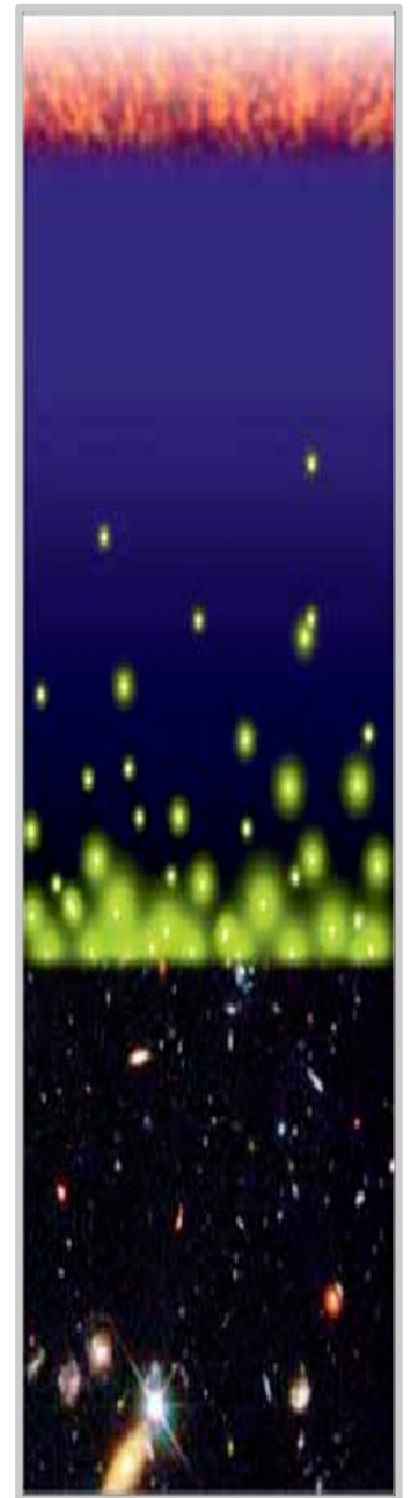


Probing the black hole growth and the chemical evolution of the quasar hosts at $z \sim 6$



Gisella De Rosa
Durham, 29 July 2010

Decarli R., Walter F., Kurk J.,
Fan X., Jiang L., Pasquali A.



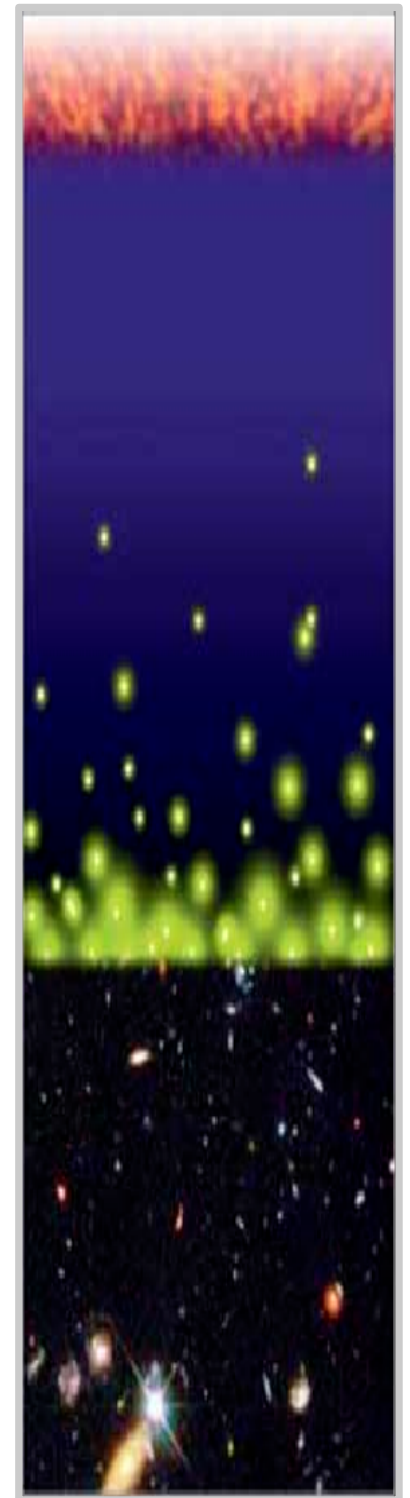


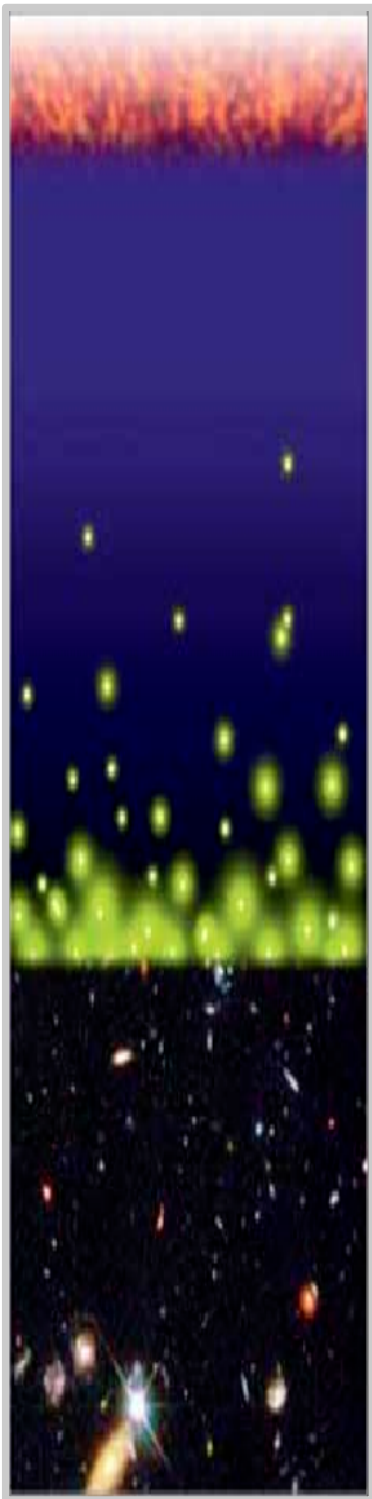
$z \sim 6$ quasars are:

