Study of X-ray and optical spectral properties of AGN from the SRG/ART-XC All-Sky Survey using Swift/XRT and SDSS archival data

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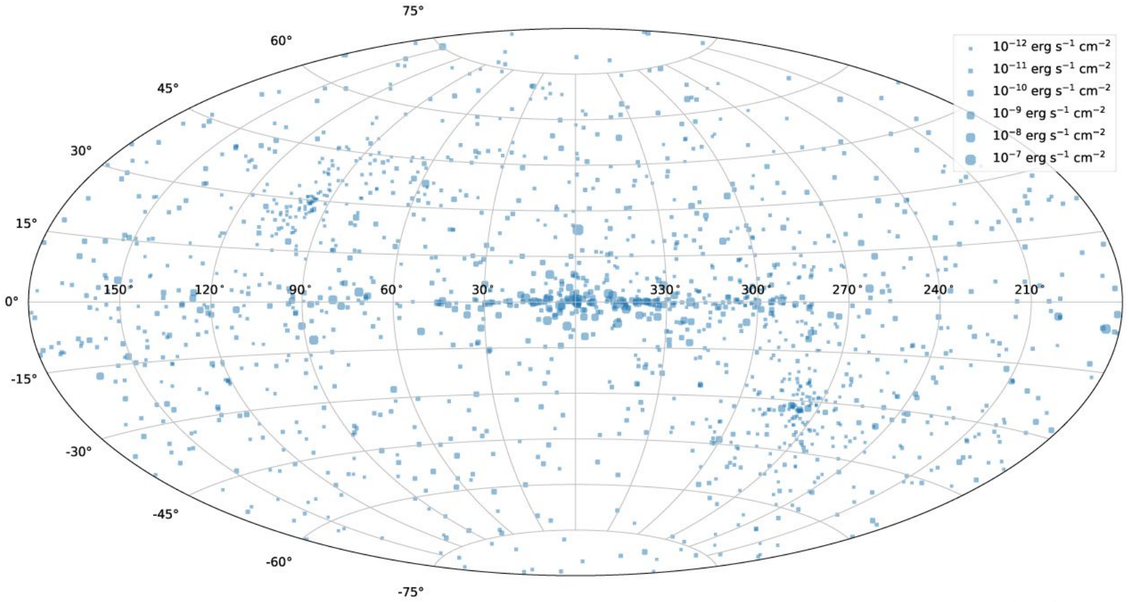
ARTSS1-5 catalog

SRG Mikhail Pavlinsky ART-XC telescope (4-12 keV)



S. Sazonov et al, (2024)

1545 sources

- 964 — extragalactic
- **715** — AGN (no blazar)

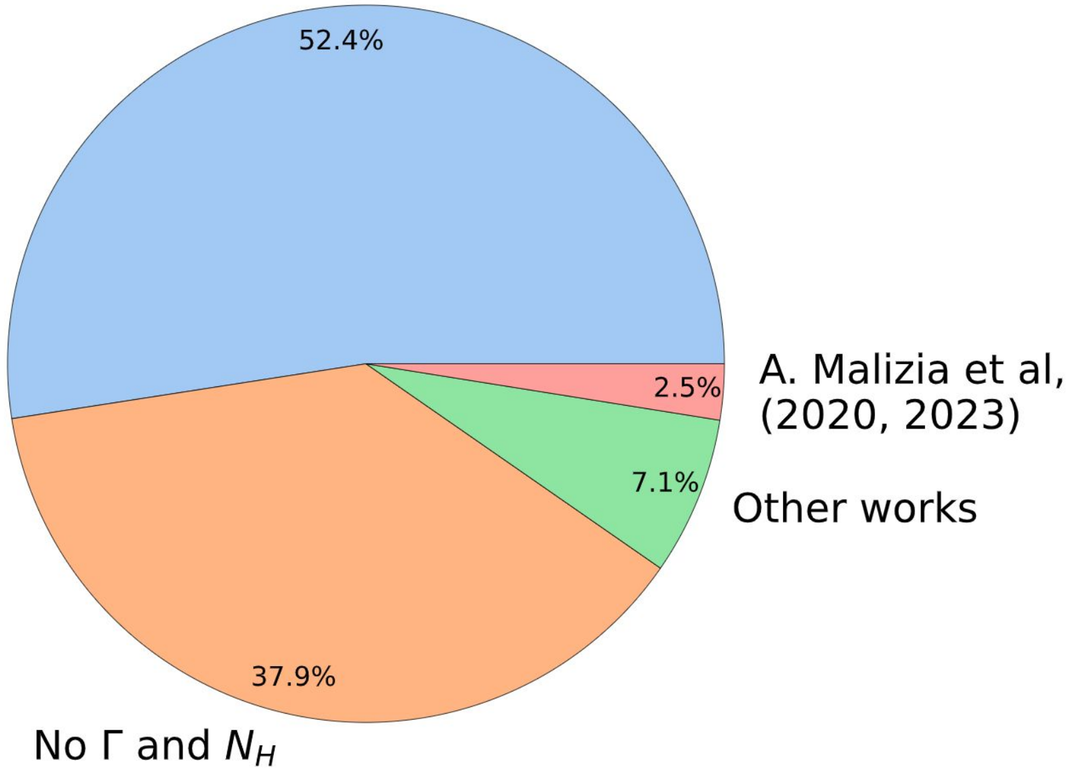
Main goal: complete catalog of spectroscopic characteristics

Swift/BAT ⟷ BASS project

SRG/ART-XC ⟷ our work

X-ray characteristics (Γ and N_H)

