AGN feedback and outflows: the road to star formation quenching

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A. Cimatti, M. Brusa + VUDS & zCOSMOS teams

AGN: negative feedback

↓

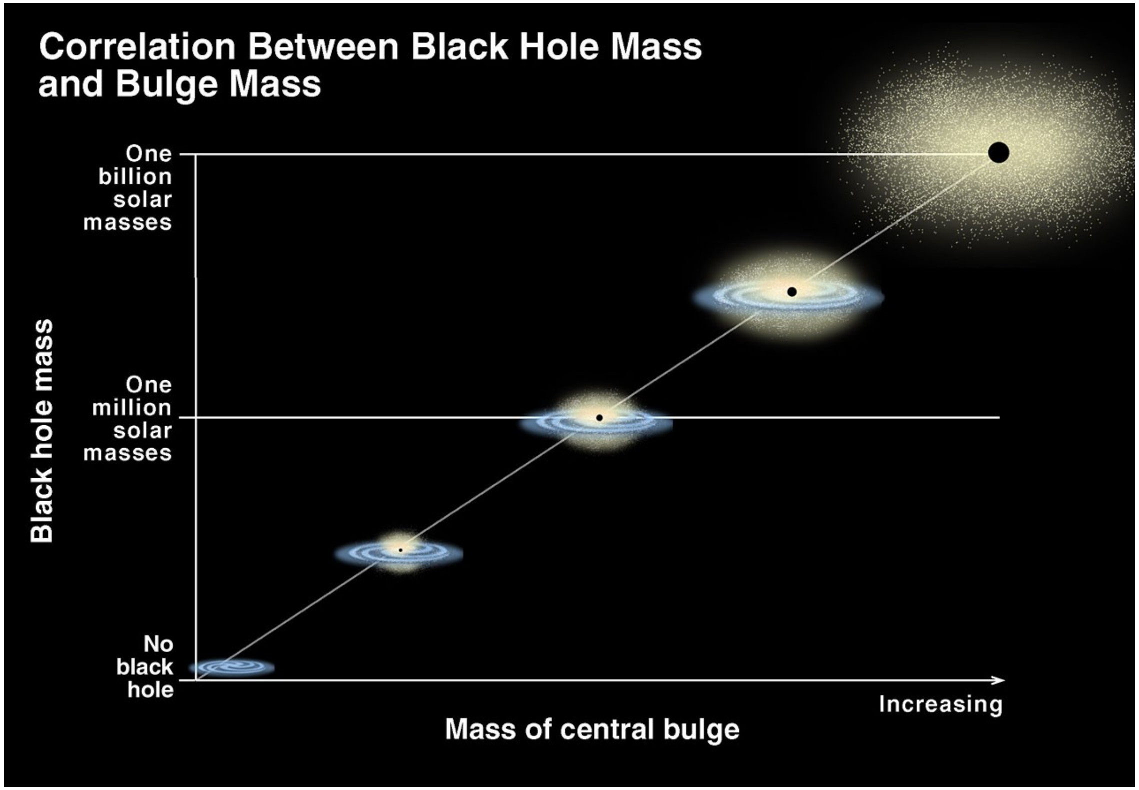
SFR suppression?

and/or

AGN: positive feedback

↓

SFR enhancement?

