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## THE WISSH PROJECT: WINDS IN THE BLR

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The  quasars project

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A. Marconi, G. Cresci INAF Arcetri

... and many others

# TARGETING WISSH QUASARS

**WISSH Quasars** →

WISE/SDSS Selected Hyper-luminous Quasars  
86 broad-line Quasars with  $L_{\text{Bol}} > 2 \times 10^{47} \text{ erg s}^{-1}$

**Extensive multi- $\lambda$  observing program**  
Panchromatic view of  
Hyper-Lum QSOs

**Goal: Nuclear, winds & host  
galaxy properties**

XMM & Chandra X-rays  
LBT/LUCI – TNG  $H\beta$  + [OIII]  
SINFONI IFU Spec  $H\beta$  + [OIII] +  $H\alpha$   
X-shooter  $H\beta$  + CIV + MgII  
ALMA CII + FIR continuum  
+ Herschel – WISE – 2MASS – SDSS  
public data

*This Talk*

SMBH mass and Eddington ratio estimate  
[OIII] outflows  
Disk Winds

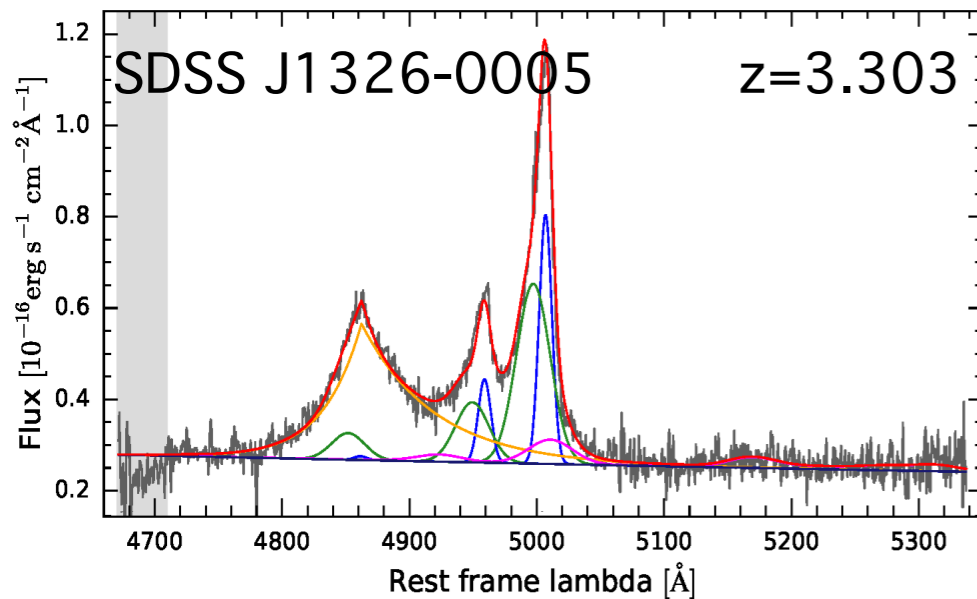
**Data**

LBT/LUCI: performed observations **18**  
**3/18** SINFONI data

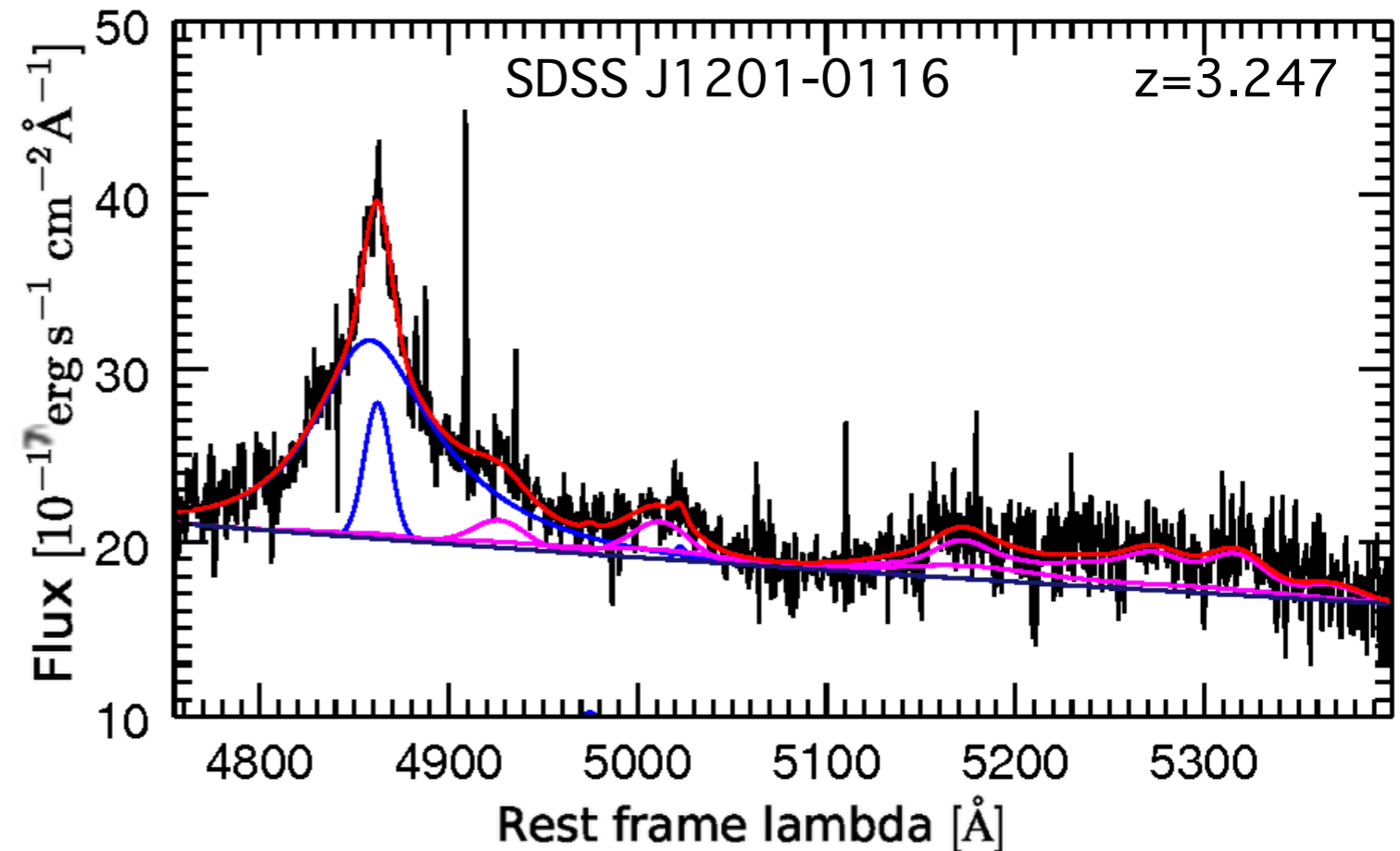
SDSS public data

# SPECTRAL OVERVIEW OF WISSH QUASARS

30% prominent broad [OIII] emission



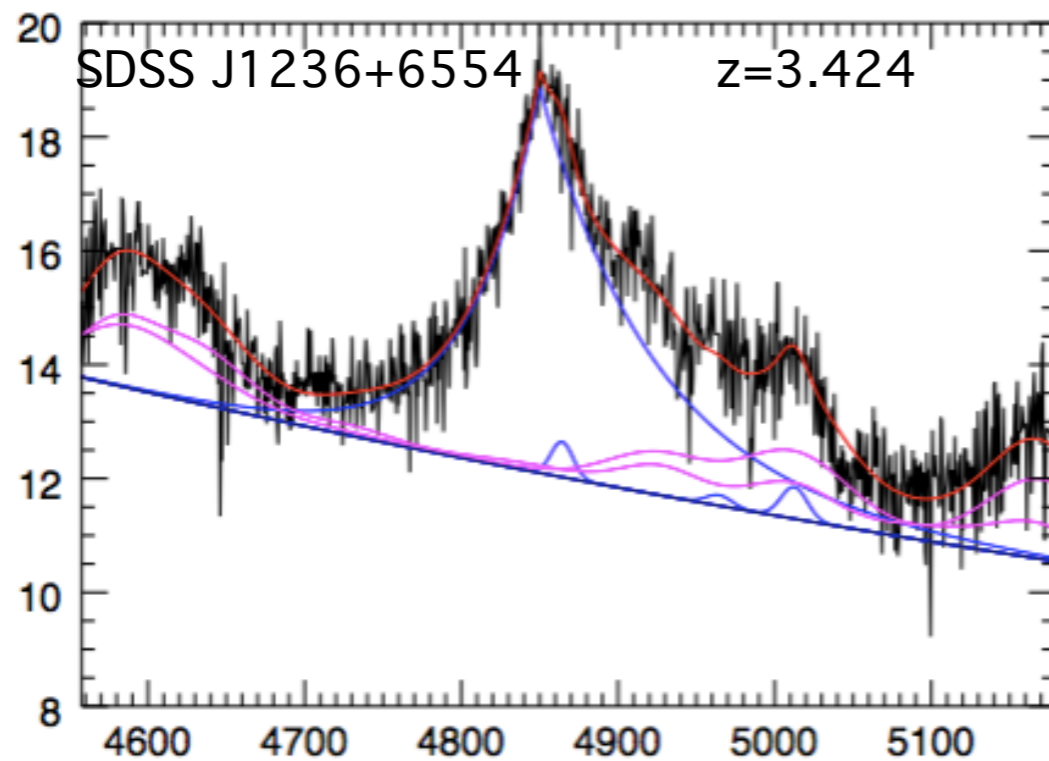
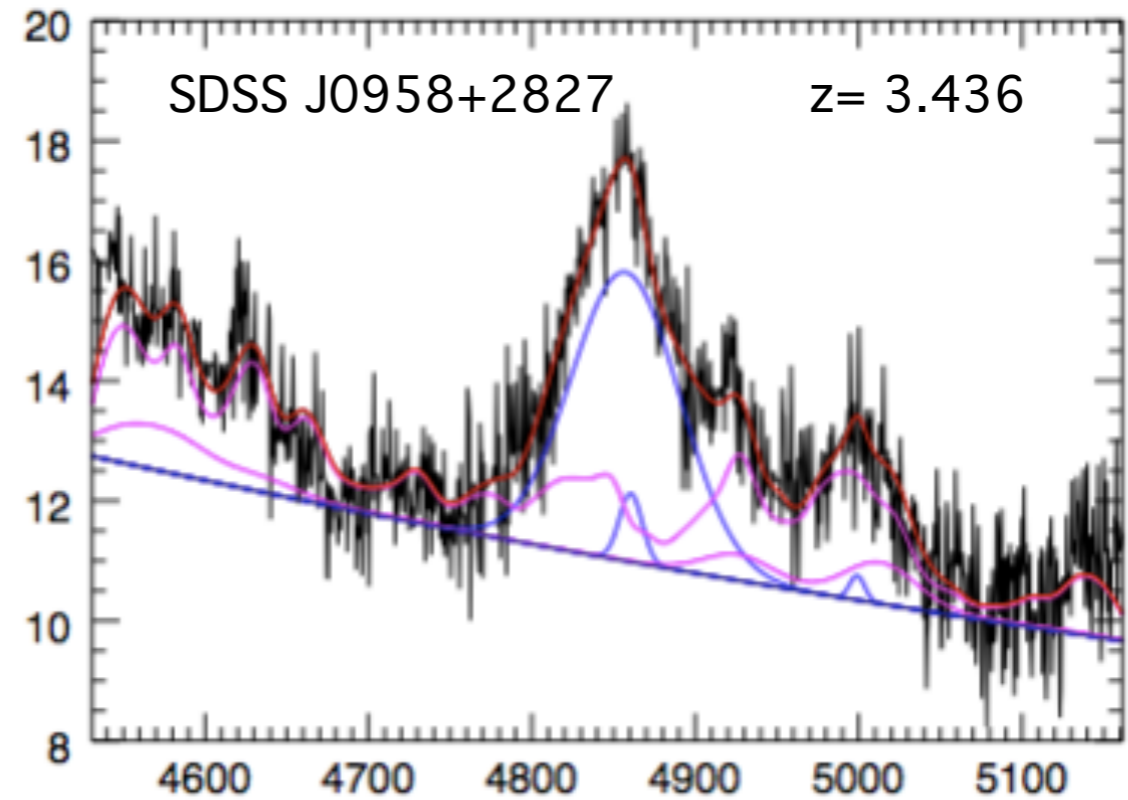
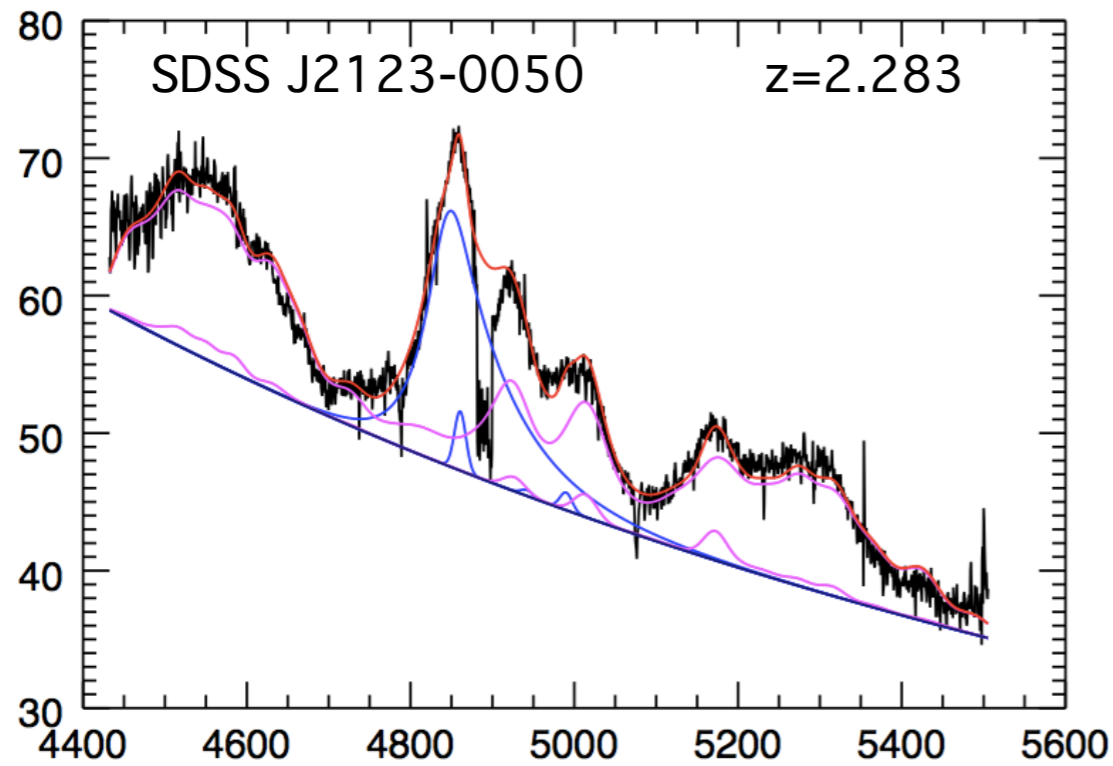
70% lack of [OIII] emission



