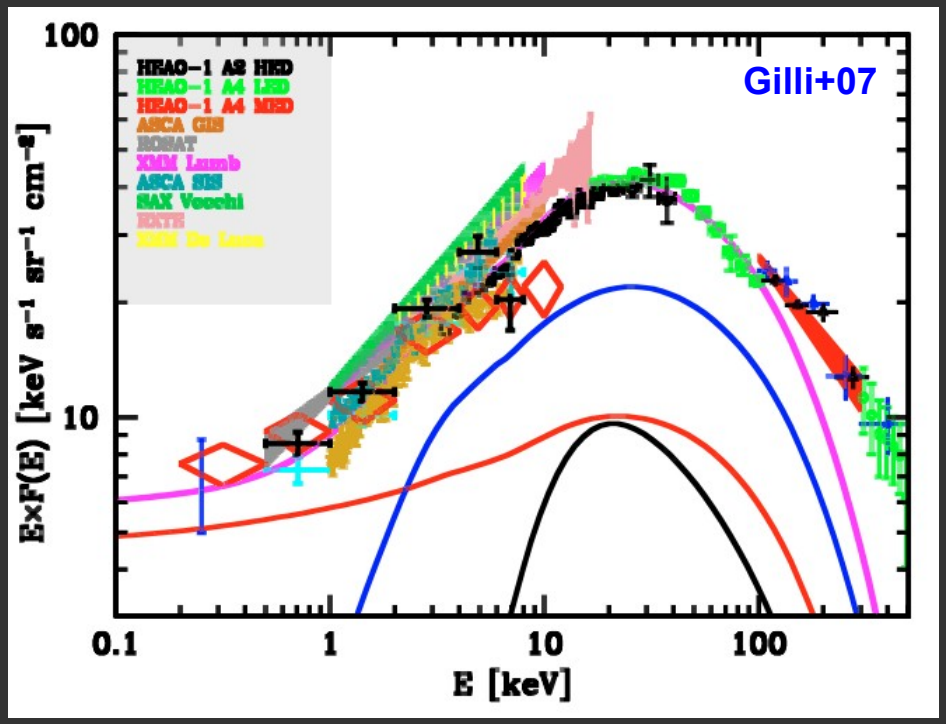
Compton Thick AGN in XMM-COSMOS

G. Lanzuisi

P. Ranalli, I. Georgantopoulos, A. Georgakakis, I. Delvecchio,

T. Akylas, S. Berta, A. Comastri, M. Brusa + COSMOS team...

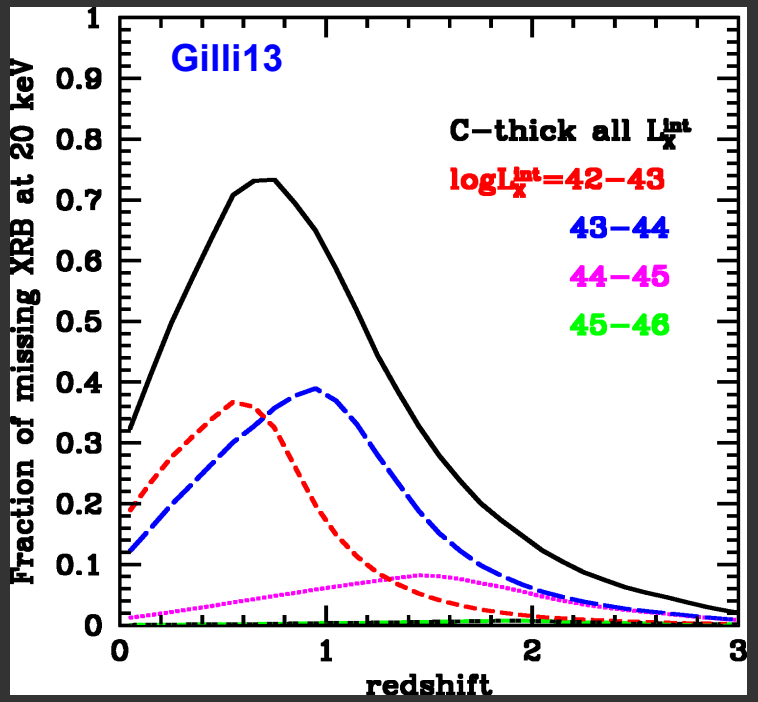
Why bother?



…see also D. Alexander's talk...