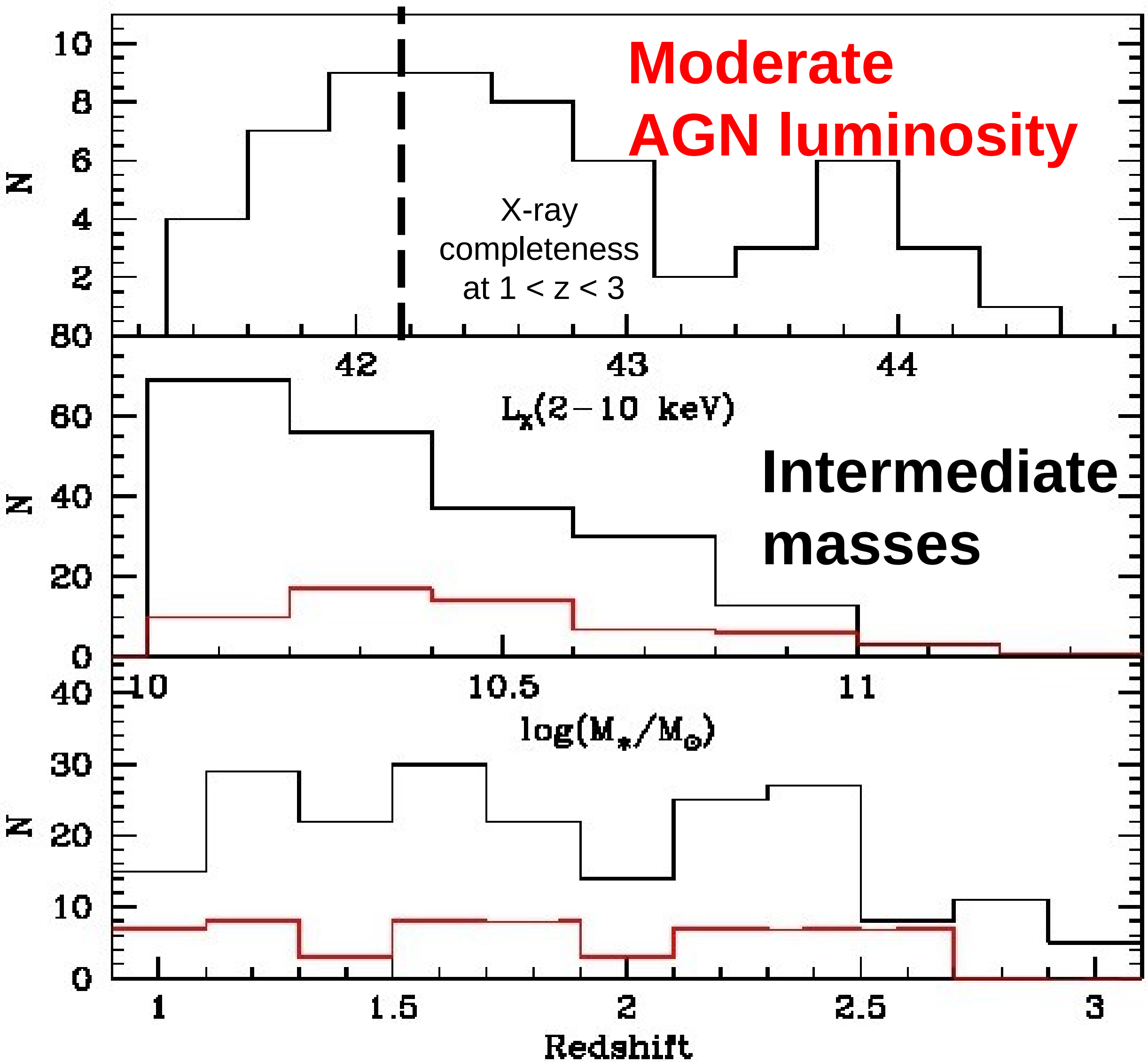


Credits:NASA

Searching for AGN – galaxy relationships at 1<z<3

The pilot work

Cimatti, Brusa, MT, et al. 2013



GMASS

Galaxy Mass Assembly
Spectroscopic Survey
+ GOODS-S public datasets

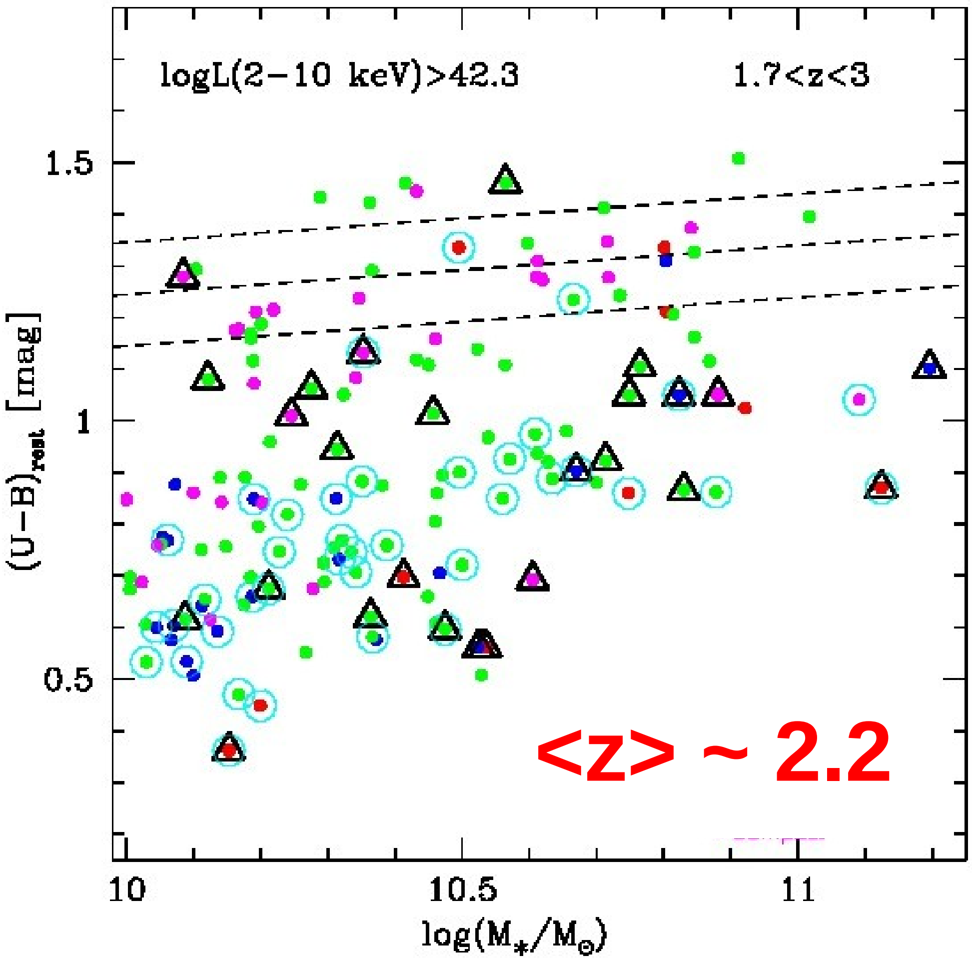
~ 270 galaxies
1 < z < 3

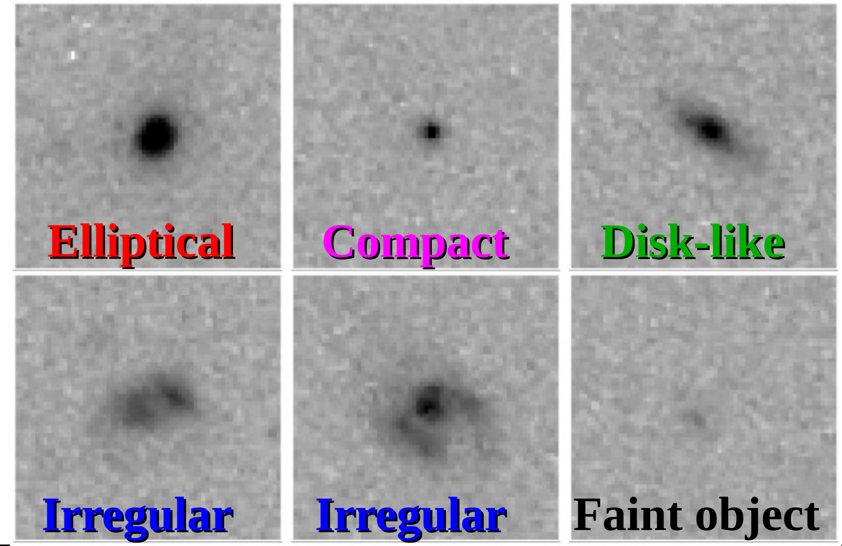
55% with rest-frame
UV spectra

