



Publication Year	2016
Acceptance in OA	2020-10-19T10:09:59Z
Title	The WISSH Quasars Project: Probing the AGN-Galaxy Coevolution In the Most Luminous Quasars
Authors	BISCHETTI, MANUELA, PICONCELLI, Enrico, VIETRI, GIUSTINA, BONGIORNO, ANGELA, FIORE, Fabrizio, Duras, F., Martocchia, S., ZAPPACOSTA, Luca, Brusa, M., Vignali, C., Marconi, Alessandro, CRESCI, GIOVANNI, WISSH Collaboration
Publisher's version (DOI)	10.5281/zenodo.163588
Handle	http://hdl.handle.net/20.500.12386/27885

The WISSH Quasars project: probing the AGN-galaxy coevolution in the most luminous quasars

Manuela Bischetti

INAF OAR - Università degli studi di Roma Tor Vergata

The *WISSH* quasars project

E. Piconcelli, G. Vietri, A. Bongiorno, F. Fiore, F. Duras,

S. Martocchia, L. Zappacosta INAF OAR

M. Brusa, C. Vignali UNIBO - INAF OABO

A. Marconi, G. Cresci INAF Arcetri

... and many others

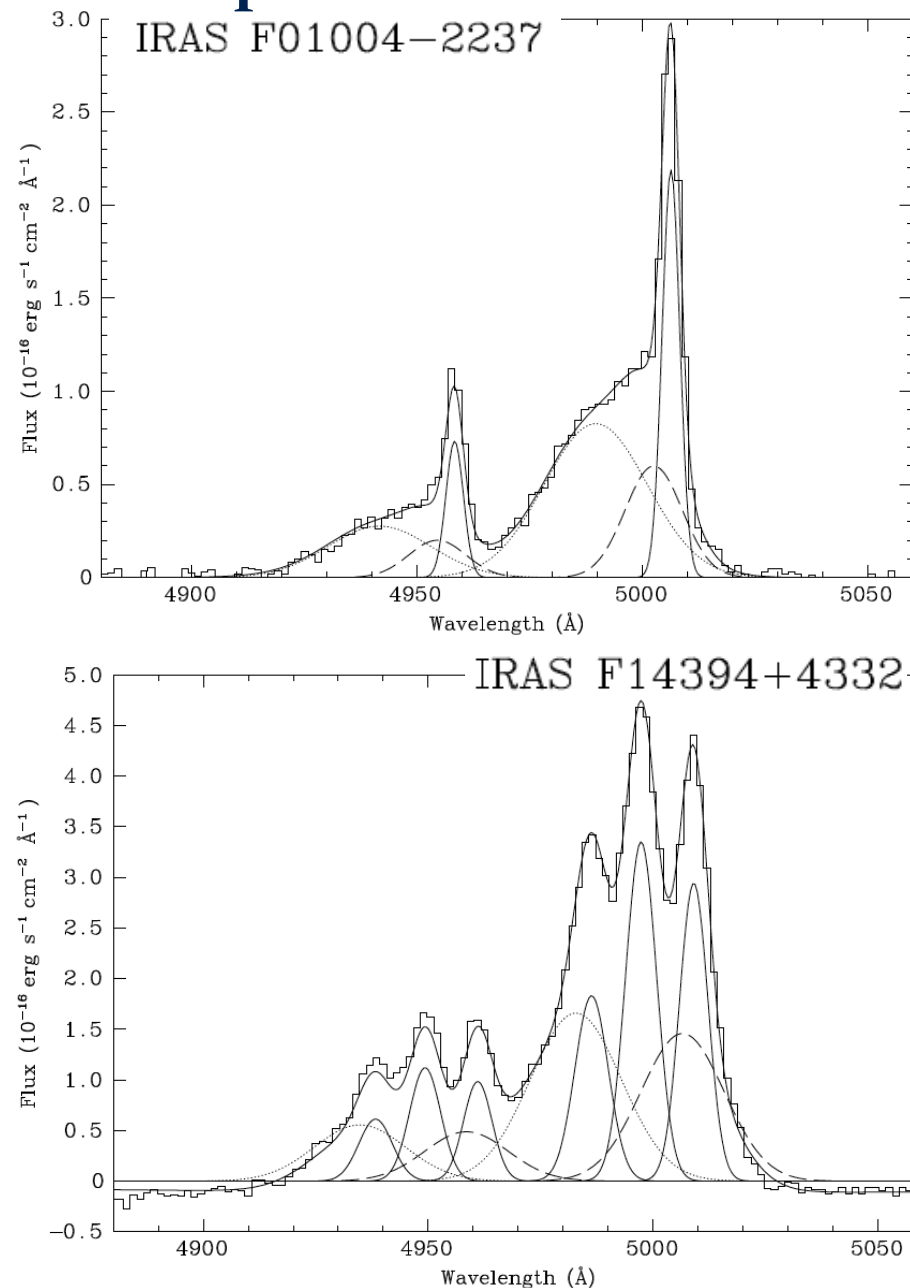


UNIVERSITA' degli STUDI di ROMA
TOR VERGATA

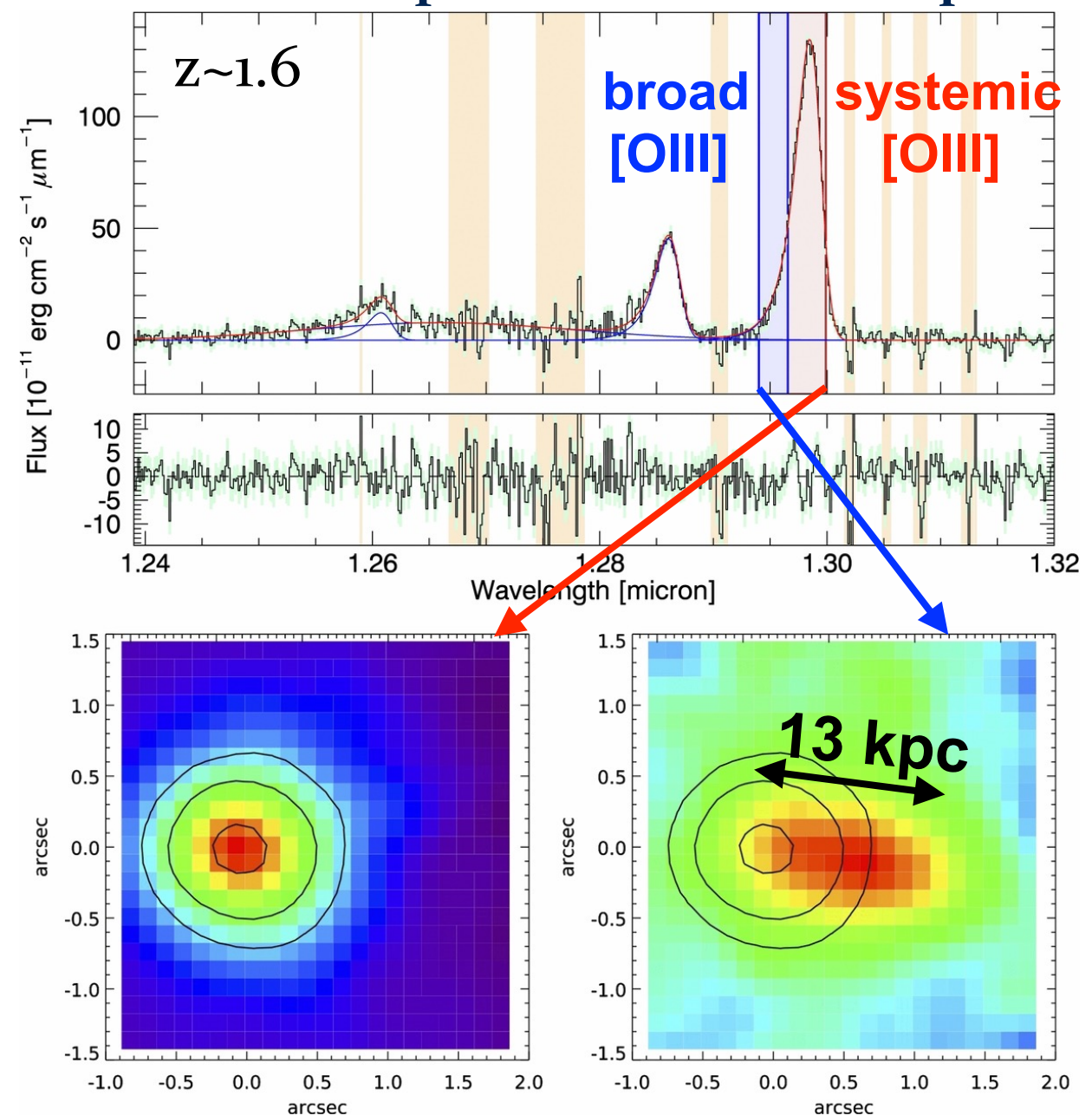
Collecting AGN-driven outflows: atomic ionised gas

