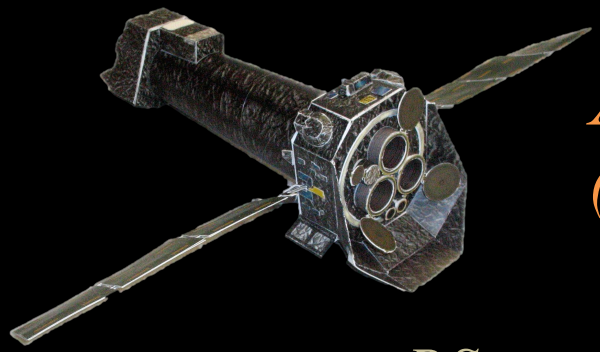
AGN diagnostic plot in the WISE and 3XMM era: the role of variability



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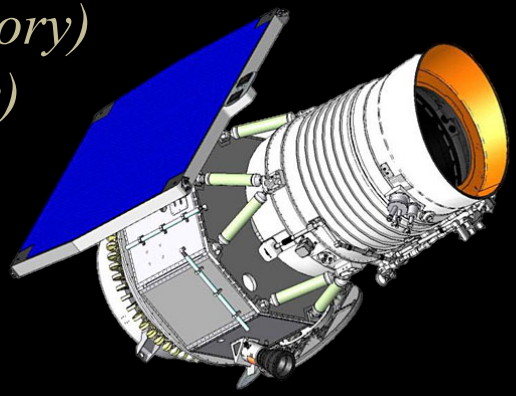


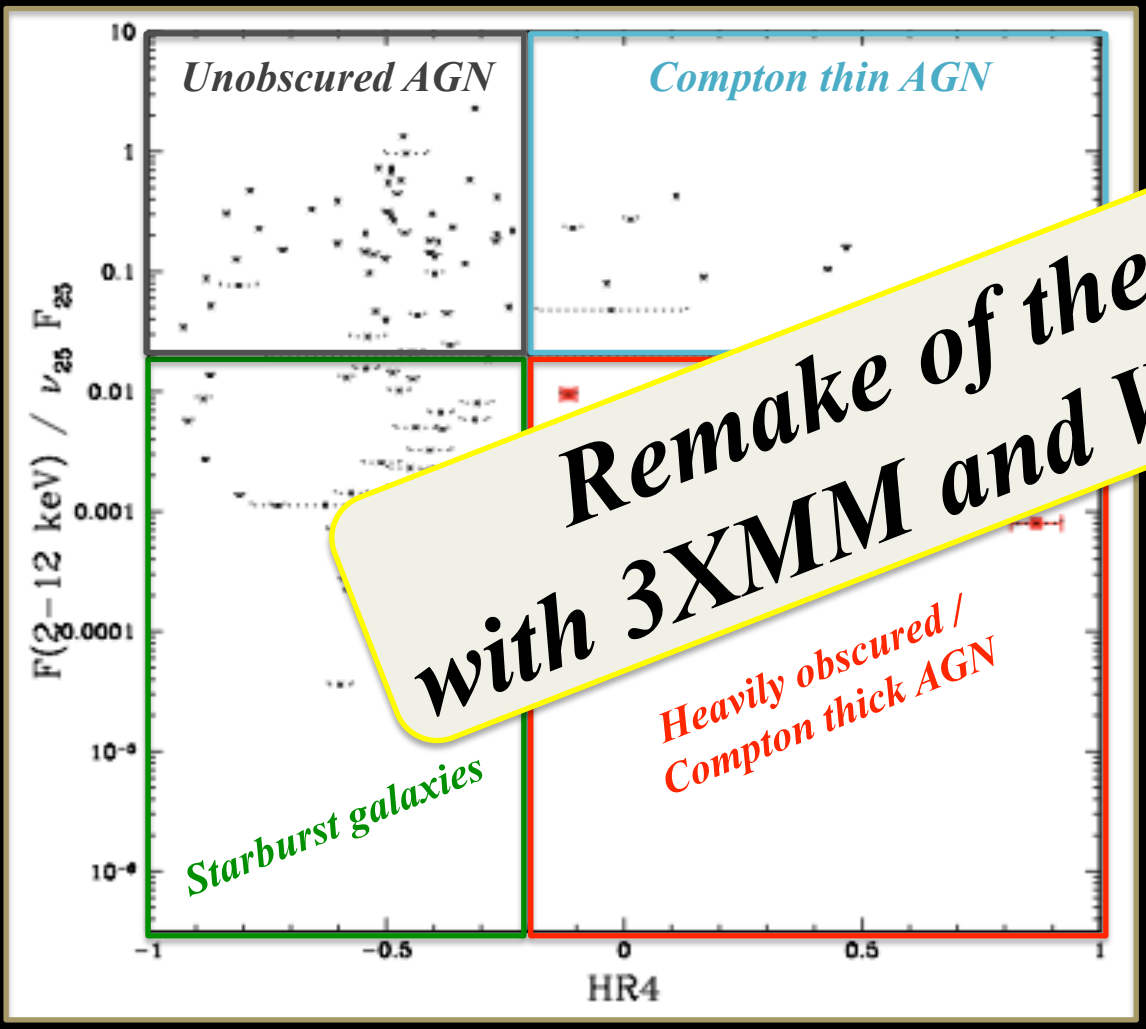
Active Galactic Nuclei 12 – Naples, 26-29 September 2016

Outline

- *2XMM-IRAS vs 3XMM-WISE diagnostic plot*
- *Catching the origin of variability*
- *Some examples of variable sources*
- *Conclusions and future perspectives*

Diagnostic plot for AGN classification

✧ *Severgnini et al. (2012)*



Remake of the plot with 3XMM and WISE data

145 sources

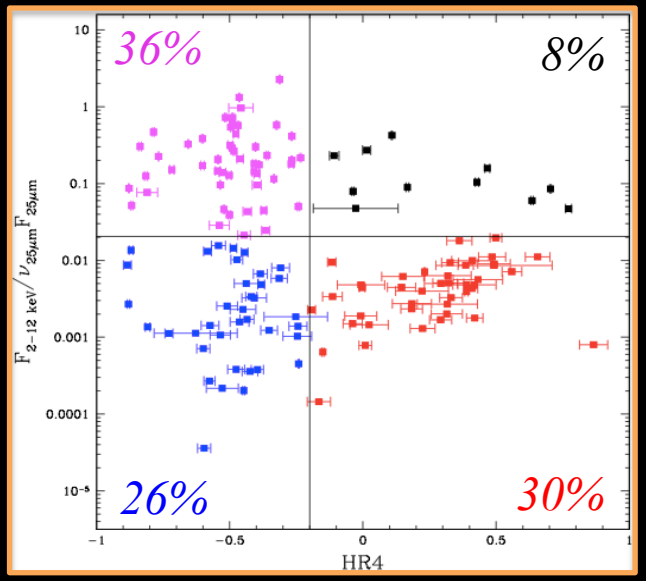
$F_X(4.5\text{-}12\ keV) > 10^{-13}\ erg\ cm^{-2}\ s^{-1}$

