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THE WISSH PROJECT: WINDS IN THE BLR

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The  **quasars project**

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M. Brusa, C. Vignali UNIBO - INAF OABO
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- λ observing program
Panchromatic view of
Hyper-Lum QSOs

Goal: Nuclear, winds & host
galaxy properties

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

This Talk

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

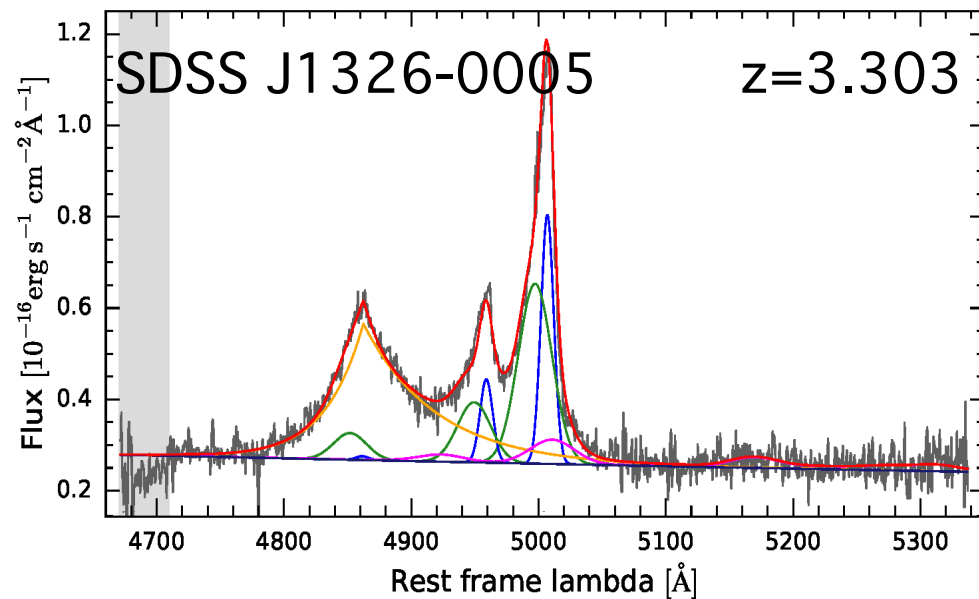
Data

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

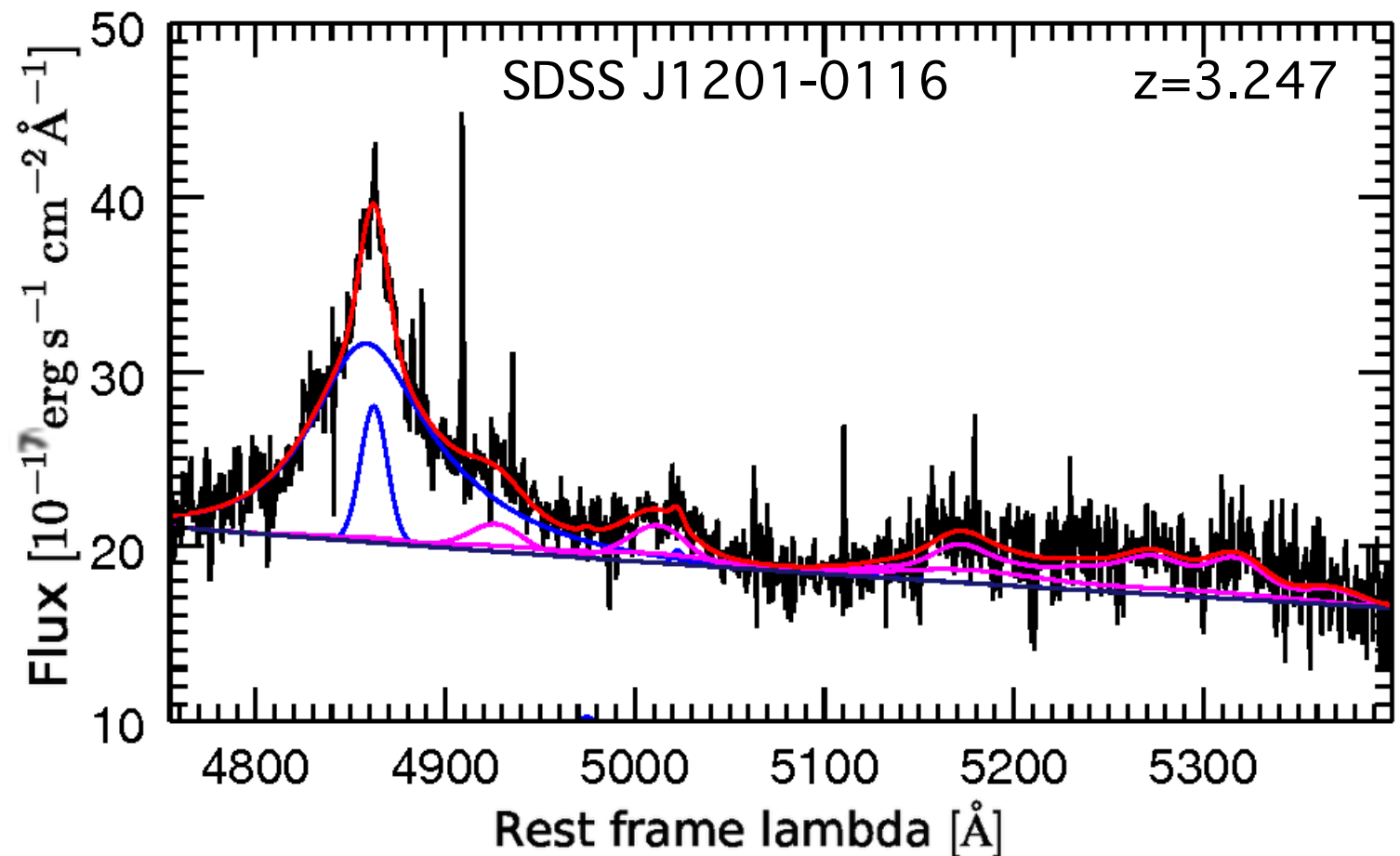
SDSS public data

SPECTRAL OVERVIEW OF WISSH QUASARS

30% prominent broad [OIII] emission



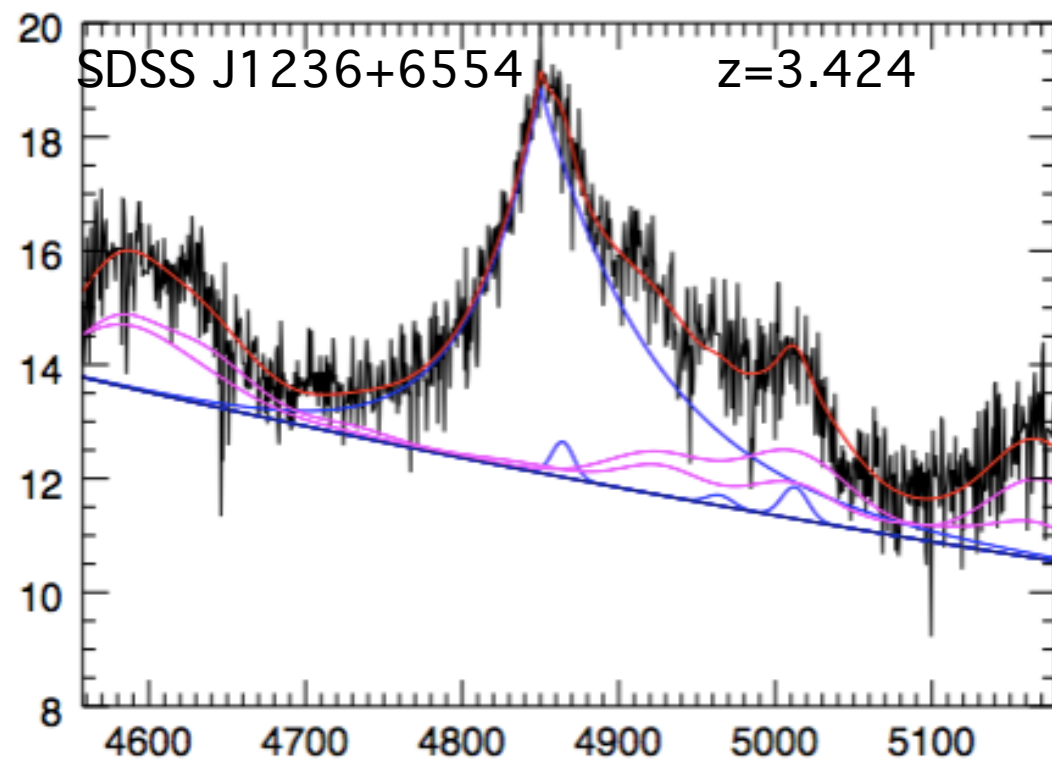
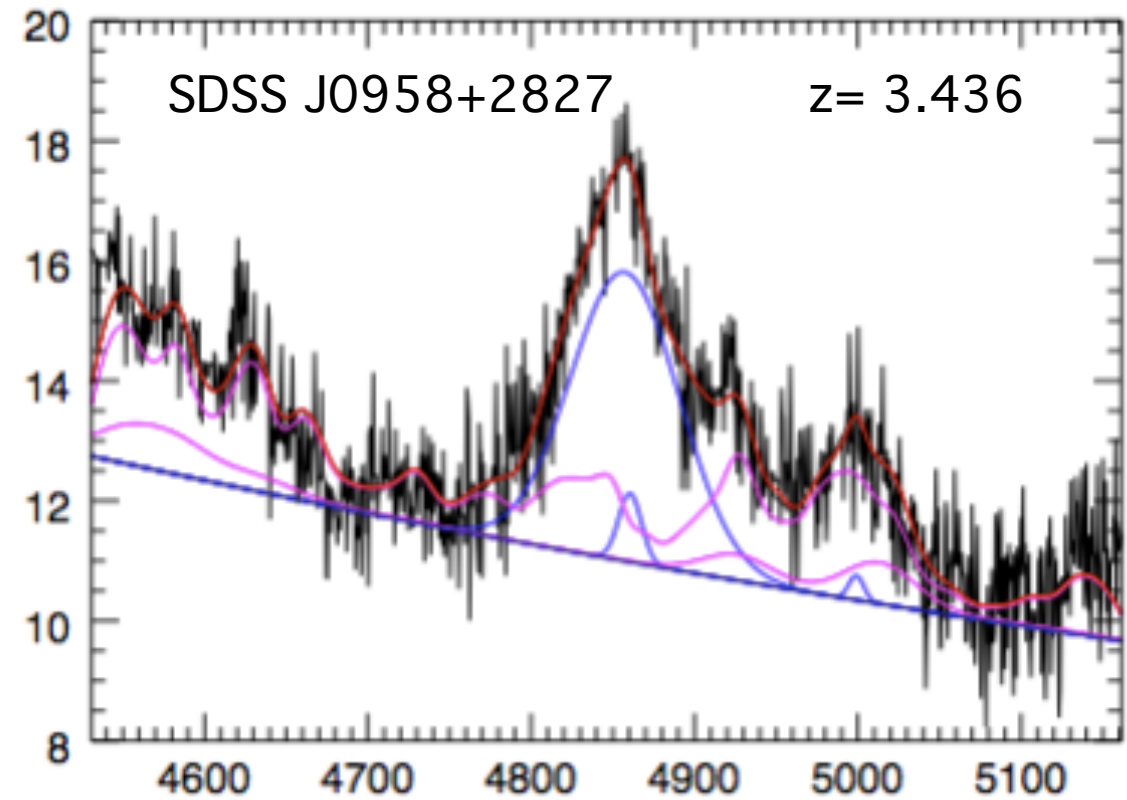
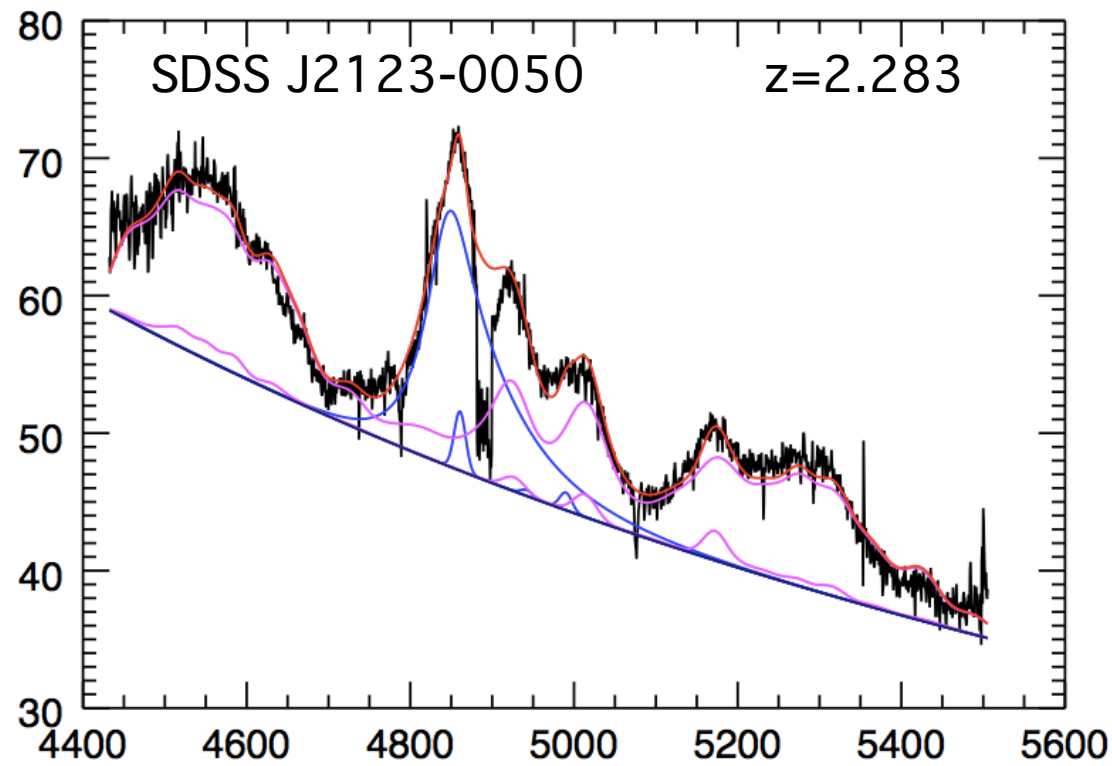
70% lack of [OIII] emission