- Amongst most luminous objects
- direct probes of the 1st Gyr of Universe:
 - BH accretion
 - galaxy formation
 - chemical evolution
 - reionization

QSO spectra give:

- black hole mass estimates
- accretion rates
- broad line region abundances

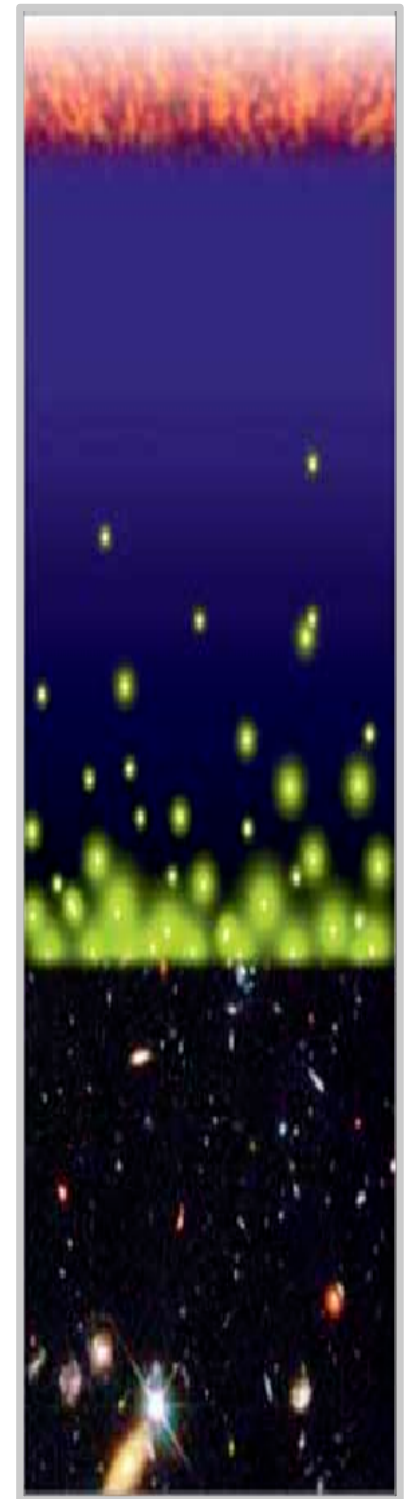




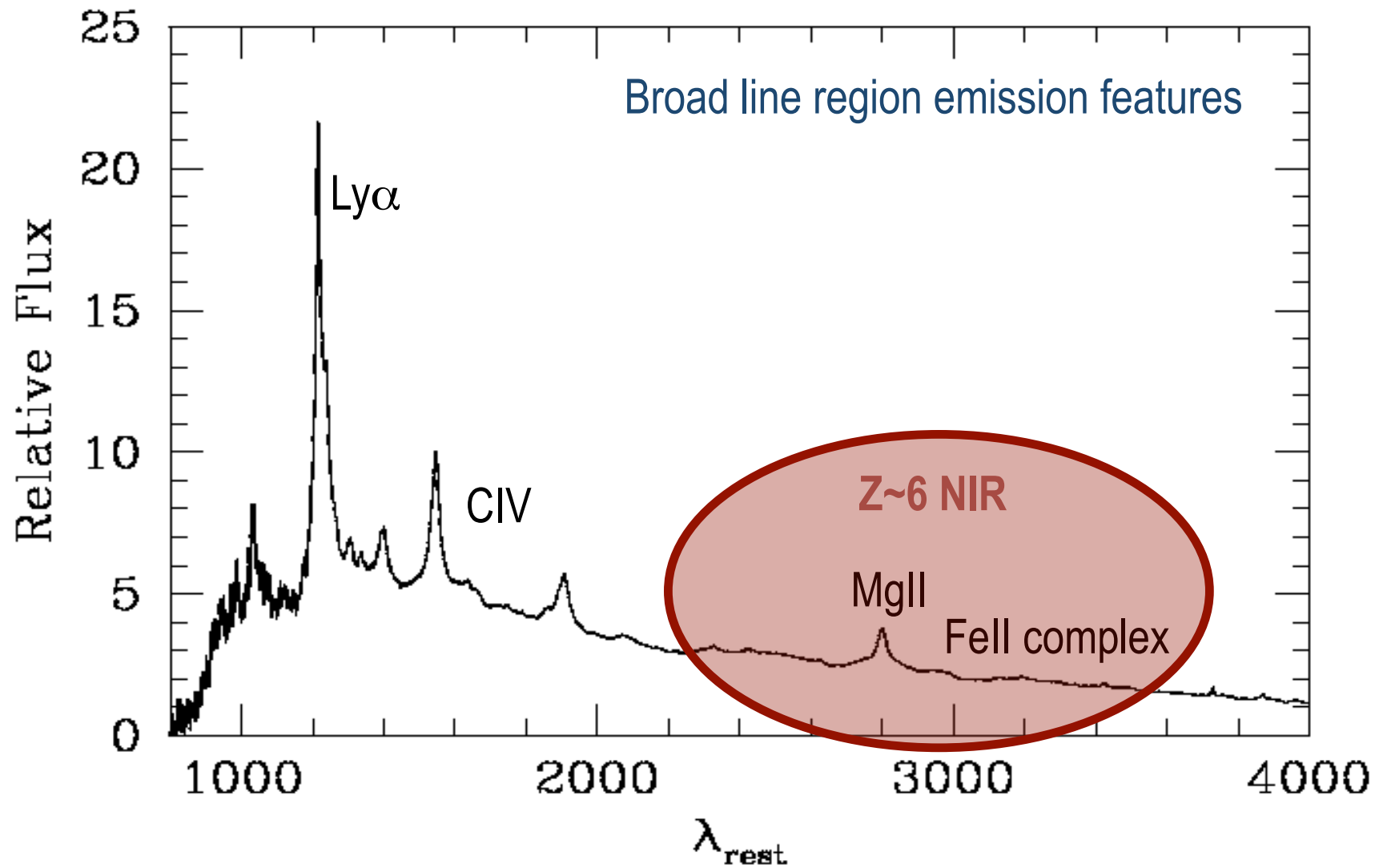
Black hole mass estimate:

From motion of the BLR clouds
(assuming Virial equilibrium)

$$M_{\text{BH}} \sim f L(3000 \text{ \AA})^\alpha \text{FWHM}^2$$



SDSS composite spectrum





Black hole mass estimate:

From motion of the BLR clouds
(assuming Virial equilibrium)

$$M_{\text{BH}} \sim f L(3000 \text{ \AA})^\alpha \text{FWHM}^2$$

BLR enrichment:

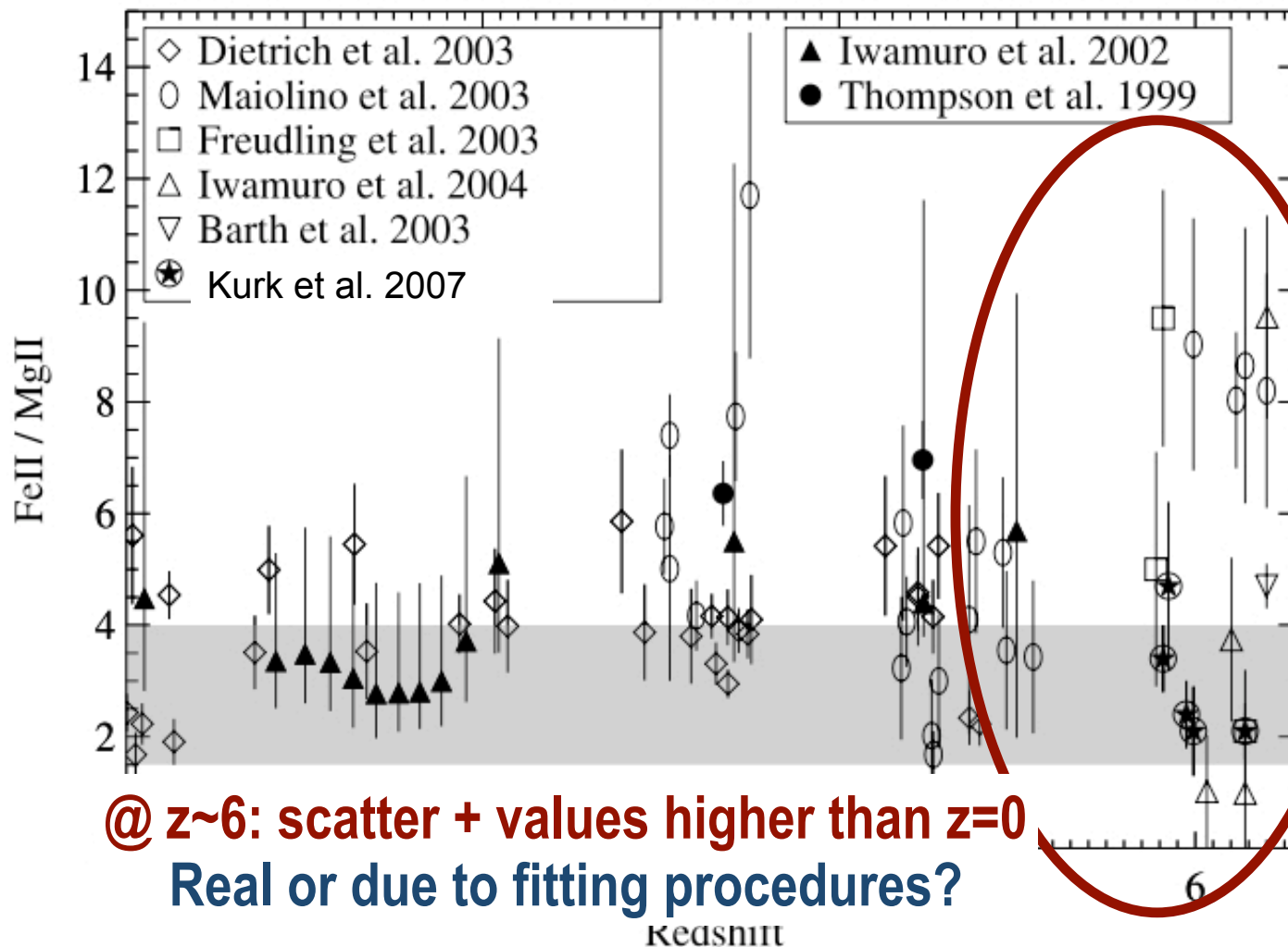
Proxy: FeII/MgII flux ratio

Fe produced mainly by SNIa

Mg produced in core collapse SN