$0.14\ Jy < F_{25\mu m} < 544\ Jy$

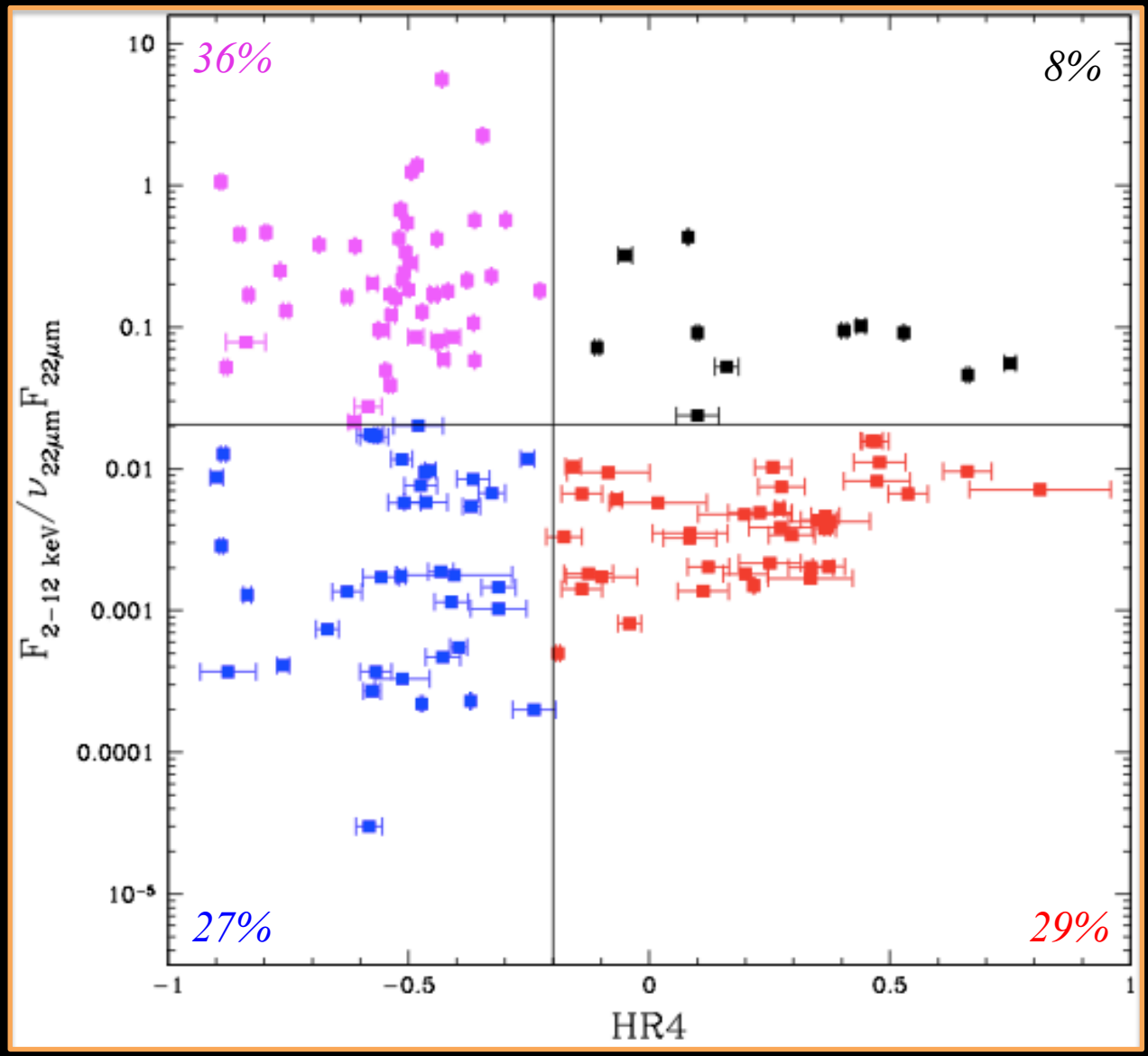
$$HR4 = \frac{cts\ (4.5\text{-}12\ keV) - cts\ (2\text{-}4.5\ keV)}{cts\ (4.5\text{-}12\ keV) + cts\ (2\text{-}4.5\ keV)}$$