- 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

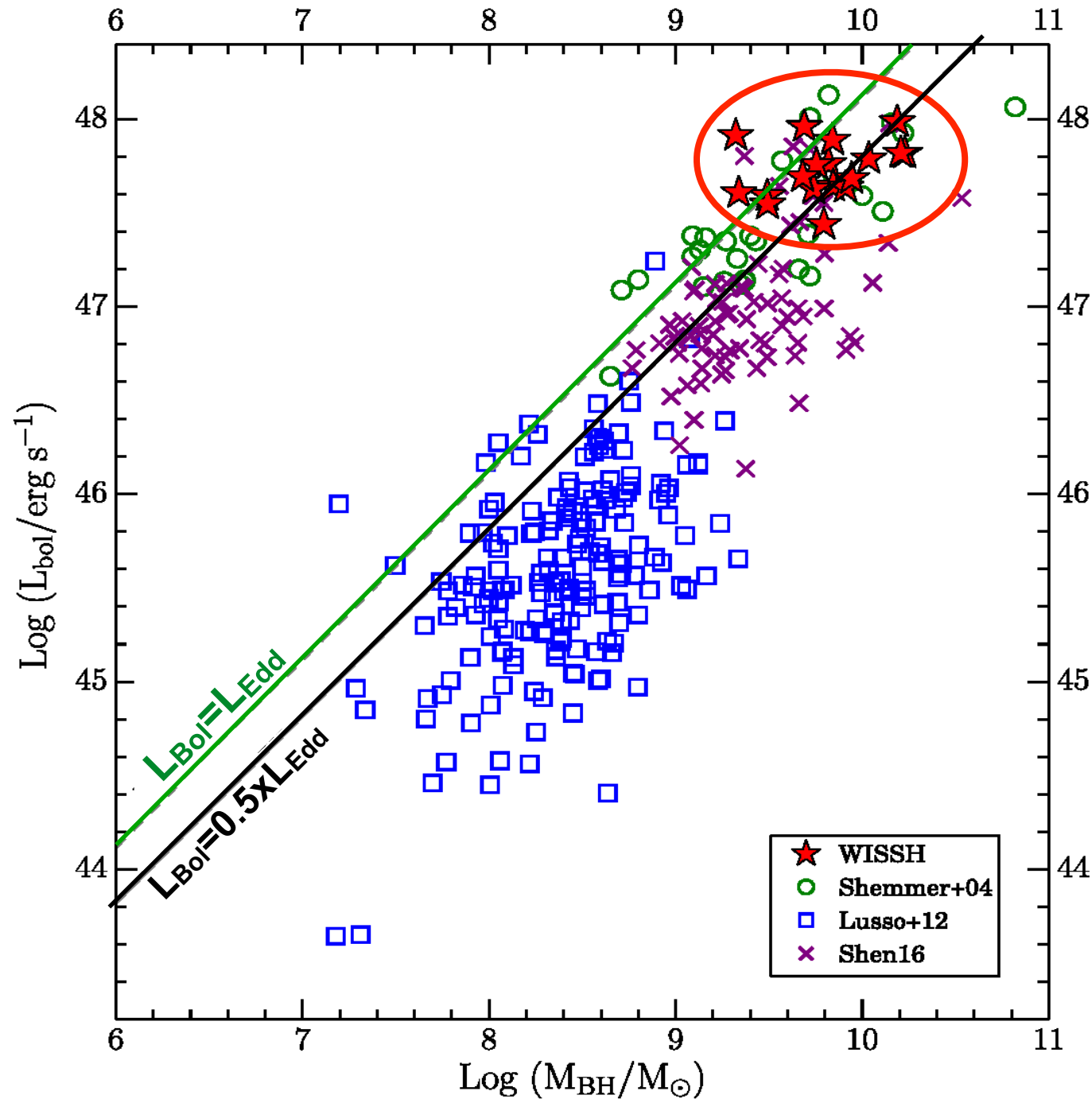


Strong, complex FeII emission

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

Weak [OIII] emission line? Iron residual?