FeII/MgII flux ratio

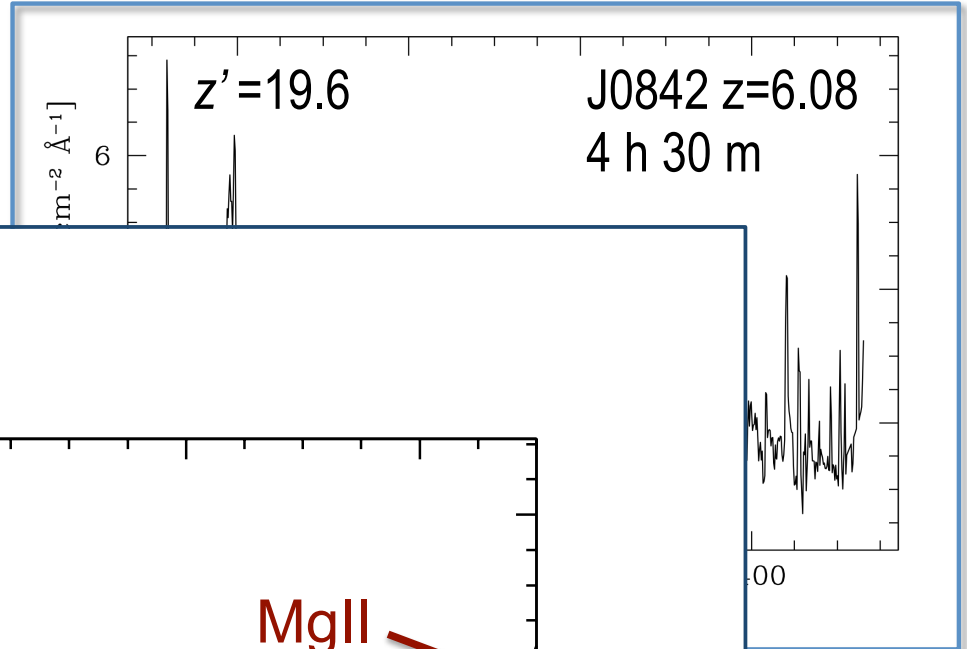




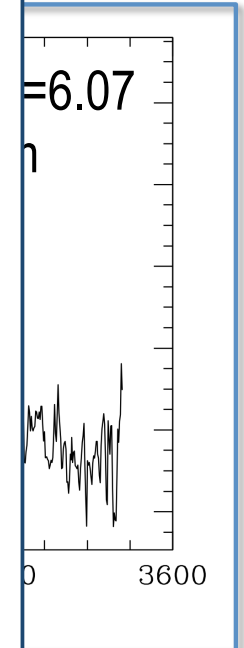
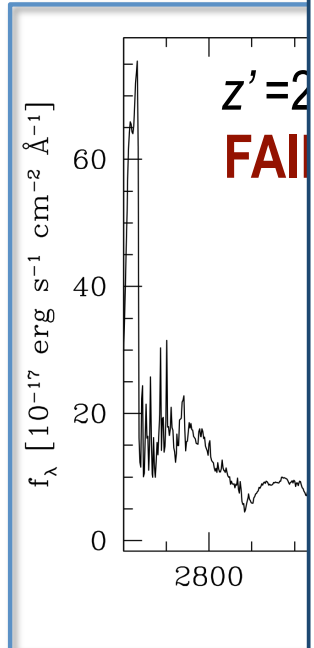
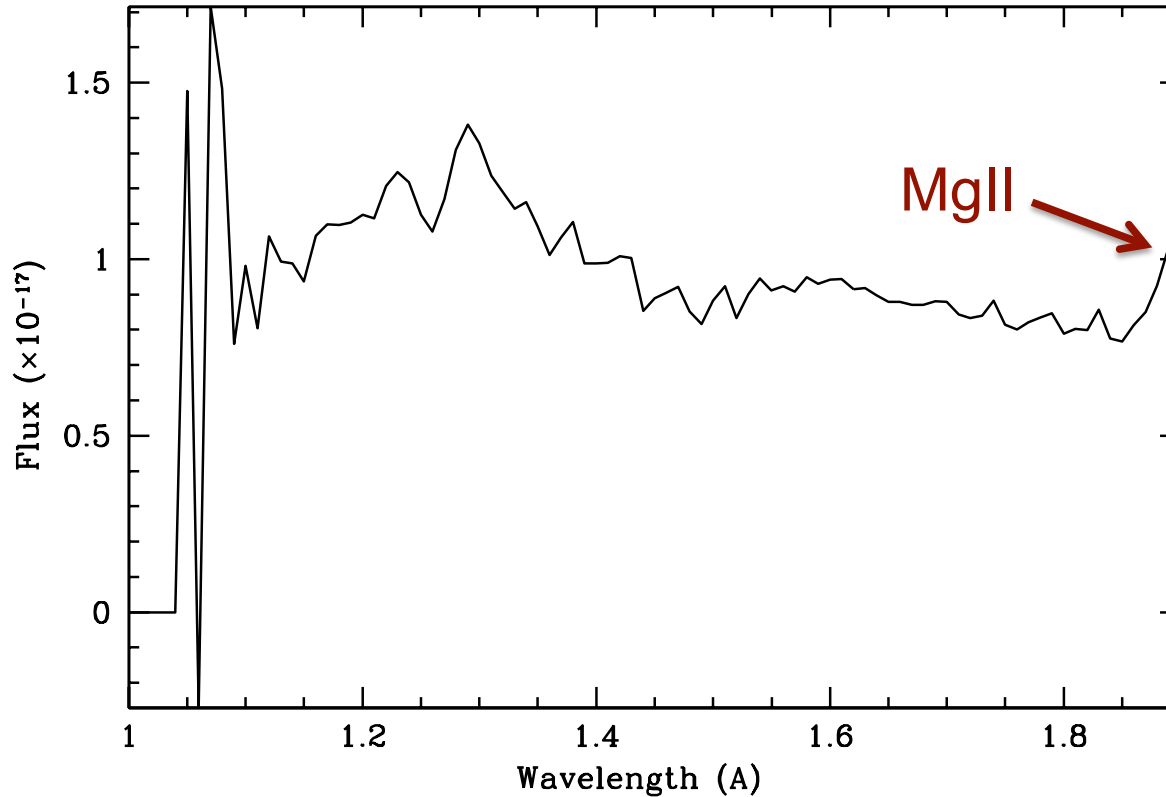
Sample: SDSS QSOs $z \sim 6$

Total 32 sources (5 weak line QSOs):

- 3 new K... quasars
- Literature 12: 4 (Barth, Fa...)



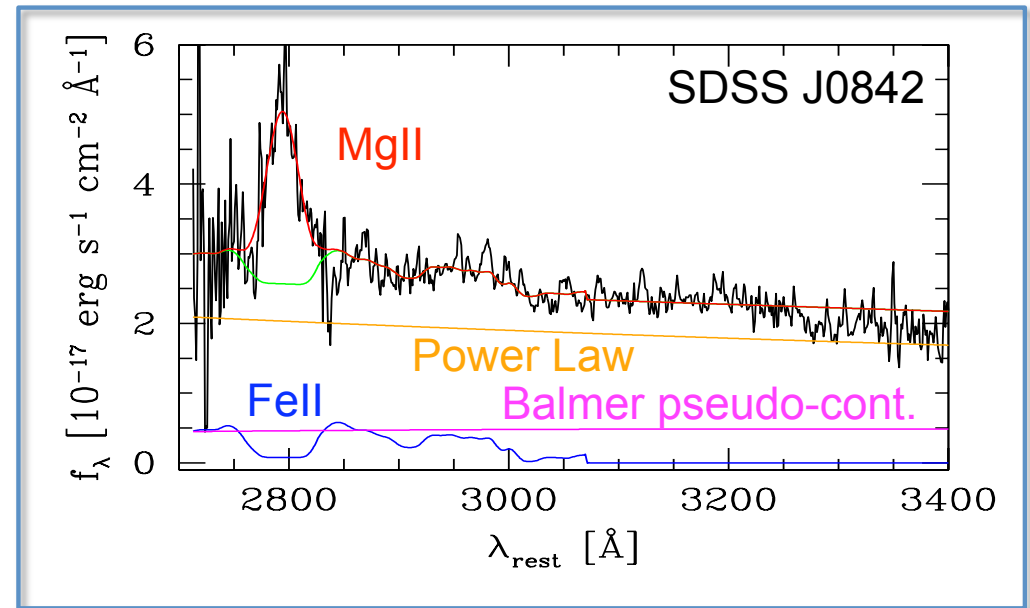
FILE: ? OBJECT: SDSSJ1044



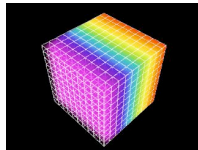
Data analysis: fitting

Spectral decomposition:

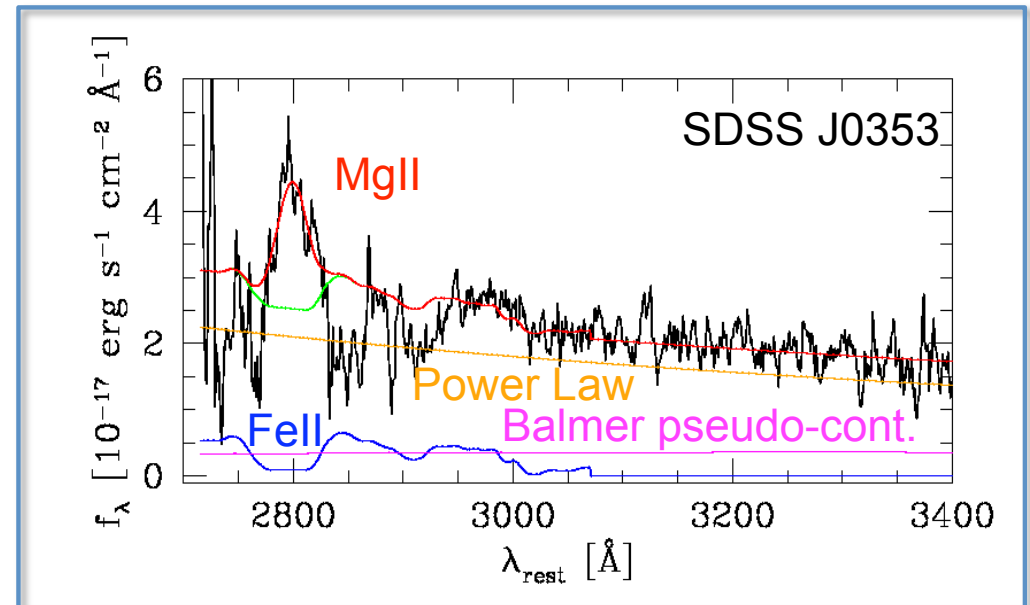
- power-law continuum
- Balmer pseudo-continuum (fixed)
- FeII forest (Vestergaard&Wilkes)
- MgII line

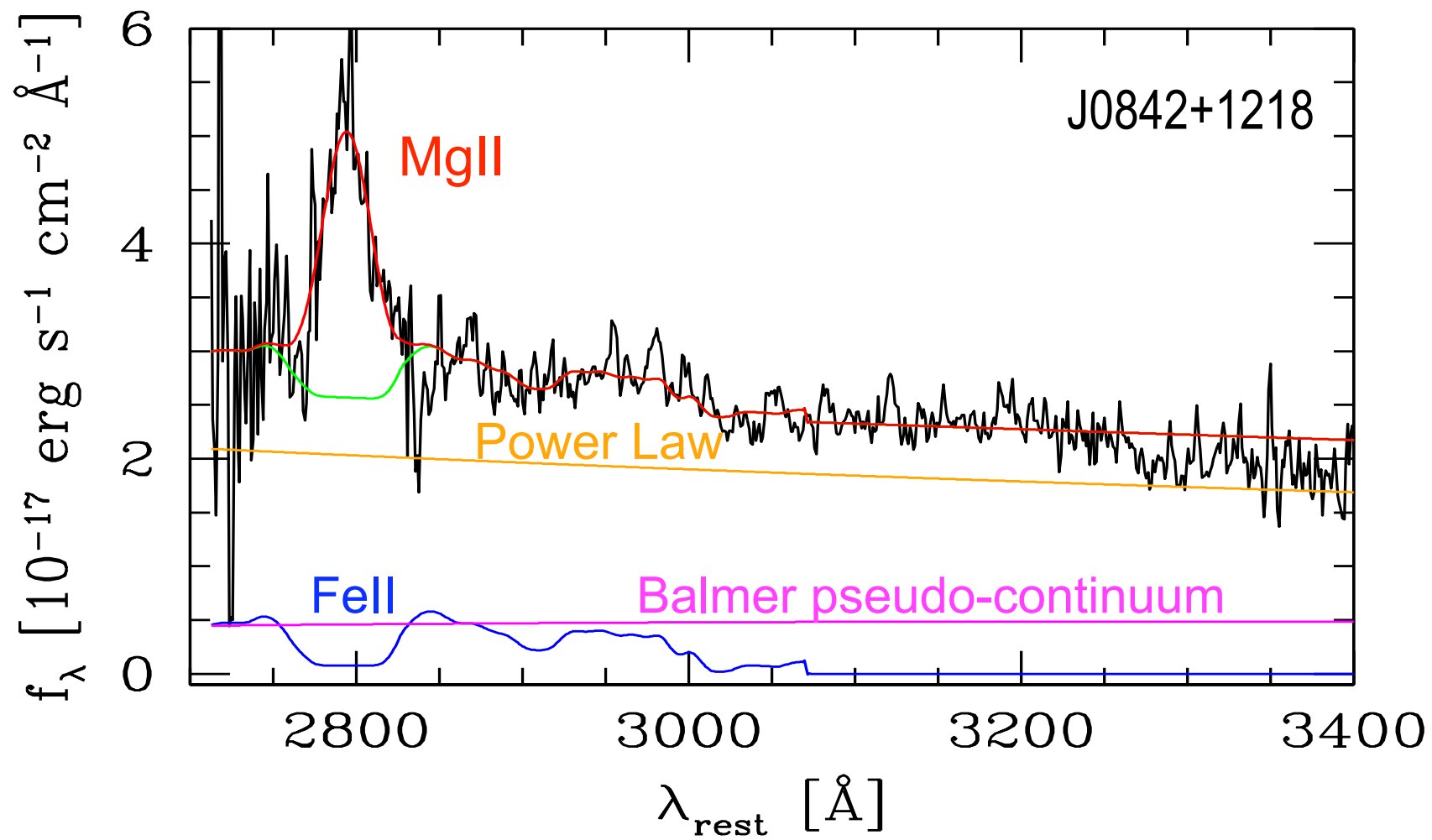


Fitting procedure:



- pseudo-continuum: χ^2 minimization on a 16000000 grid
- pseudo-continuum subtraction
- line: least squares, single gaussian

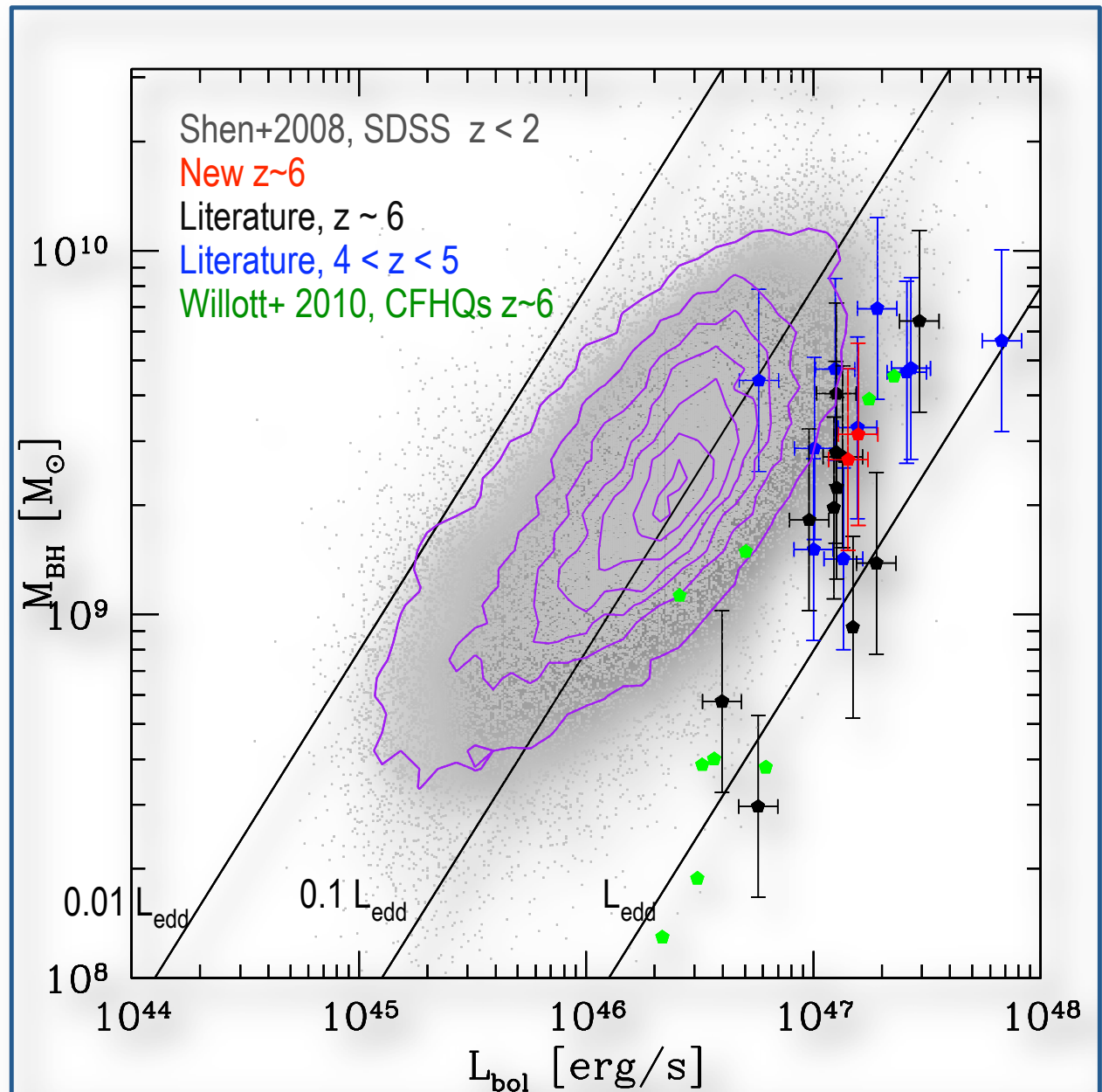




Results: BH masses and accretion ratios

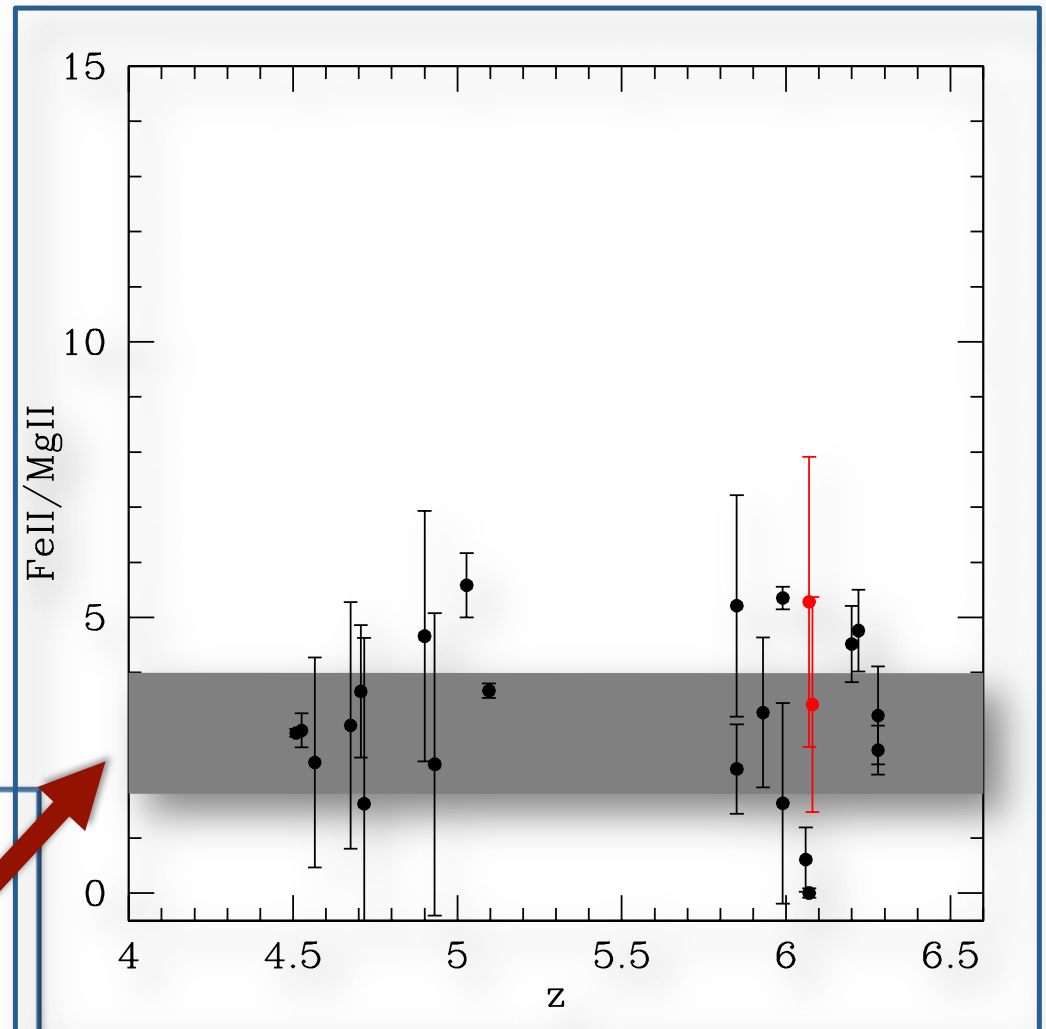
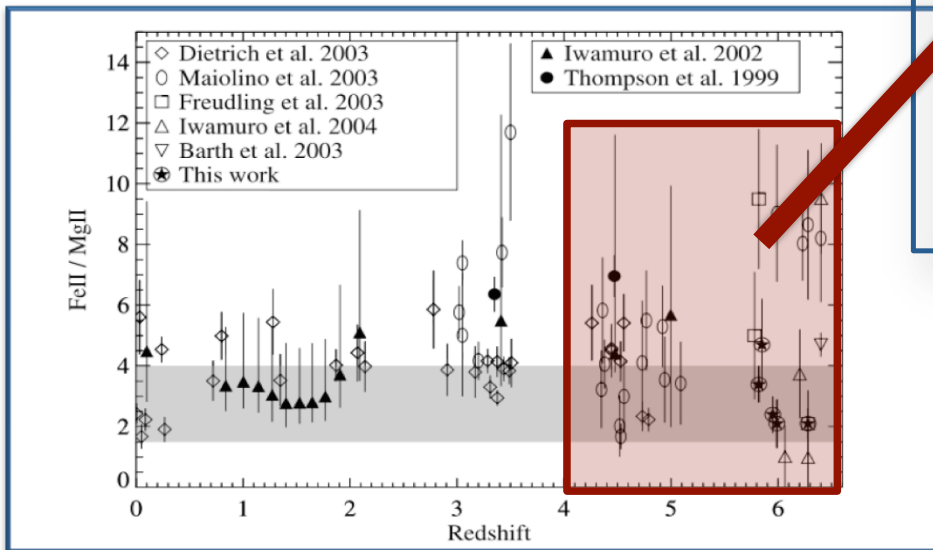
$$M_{\text{BH}} \sim f L(3000 \text{ \AA})^\alpha \text{FWHM}^2$$

- dependence on the adopted MgII line model within the intrinsic scatter
- no significant dependence on pseudo-continuum fitting
- **z~6 QSO show higher accretion rates than lower z population**