2XMM-IRAS vs 3XMM-WISE plot

2XMM-IRAS



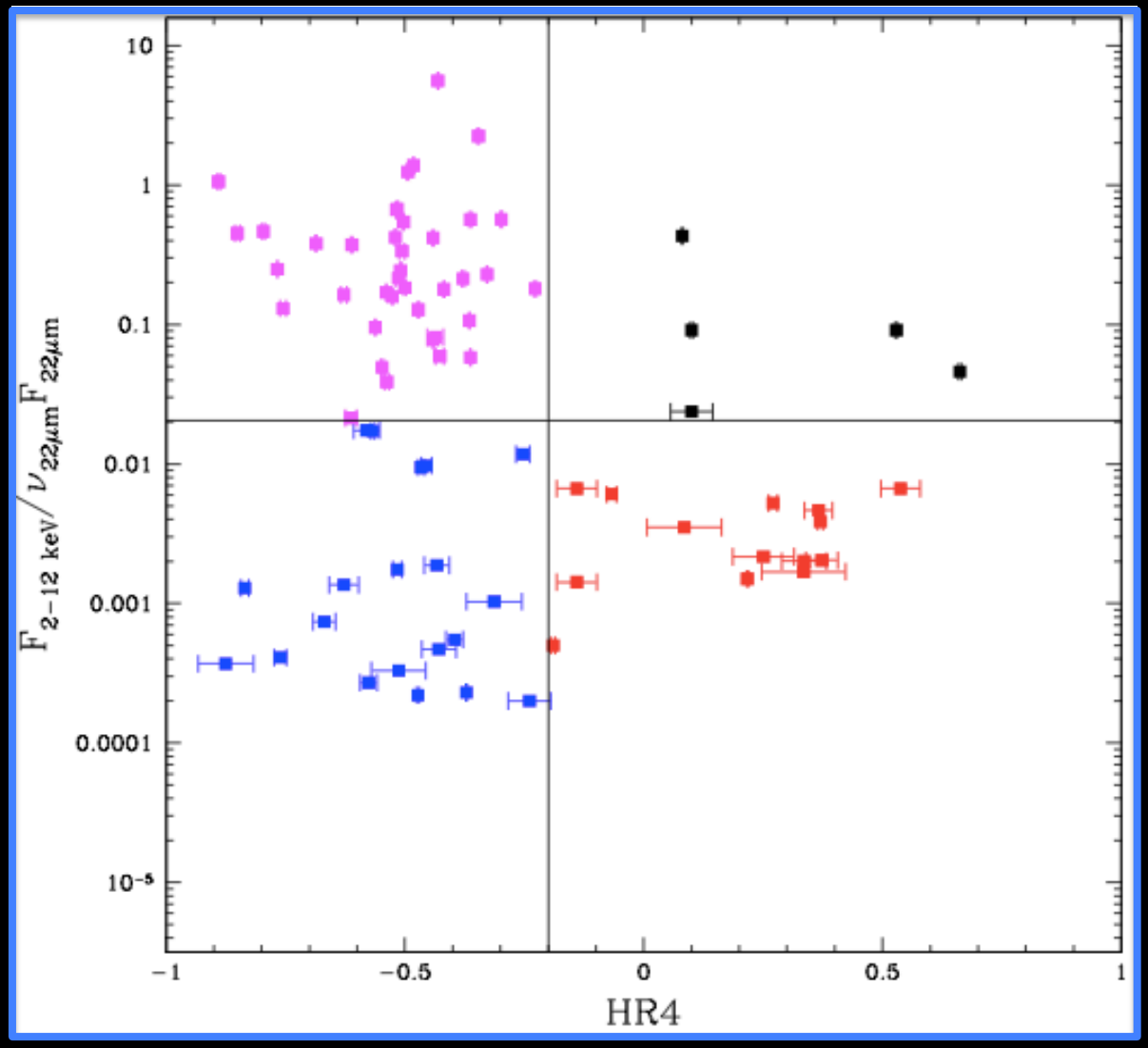
3XMM-WISE



- *Stability of the diagnostic plot*
- *Only <5% of the sources change its location within the plot*

Does variability play a role?

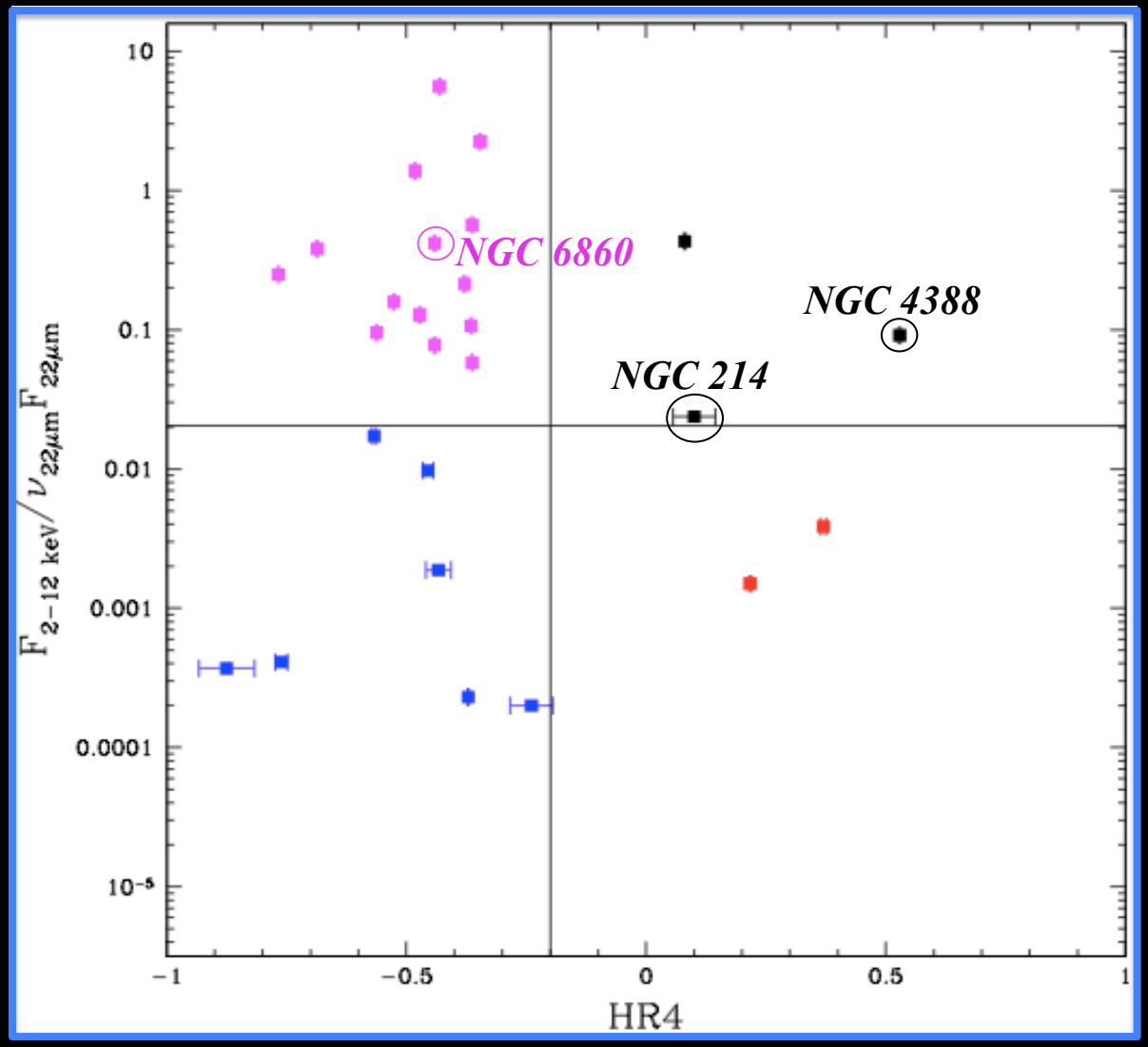
Sources with multiple detections in the 3XMM catalogue



~55% of the sources

Does variability play a role?