- CT needed to reproduce the XRB

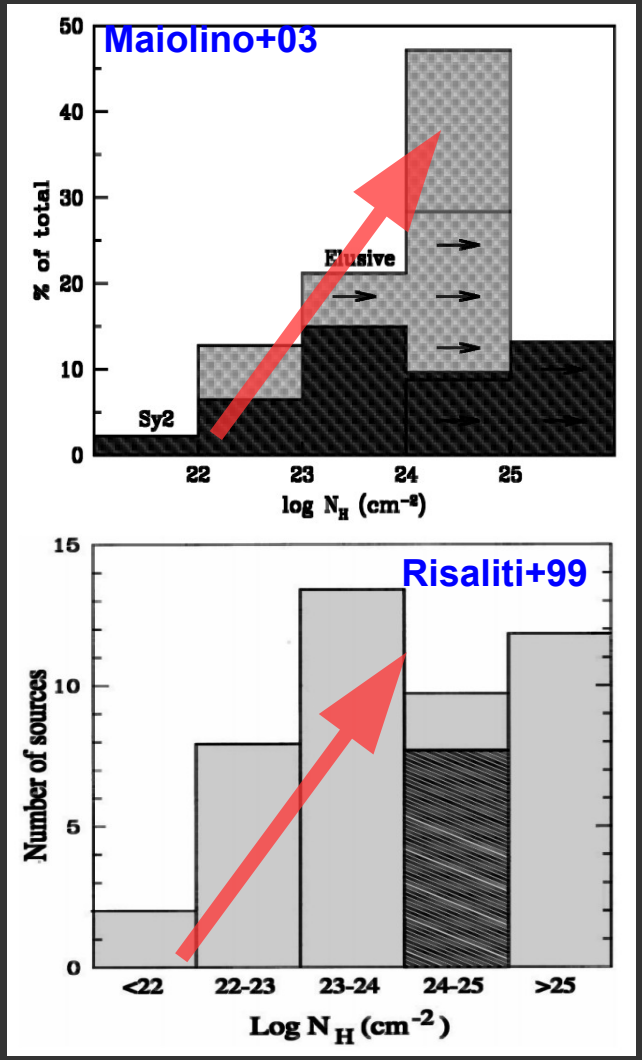
- Mostly from low luminous CT AGN @ z~1



http://www.oabo.inaf.it/~gilli/xrb.html

CT in the local Universe...

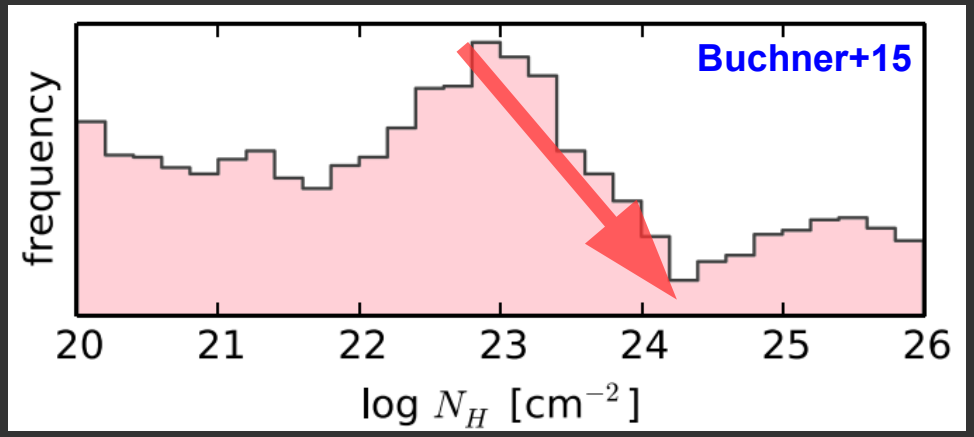
Common (>50% of Seyfert-2)
in the local Universe