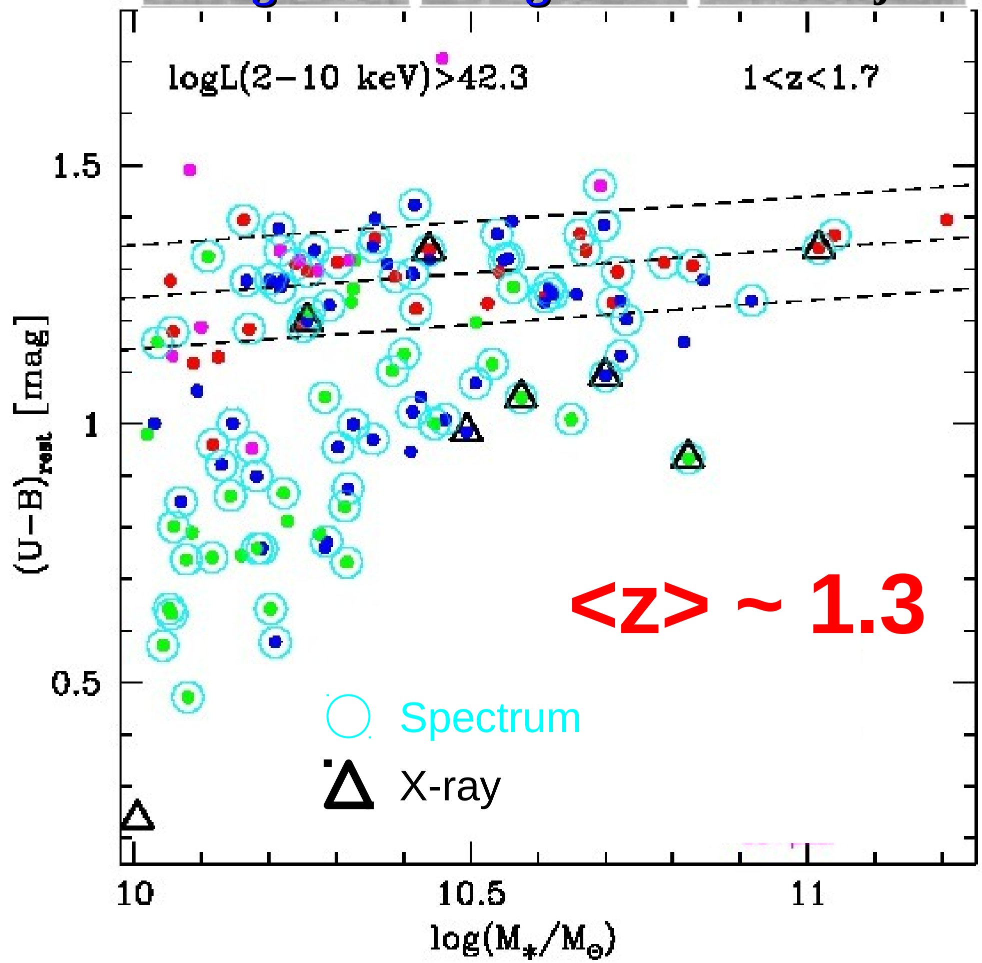
$M^* > 10^{10}\ M_\odot$

(90% complete @1<z<3)

~ 60 galaxies
Xray detected







After ~ 2 Gyr

Red Sequence ↑

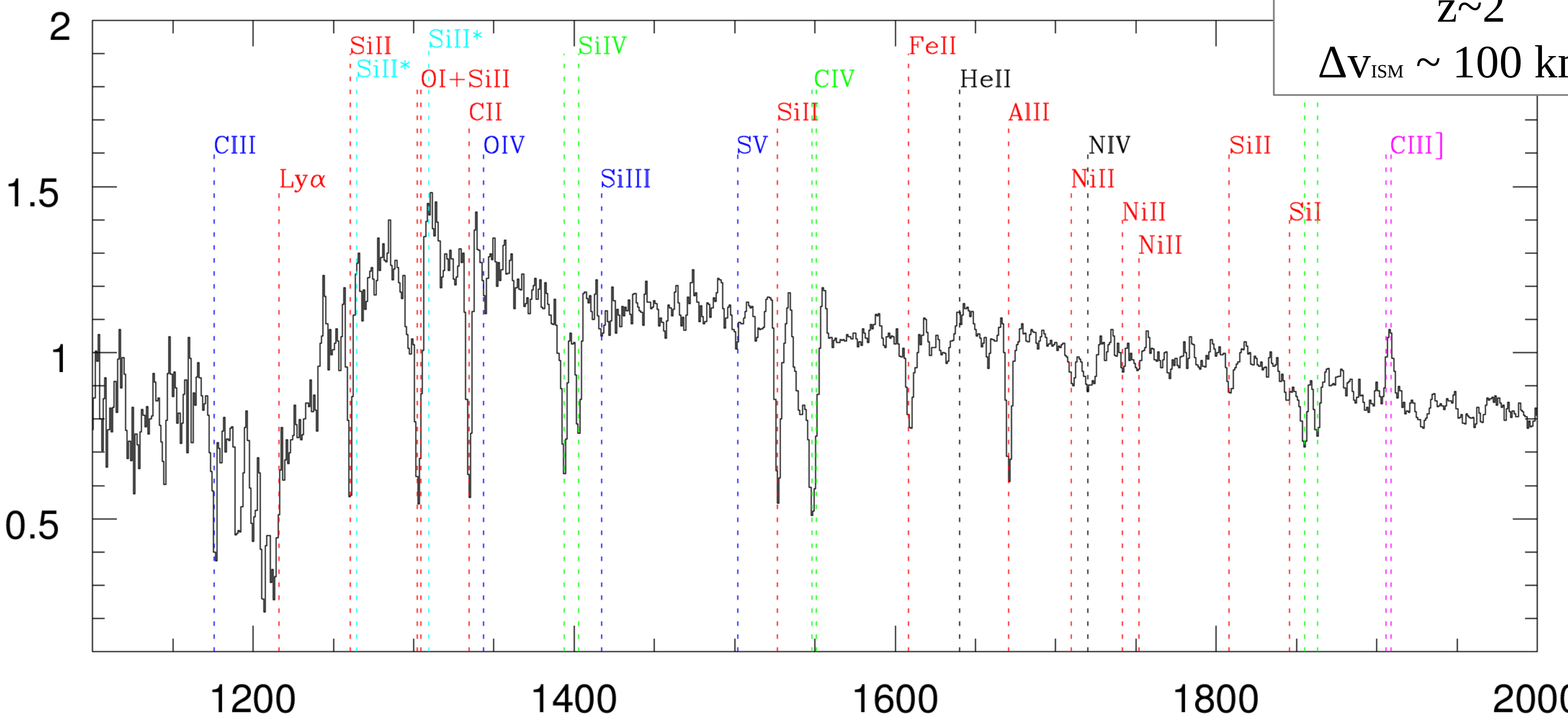
AGNs ↓

The role of outflows

Multiphase phenomenon
Different spectroscopic tracers:
- Molecular emission lines (CO)
- Optical emission lines (Hα, [OIII])
- **UV absorption lines → STACKING!**