C. Ricci et al, (2017)



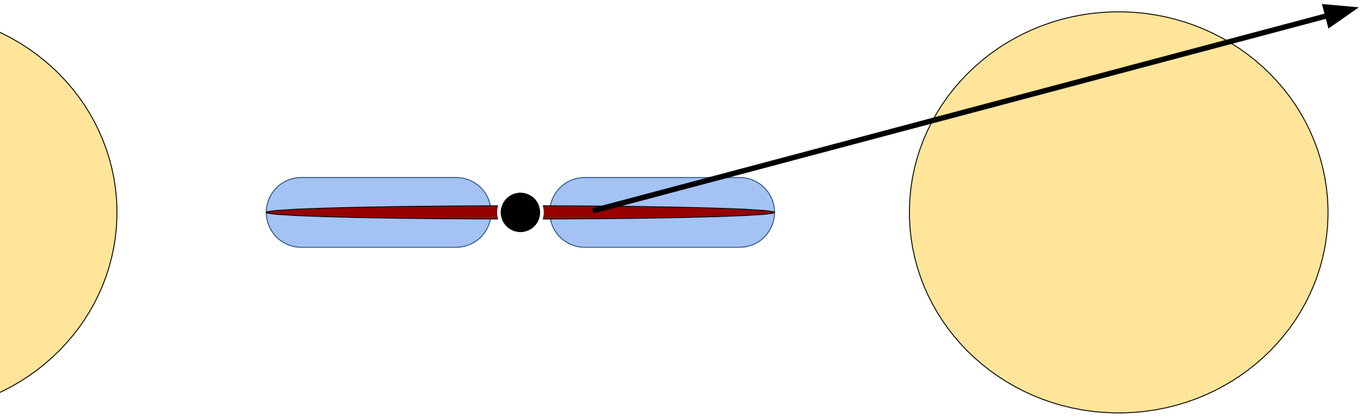
Swift/XRT, LSXPS
(**L**iving **S**wift **X**RT **P**oint **S**ource **C**atalogue)

