

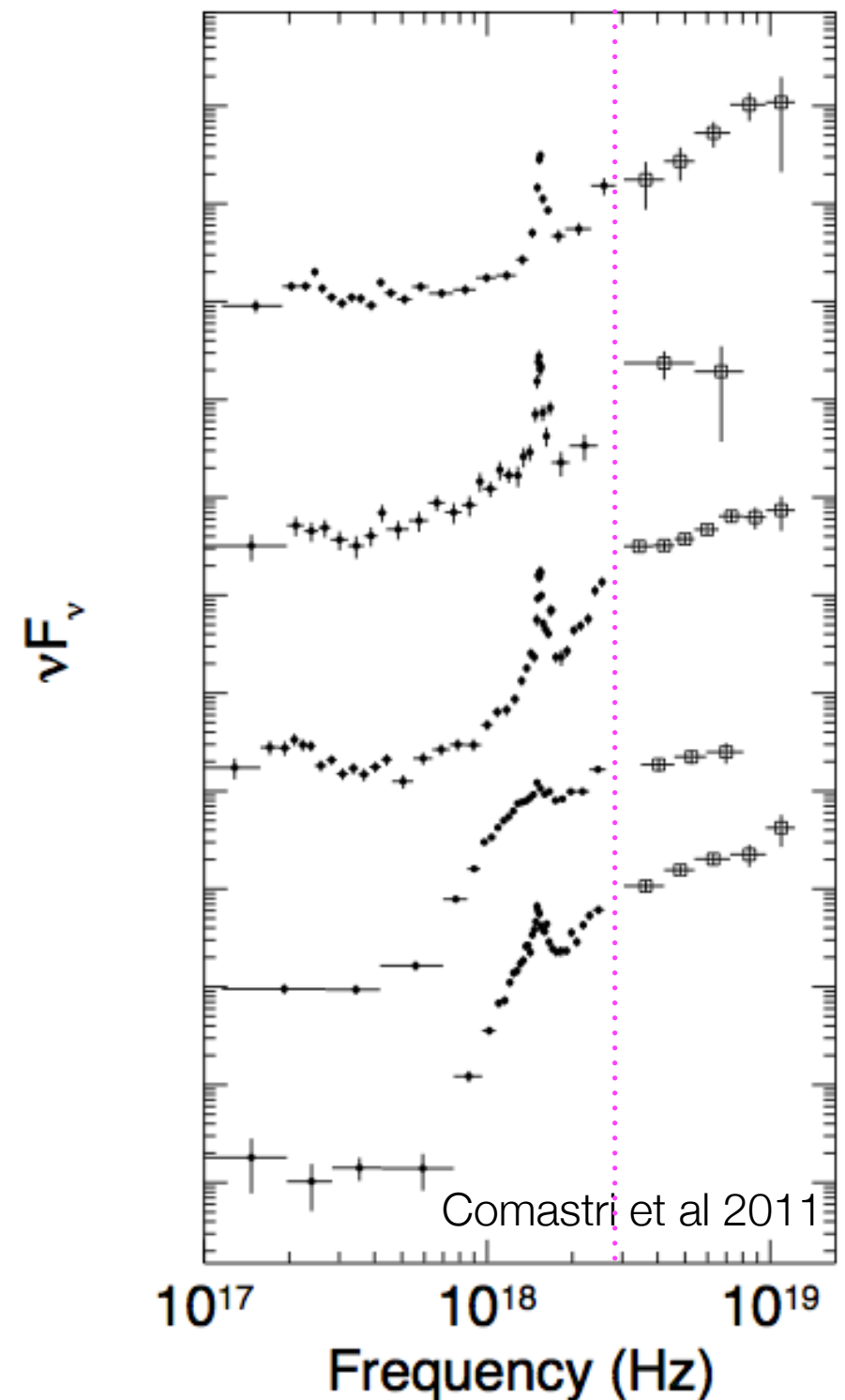
# A 9-20 keV selection of heavily obscured AGN at $z > 1.7$