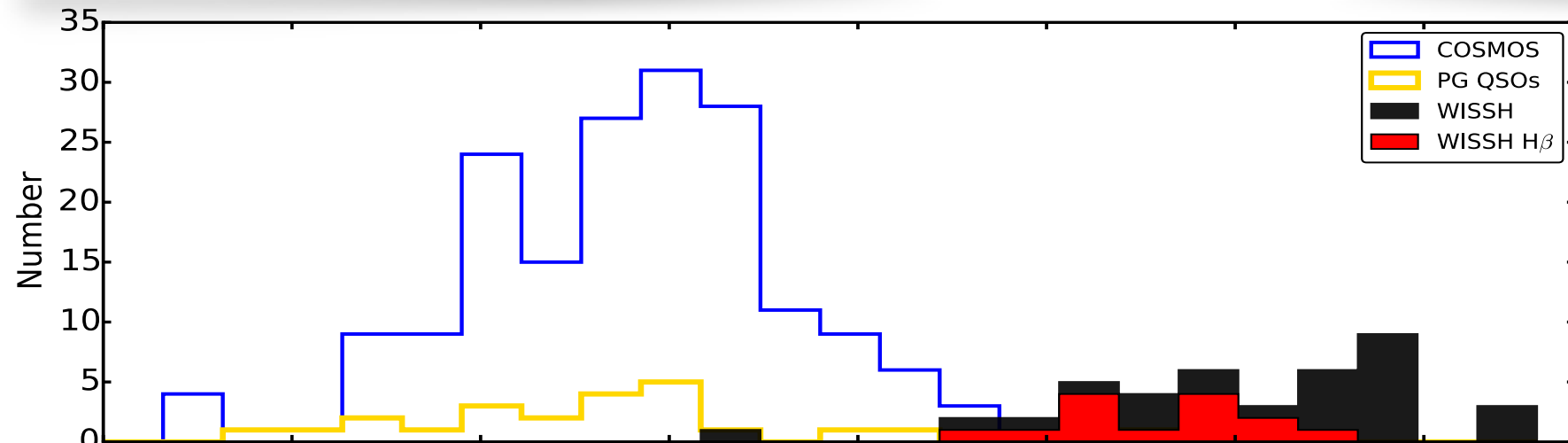
REVEALING ULTRA-MASSIVE, HIGHLY ACCRETING SMBH



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

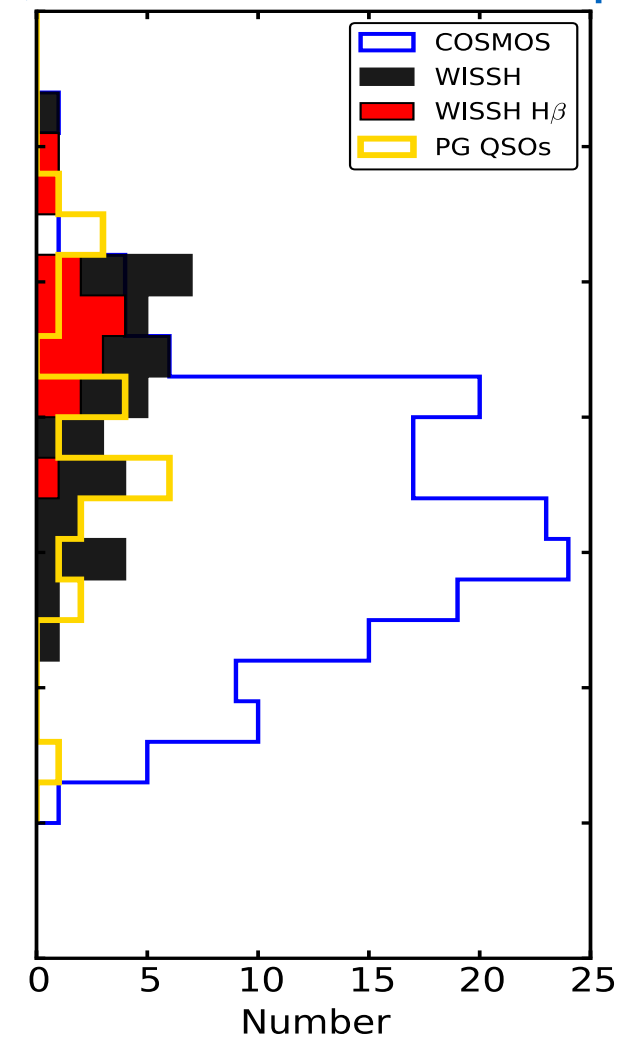
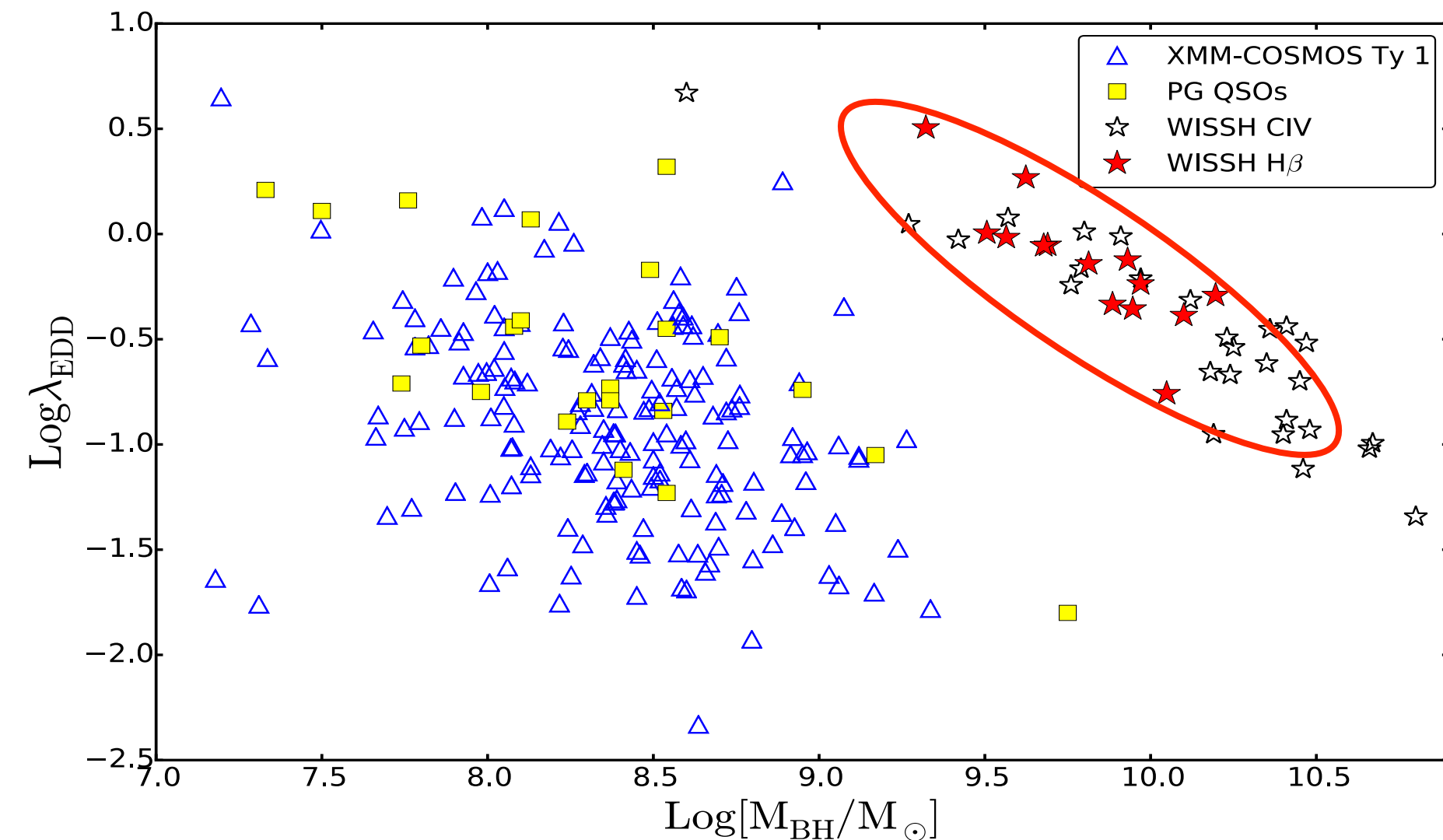
WISSH QSOs populate the massive end
of the BH mass function at $z \sim 2.5 - 3.5$