- Very complex spectra, different from those typically observed
- Narrow [OIII] emission weak or absent in all of them
- If present, [OIII] shows broad blue-shifted profiles (in 5/18 quasars) indicative of outflows (*Manuela Bischetti Talk*)
- Strong, complex FeII emission

# LACK OF [OIII] IN WISSH QUASARS?

70% lack of [OIII] emission

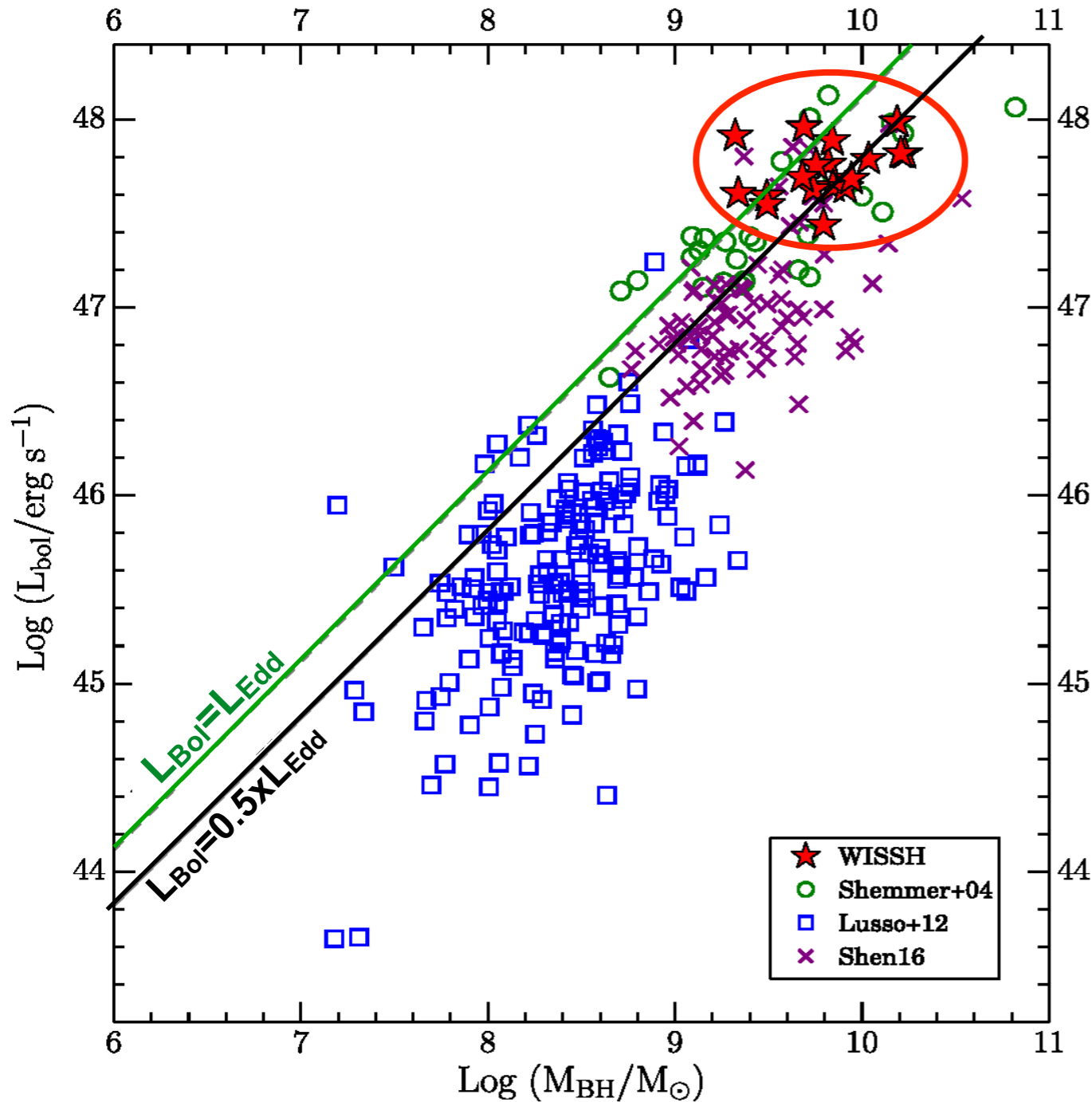


Strong, complex FeII emission

Upper limits on [OIII]: FWHM~500 km/s

Weak [OIII] emission line? Iron residual?