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K. Iwasawa

# Motivations

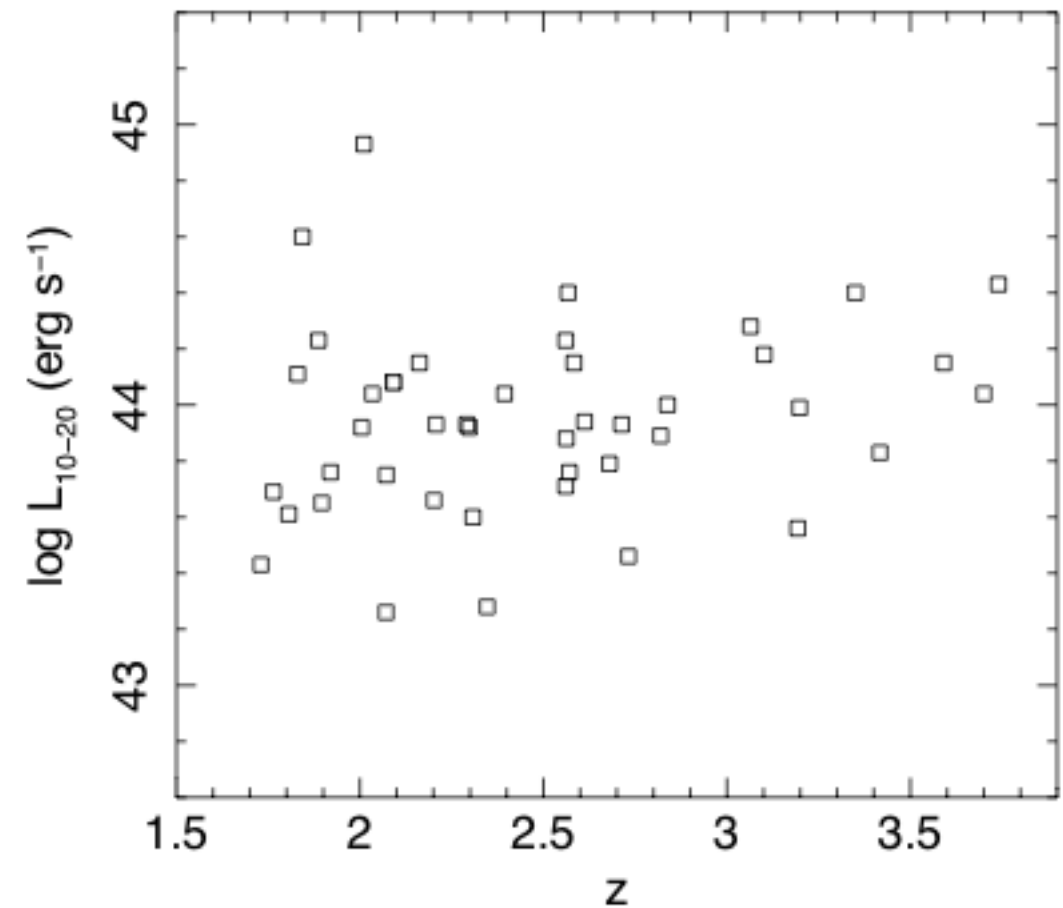
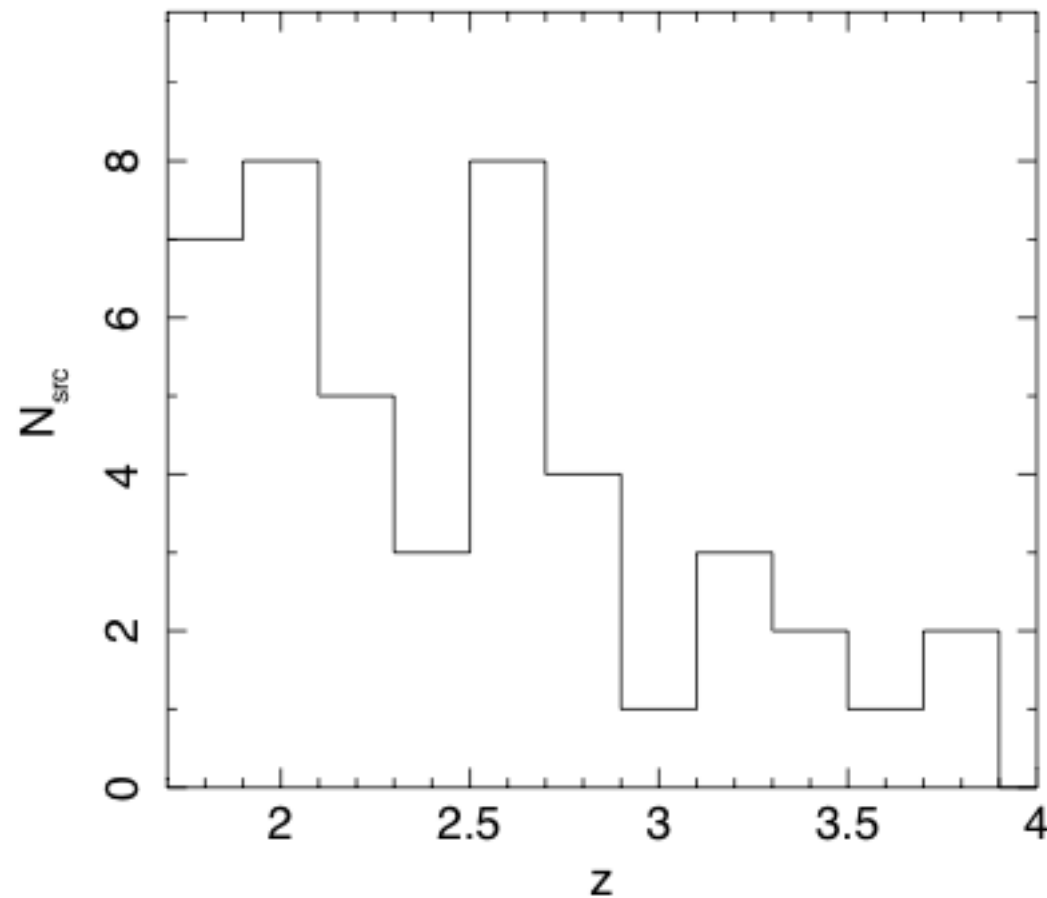
- Hard X-ray ( $>10$  keV) excess when  $nH$  approaches  $10^{24}$   $\text{cm}^{-2}$
- Rest-frame 10-20 keV enters the XMM bandpass for  $z > 1.7$
- Negative K correction for absorbed spectra
- Significant depth of the XMM CDFS survey