For spectroscopic analysis e use spectra with: counts > 100 and known z

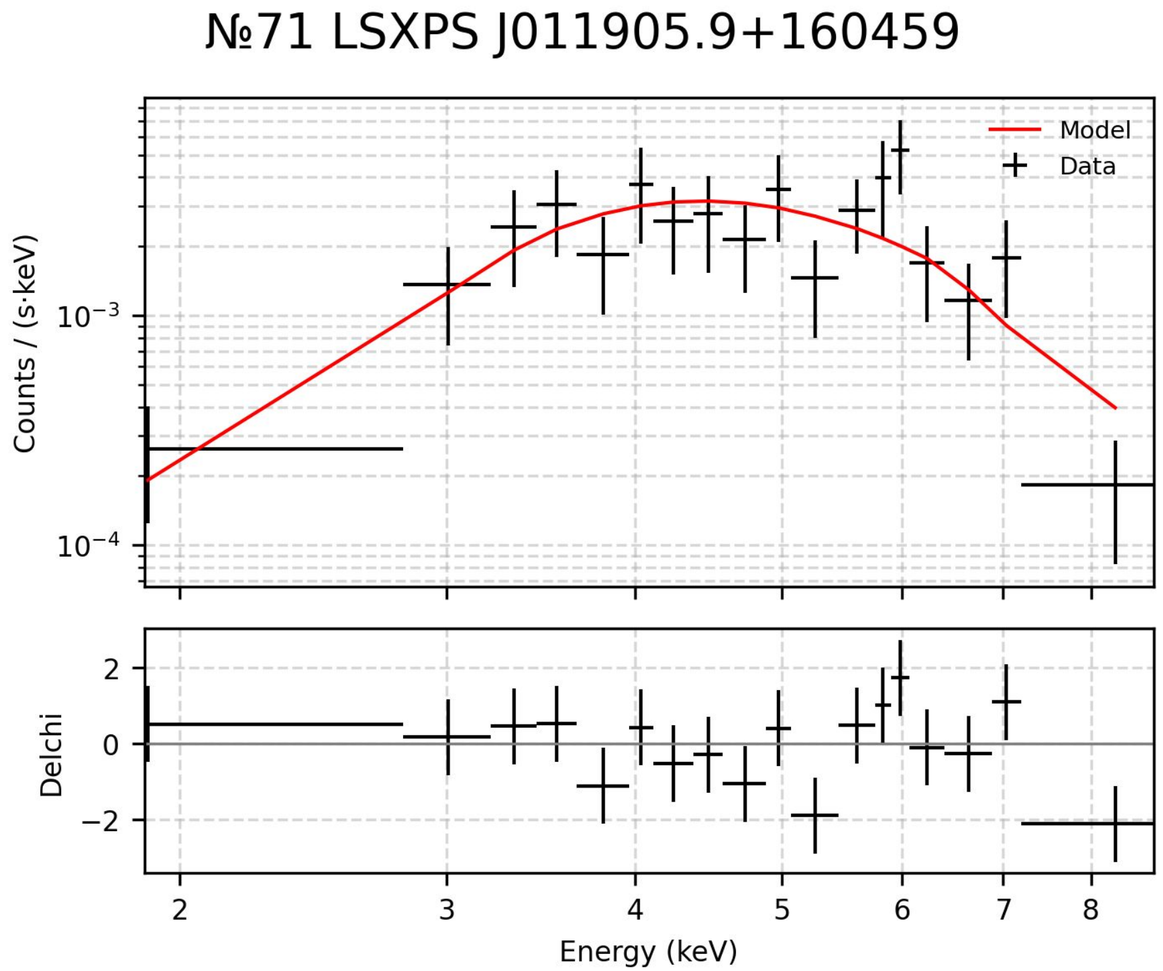
101 X-ray spectra in total

- 454 - crosscorrelation with other works
- **271** without Γ and N_H

X-ray spectra fitting

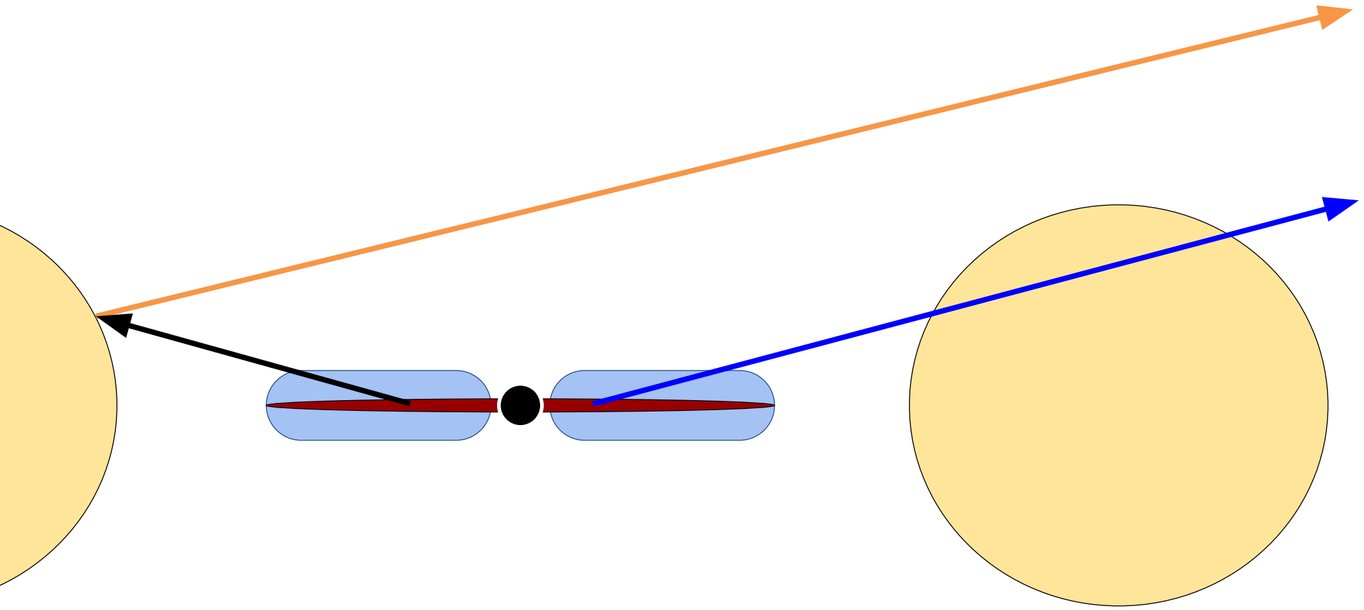


tbabs * ztbabs * zpowerlw

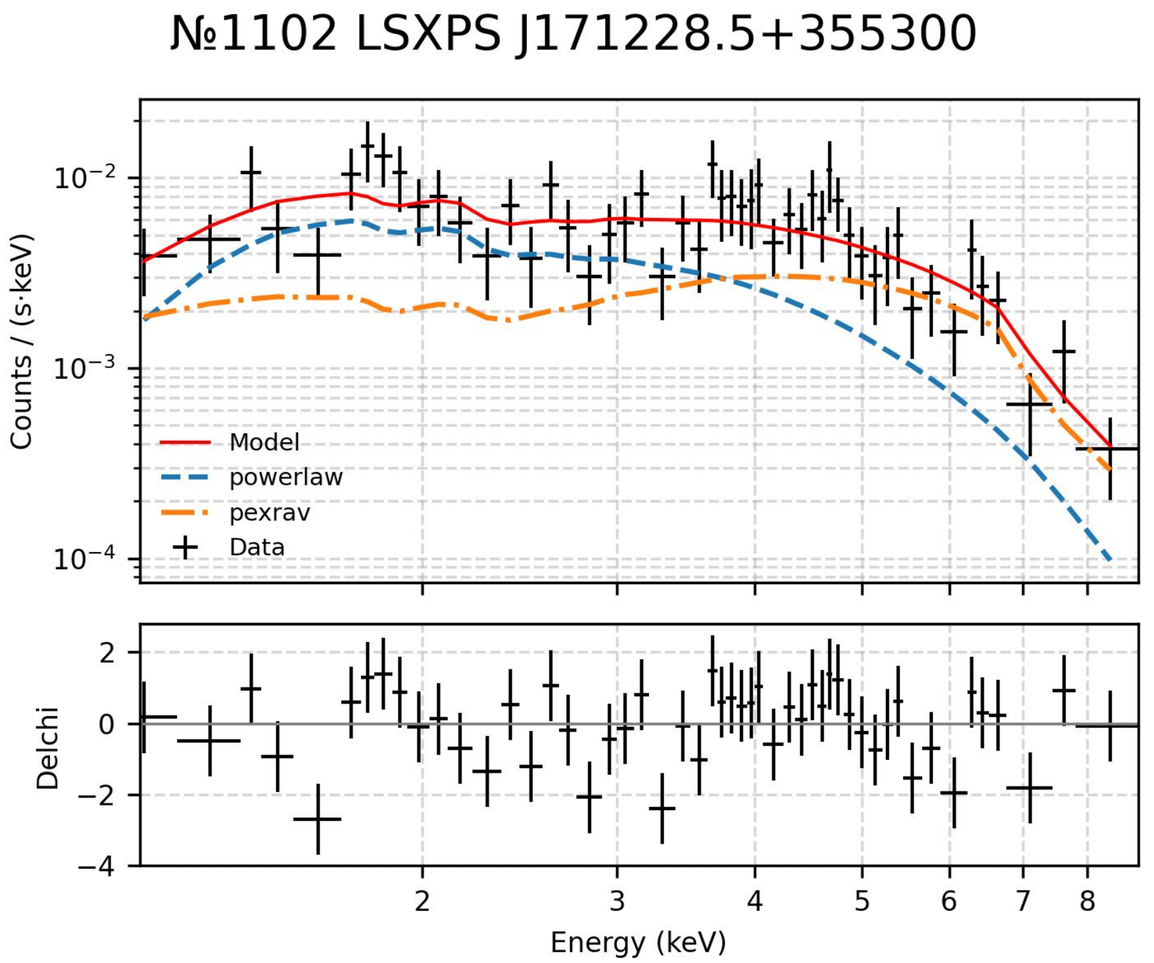


A. Sokolov et al, (2025)

X-ray spectra fitting



tbabs * (ztbabs * zpowerlw + pexraw)