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

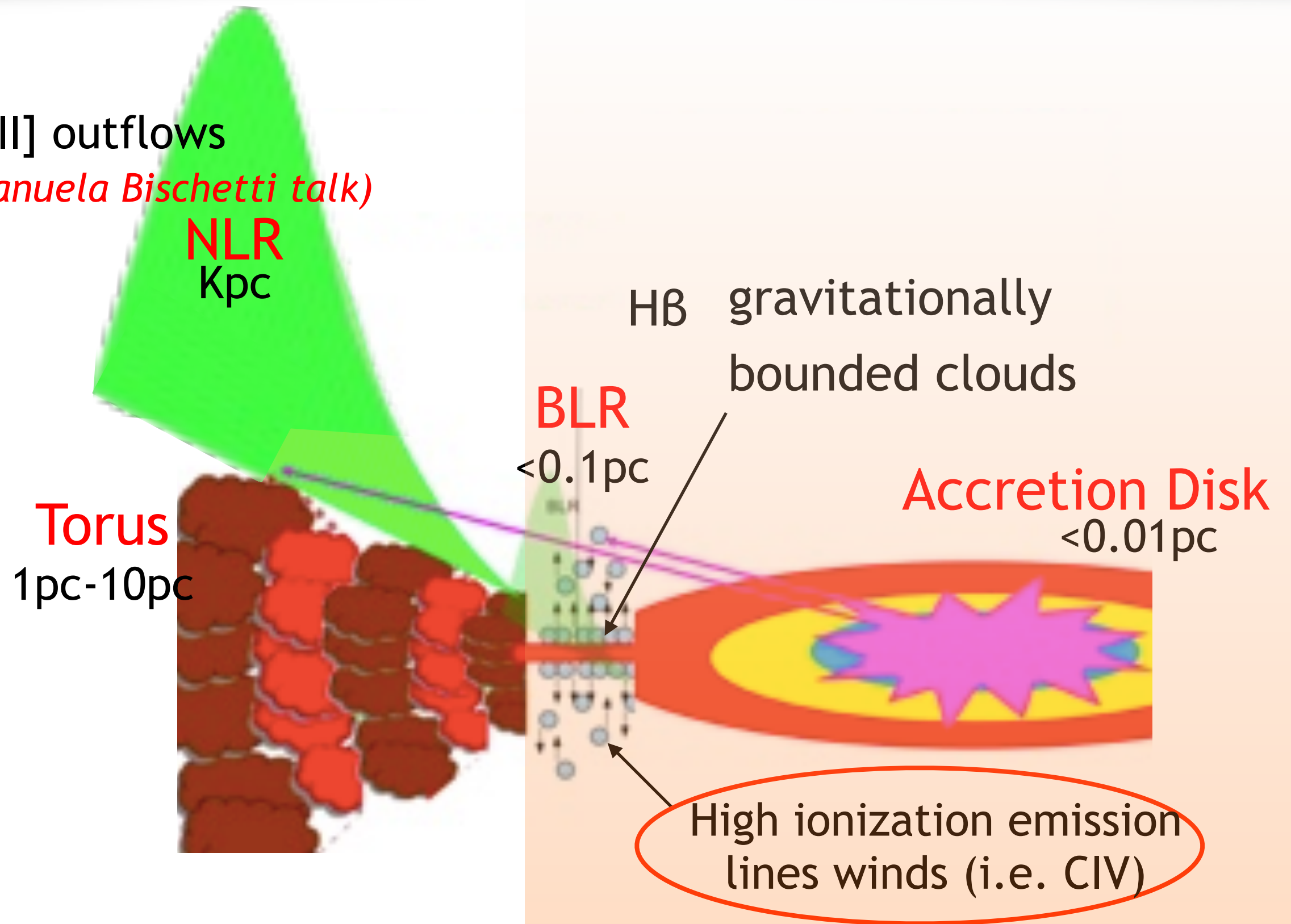
Torus
1pc-10pc

H β gravitationally