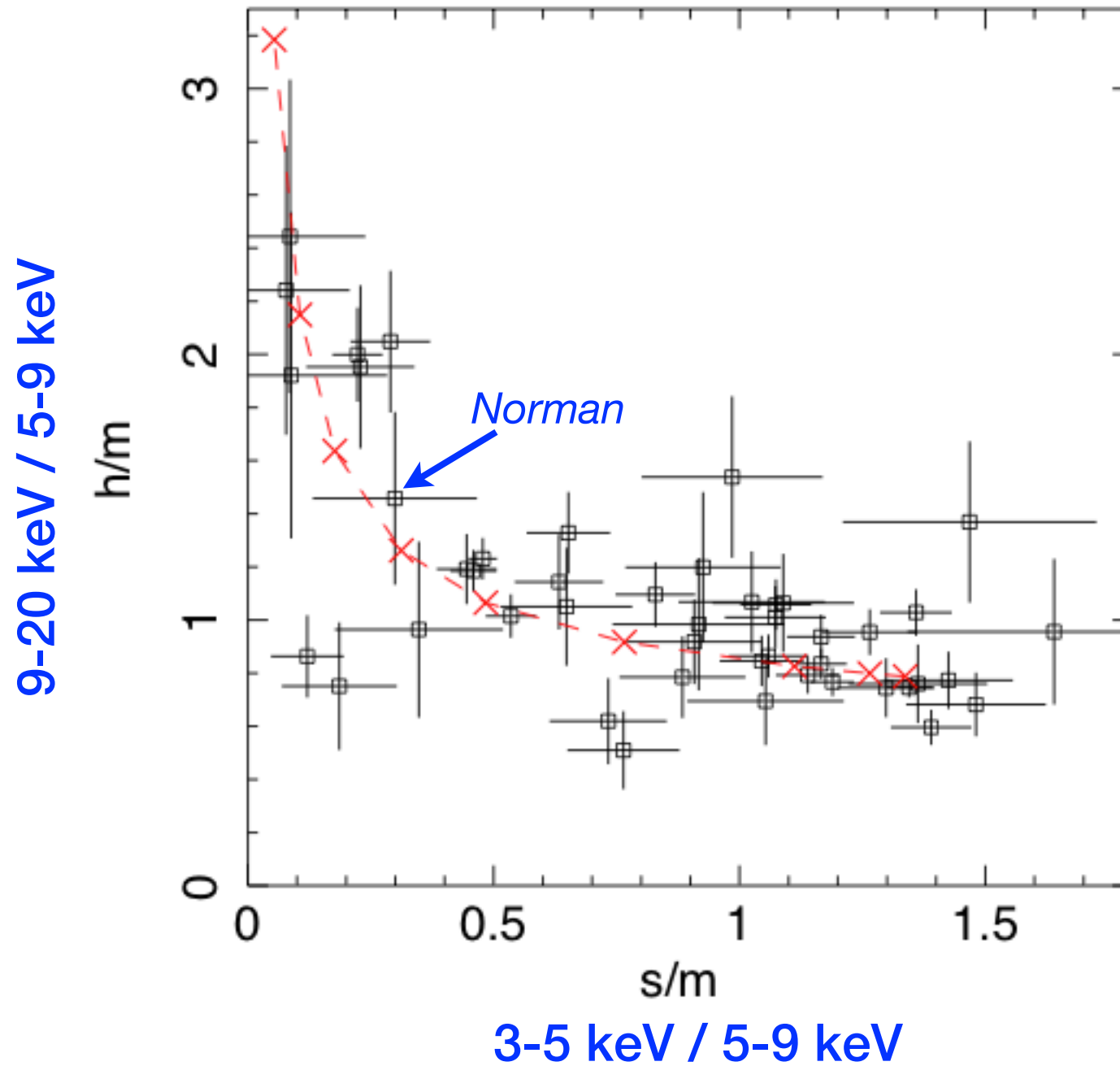
# Sample

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- Extracted from the first XMM-CDFS catalogue (146 sources)
- 44 objects at  $z > 1.7$