A. Sokolov et al, (2025)

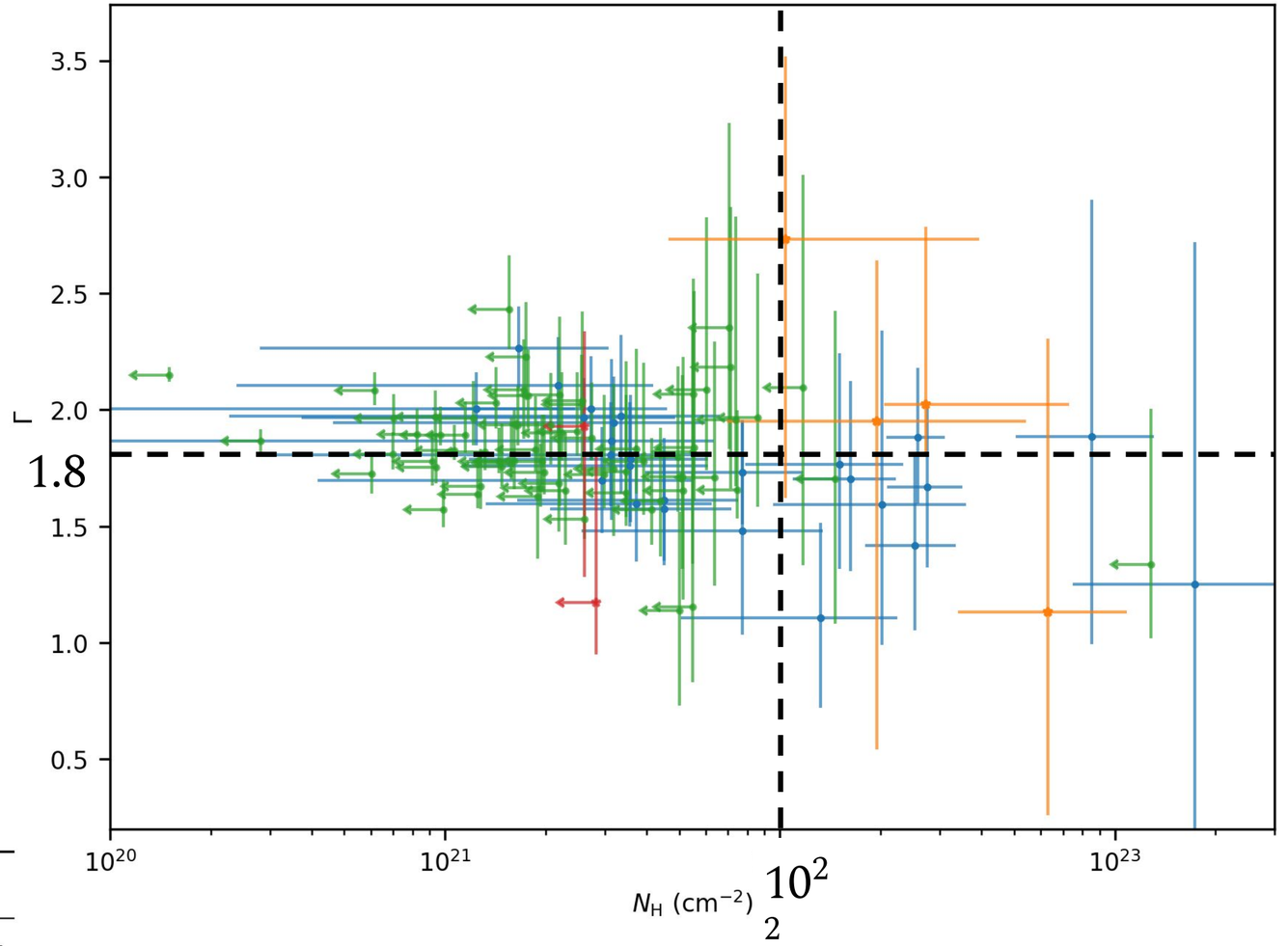
X-ray characteristics

15 AGN: $N_H > 10^{22}$ cm^{-2}

all sources: $\Gamma \sim 1.8$

№	Object	z	N_H	Γ	F_{1-10}	cstat	dof
71	J011905.4+160504	0.070	$17.36^{+13.25}_{-9.86}$	$1.25^{+1.47}_{-1.18}$	$5.73^{+2.13}_{-5.69}$	80.95	86
801	J133333.6-102810	0.103	< 0.48	$1.78^{+0.42}_{-0.23}$	$4.20^{+0.58}_{-0.66}$	151.31	187

№	Object	z	N_H	Γ	$F_{1-10}^{zpowerlw}$	F_{1-10}^{pexraw}	cstat	dof	ΔAIC
1079	J170228.0+341055	0.1053	$2.72^{+4.59}_{-0.67}$	$2.02^{+0.76}_{-0.21}$	$0.54^{+0.28}_{-0.35}$	$0.39^{+0.23}_{-0.05}$	488.67	530	-14.0587
1102	J171228.8+355313	0.0264	$1.94^{+3.49}_{-1.25}$	$1.95^{+0.69}_{-1.41}$	$2.28^{+3.09}_{-1.48}$	$2.67^{+1.28}_{-1.48}$	205.97	250	0.7297

