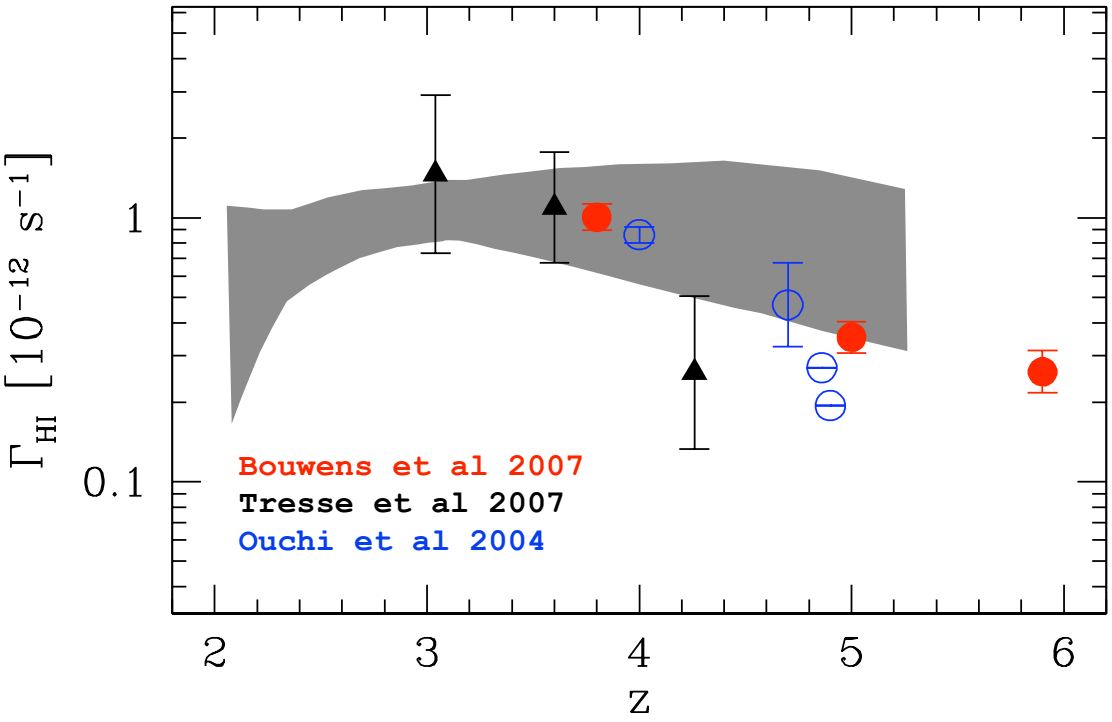
AGN contribution
[a..d] QSO
Luminosity Functions



Decomposing the cosmic UV Background

AGN contribution
[a..d] QSO Luminosity Functions





Galaxy contribution
Uncertain evolution & Luminosity Function

The evolution of the cosmic UV background

- **The Proximity Effect can be employed to directly determine an unbiased UV Background photoionisation rate**

- **The UV Background photoionisation rate is constant at $2<z<3.5$ and eventually up to $z\sim4.5$**

- **Star-forming galaxies dominate the cosmic photoionisation rate beyond $z\sim3$ and existing surveys may fall short of the measured UV background for $z>4.5$**