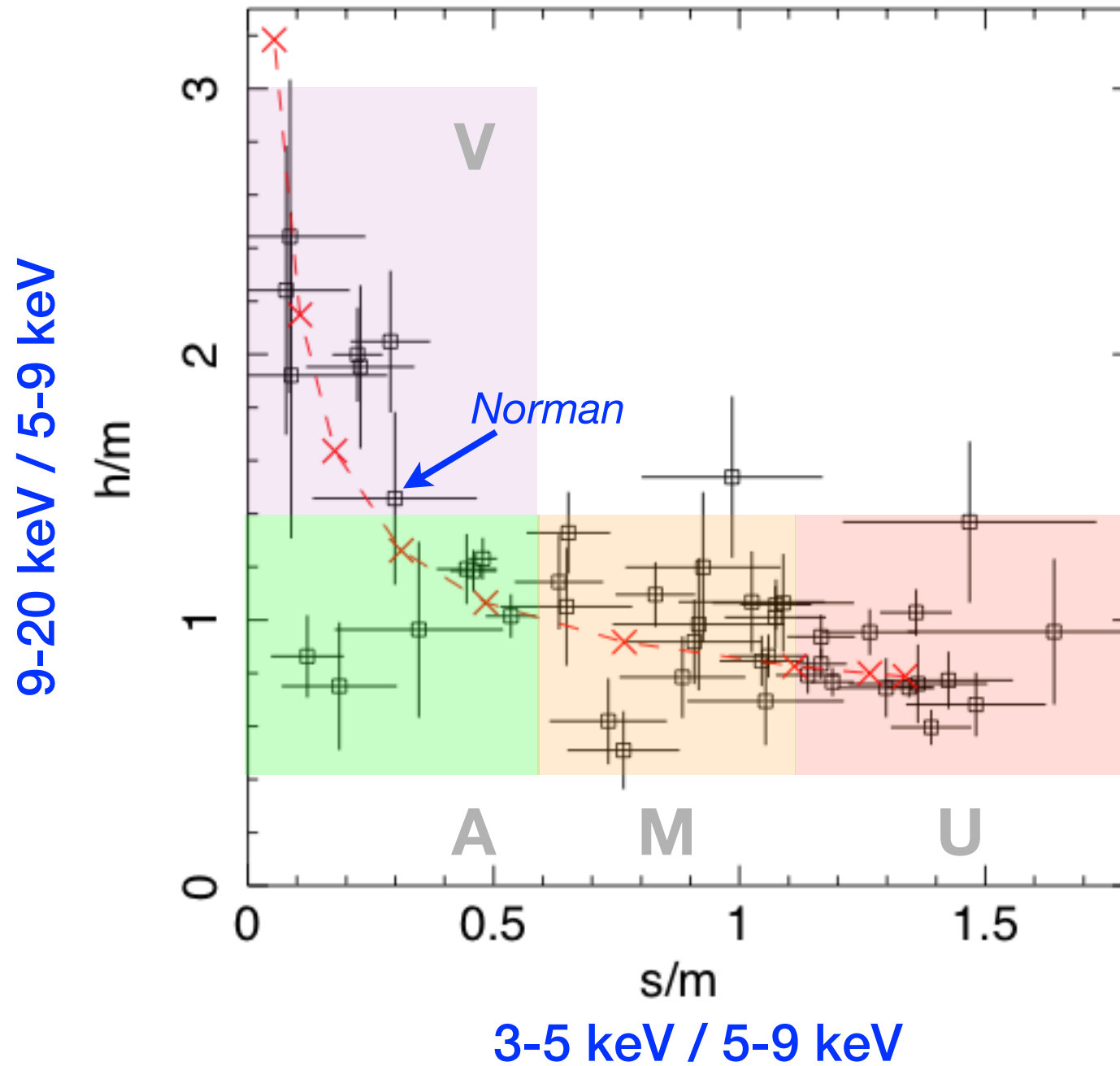


# X-ray colour-colour diagram



$\log nH = 21, 22, 22.5, 23, 23.3, 23.5, 23.7, 23.85, 24$

# X-ray colour-colour diagram



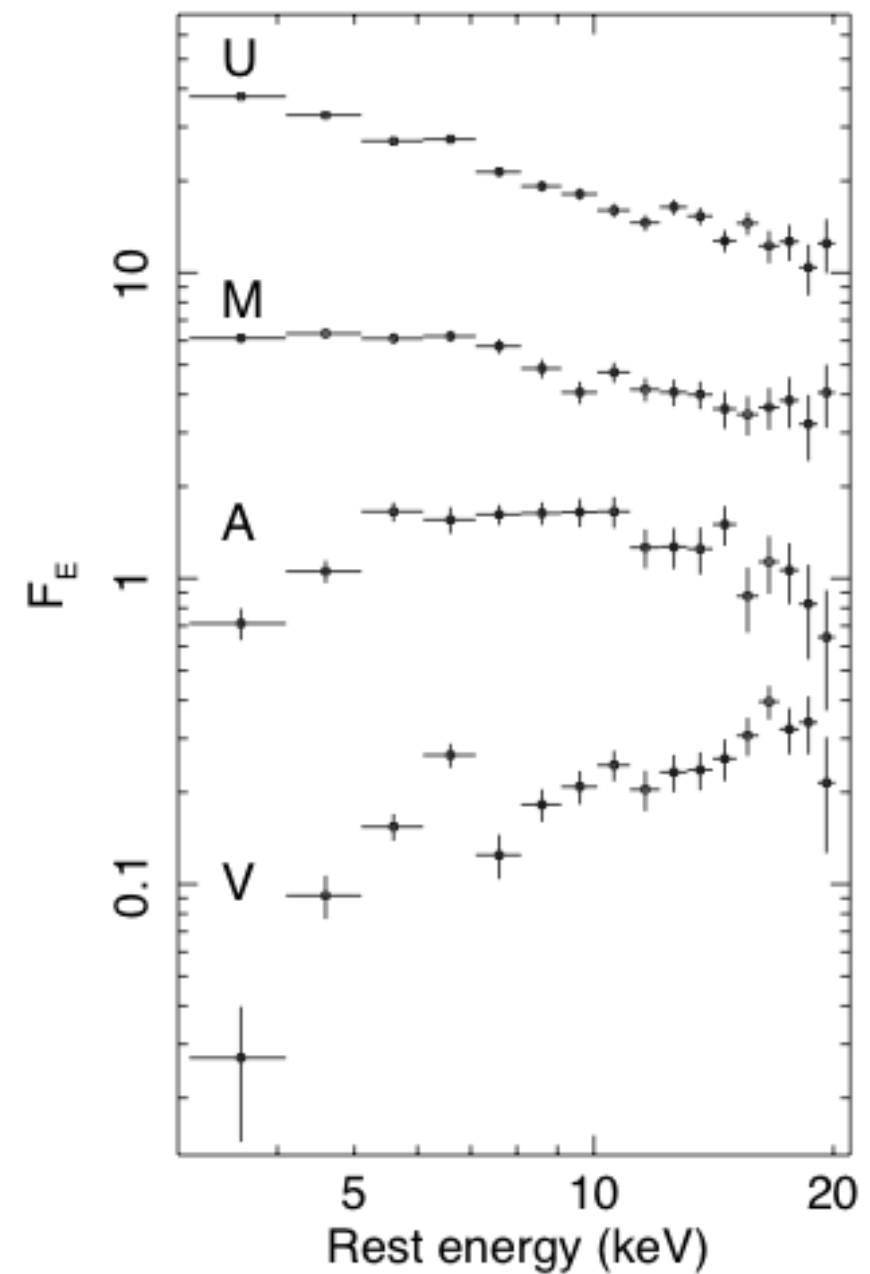
$\log nH = 21, 22, 22.5, 23, 23.3, 23.5, 23.7, 23.85, 24$