bounded clouds

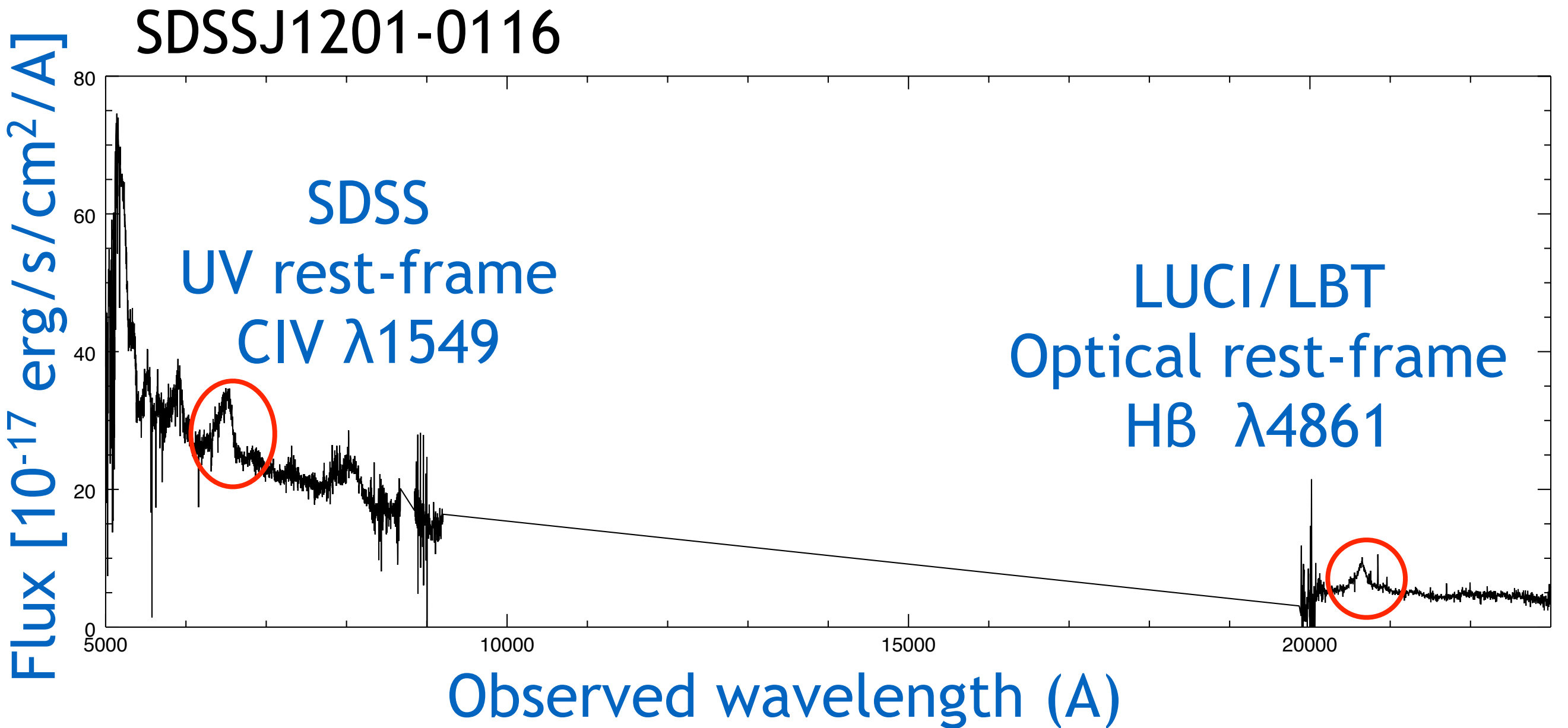
BLR
<0.1pc

Accretion Disk
<0.01pc

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