Sources with multiple detections in the 3XMM catalogue

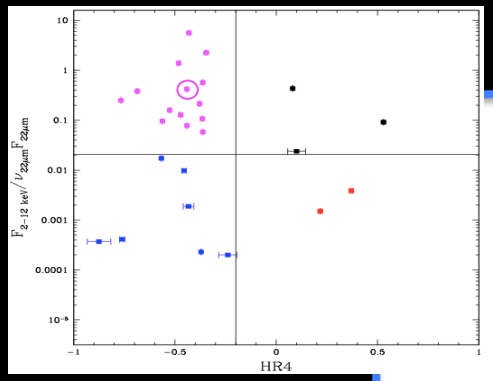


check for variability

$\Delta F_X > 2$ *and/or* $\Delta HR4 > 2$

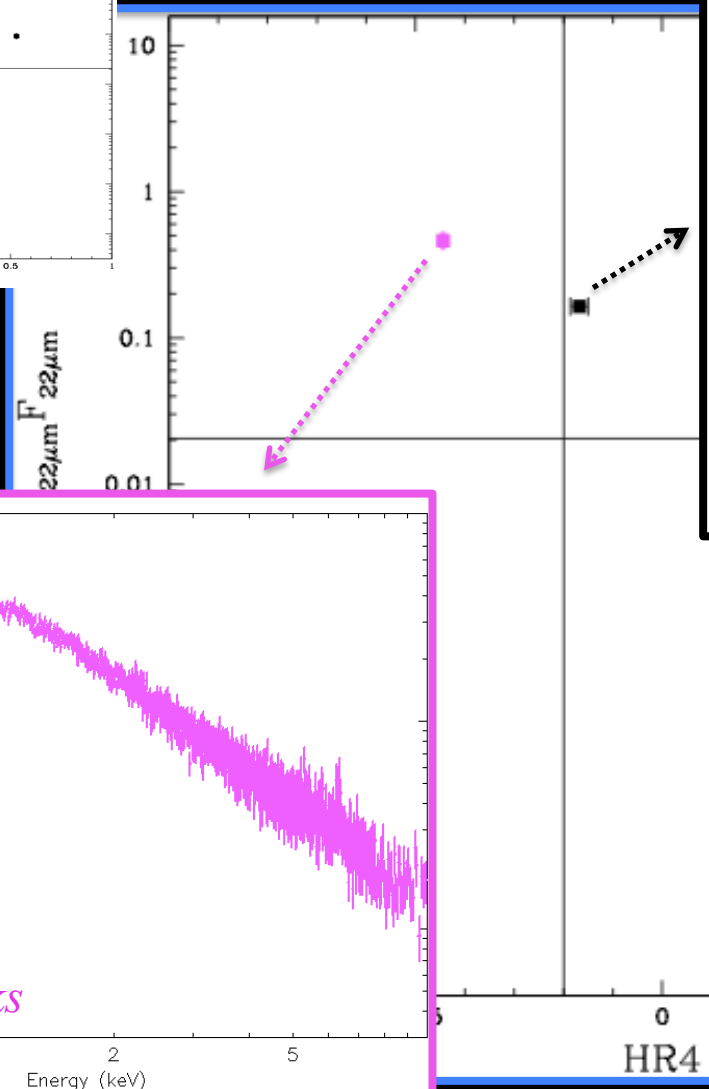
~33% of the sources with multiple detections

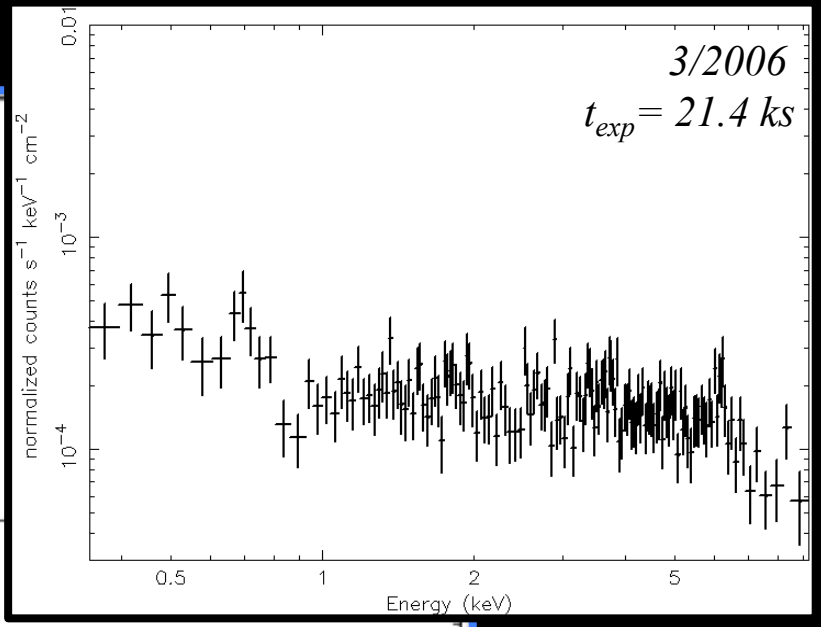
Some examples of variable sources - NGC 6860

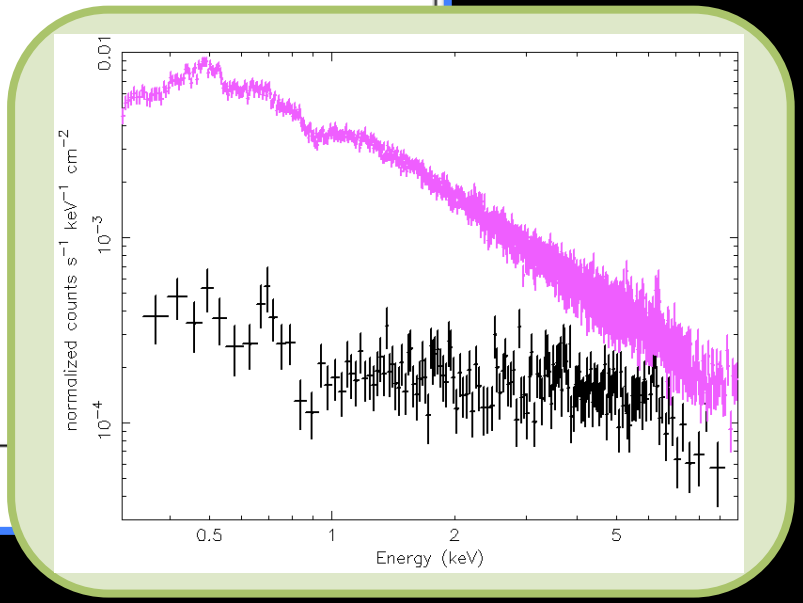


Winter et al. (2007)