# Colour categories

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Rest-frame staked spectra in Flux density

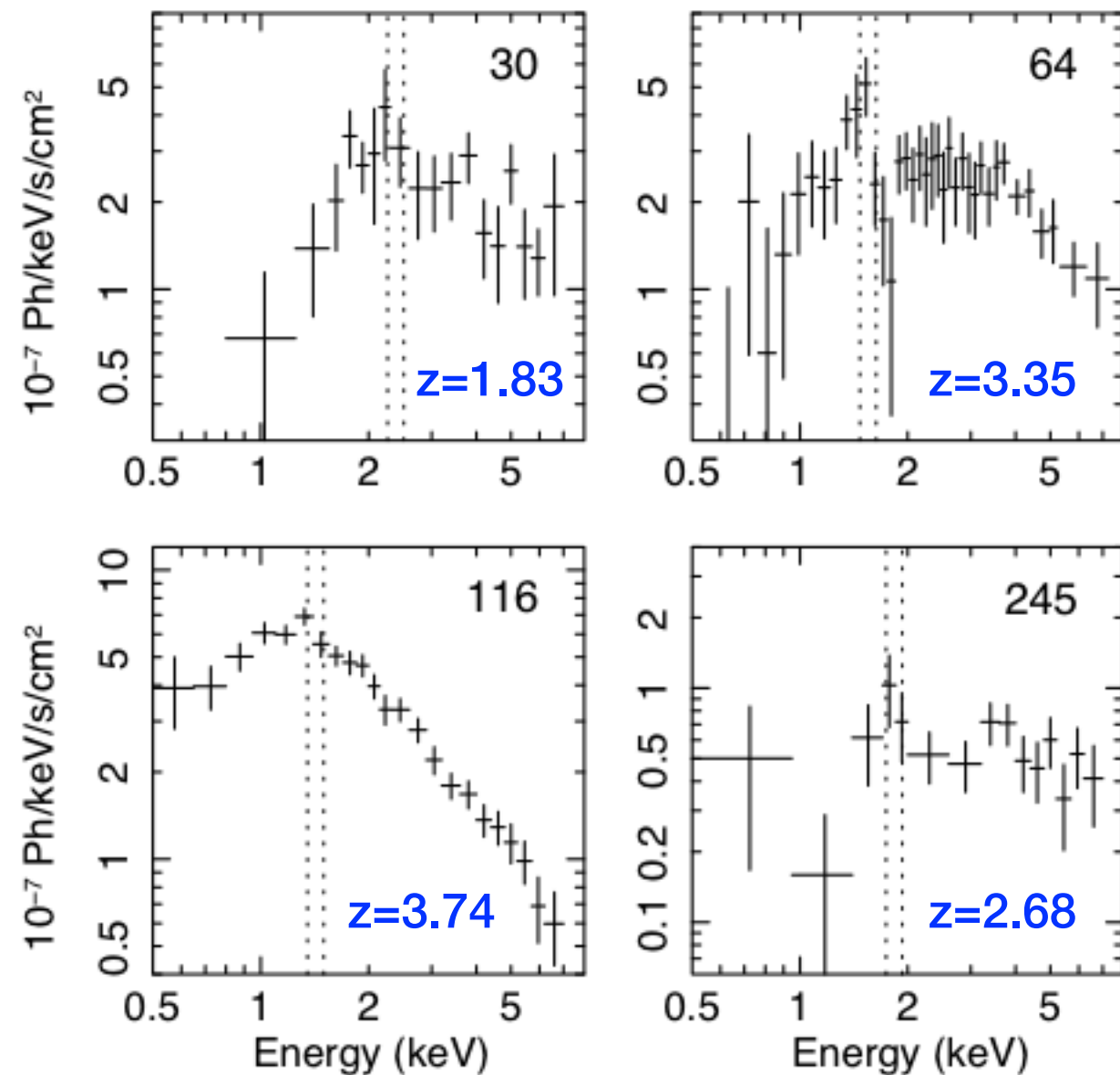
Category	$N$	$Z$	$\log L_{10-20}$
V	7	2.68	44.04
A	5	2.84	43.99
M	17	2.29	43.93
U	14	2.19	43.98