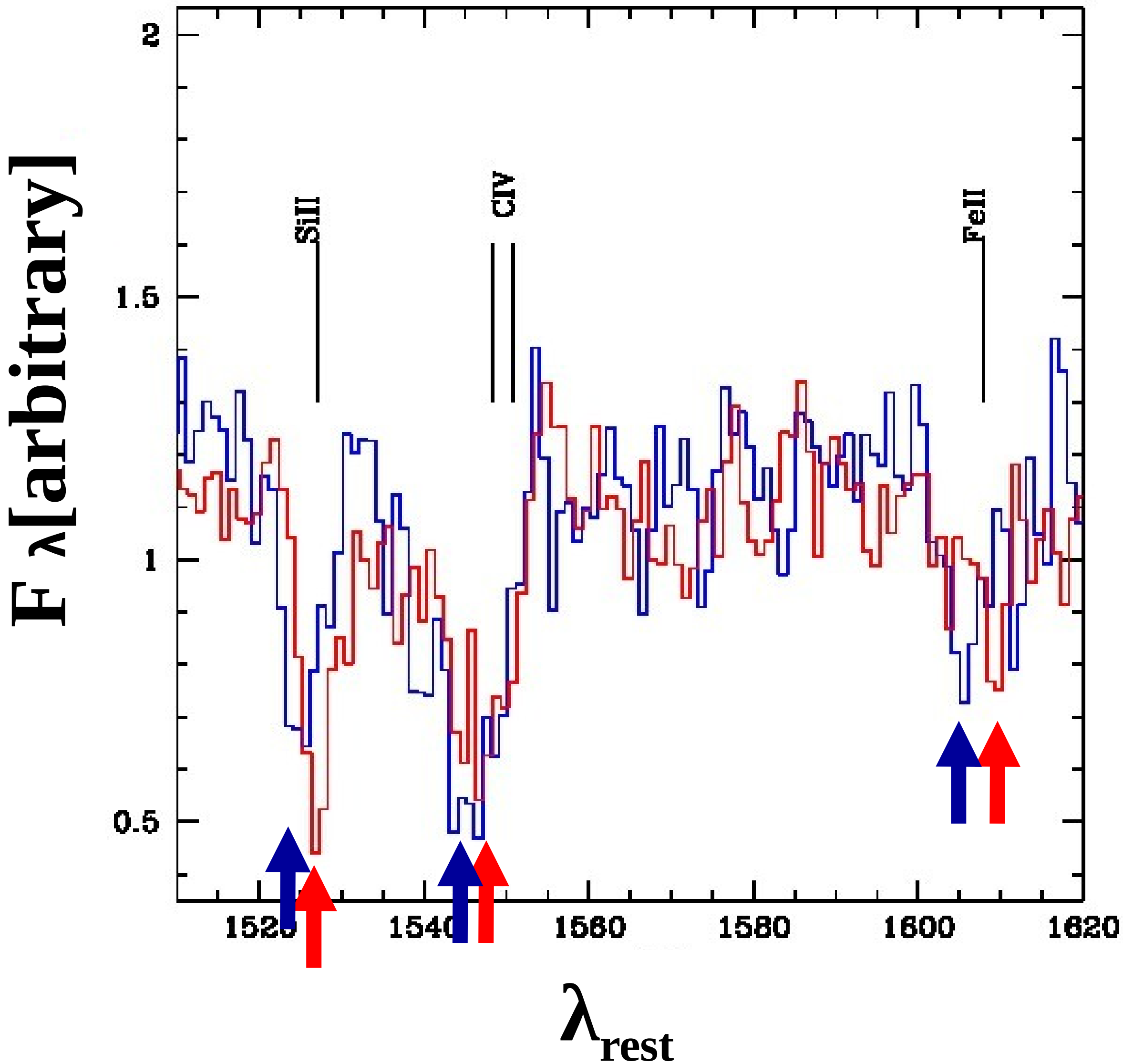
Different driving mechanisms:
- SF activity (Sne)
- AGN activity