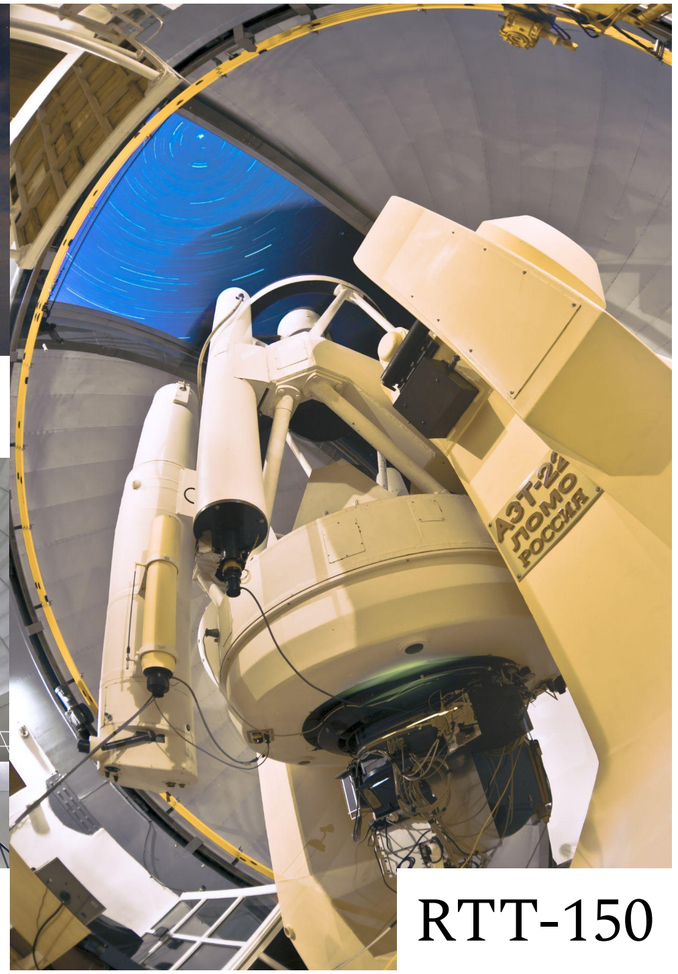


A. Sokolov et al, (2025)

Optical spectra

SDSS

DESI



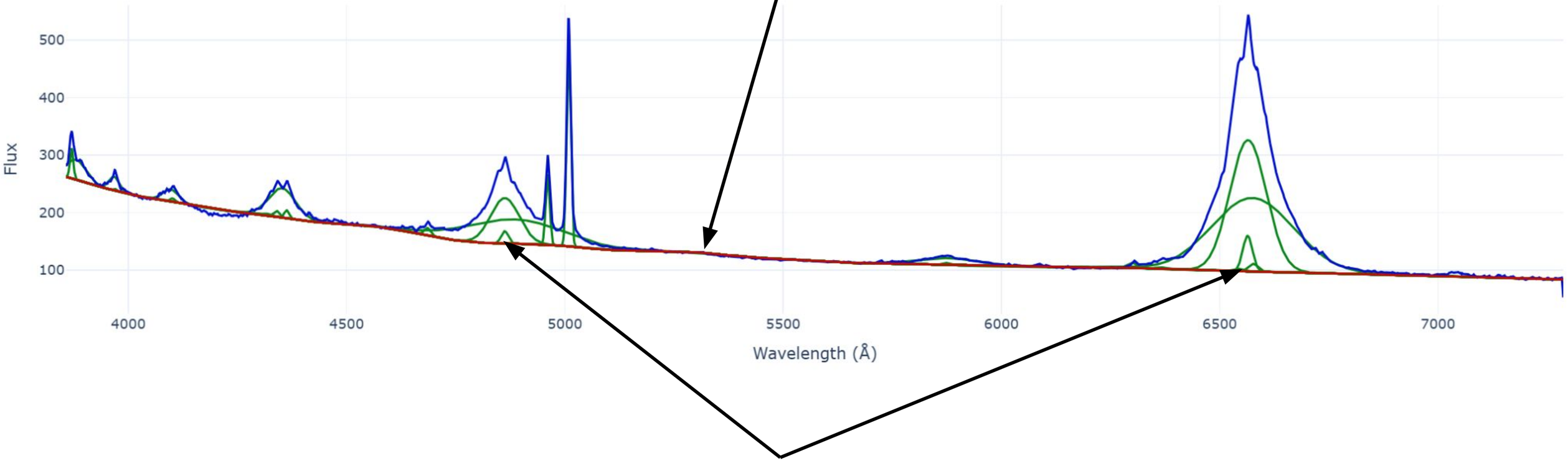
RTT-150

Flux, FWHM and $\Delta\lambda$ of emission lines

150 optical spectra

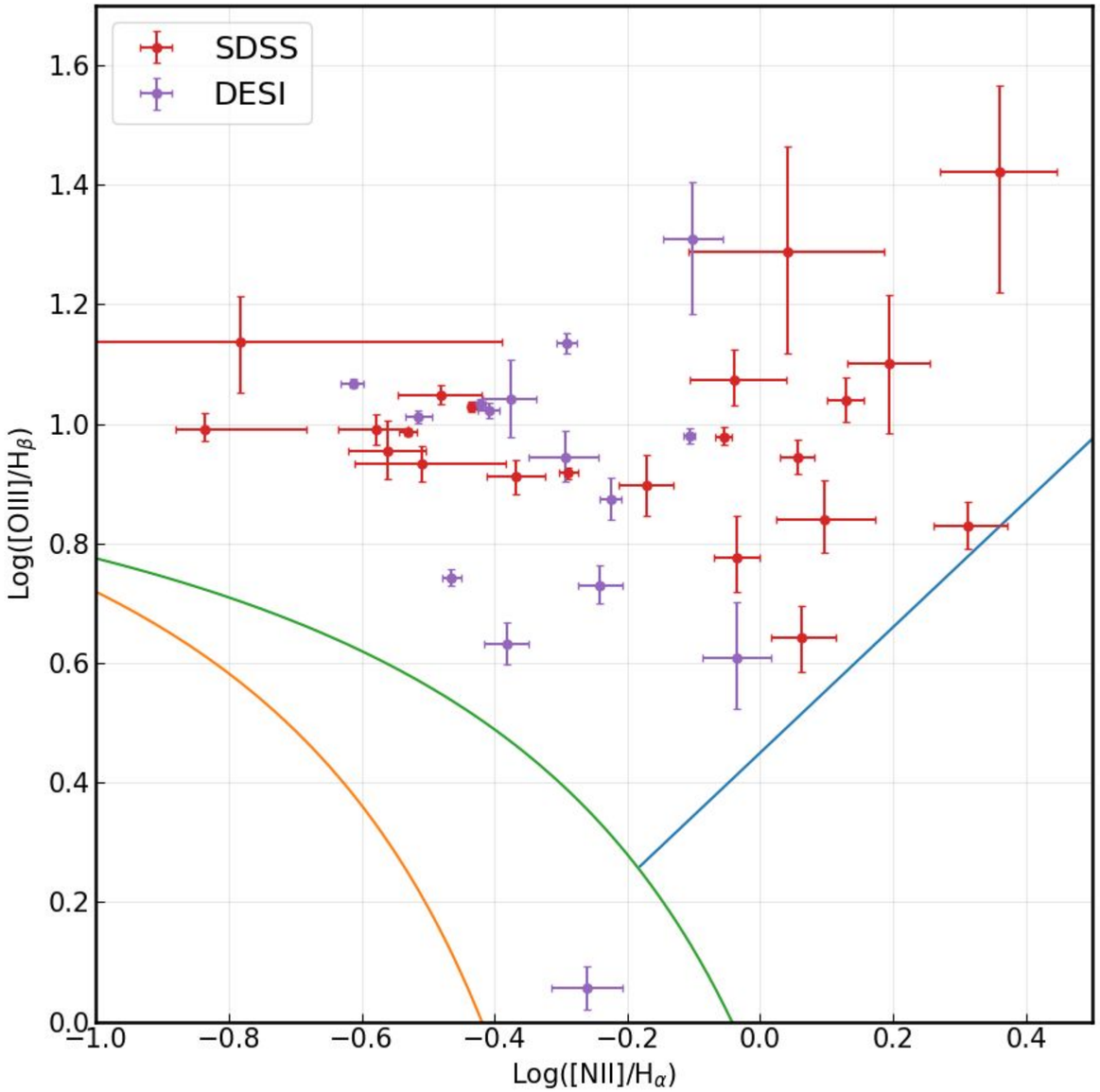
Optical spectra