Outflows historically revealed in the atomic ionised phase, from both absorption and emission (typically [OIII] with $v_{\text{out}} \sim 1000 - 2000 \text{ km/s}$) line features

WHT spectra of local ULIRGs



SINFONI IFU spectrum of XID2028 quasar



(Rodriguez-Zaurin+2013)

(Cresci+2015)

AGN-feedback models consider such galaxy wide outflows as responsible for the AGN-galaxy coevolution

(e.g. King 2003, 05, 10)

At the brightest end of the AGN luminosity function

“Looking for AGN feedback in action: where to observe?”

Theory

e.g. Menci+08, Faucher-Giguère&Quataert 2012
Zubovas&King 2012

Observations

e.g. Cicone+14, Feruglio+15



The more luminous
is the AGN, the higher is
the outflow
momentum rate
 $\dot{M}v \sim 20\text{--}50 L_{\text{Edd}}/c$

**The most luminous quasars are potentially the best targets
to hunt for powerful AGN-driven outflows**



WISSH Quasars sample

Primary targets to search for
AGN feedback at $z \sim 2 - 4$

LBT targeting of WISSH Quasars

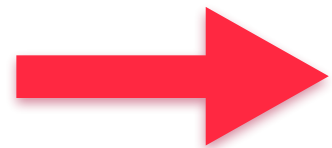
This talk:

LBT/LUCI Spectroscopy
to investigate [OIII] - H β spectral region
on 18 targets (21 more expected within 2017)

Goal(s)

- revealing ionised outflows in hyperluminous quasars
- measuring SMBH mass and λ_{Edd}

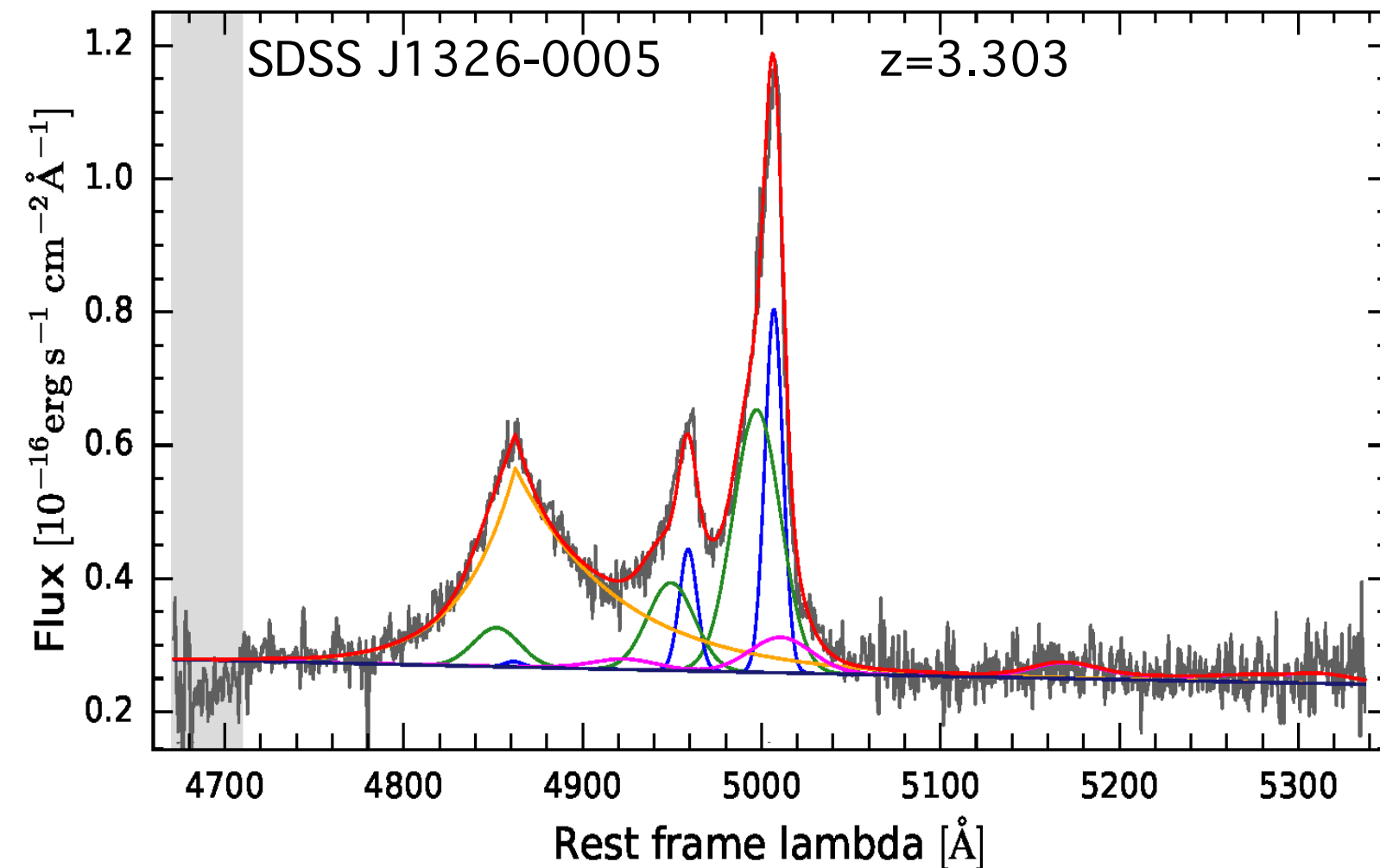
*... see talk by Giustina Vietri
on tomorrow*