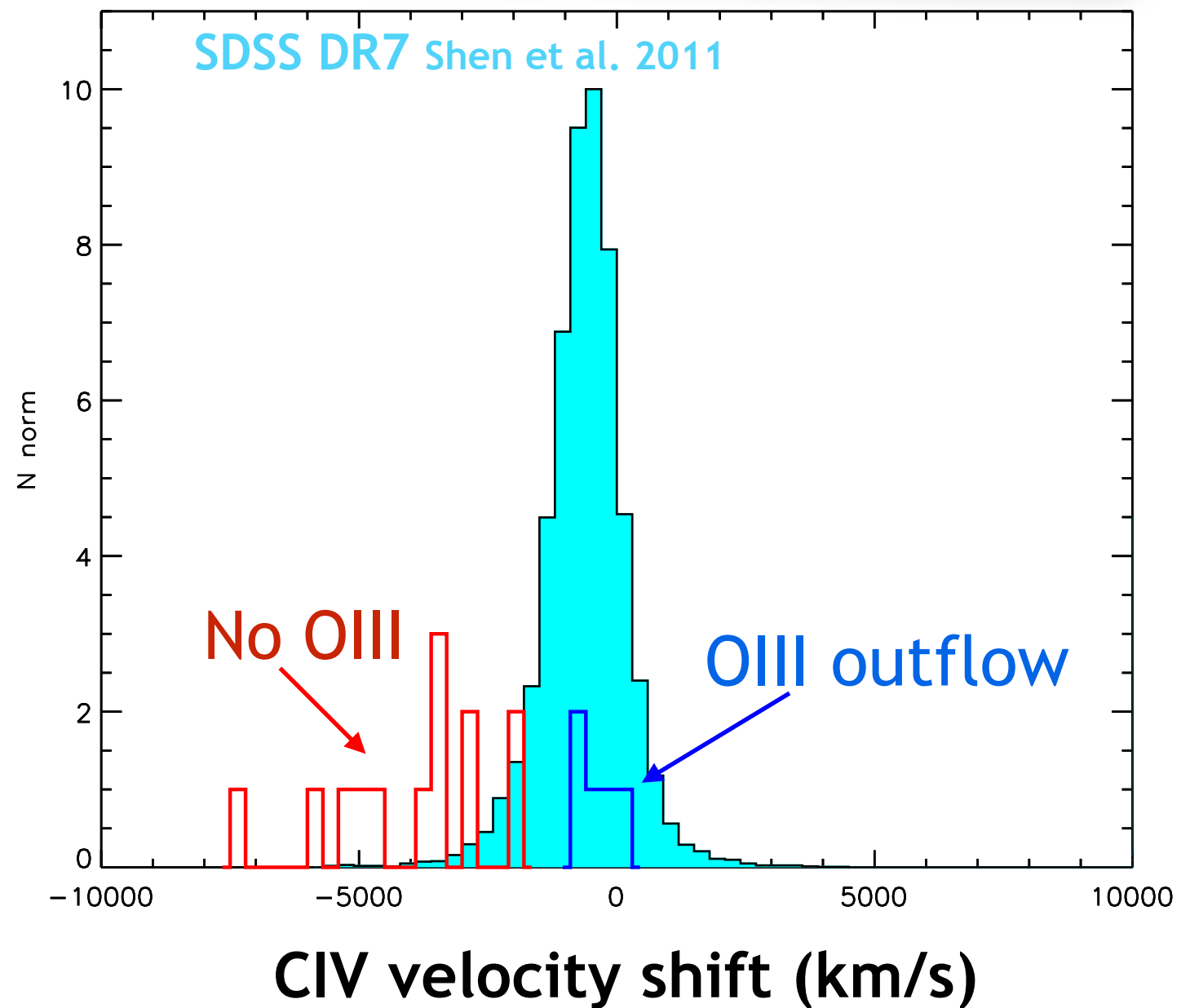
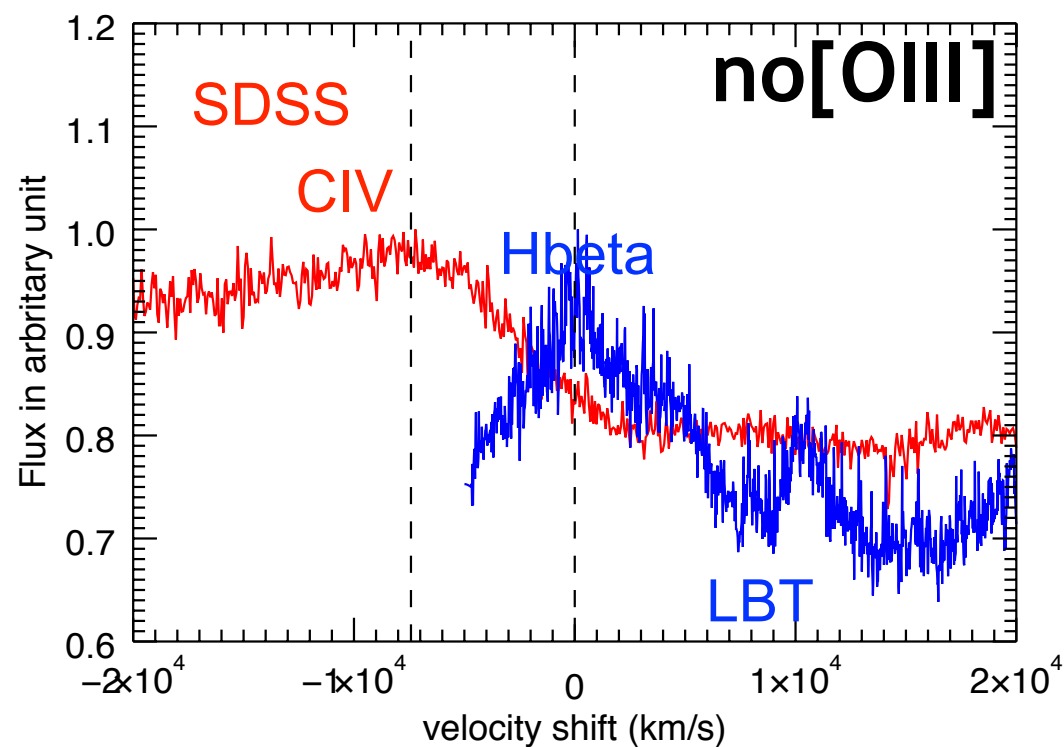
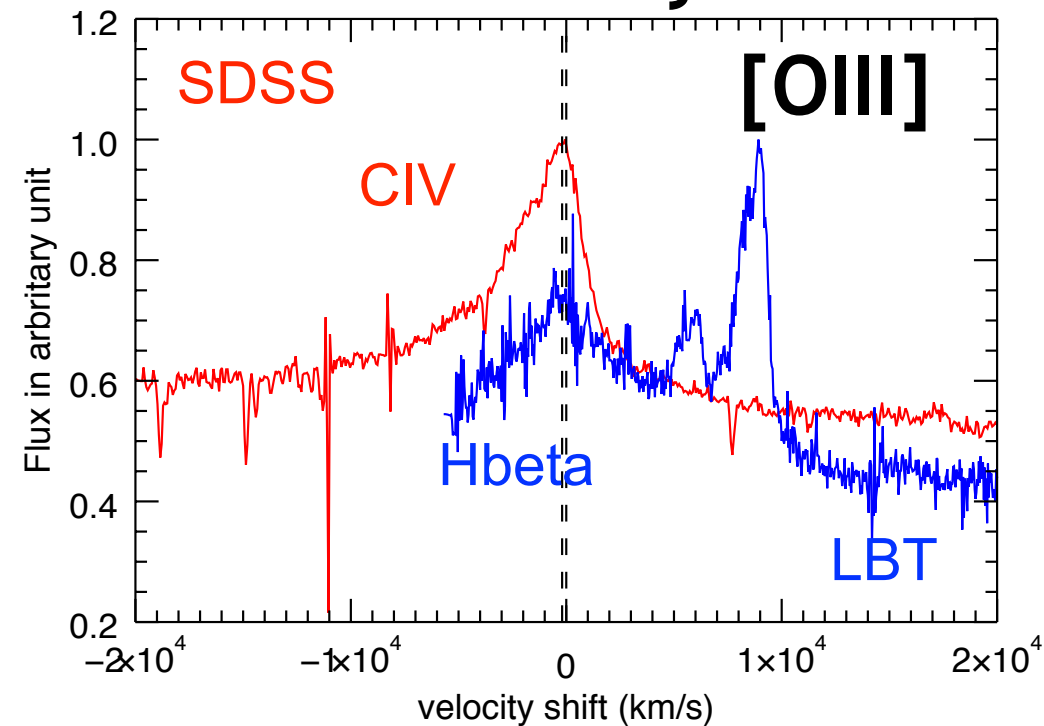