Results: BLR metal enrichment

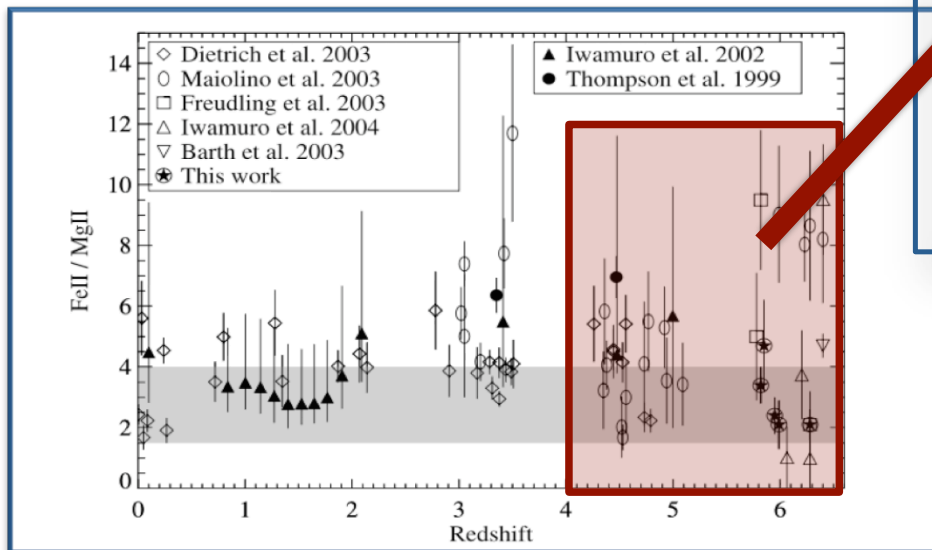
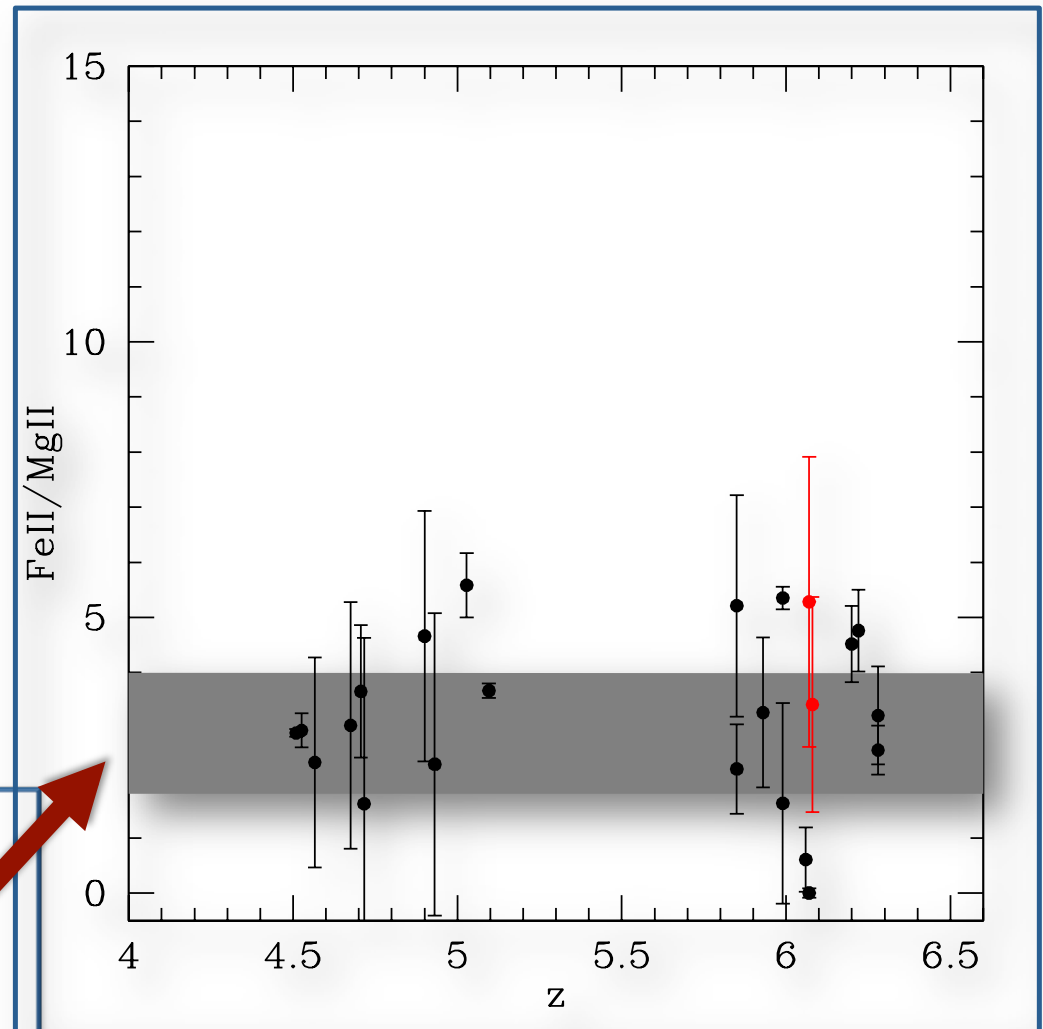
ZOOM



Results: BLR metal enrichment

REDUCED SCATTER @ $z \sim 6$:
strong dependence on adopted
pseudo-continuum fitting procedure

NO EVOLUTION with $4 < z < 6.5$



**Values in agreement with local
predictions for FeII/MgII ratio**

Conclusions

BH mass:

- $z \sim 6$ QSOs show higher accretion rates than local population

Fell/MgII:

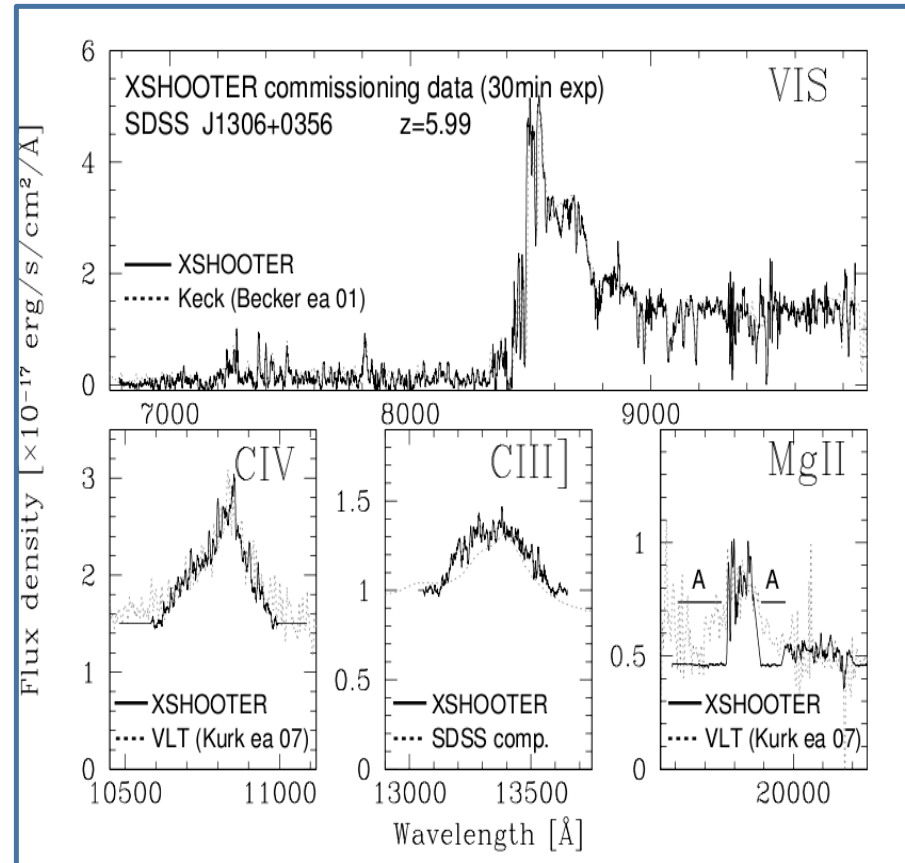
- Reduced scatter
- No evolution for $4 < z < 6.5$
- No Fell enhancement compared to local universe

Need of complete sample: looking for lower luminosities and higher z QSOs



The future: Xshooter

Need for complete and consistent spectral coverage + high S/N



**Awarded: 8 faint quasars with $z > 5.8$,
 $z' > 20.7$, 54 h**