# X-ray redshift

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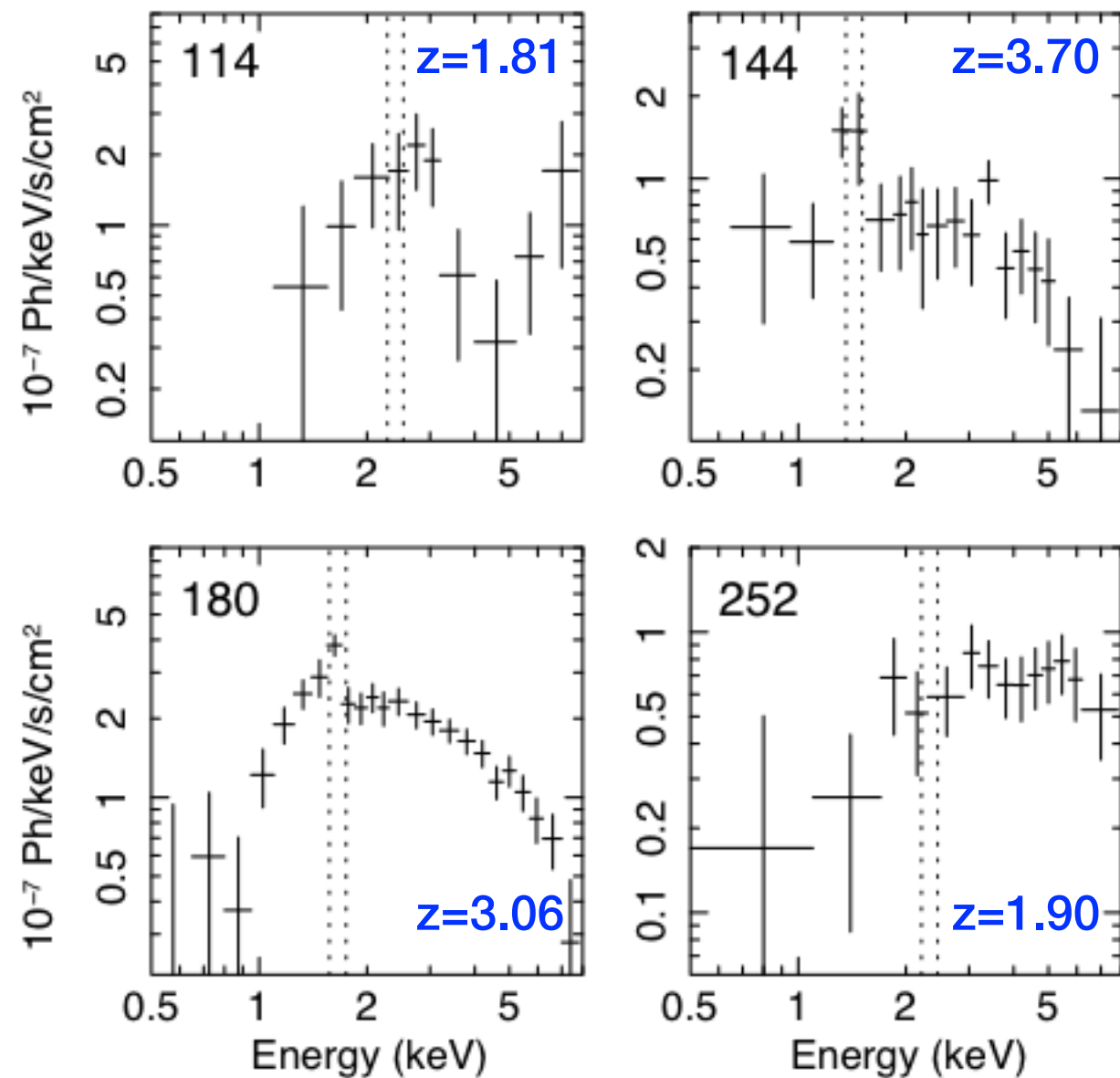
- For photo-z sources
- Using Fe K features of strongly absorbed sources, i.e., V/A categories