z ~ 0.015



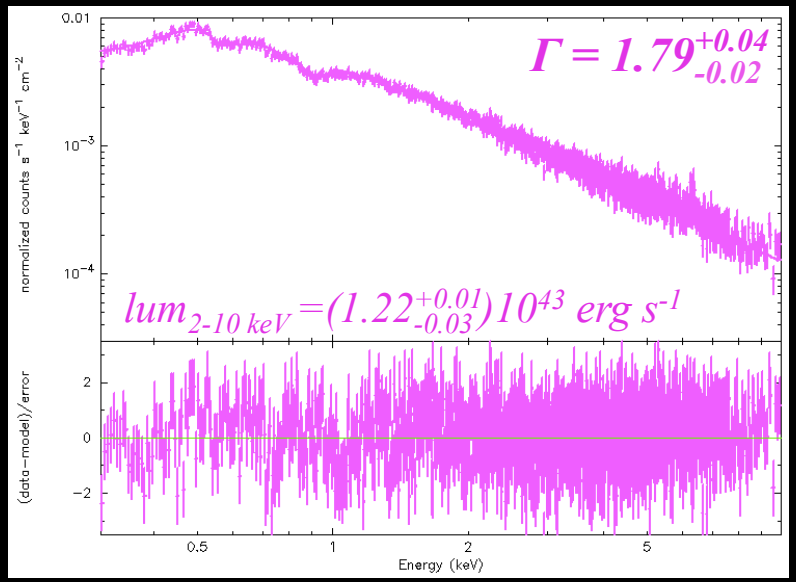




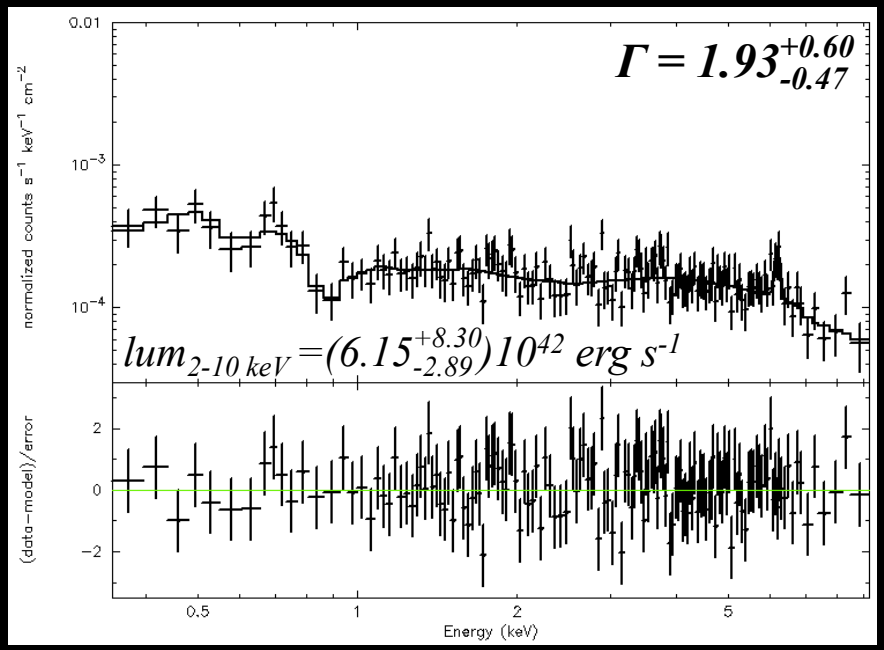
Winter et al. (2010)

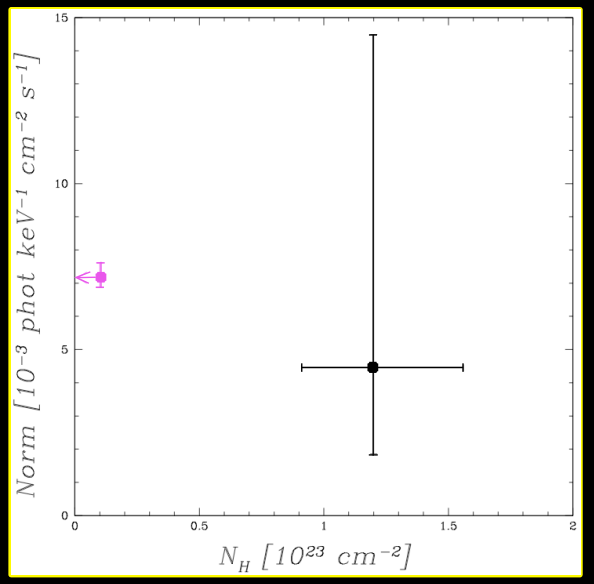
Some examples of variable sources - NGC 6860

- *absorbed powerlaw*
- *ionized absorber*
- *reflection component*
- *FeI k_α line*