“Pure” SFGs
z~2
Δv_{ISM} ~ 100 km/s



Talia, et al. 2012

The role of outflows



Cimatti, et al. 2013

$1.7<z<3.0$

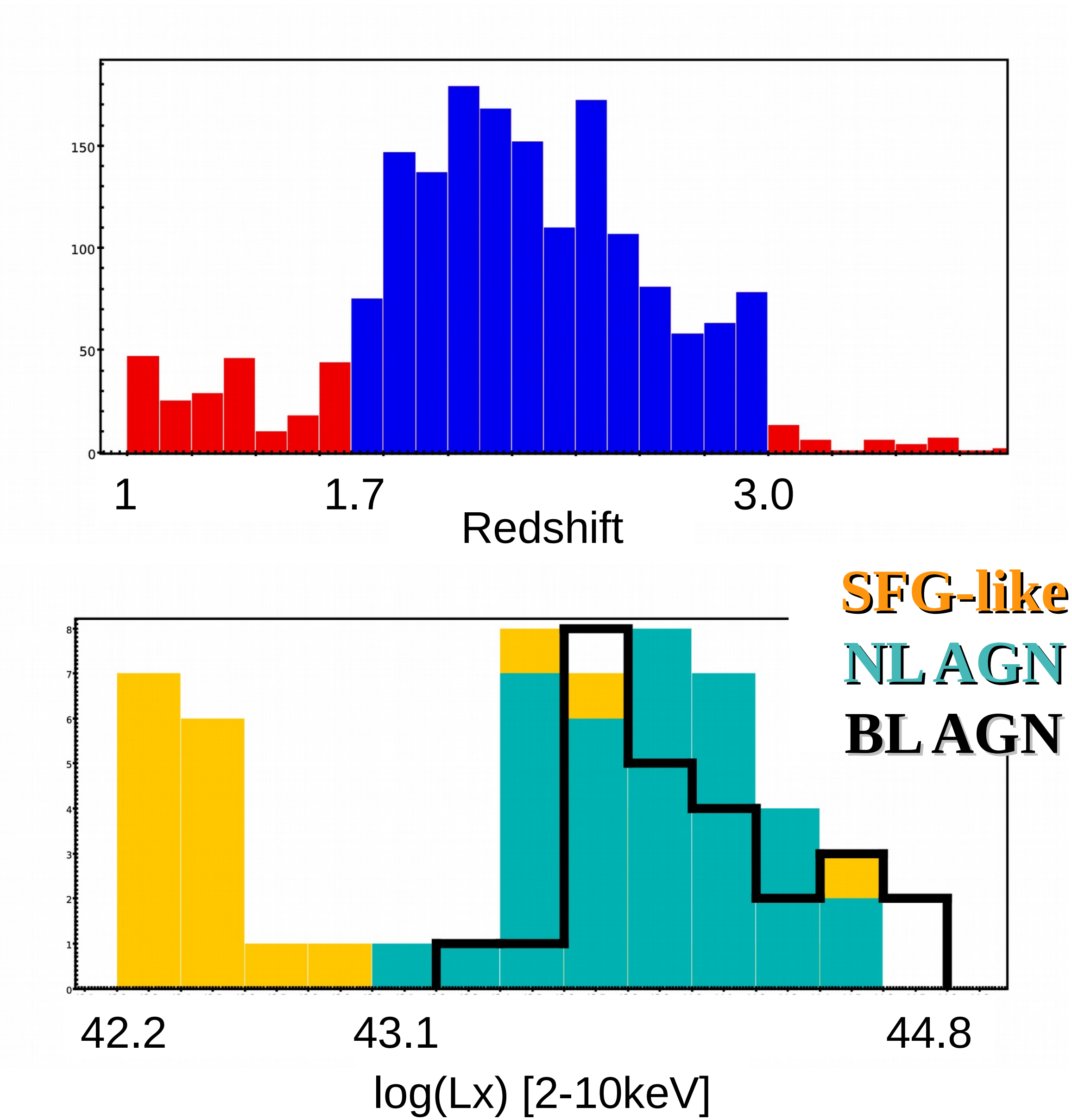
Detected ISM outflows

$\Delta v \sim 70\text{-}100\ kms^{-1}$

$\Delta v \sim 350\ kms^{-1}$
$\Delta v_{max} \sim 500\text{-}600\ kms^{-1}$
≥ escape velocity

Enlarging the sample...

Talia et al., 2015 in prep.