Testing AGN feedback at its extreme

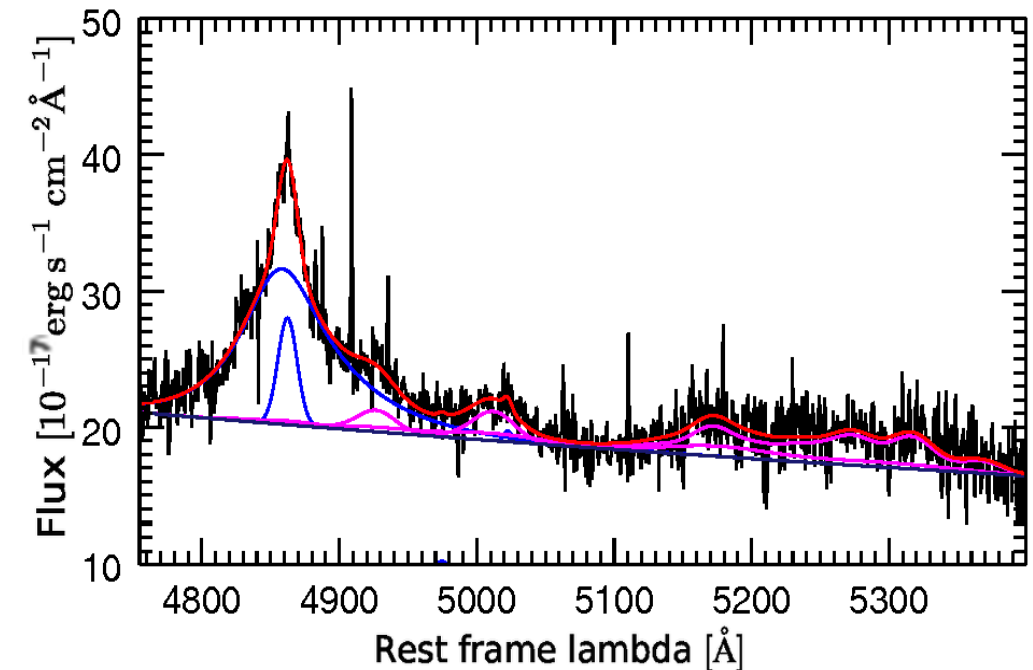
LBT view of WISSH Quasars

30% presence of [OIII] emission



... see Giustina's talk

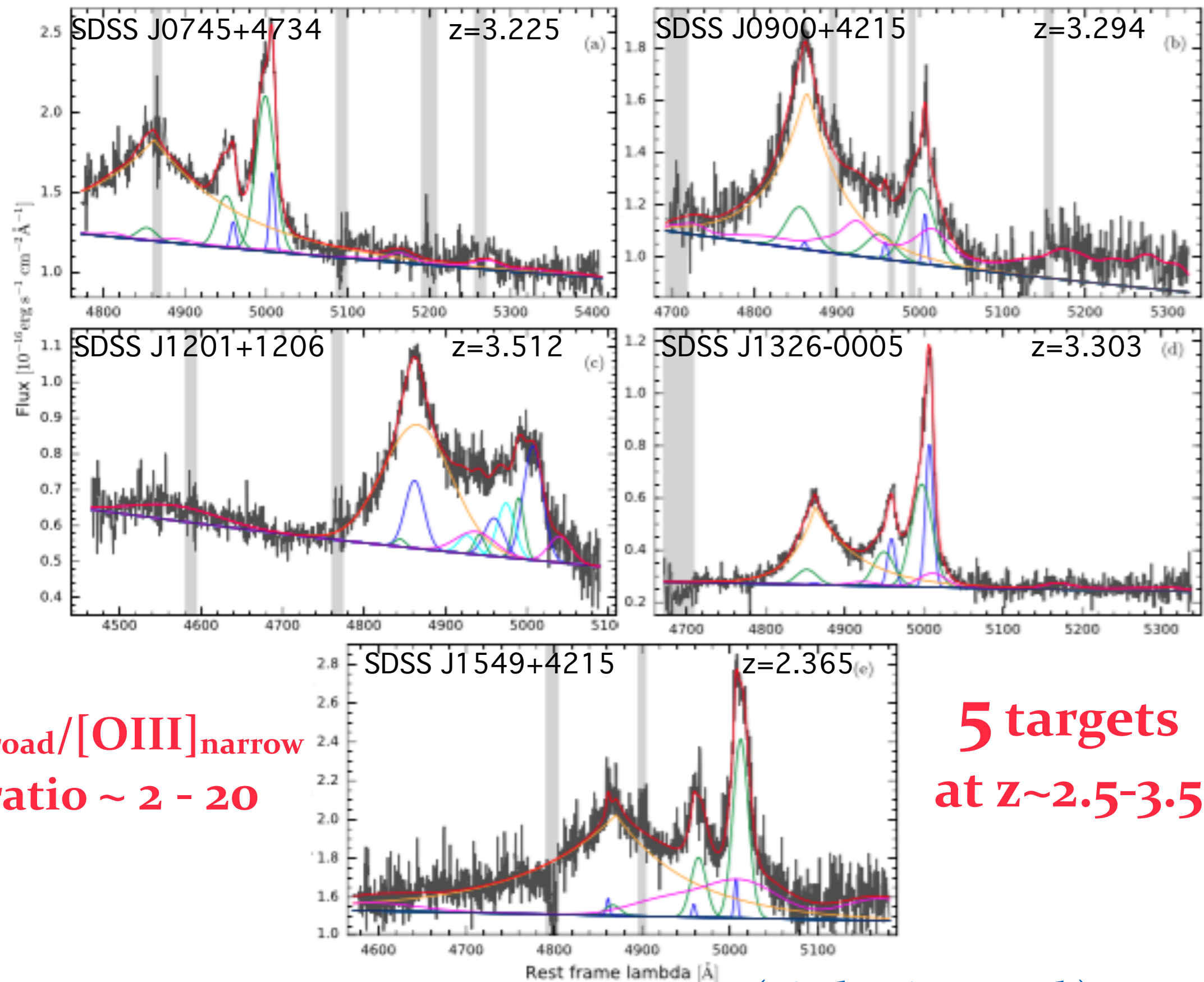
70% lack of [OIII] emission



Studying [OIII] outflows in Type I quasars

- Non-standard spectra: blended [OIII] and $\text{H}\beta$ profiles, strong FeII emission
- Broad blue-shifted [OIII] profiles, indicative of outflows