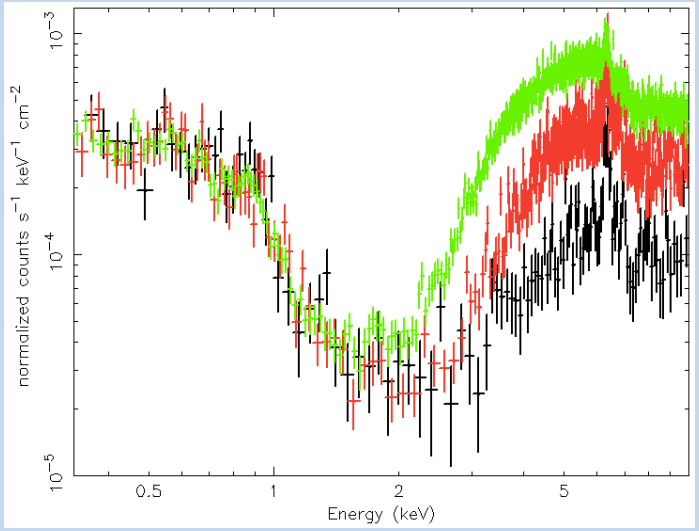


z ~ 0.015

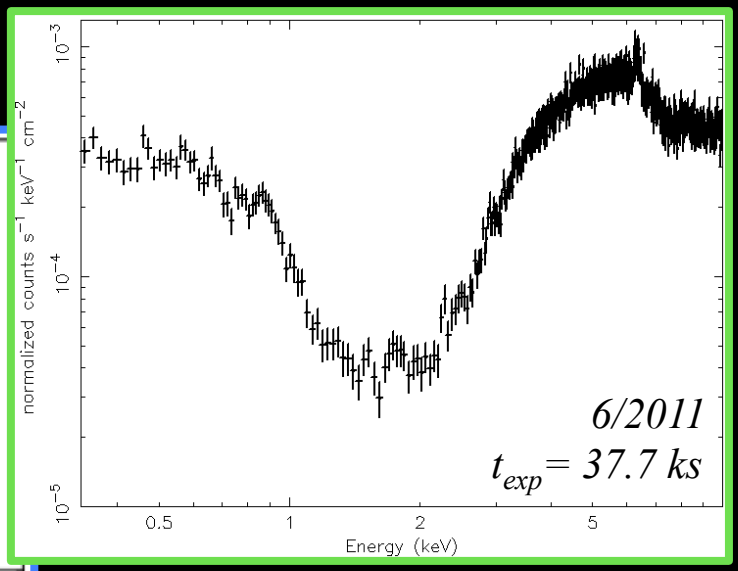


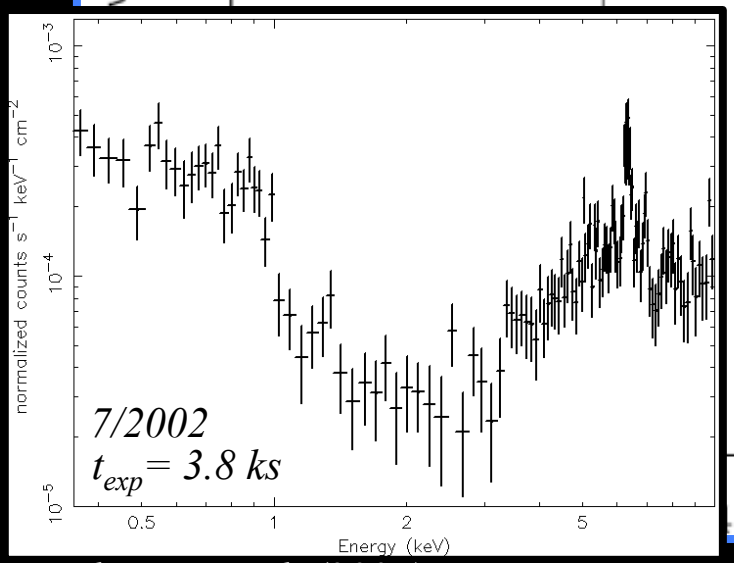


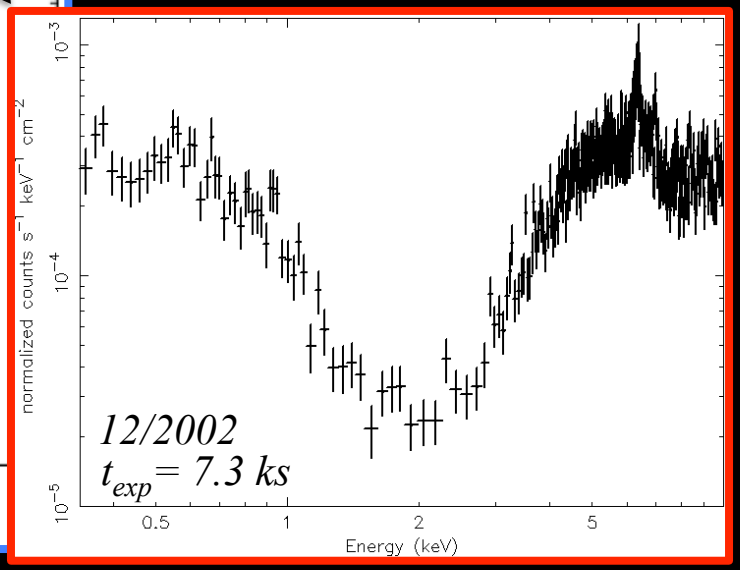
Some examples of variable sources - NGC 4388



z ~ 0.008



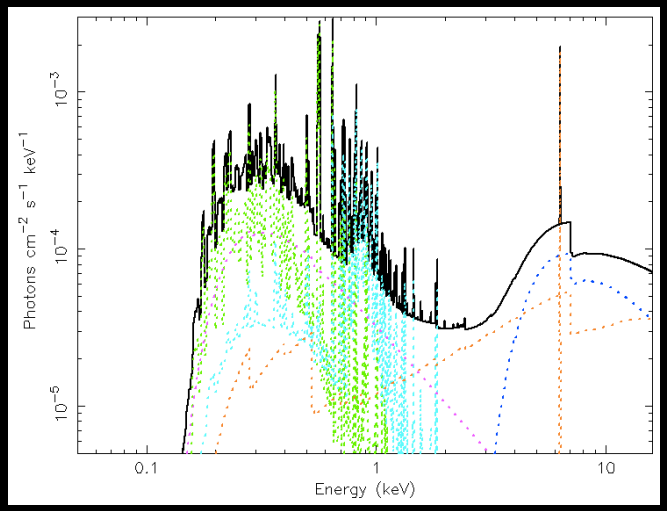




Beckmann et al. (2004)

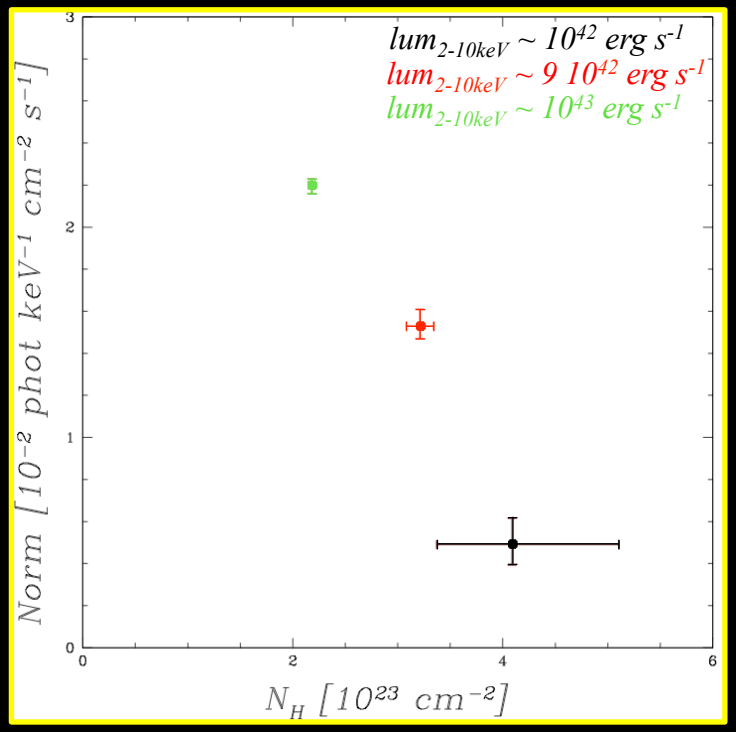
Beckmann et al. (2004)

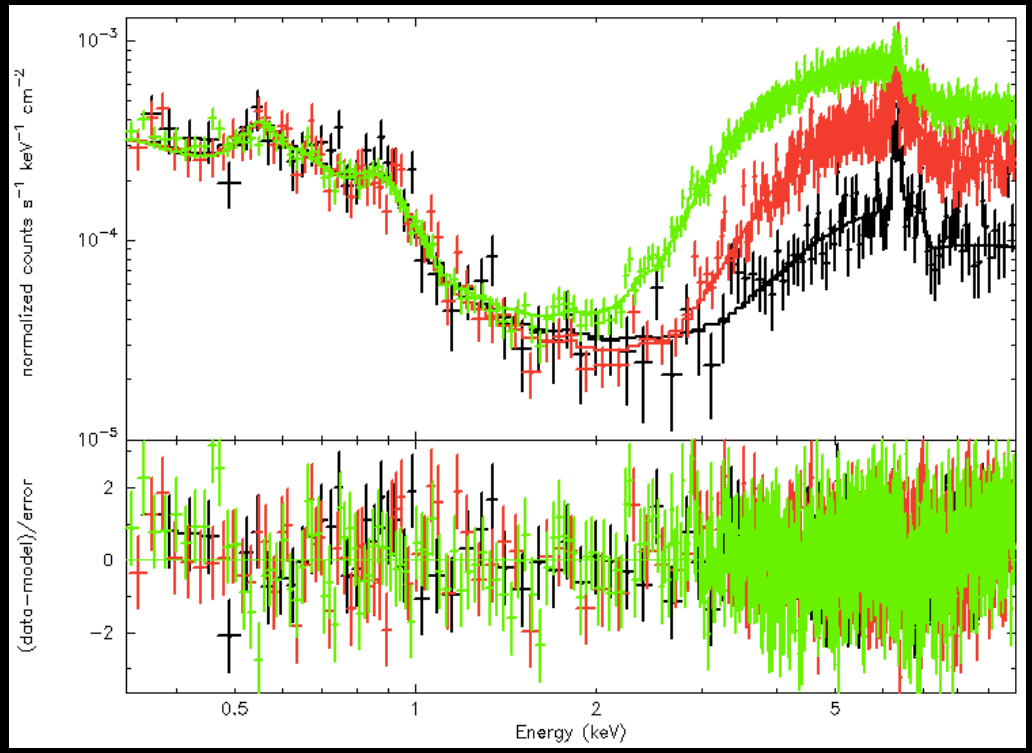
Some examples of variable sources - NGC 4388