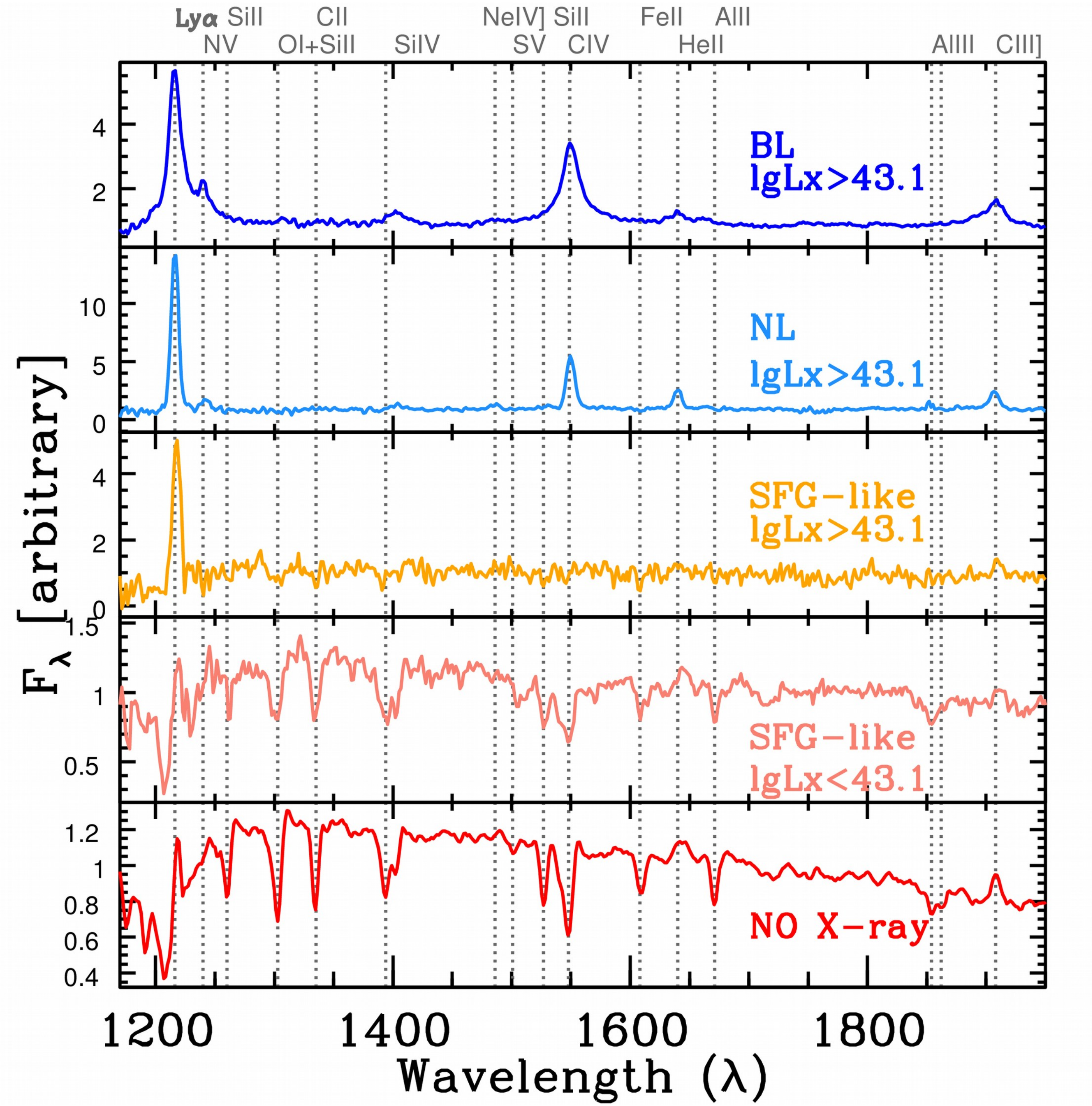
<u>GOODS-South + COSMOS fields</u>

K < 24

X-ray from **CHANDRA**

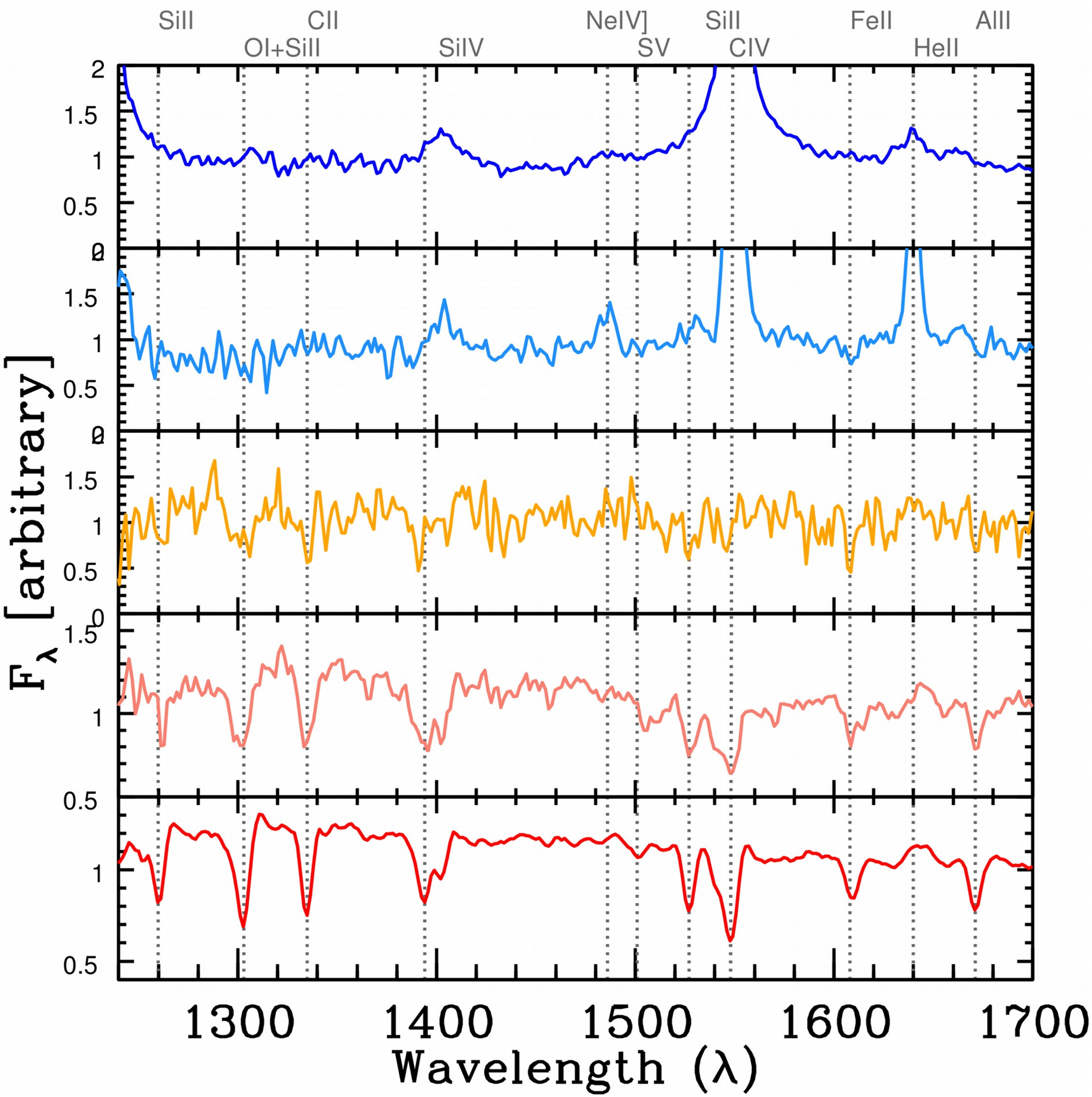
<u>~1000</u> spectra from:

GMASS
ESO Surveys
zCOSMOS-Deep
VUDS



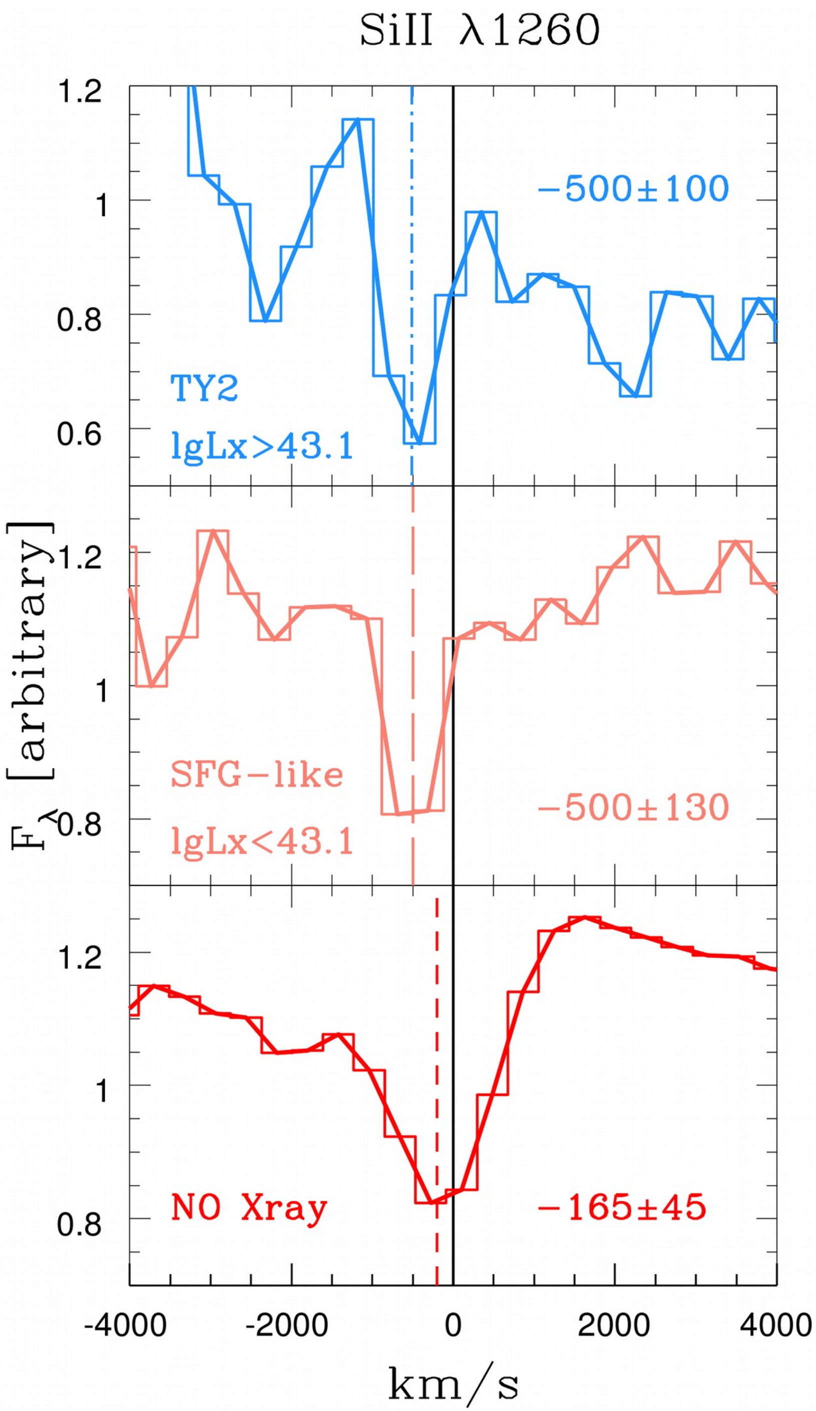
1.7<z<3.0

Study the dependence of outflow properties on AGN spectral Type and Lx



1.7<z<3.0

Study the dependence of outflow properties on AGN spectral Type and Lx

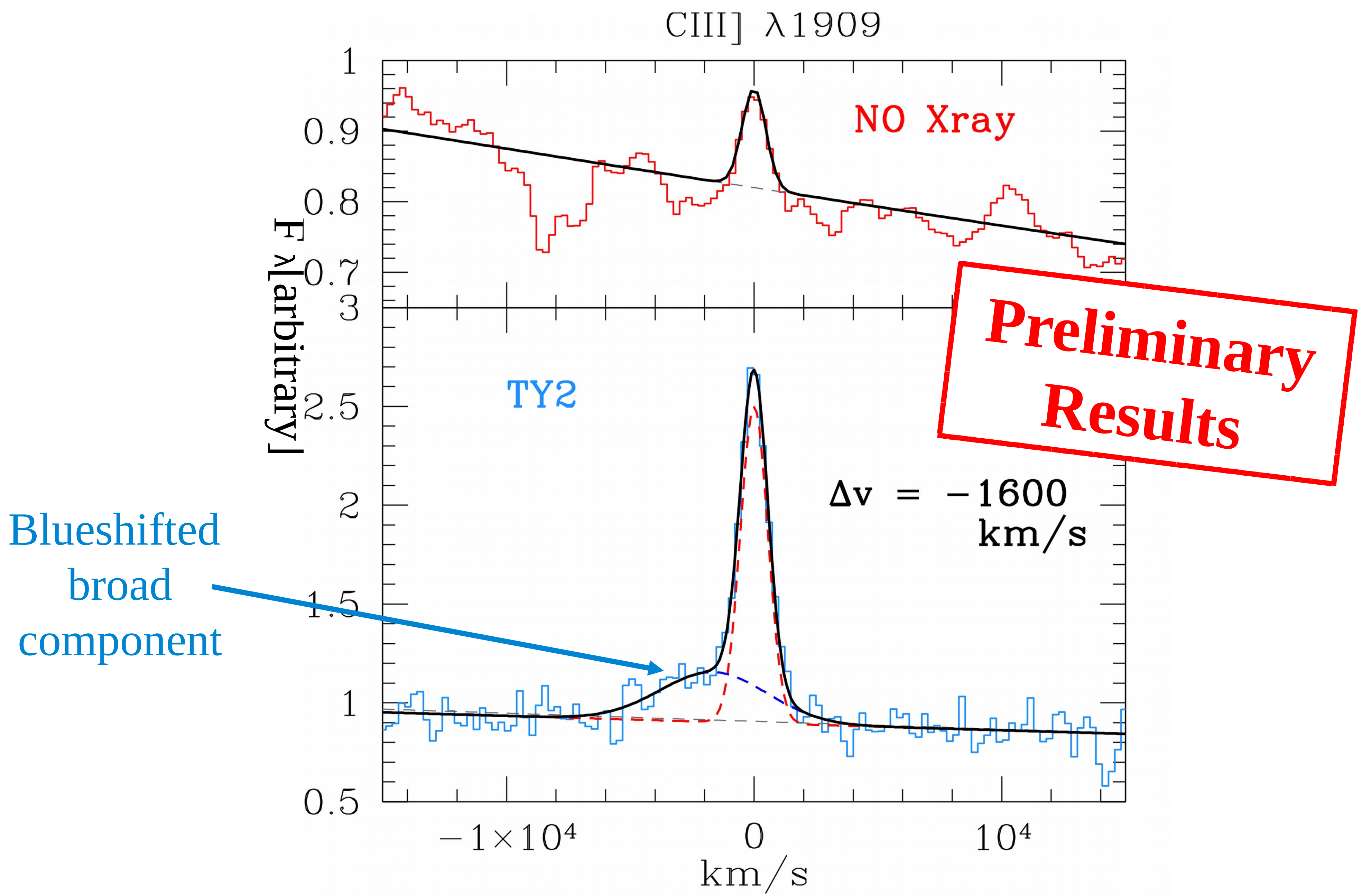


1.7<z<3

Detected ISM outflows

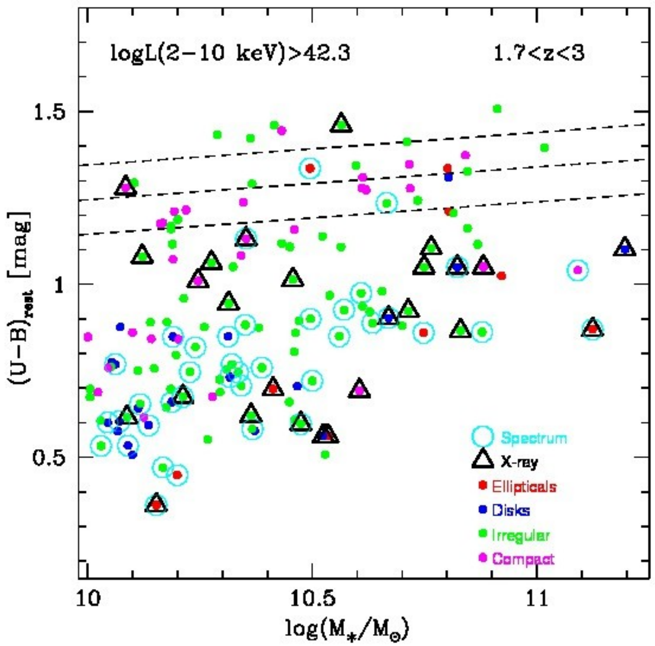
Outflows are faster
in galaxies hosting an AGN
w.r.t. "pure" SFGs
BUT
apparently no dependence