BLR WINDS IN WISSH QUASARS



BLR WINDS VS [OIII] WINDS: A DICHOTOMY

CIV-H β velocity shift

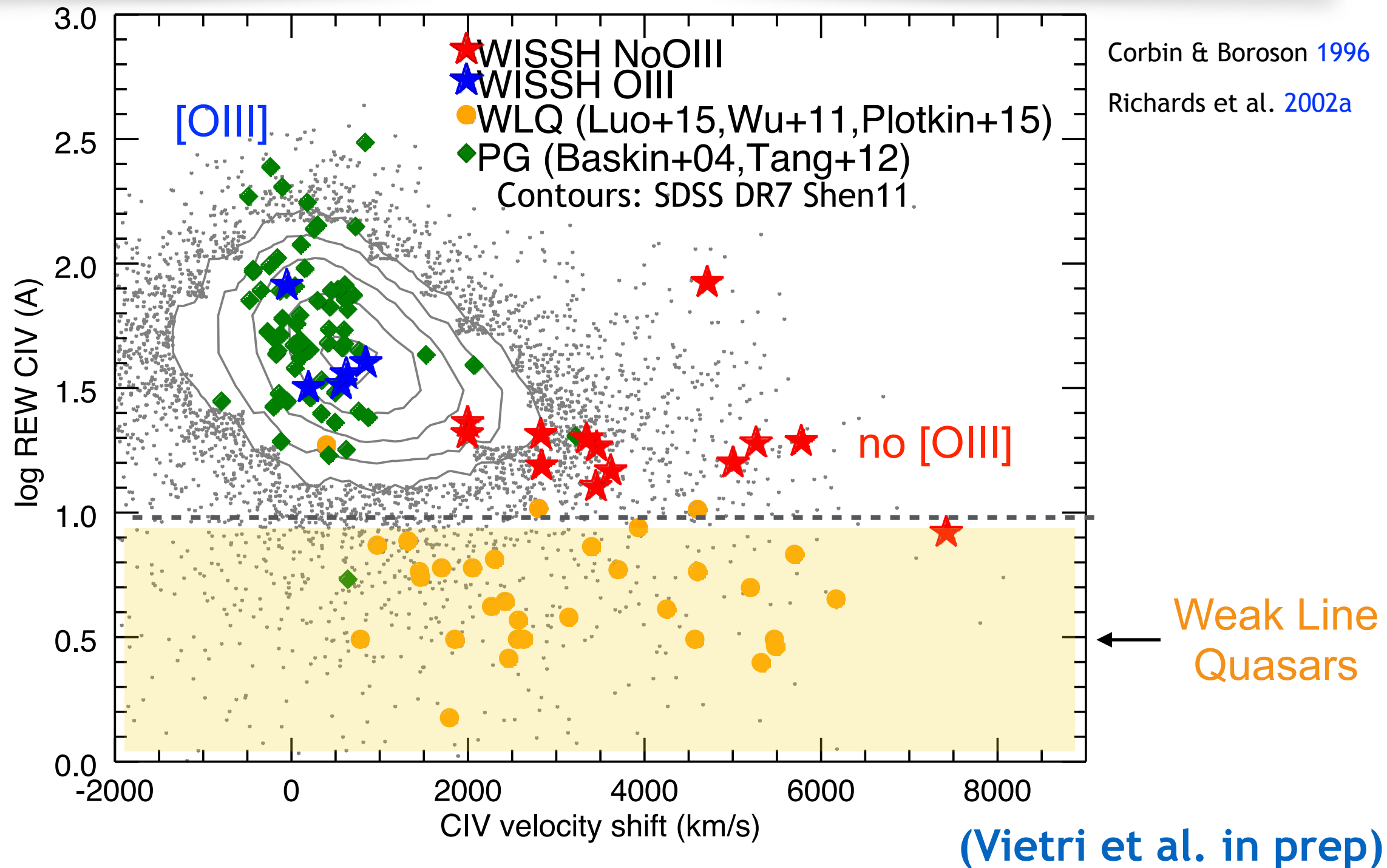


Evidence of dichotomy
CIV vshift > 2000 km/s if **no [OIII]**
CIV vshift < 2000 km/s if **[OIII]**

Gaskell 1982
Marziani+1996
Richards+2011

Radiatively driven winds dominating the BLR kinematics

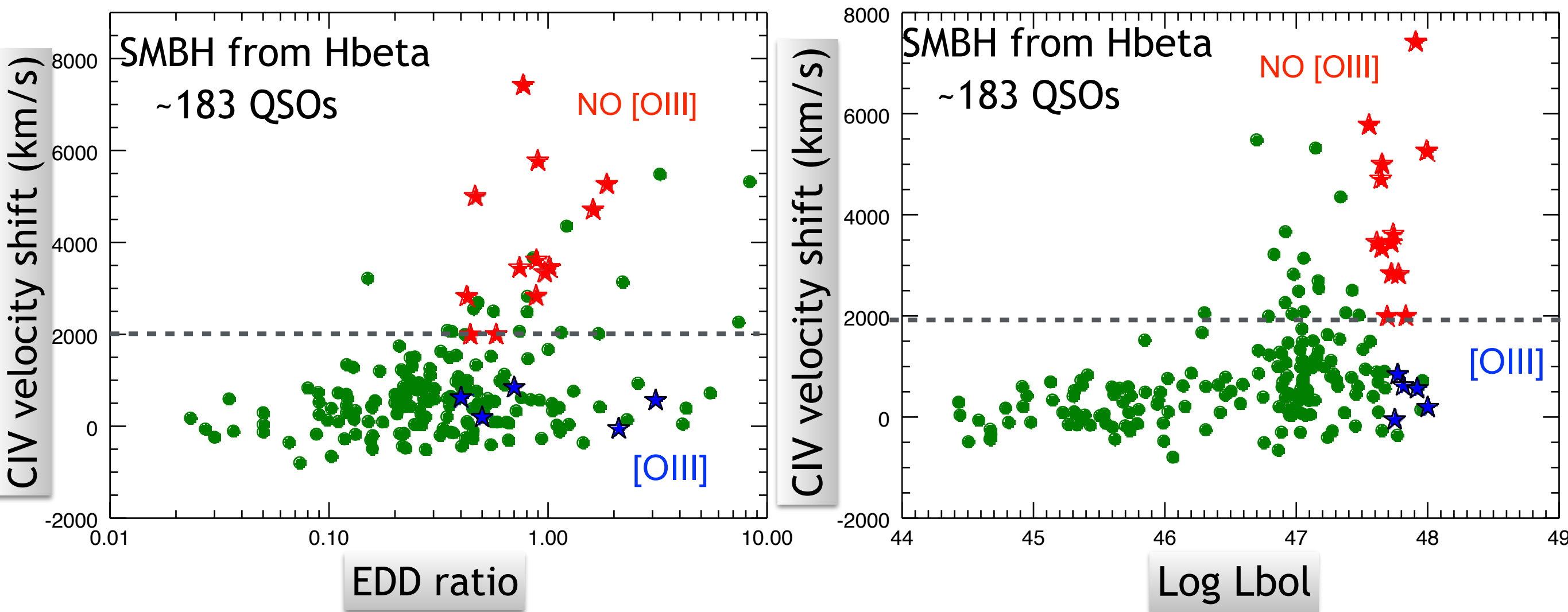
BLR WINDS VS [OIII] WINDS: A DICHOTOMY



[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_{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 $10^{45} \text{ erg s}^{-1}$)
- 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.....

(Manuela talk)

SED properties?
Xray weakness?