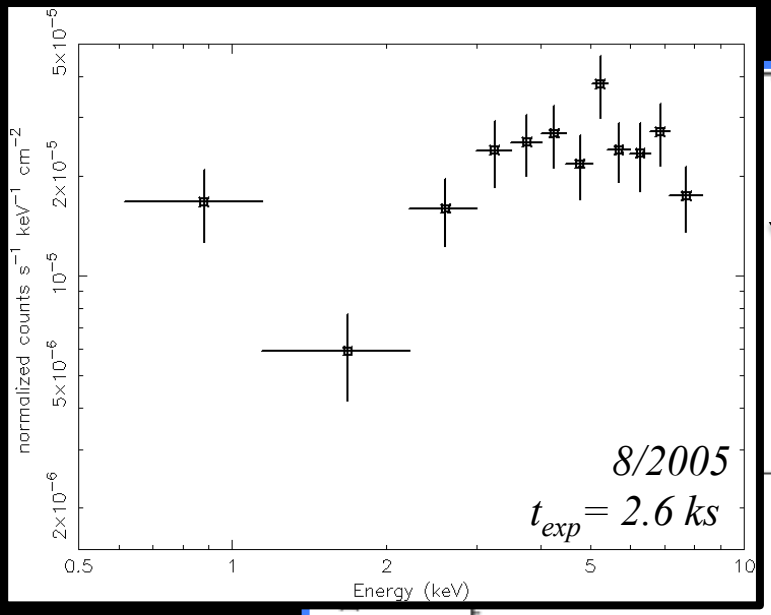
- *thermal components:* $kT_1 = (0.19 \pm 0.01)$ *keV*
  $kT_2 = (0.67^{+0.04}_{-0.03})$ *keV*
- *scattering < 1%*
- *absorbed powerlaw:* $\Gamma = 1.7$ *(fixed)*
- *reflection component + FeI* k_α *line*