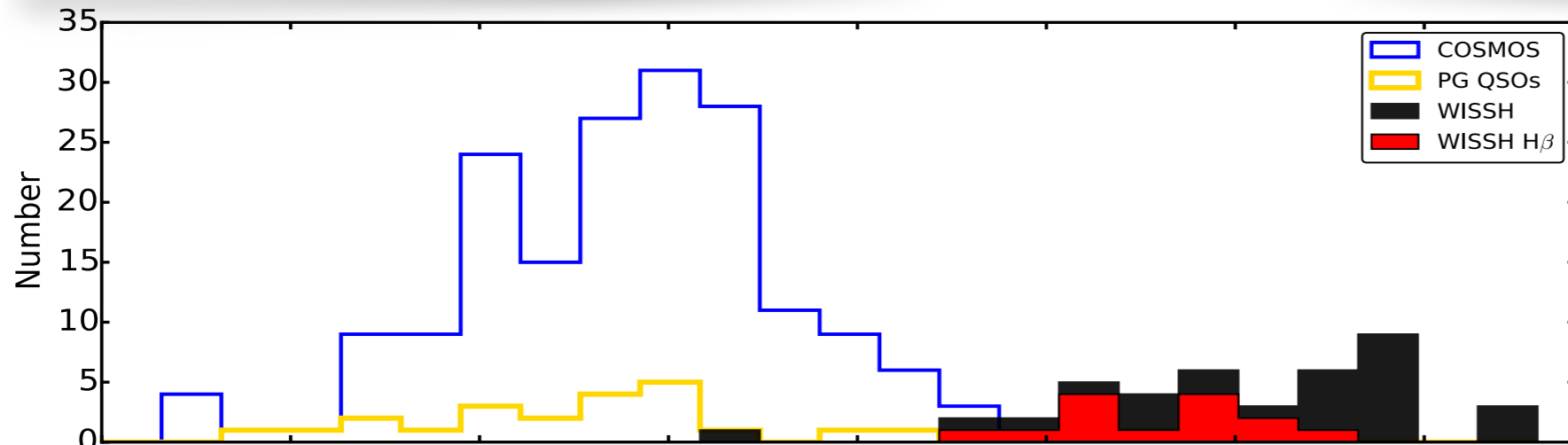
# REVEALING ULTRA-MASSIVE, HIGHLY ACCRETING SMBH



- **HB-based SMBH masses** from  $\sim 2 \times 10^9 M_{\odot}$  up to  $\sim 2 \times 10^{10} M_{\odot}$
  - **$L_{\text{Bol}}$  from multi-component broad-band (far-IR to UV) SED fitting** (Duras et al. in prep)
- (Federica Duras Talk)*

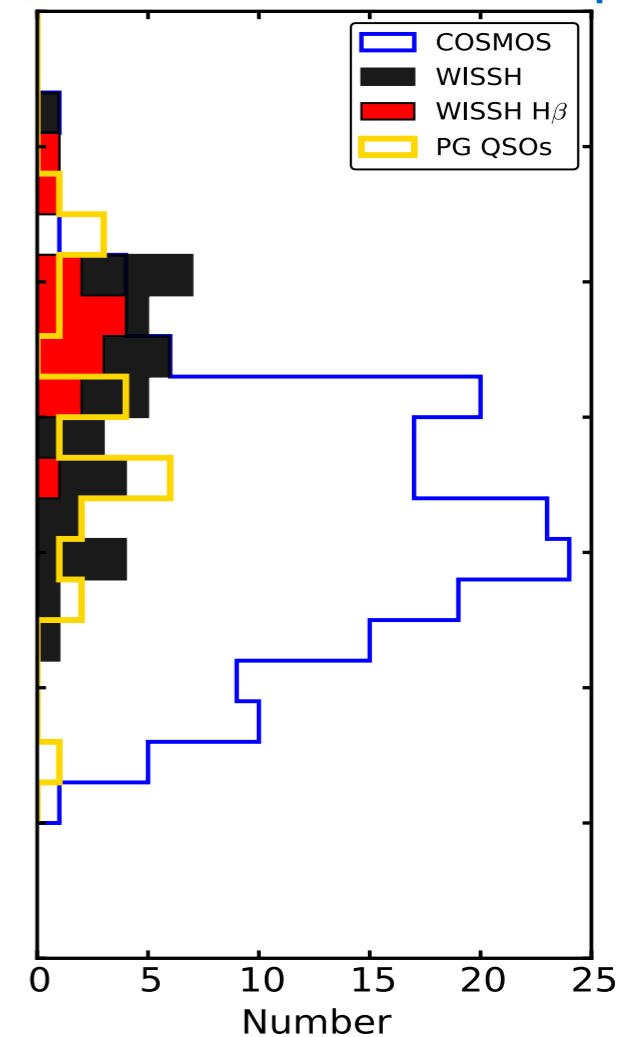
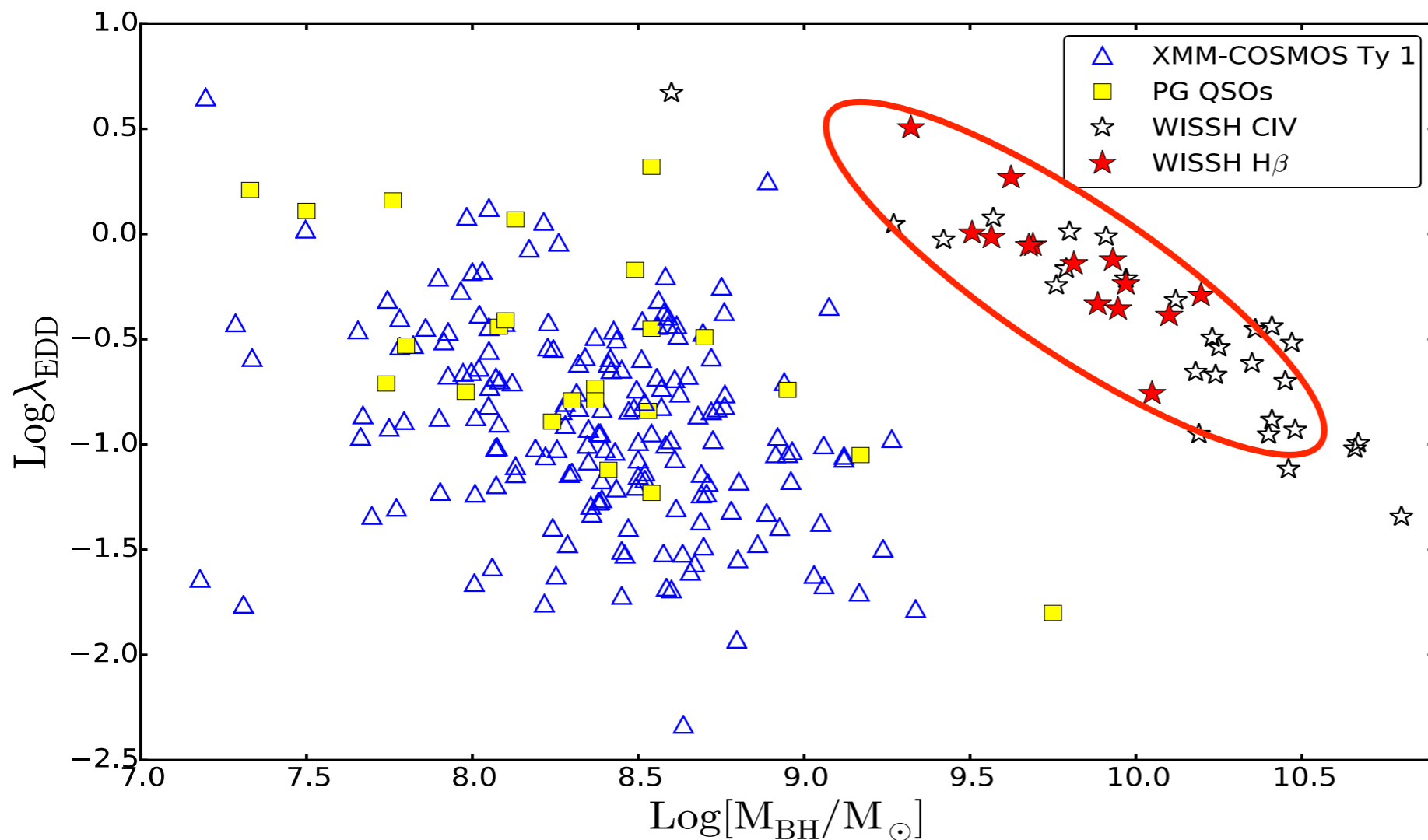
WISSH QSOs populate the massive end of the BH mass function at  $z \sim 2.5 - 3.5$