continuum = powerlaw + polynom^3 + FeII lines



several gauss components
per one broad line

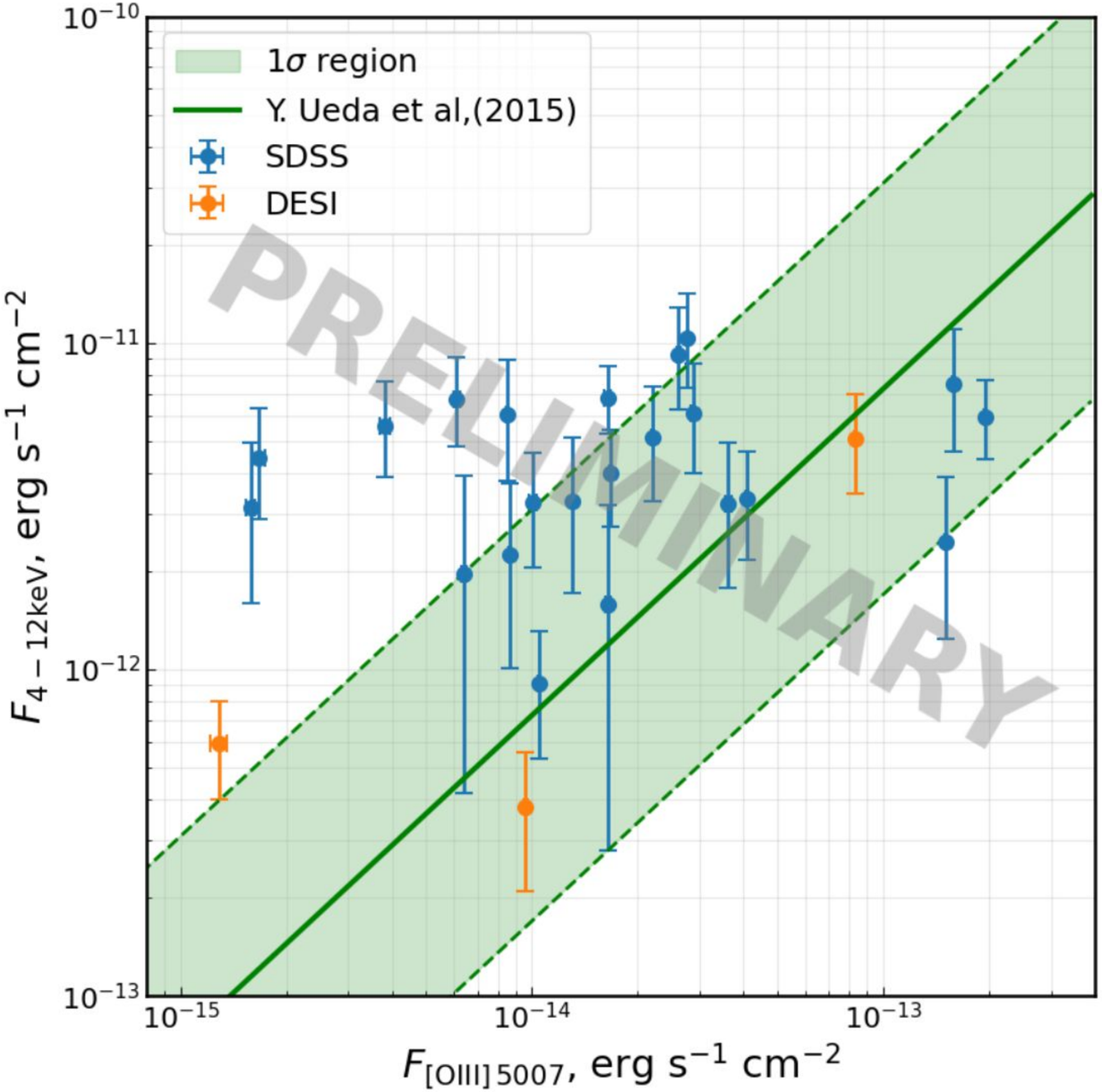
Emission lines characteristics



Results:

- **36** spectra fitted
- **6** CL-AGN (based on difference in SDSS and DESI data)
- **13** spectra with complex Balmer line profiles