Prominent [OIII] emission in WISSH quasars

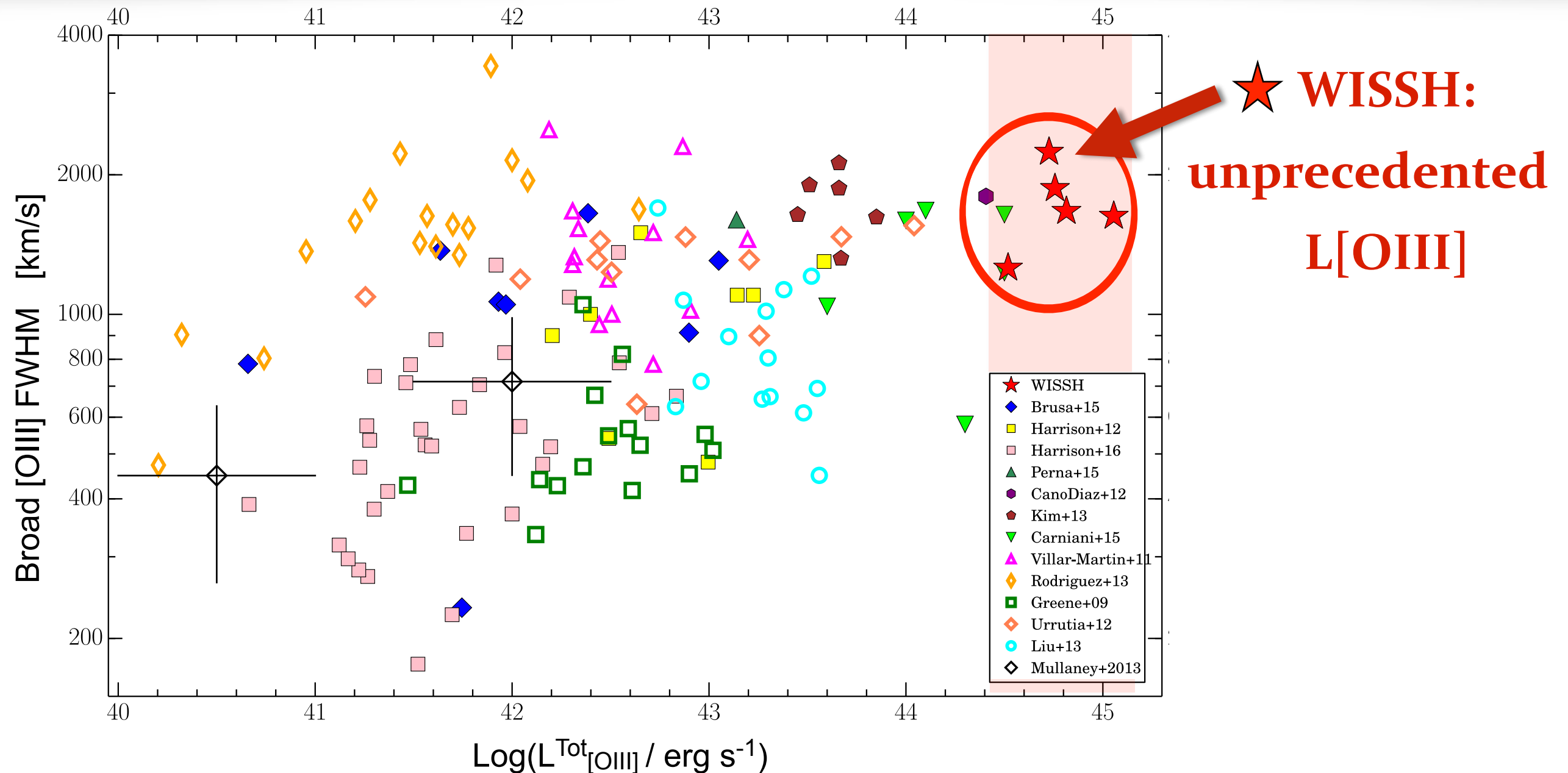


$[\text{OIII}]_{\text{broad}}/[\text{OIII}]_{\text{narrow}}$
flux ratio $\sim 2 - 20$

5 targets
at $z \sim 2.5-3.5$

(Bischetti+2016 sub)

Powerful [OIII] outflows in WISSH Quasars



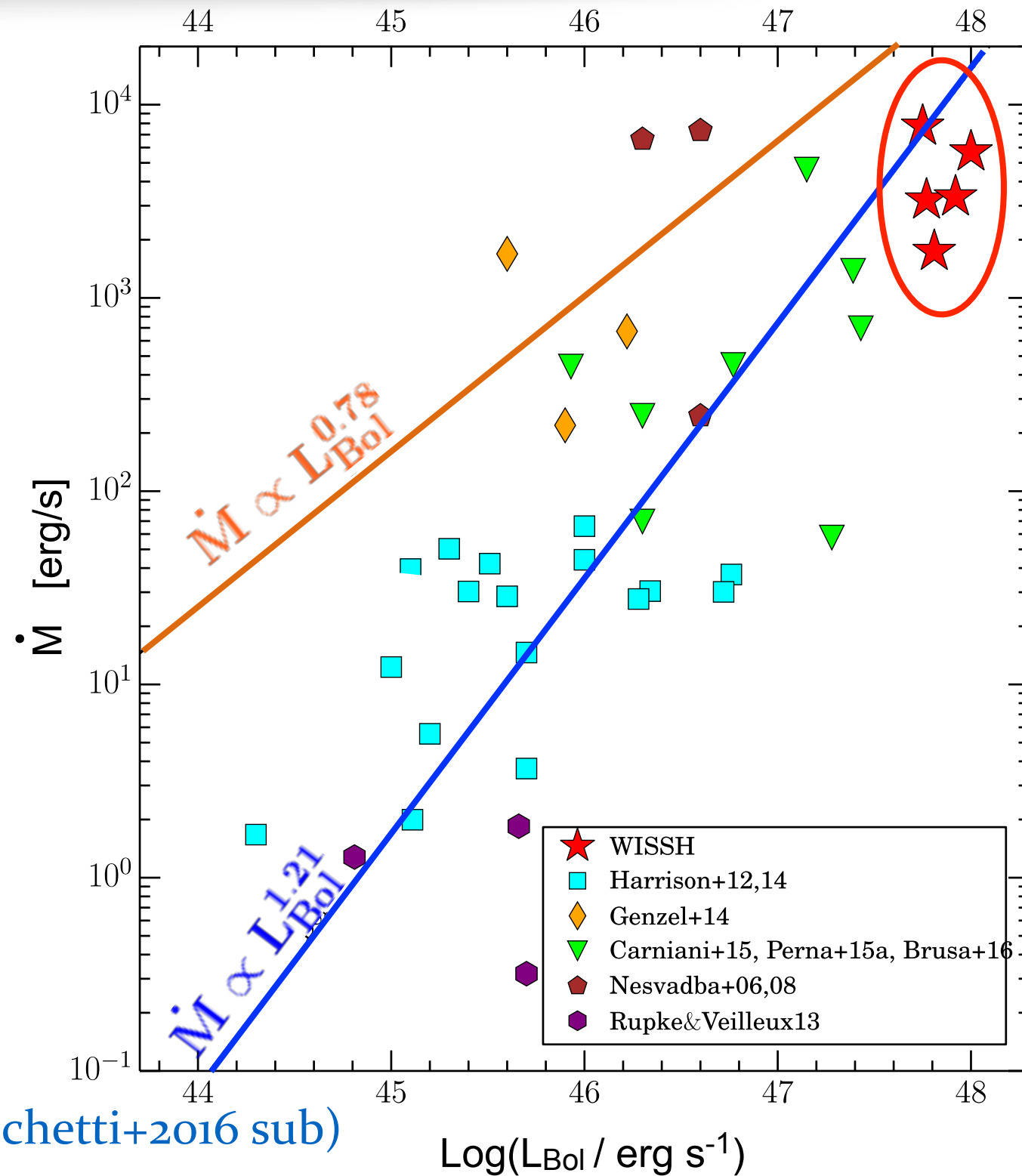
Very broad [OIII] lines
FWHM_[OIII] ~ 1200 - 2200 km/s

Very strong [OIII] lines
L_[OIII] > 10⁴⁴ erg/s

High L_[OIII] correspond to large FWHM

Hint of a forbidden area...?