# WISSH VS “TYPICAL” AGN SMBHs



● high accretion rates  
 $0.4 < \lambda_{\text{Edd}} < 3$

(Martocchia et al. in prep)



Opportunity of collecting high-mass, highly accreting SMBHs at the peak of the quasars number density

# WINDS IN WISSH QUASARS

[OIII] outflows

*(Manuela Bischetti talk)*

**NLR**  
Kpc

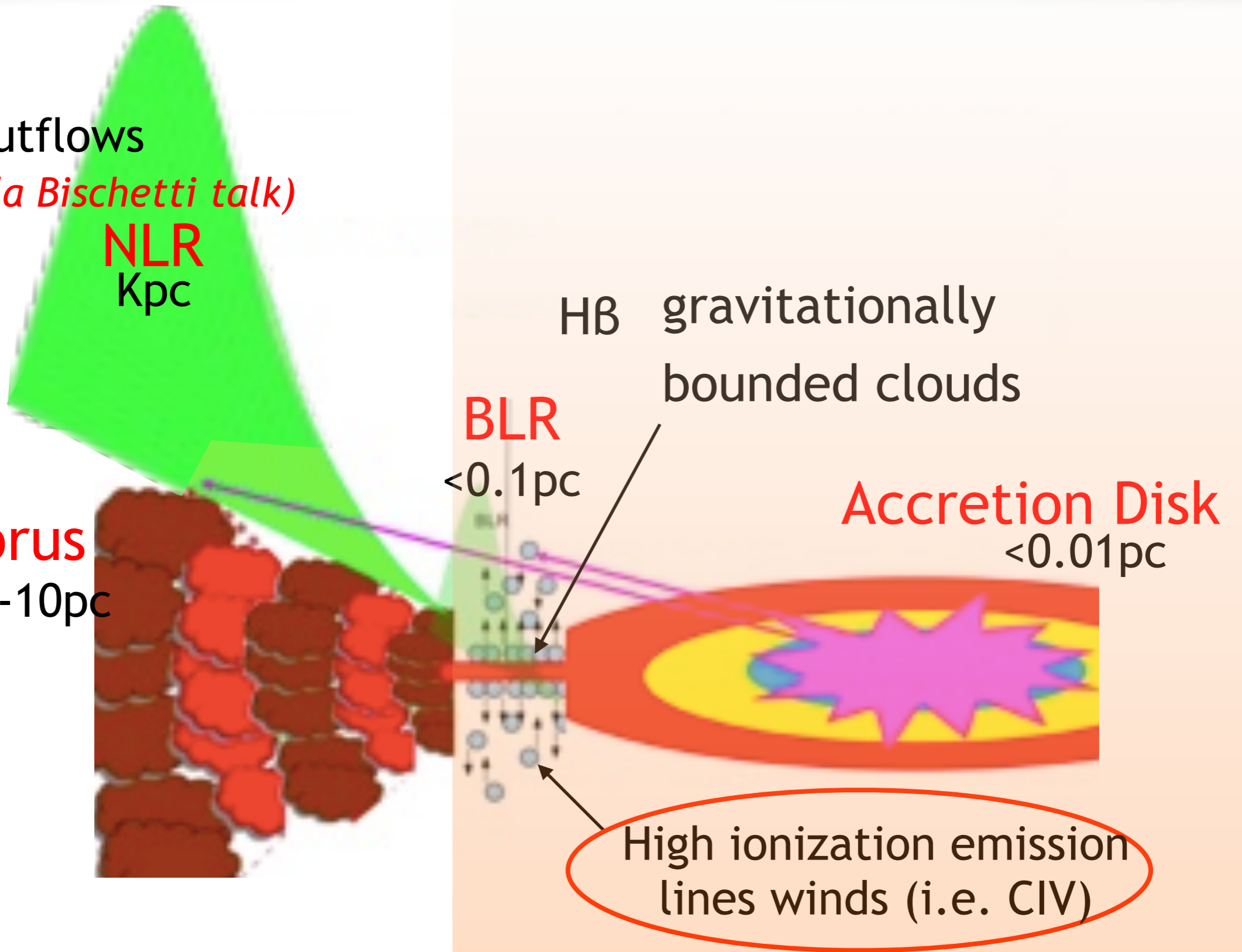
**Torus**  
1pc-10pc

H $\beta$  gravitationally  
bounded clouds

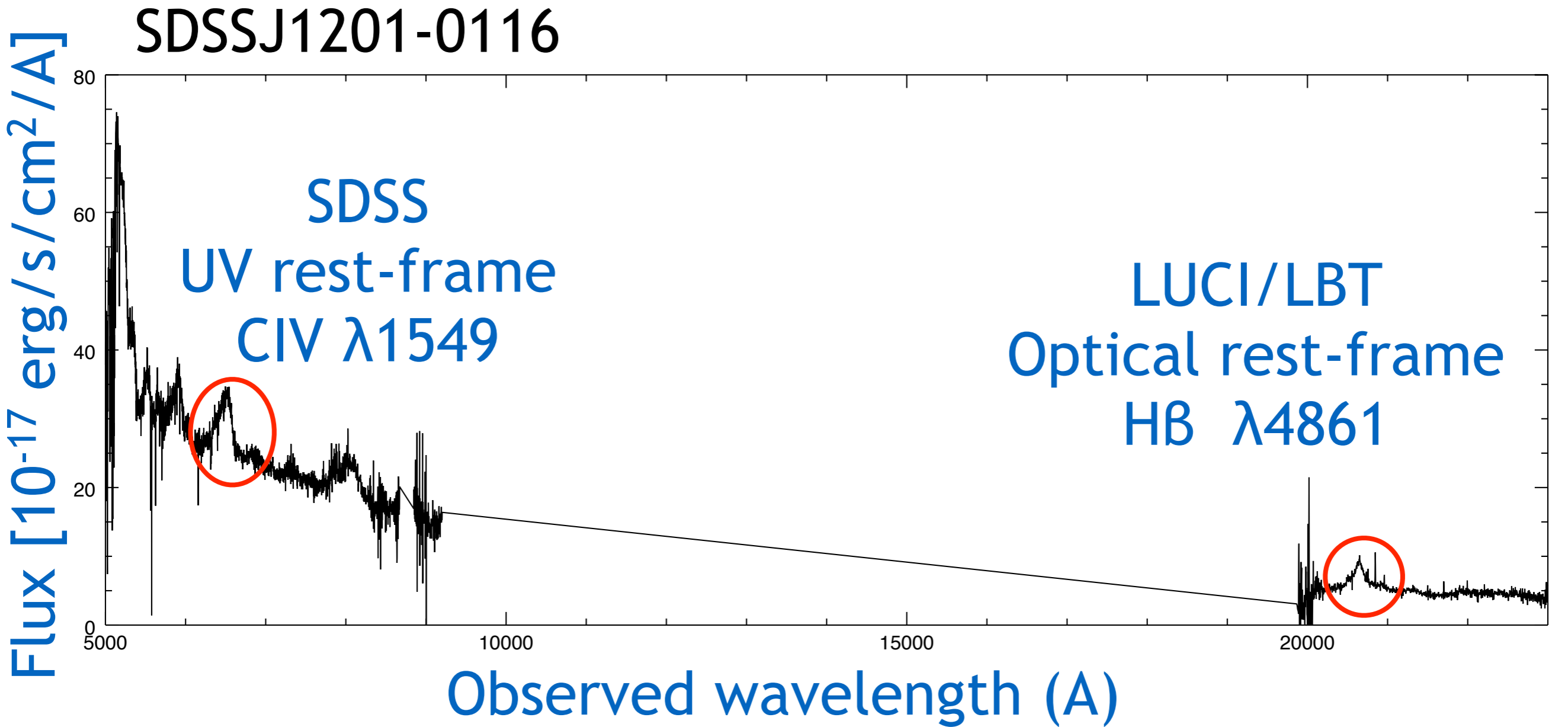