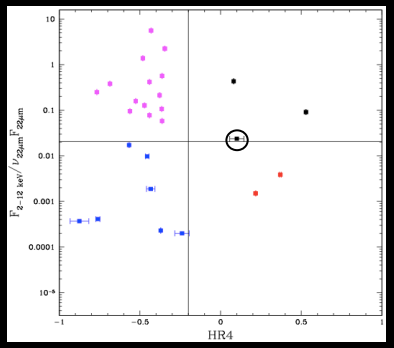
z ~ 0.008

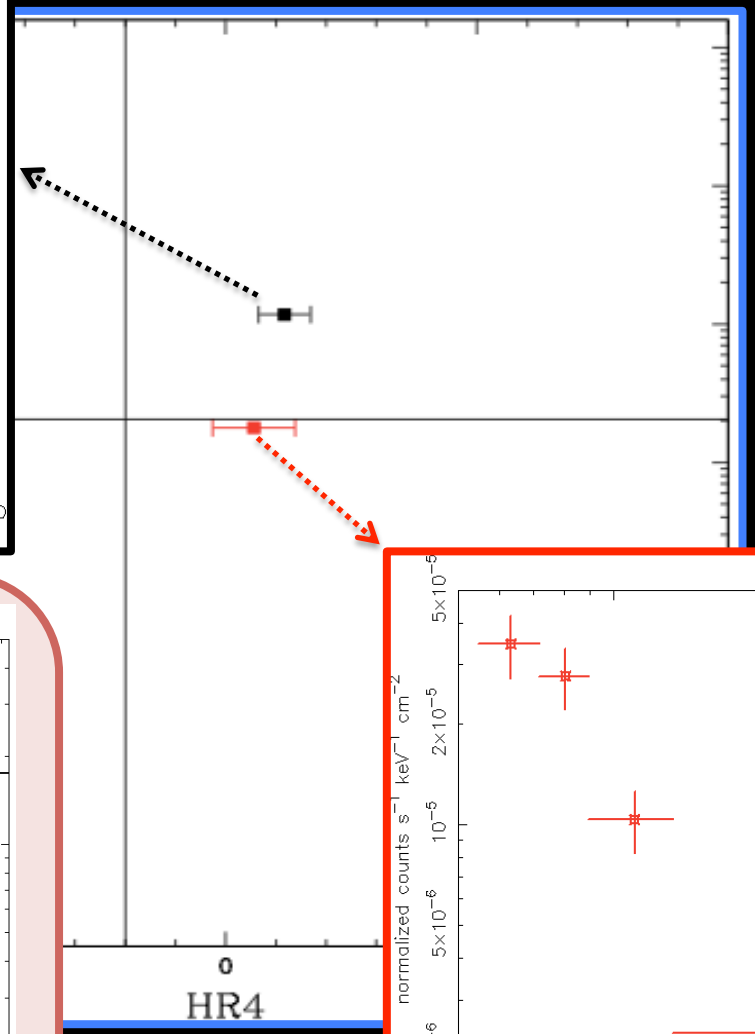


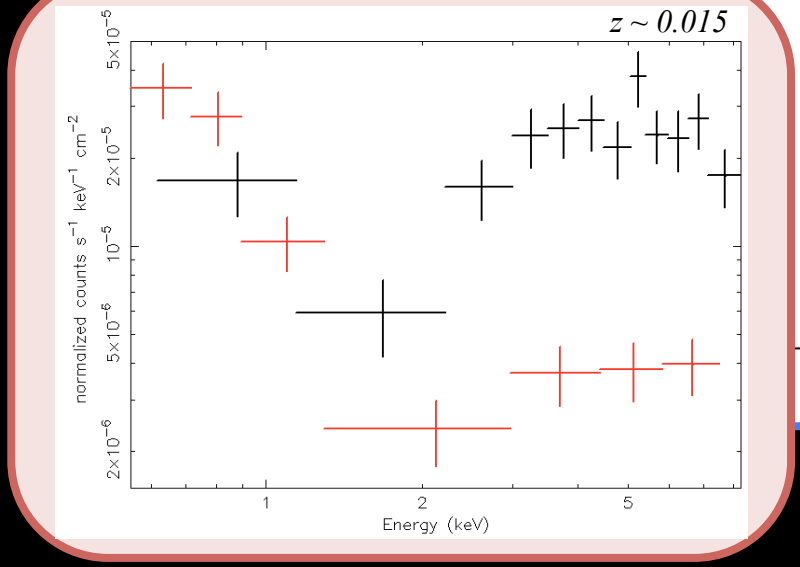


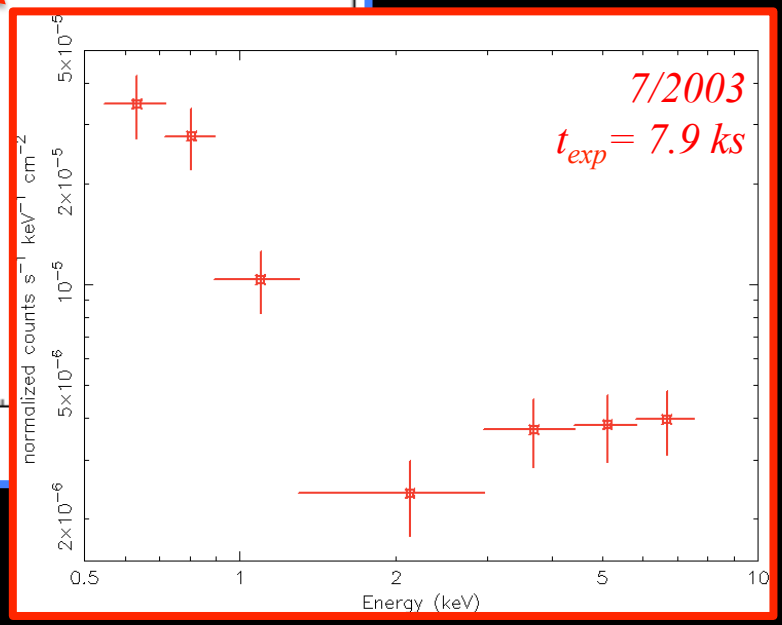
Some examples of variable sources - NGC 214



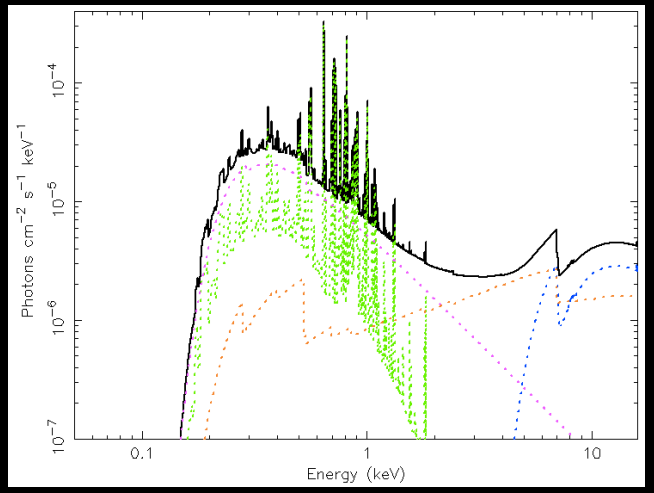








Some examples of variable sources - NGC 214



- *thermal component: $kT = 0.35^{+0.29}_{-0.10}$ keV*
- *scattering < 1%*
- *absorbed powerlaw: $\Gamma = 1.9$ (fixed)*
- *reflection component*

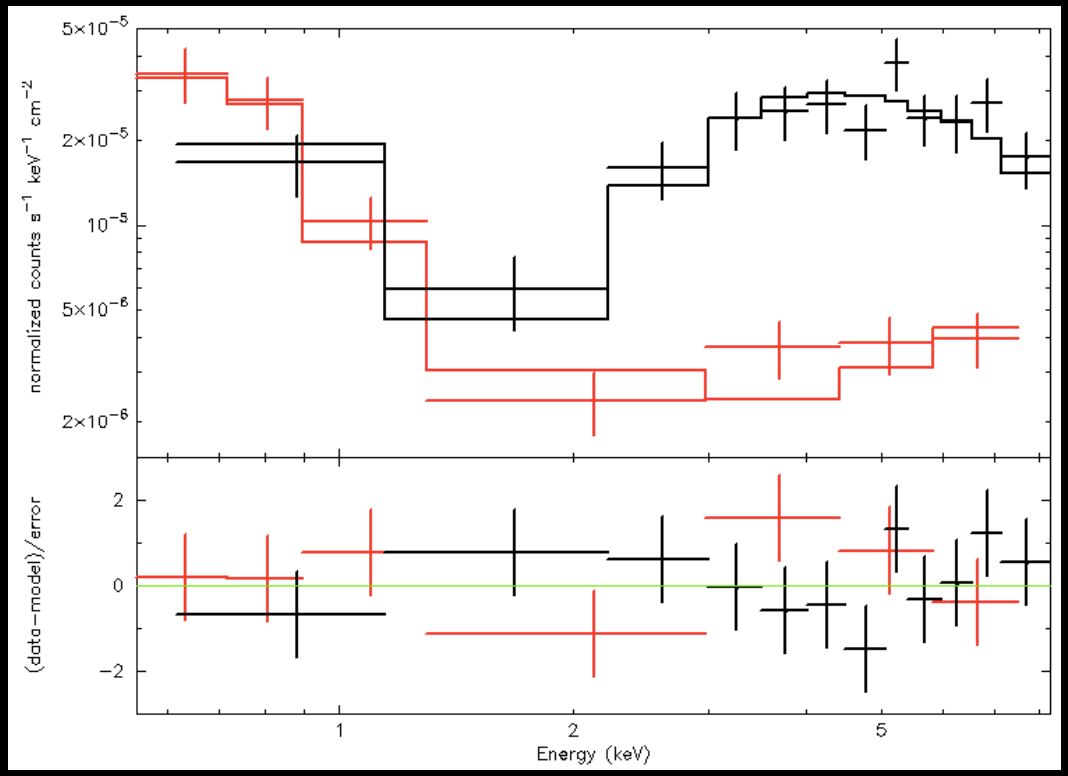
z ~ 0.015

$N_H = (1.19^{+0.43}_{-0.29}) 10^{23}$ cm^{-2}

$N_H = (1.23^{+0.97}_{-0.32}) 10^{24}$ cm^{-2}

$lum_{2\text{-}10keV} \sim 10^{42}$ erg s^{-1}

$lum_{2\text{-}10keV} \sim 10^{42}$ erg s^{-1}



Conclusions and future perspectives

Summary:

- *Revisiting mid-IR/X-ray selection of local AGN sources with the latest 3XMM and WISE data*
- *Investigation of the role of variability within the AGN selection and classification through a diagnostic plot*

Conclusions:

- *Plot stability*
- *Diagnostic plot as hint of the origin of source variability*
- *Overall, plot in agreement with spectral analysis*

Future perspectives:

- *Carry out variable sources spectral analysis*
- *XMM/NuSTAR proposal to investigate the origin of variability*
- *Investigation of starbursts variability*


Thank you!
Napoli, 26-29 September 2016
Active Galactic Nuclei 12
a Multi-Messenger perspective