of velocity
on spectral type and/or Lx

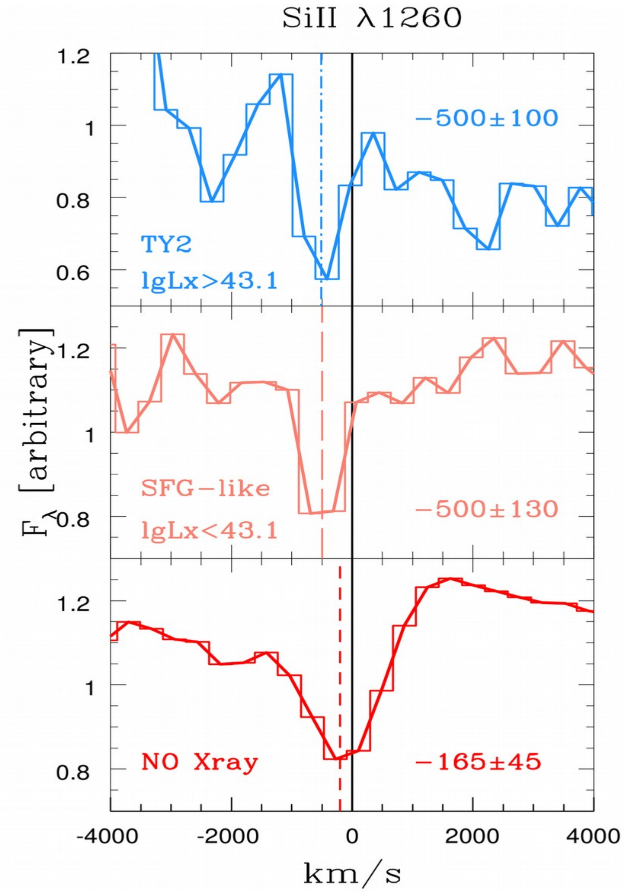
Looking at emission lines...



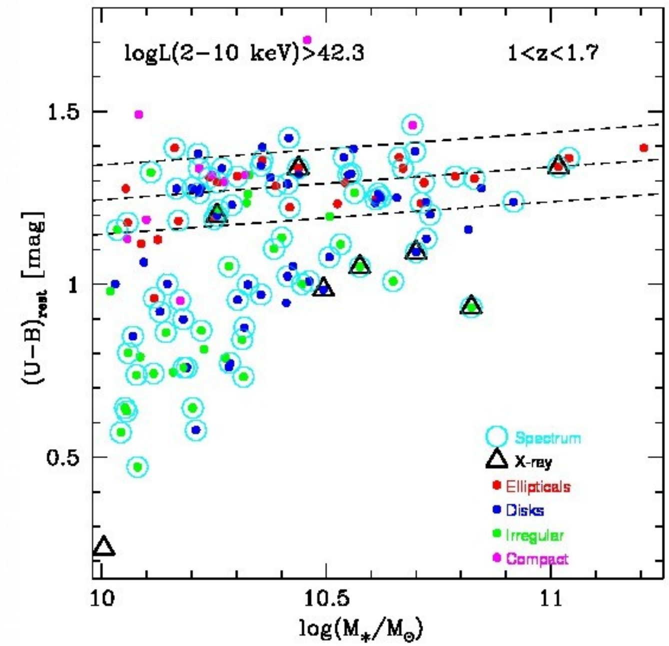
Conclusions

1.7<z<3.0





1.0<z<1.7



Moderately luminous AGNs ($L_X<10^{44.5}$ ergs^{-1}) at 1.7<z<3.0 drive powerful outflows that possibly contribute to star-formation quenching in galaxies with $10^{10}<M^*<10^{11}$ $M_\odot$

Talia et al., 2015, in prep.
Cimatti, Brusa, MT et al., 2013, ApJL