**BLR**  
<0.1pc

**Accretion Disk**  
<0.01pc

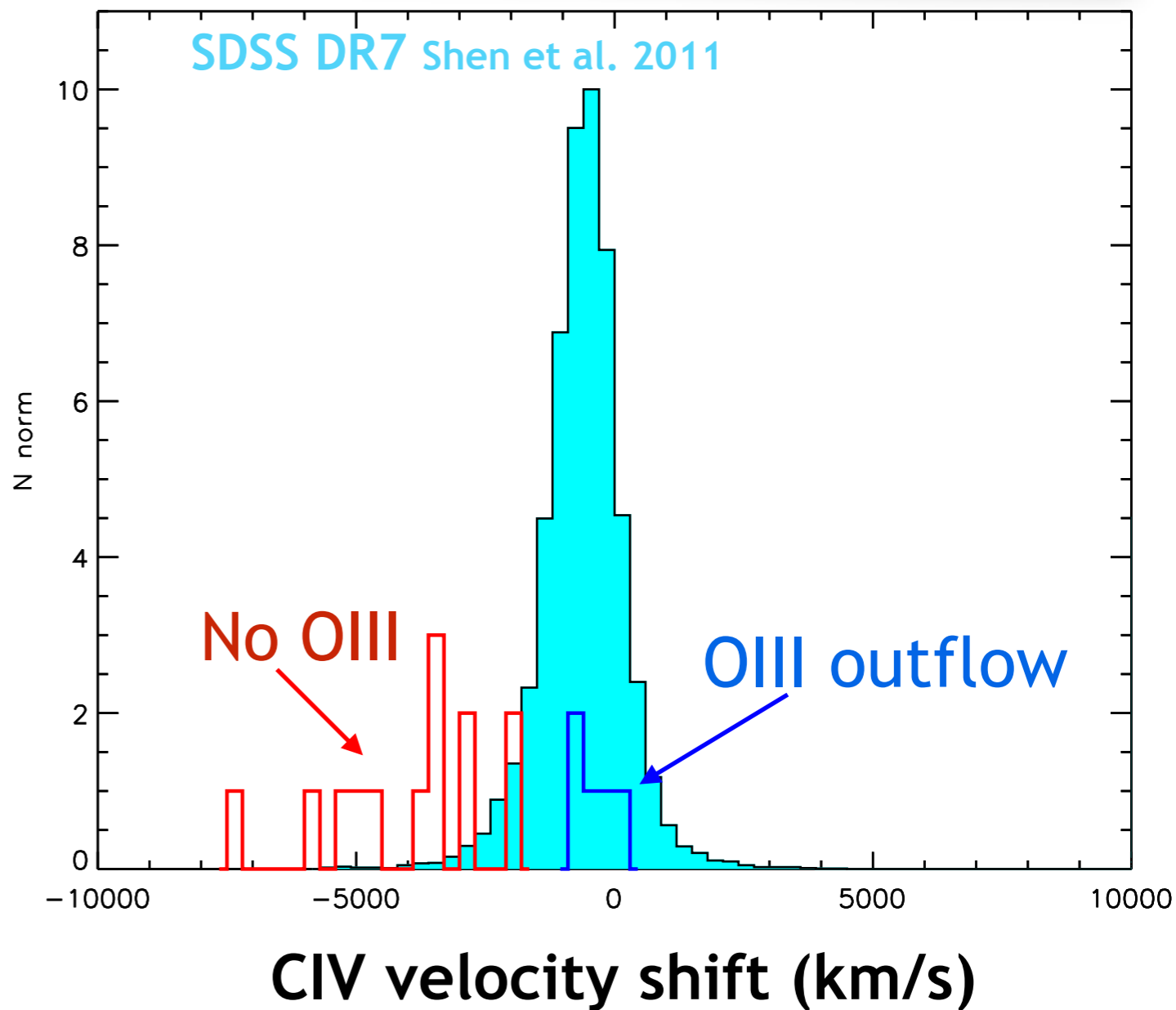
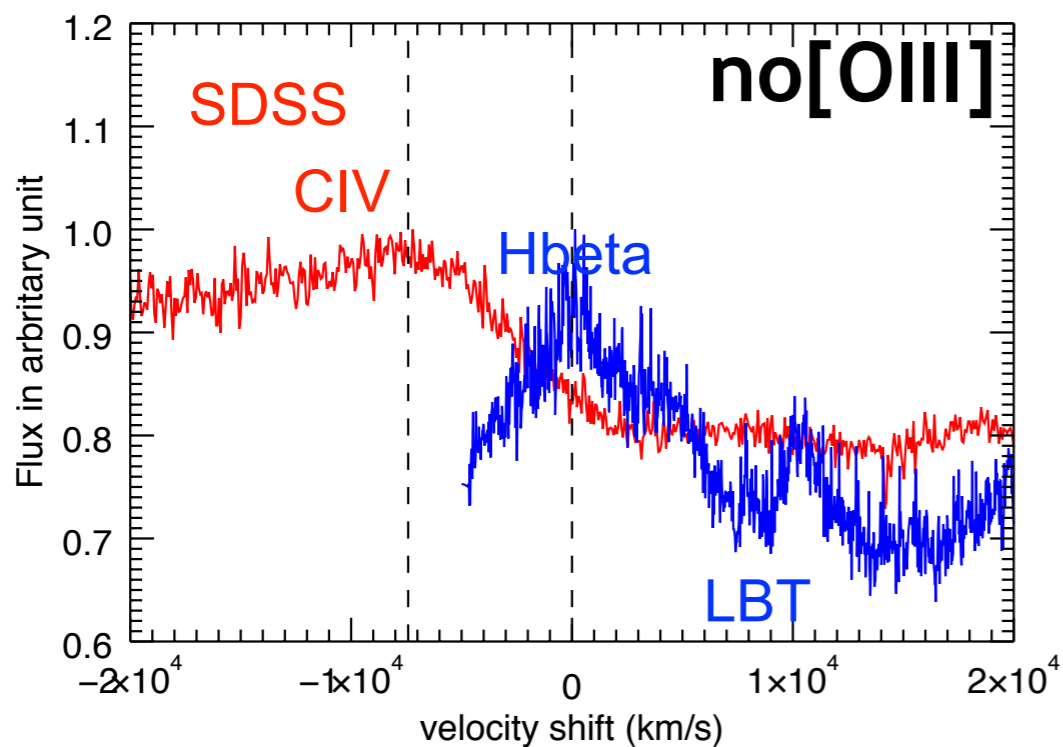
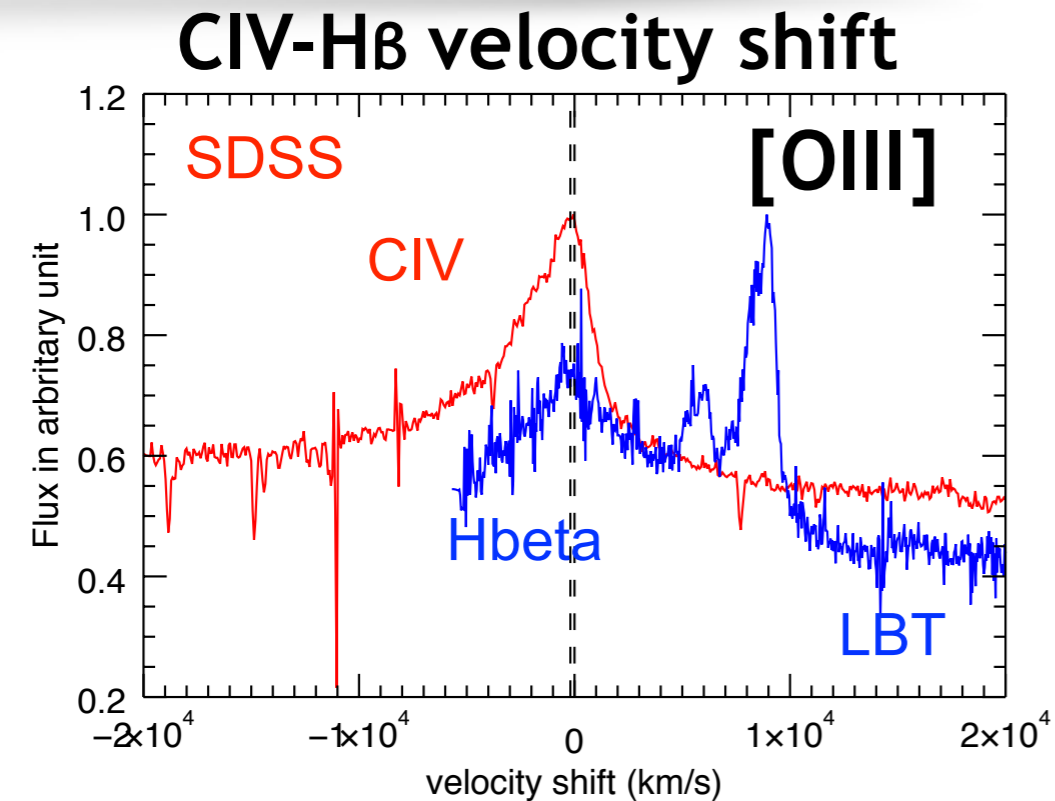
High ionization emission  
lines winds (i.e. CIV)