Powerful [OIII] outflows in WISSH Quasars



$$L_{[\text{OIII}]}^{\text{broad}} \rightarrow M_{\text{ion}}$$

$$\dot{M} \sim 3 \frac{M_{\text{ion}} v_{\text{max}}}{R}$$

$$v_{\text{max}} = \Delta v + 2\sigma$$

$$\dot{M} \sim 1800 - 7700 M_{\odot}/\text{yr}$$

Best fit relations:

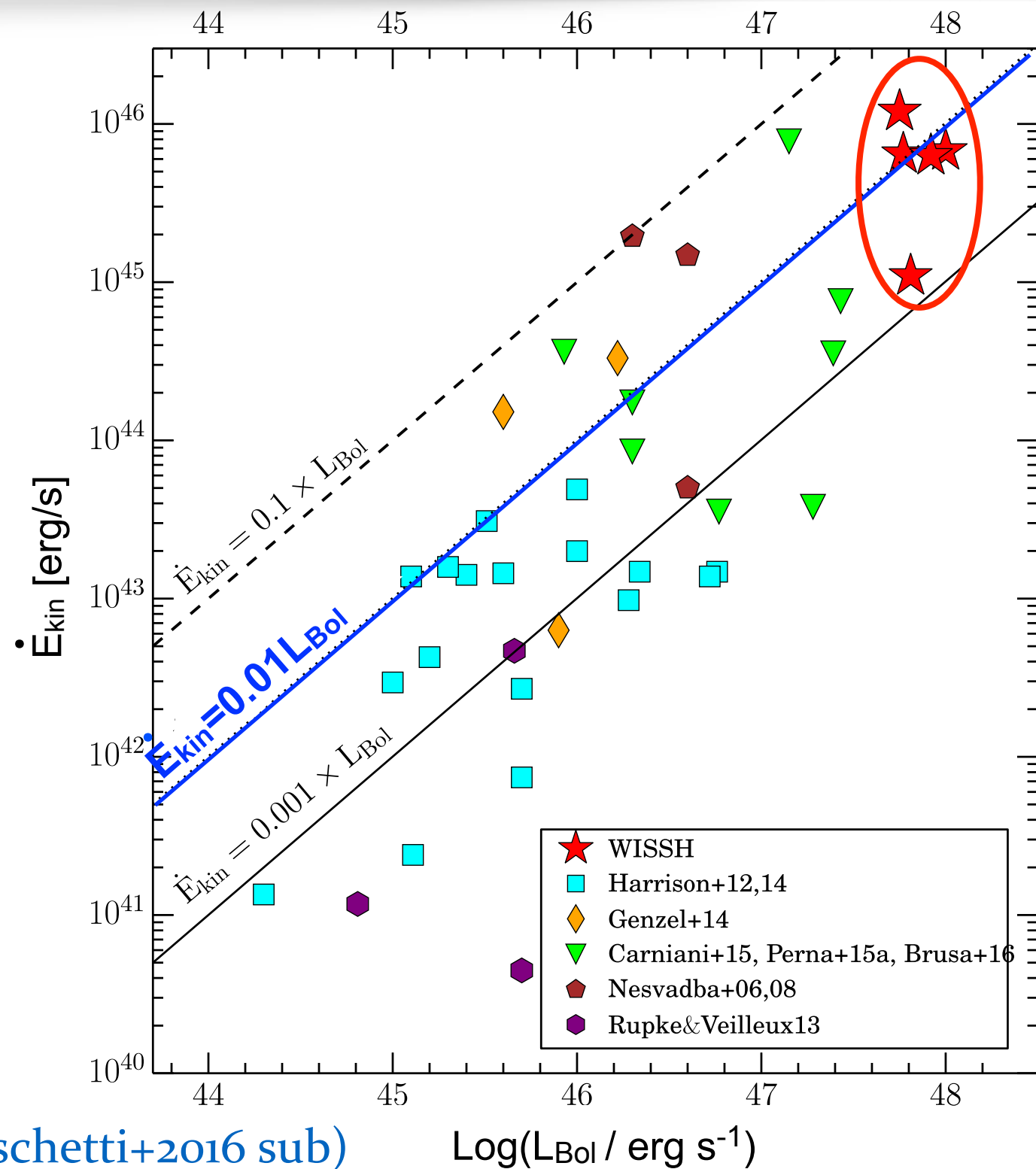
— ionised outflows

— molecular outflows

(Fiore+2016 sub)

At the highest luminosity ionised outflows may trace
a larger fraction of the total outflowing gas

Powerful [OIII] outflows in WISSH Quasars



$$\dot{E}_{kin} = \frac{\dot{M} v_{max}^2}{2}$$

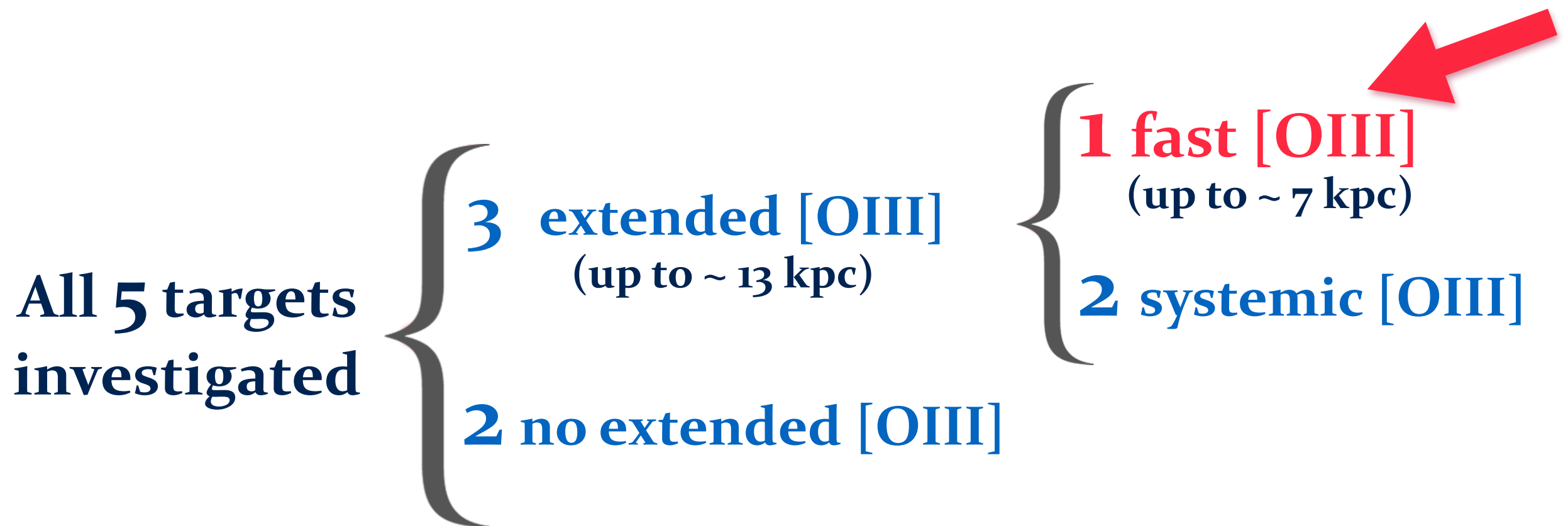
$$\dot{E}_{kin} \sim 10^{45} - 10^{46} \text{ erg/s}$$
$$\sim 1 - 3 \% L_{Bol}$$

Consistent with
predictions for an
efficient AGN feedback
(e.g. Faucher-Giguère & Quataert 2012)