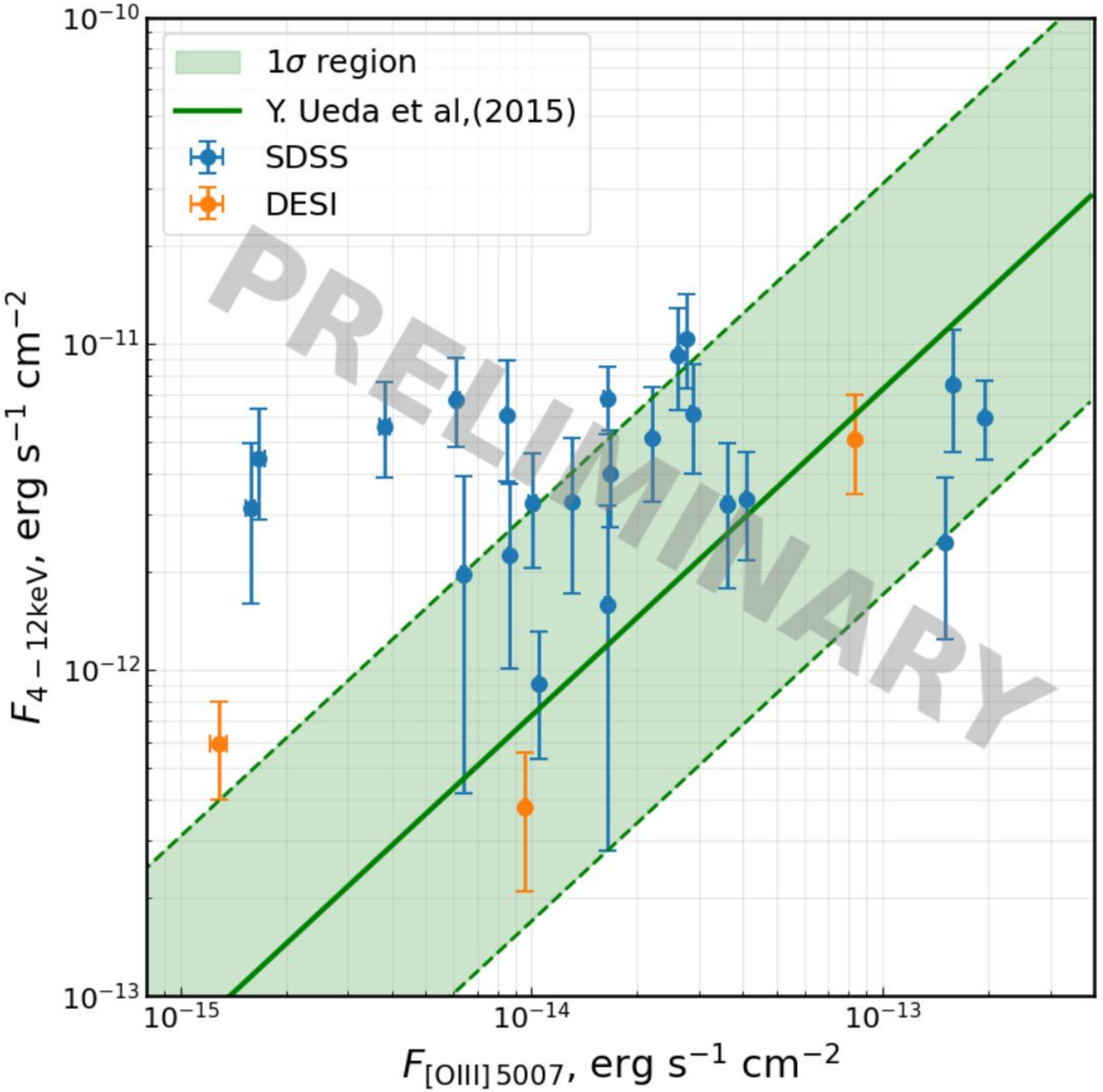
X-ray vs optical



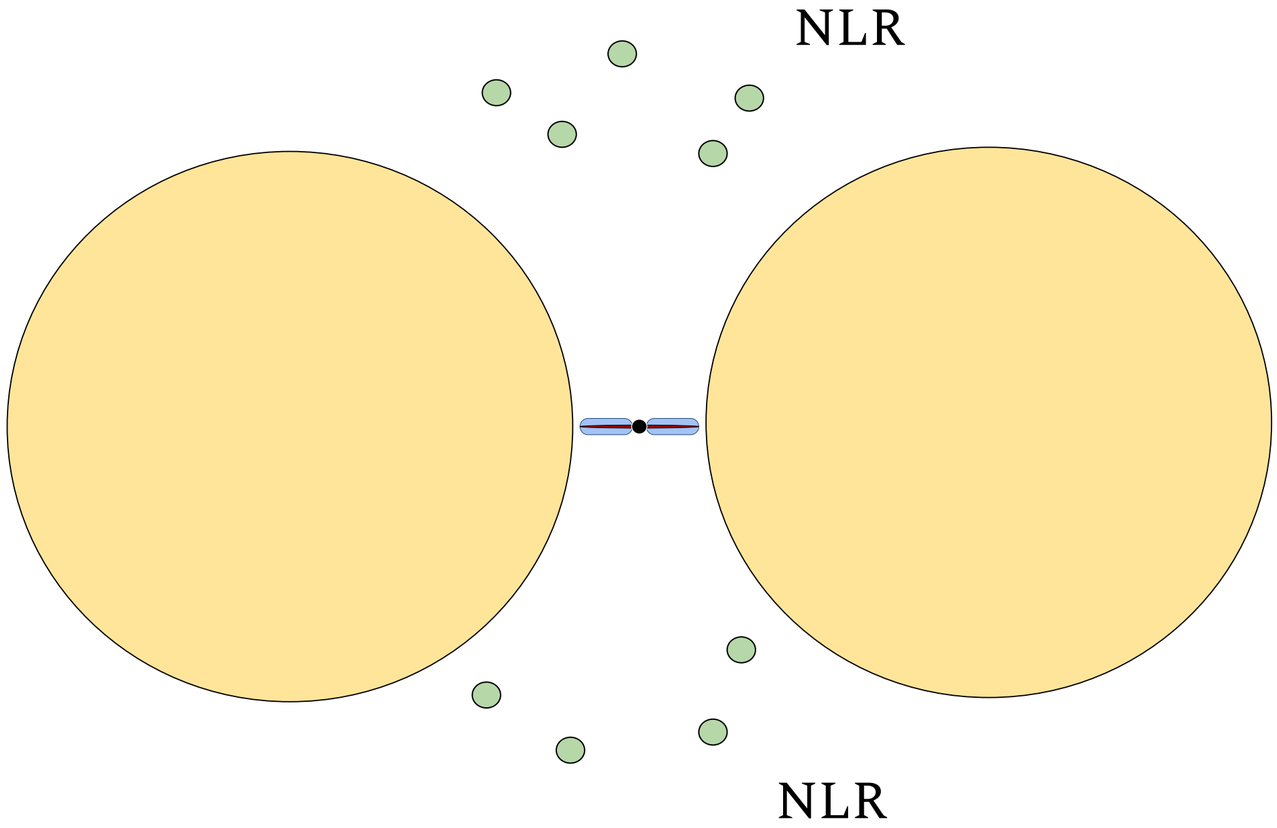
Y. Ueda et al,(2015):