# BLR WINDS IN WISSH QUASARS



# BLR WINDS VS [OIII] WINDS: A DICHOTOMY

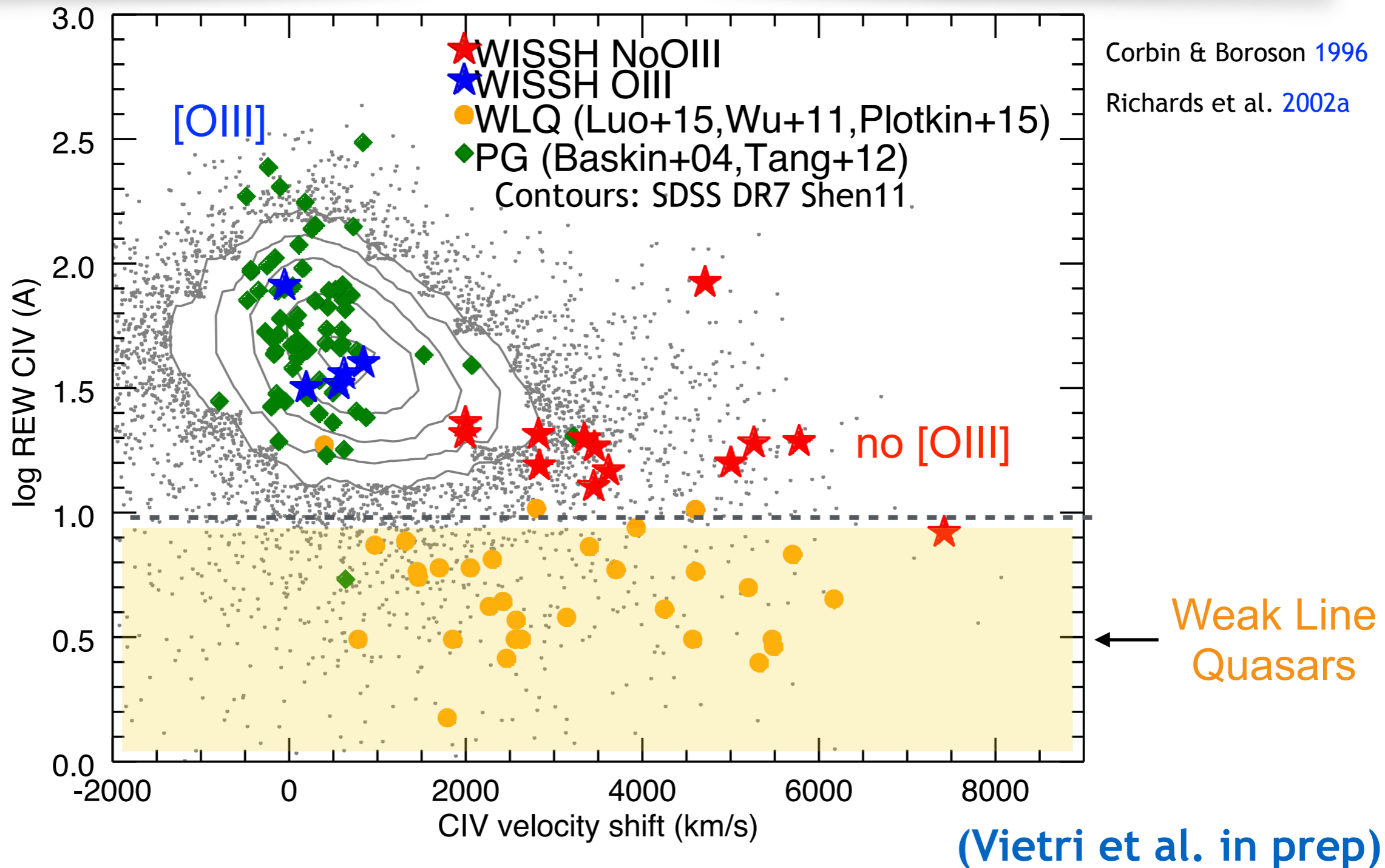


Evidence of dichotomy  
CIV vshift > 2000 km/s if **no [OIII]**  
CIV vshift < 2000 km/s if **[OIII]**

Gaskell 1982  
Marziani+1996  
Richards+2011

Radiatively driven winds dominating the BLR kinematics

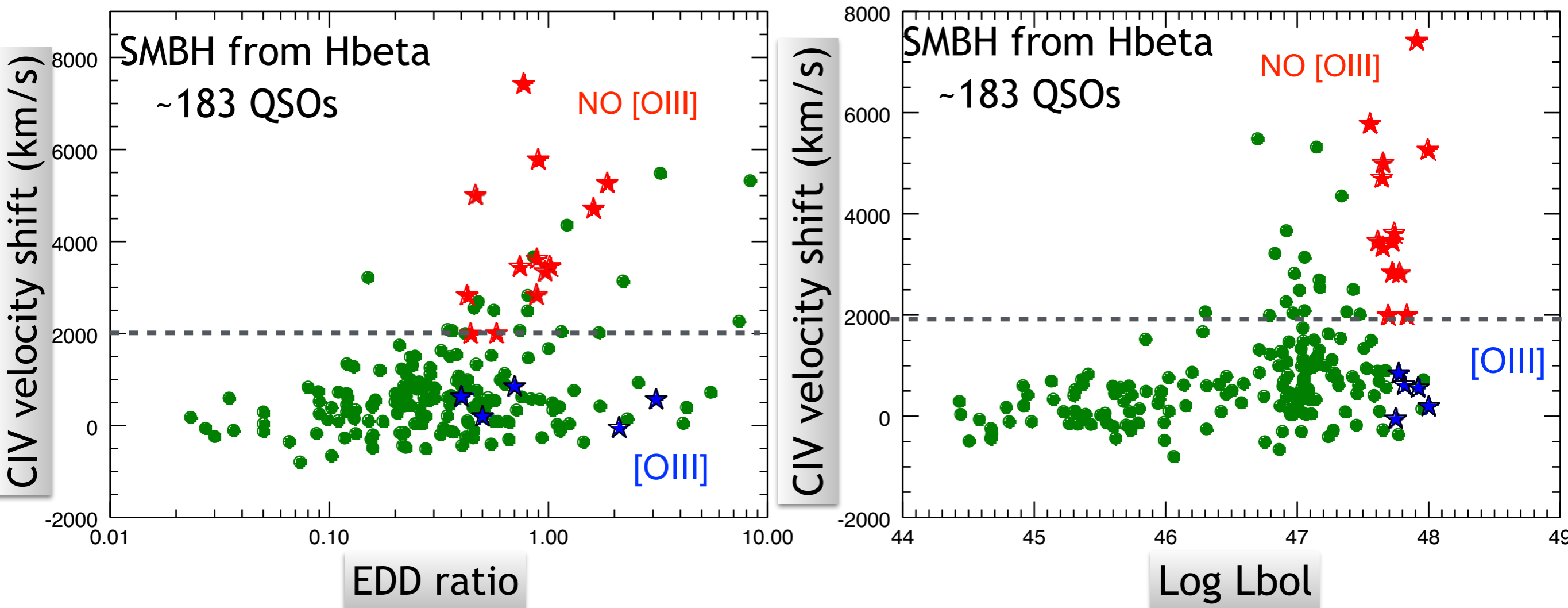
# BLR WINDS VS [OIII] WINDS: A DICHOTOMY



[OIII]: higher EWCIV and lower velocity shift  
NO [OIII]: lower EWCIV and higher velocity shift

**WISSH selection very effective in collecting the highest CIV winds**

# BLR WINDS VS EDD RATIO AND BOLOMETRIC LUMINOSITY



Higher velocity shift with increasing  $L_{\text{Bol}}$

BUT what else..?

(Vietri et al. in prep)

# CONCLUSIONS

The WISSH sample

86 hyper-luminous, IR-loud, broad-line quasars at  $2 < z < 5$  with  $L_{\text{Bol}} > 2 \times 10^{47} \text{ erg s}^{-1}$

Ongoing multi-lambda observing programs (LBT, SINFONI, CHANDRA, ALMA,...)

## RESULTS FROM LBT/SINFONI OBSERVATIONS (18 TARGETS):

- SMBH ( $2 \times 10^9 M_{\odot}$  up to  $2 \times 10^{10} M_{\odot}$ ) at the massive end of the BH mass function
- High accretion rates ( $0.4 < \lambda_{\text{Edd}} < 3$ )

- Narrow [OIII] emissions weak/absent
- If present (30%), broad [OIII] (FWHM  $\sim 2000 \text{ km/s}$ ) indicative of outflows  
highest broad [OIII] luminosities observed so far (up to  $10^{45} \text{ erg s}^{-1}$ )

*(Manuela talk)*

- BLR winds with CIV shifts  $2000 - 7000 \text{ km/s}$  (70%)
- BLR winds - [OIII] winds dichotomy
- Dependence of CIV velocity shift on Bolometric Luminosity but there is more....

SED properties?  
Xray weakness?