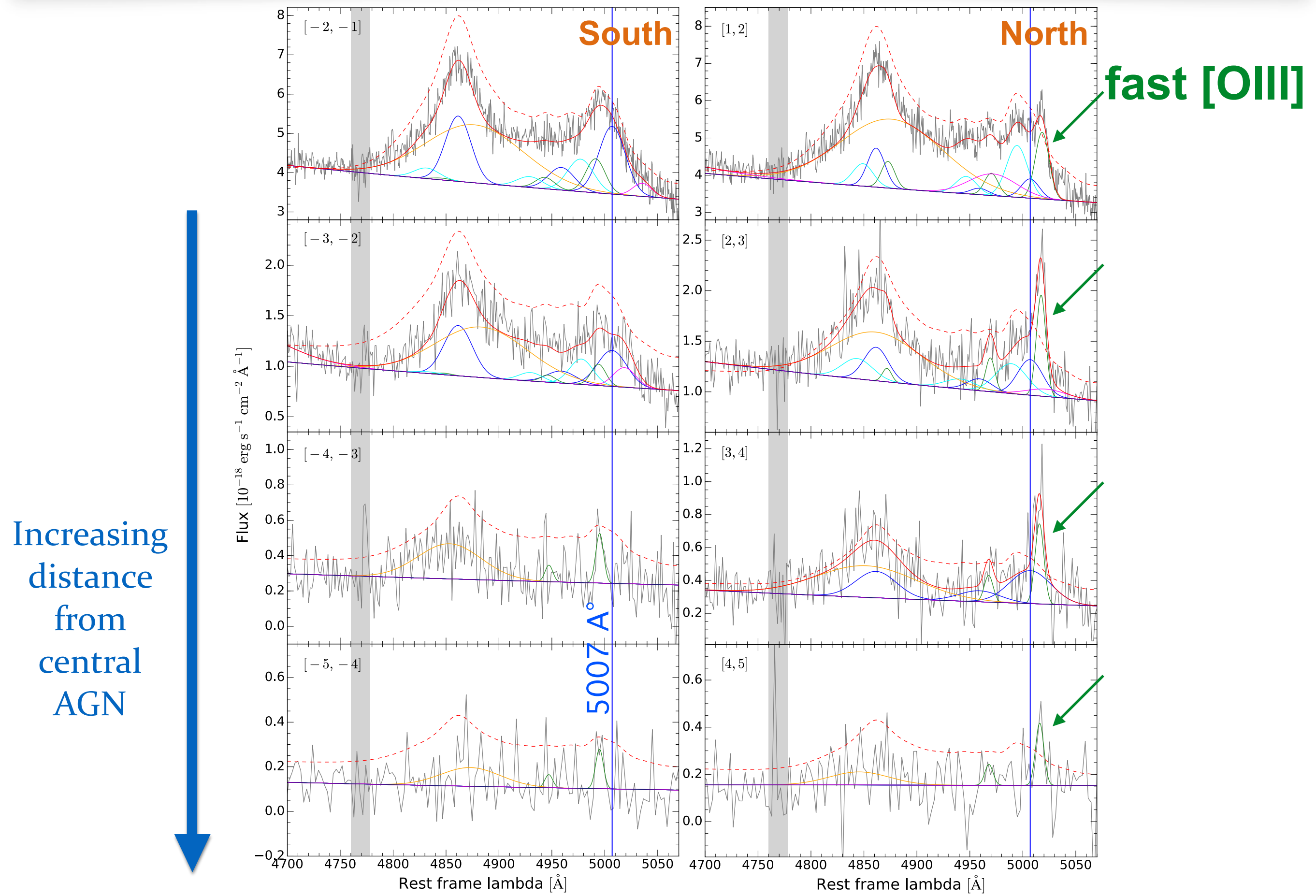
At the highest luminosity ionised outflows may reach
larger fraction of L_{Bol}

Near-slit spectroscopy of WISSH Quasars

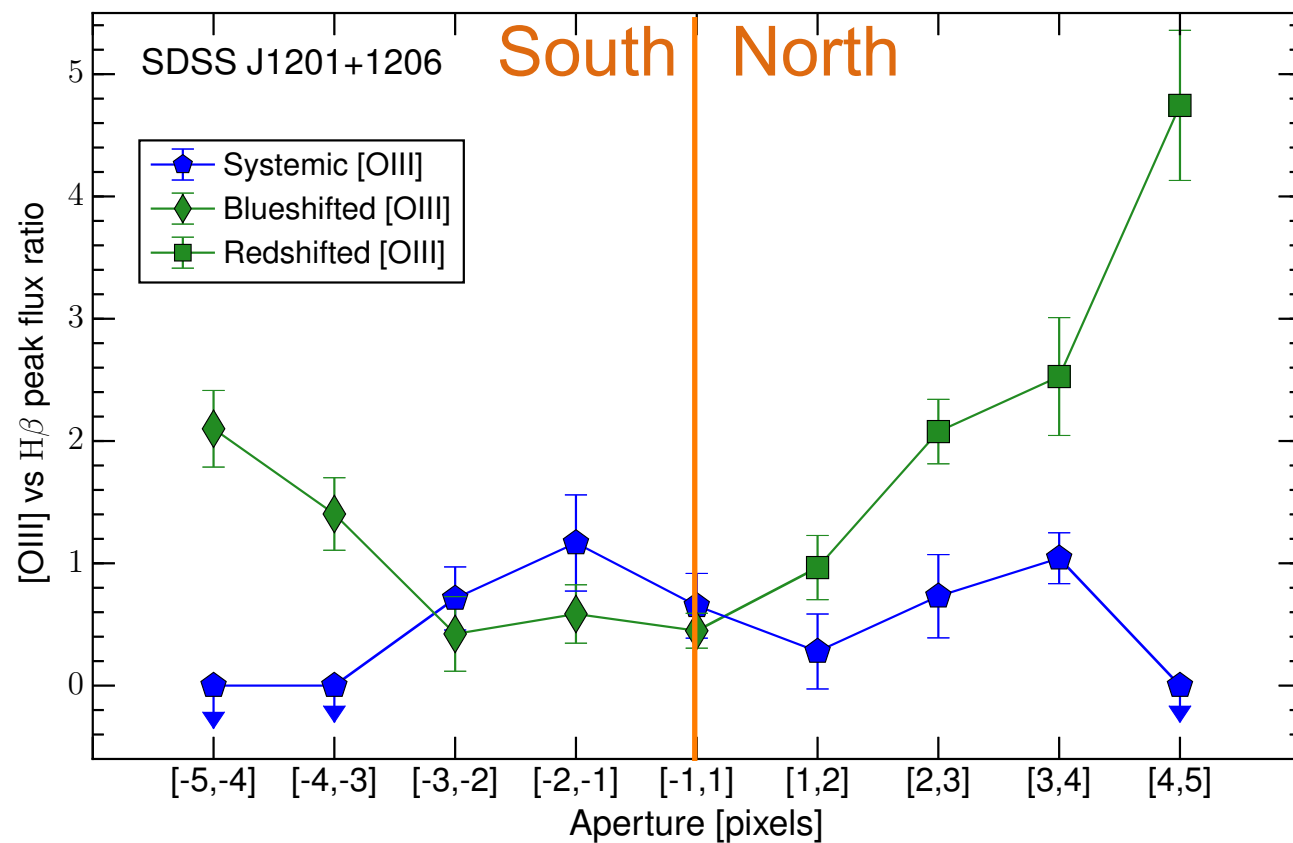
- Presence of extended emitting gas investigated by near-slit spectroscopy
- 1D spectra at increasing offset distances from the AGN
- Possible spatially extended [OIII] should be enhanced
(Perna et al. 2015a)