# 9-20 keV excess sources (V)

- Norman Sy2 (z=3.7)  
+ six others

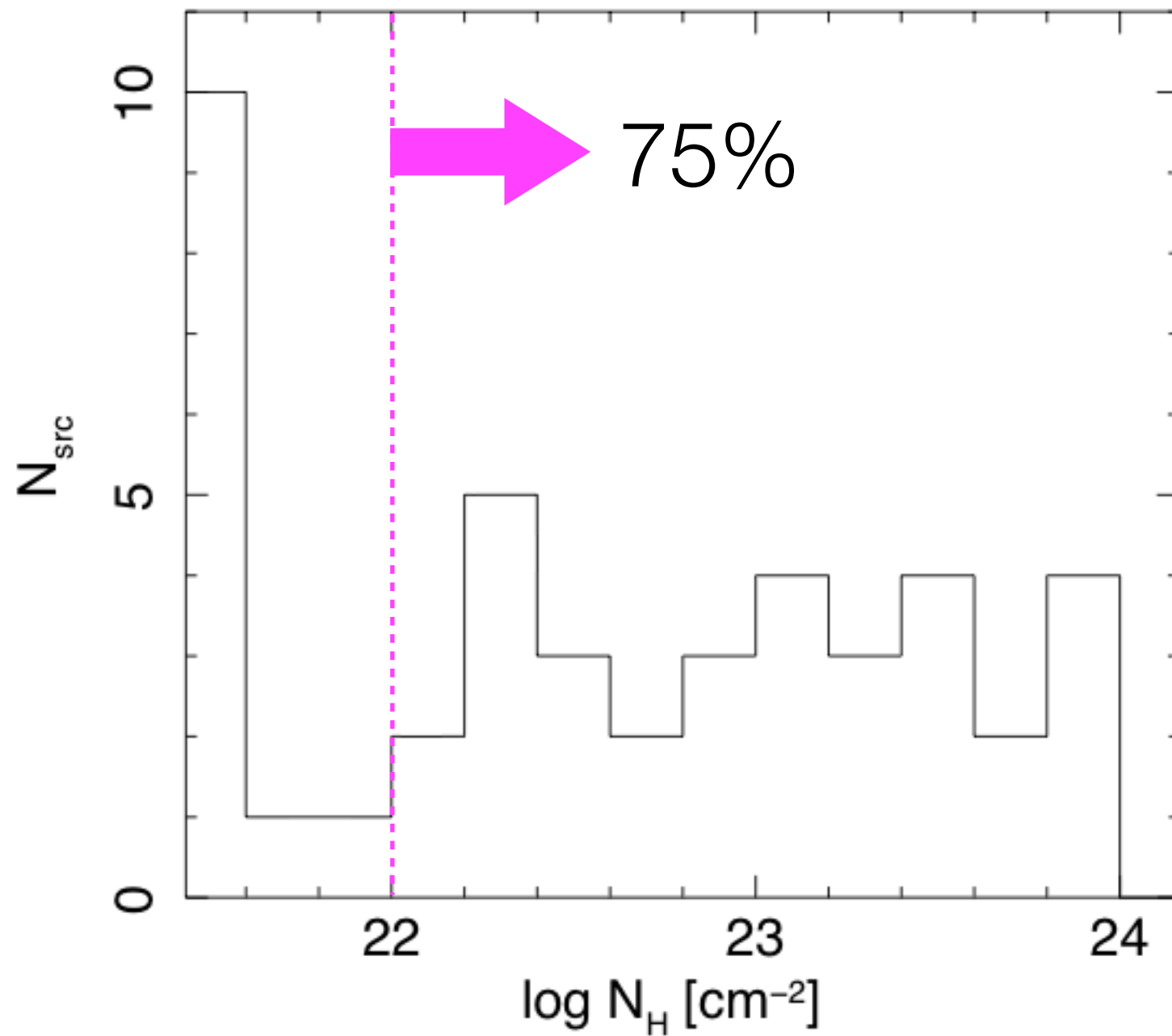
- $N_{\text{H}} = (0.5-1) \times 10^{24}$   
 $\text{cm}^{-2}$





# $N_H$ distribution, absorbed fraction

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# Fe K properties

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- V sources .... Strong (but not all)
- A/M sources .... Weak (generally undetected)
- U sources .... EW~0.12 keV (stronger than expected for  $\log L_x = 44$ )

PID 352: a strongly absorbed, powerful source  
with fast outflow

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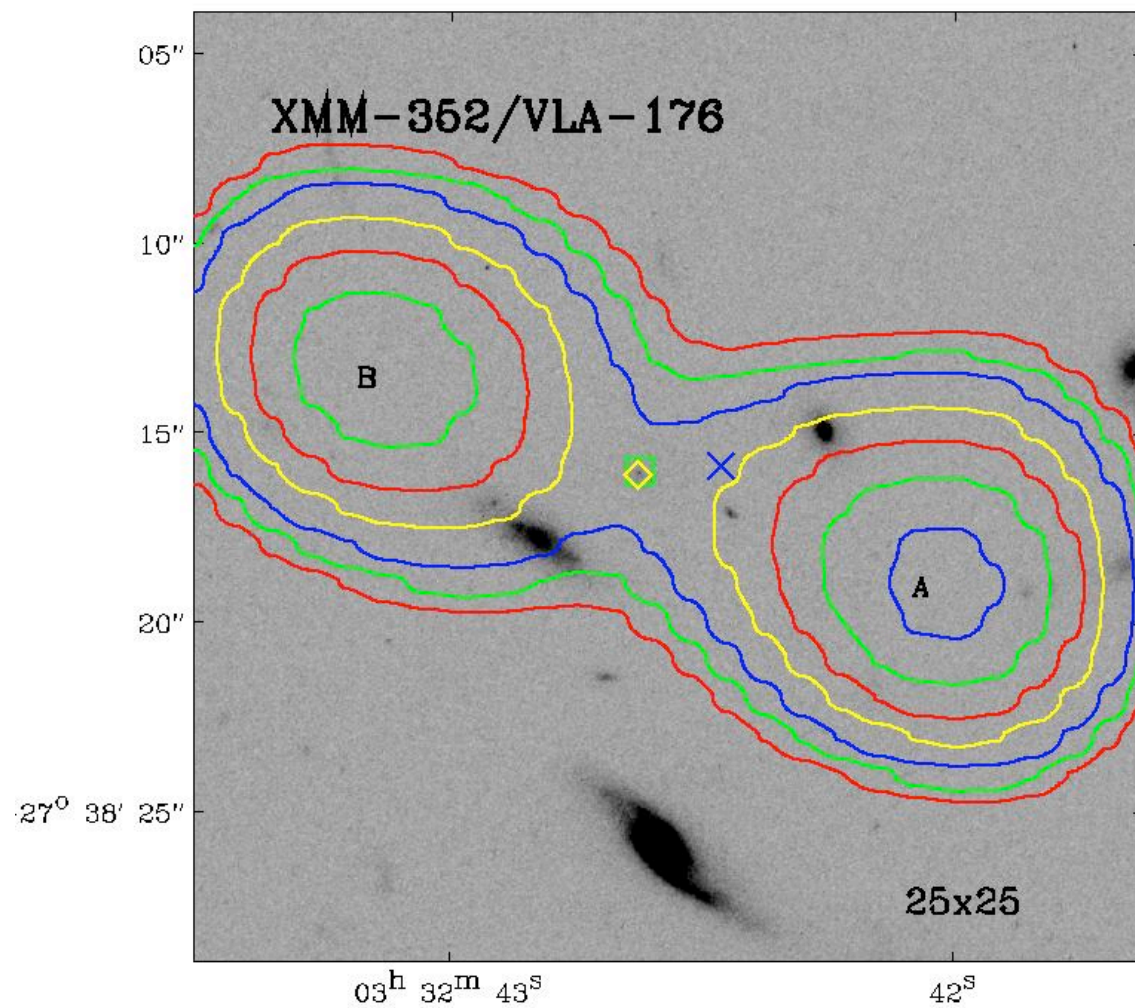
# General properties