$$\lg\left(\frac{F_{[\mathrm{O\,III}]}}{F_{4-12\,\mathrm{keV}}}\right) = -1.86$$

X-ray vs optical



6 outliers = buried AGN???



Results

- X-ray (Γ, N_H) characteristics for **101** spectra (**6** with reflection model)
- **15** Compton thick AGN
- Optical emission lines characteristics for **36** sources
- **6** CL-AGN candidates, **12** spectra with complex Balmer line profiles and **6** buried AGN candidates

Thank you for your attention!

Emission lines

HI (Hζ, Hε, Hδ, Hγ, Hβ, Hα)

MgII (2798)

HeI (5876)

HeII (3203, 4686)

NI (5197, 5200)

NII (6549, 6585)

OI (6300, 6364)

OII (3729)

OIII (4363, 4959, 5007)

OIV (4711, 4740)

NeIII (3868, 3967)

NeV (3426)

SII (6718, 6732)

ArIII (7135)

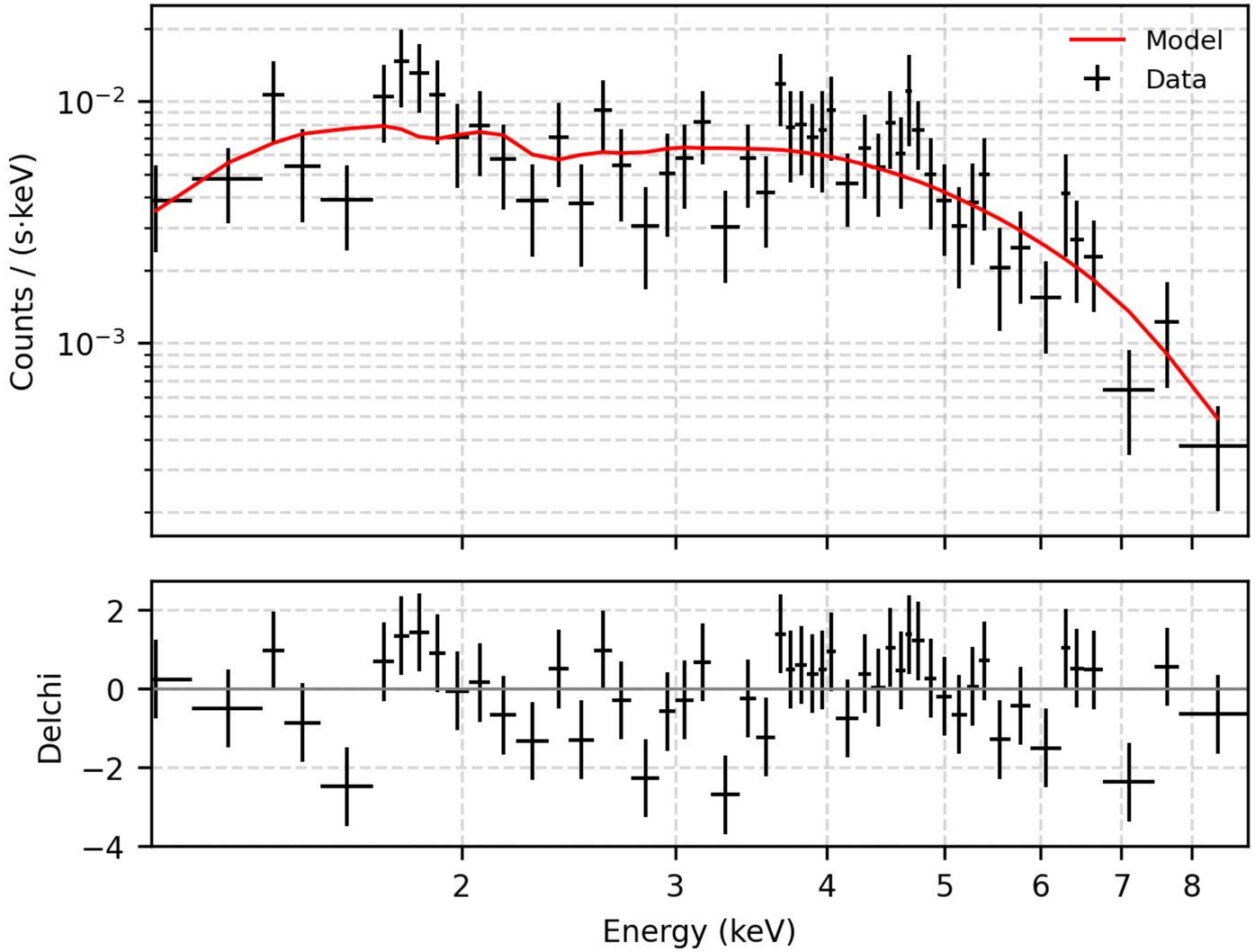
Relation of Balmer lines fluxes

$$F_{H\beta} = 0.350\ F_{H\alpha}$$
$$F_{H\gamma} = 0.164\ F_{H\alpha}$$
$$F_{H\delta} = 0.091\ F_{H\alpha}$$
$$F_{H\varepsilon} = 0.056\ F_{H\alpha}$$
$$F_{H\zeta} = 0.037\ F_{H\alpha}$$

K. Oh, et al (2011)

Why bother with reflection model?

№1102 LSXPS J171228.5+355300



$\Gamma+\Delta\Gamma = 1.18 < 1.5$

6 spectra