The case of SDSSJ1201+1206

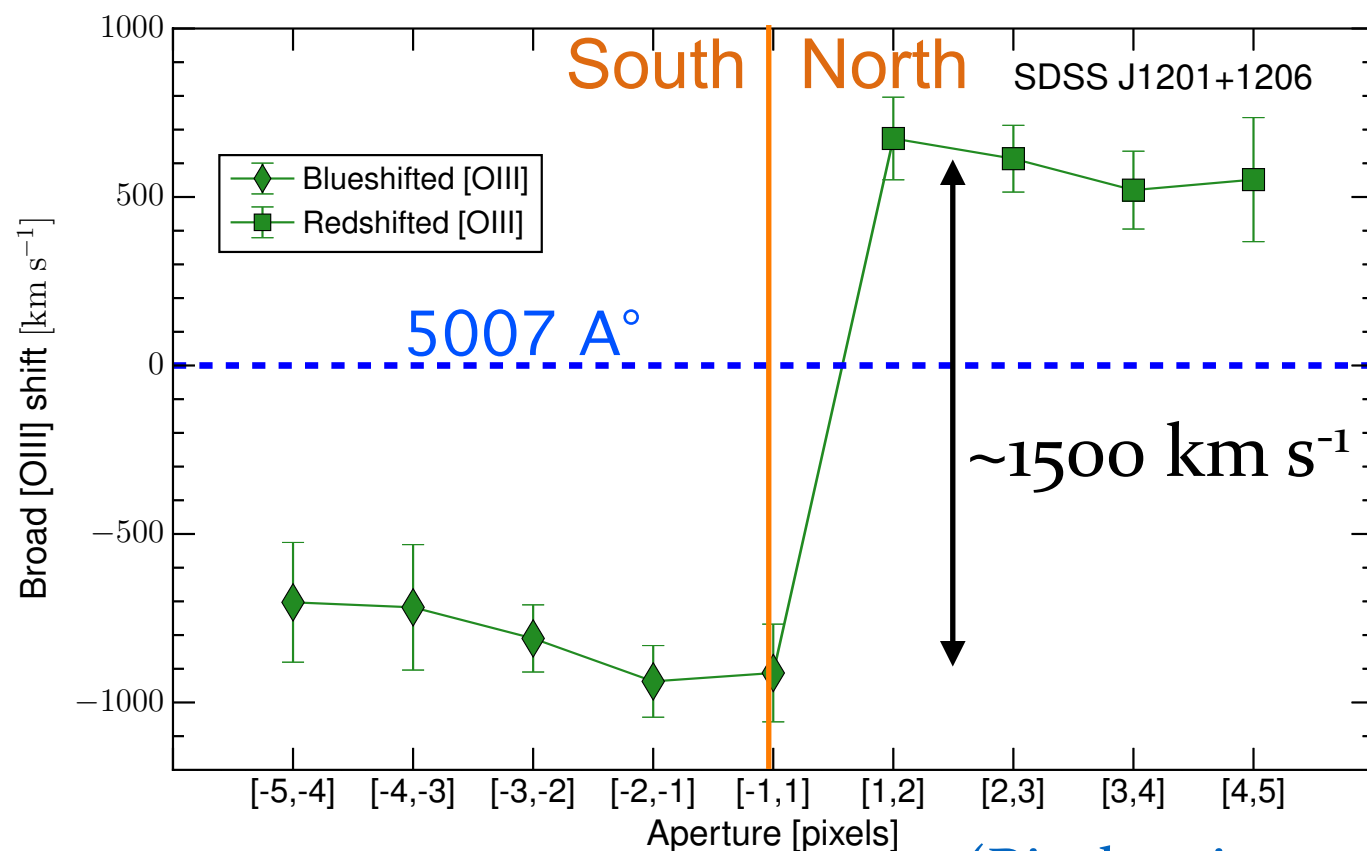


Extended fast [OIII] in SDSSJ1201+1206



An increased [OIII]/ $H\beta$ (BLR) flux ratio indicating

truly extended outflowing gas up to ~ 7 kpc

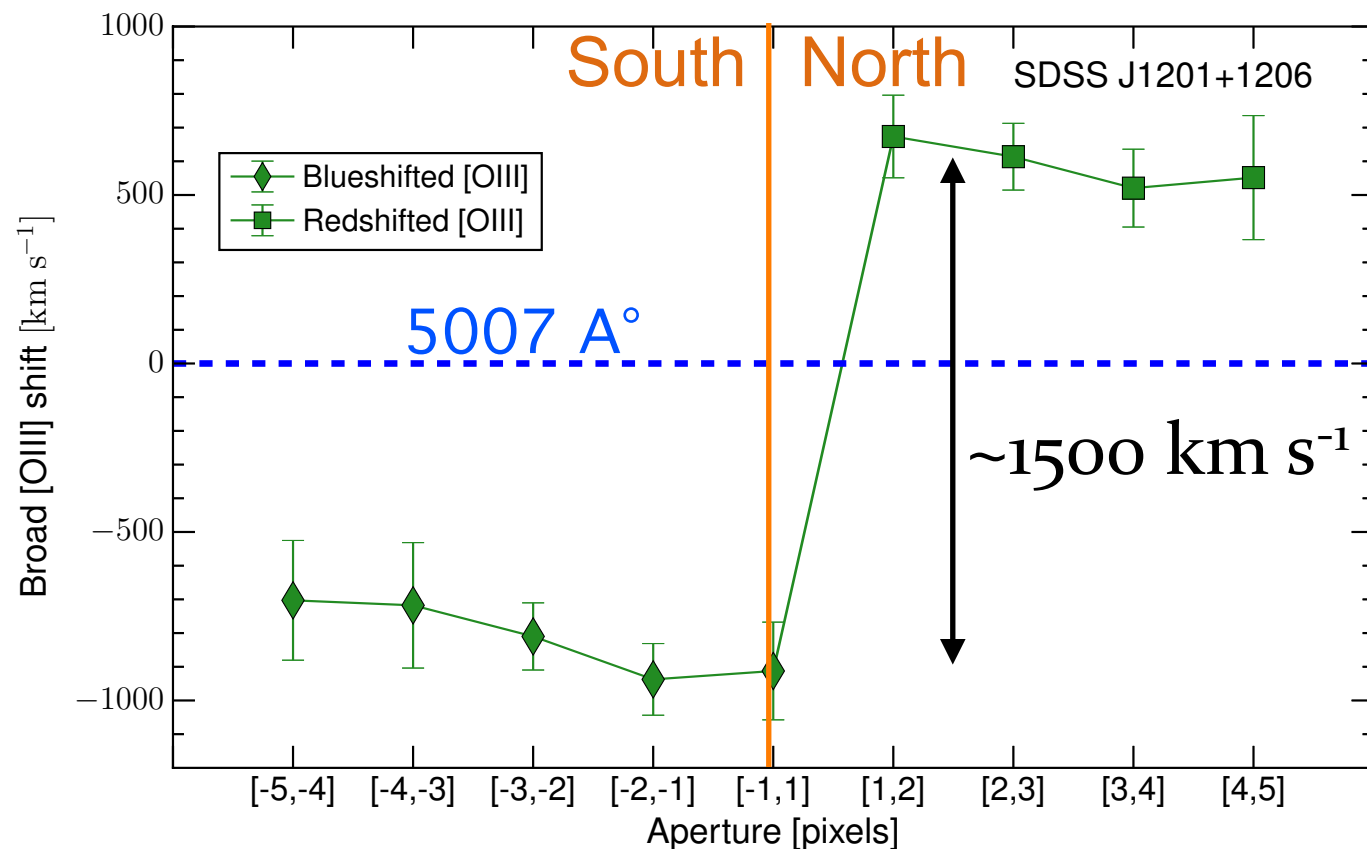
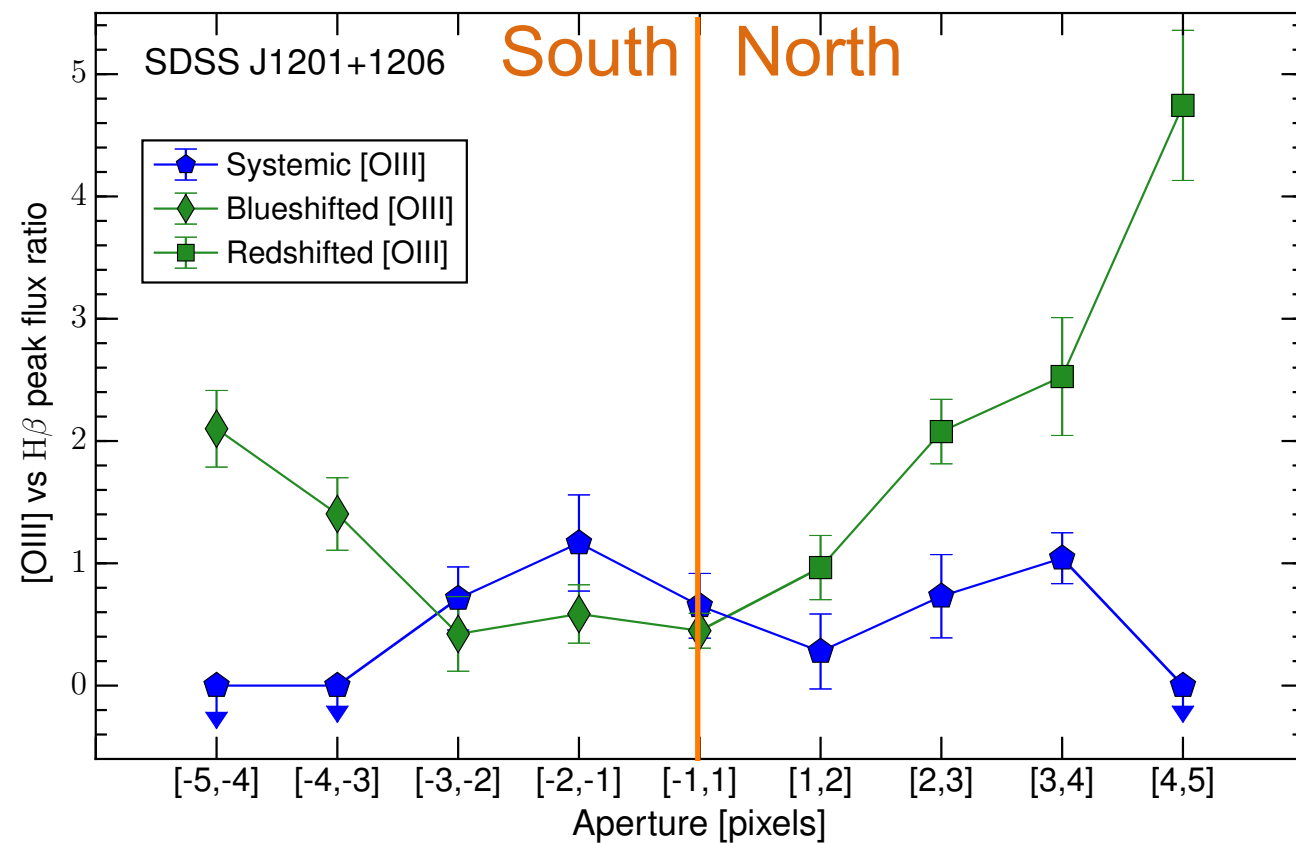


Blue/red-shifted components

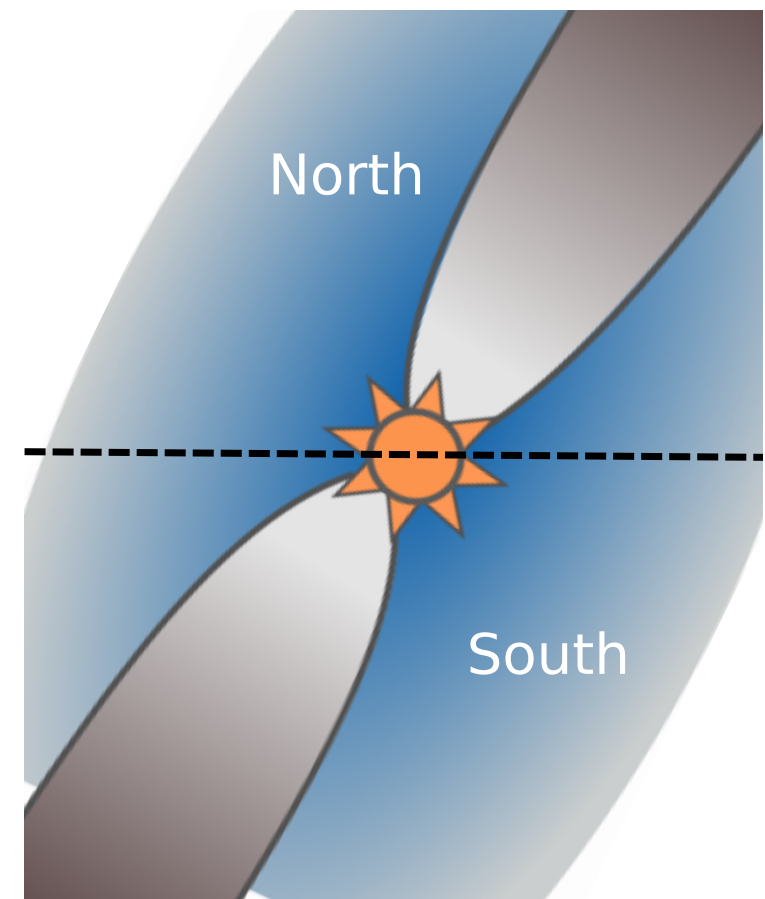
relative velocity of $\sim 1500 \text{ km/s}$

(Bischetti+2016 sub)

Extended fast [OIII] in SDSSJ1201+1206



Such a scenario can be likely interpreted as a **Bipolar Outflow**



IFU/SINFONI data incoming...

Conclusions

- Hyperluminous quasars are potentially the best targets to hunt for powerful AGN driven outflows —-> WISSH quasars sample built up to observe AGN feedback at its extreme

Results from LBT observations: 5 [OIII] targets

- **Broad [OIII]** (FWHM ~ 2000 km/s) indicative of outflows
- Narrow [OIII] emissions weak/absent
- **Highest [OIII] luminosities observed so far** (up to 10^{45} erg/s)
- Associated **very large mass outflow rates** (up to $\sim 8000 M_{\odot}/\text{yr}$) and **kinetic powers consistent with $\sim 1-3\%$ L_{Bol}**
- Extended (up to 13 kpc) [OIII] in 3/5 sources. **Bipolar outflow extended up to ~ 7 kpc** in SDSSJ1201+1206

Incoming (within first half of 2017, P.I. Bongiorno) VLT/SINFONI IFU data of J1326-0005 and J1201+1206 will allow to accurately constrain the morphology and effects on the host galaxy ISM in these hyper-luminous sources.