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- Optically faint, infrared bright source
- Only photo-z ( $z=1.78$ ) available --> X-ray  $z = 1.60$
- Double radio source (FR II)
- Bright X-ray source (3784 counts in rest 3-20 keV)
- $L(10-20 \text{ keV}) = 2e44 \text{ erg/s}$
- Would be in the A category

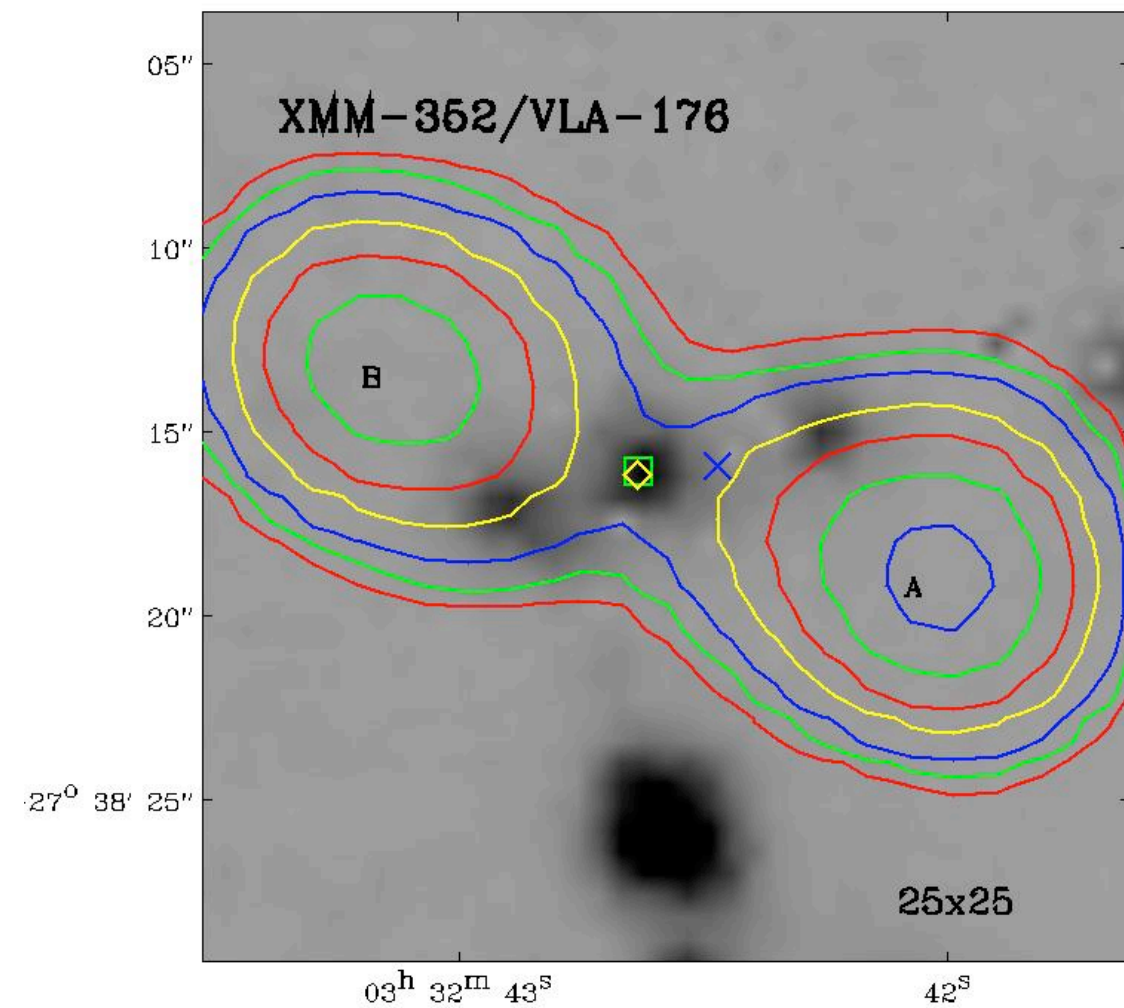
# Source identification

GEMS z



CENTER: R.A. 03 32 42.57 DEC -27 38 16.4

Spitzer IRAC 4.5  $\mu\text{m}$



CENTER: R.A. 03 32 42.58 DEC -27 38 16.5

# X-ray spectrum

$$N_H \sim 4 \times 10^{23} \text{ cm}^{-2}$$