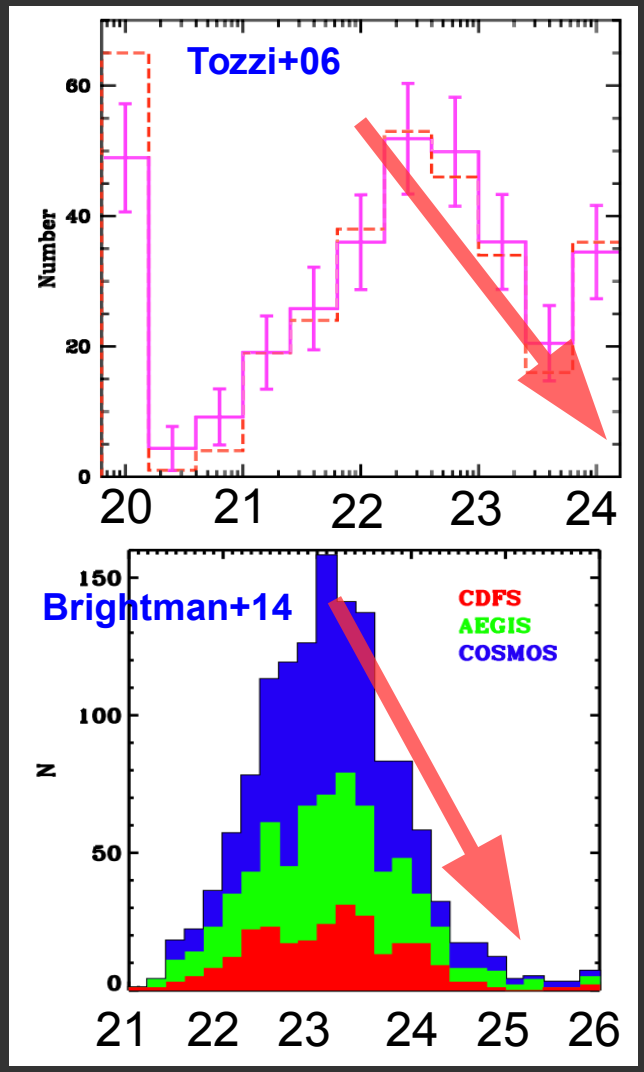


...and beyond that...

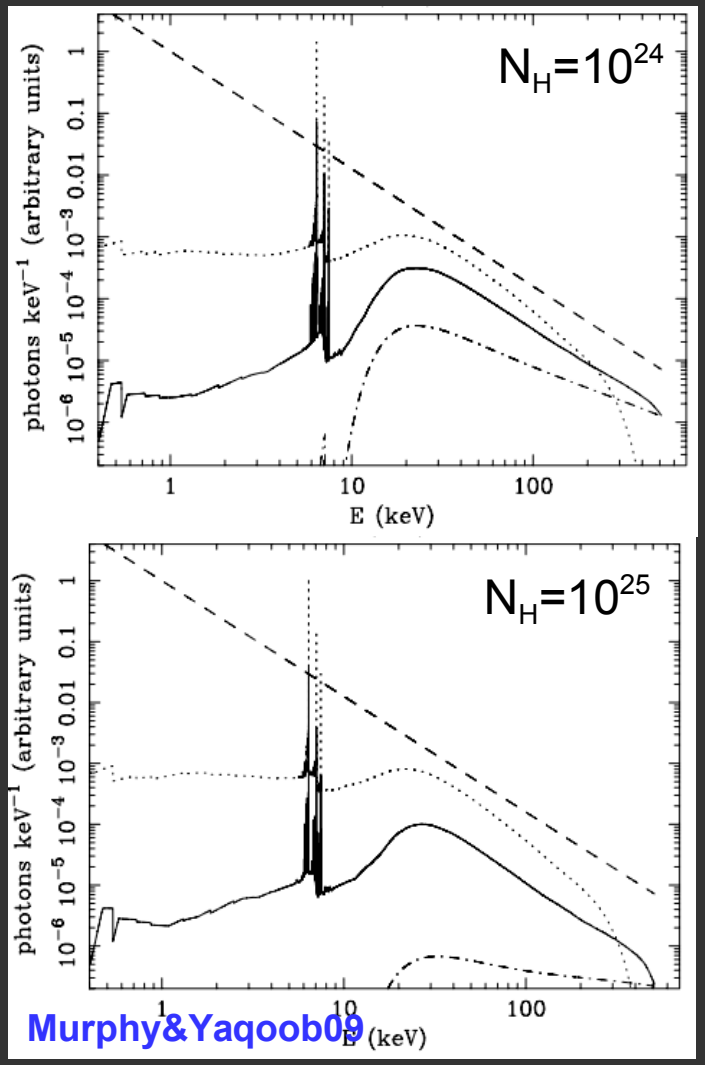
Common (>50% of Seyfert-2) in the local Universe

Difficult to detect in 2-10 keV beyond few tens of Mpc
e.g. Ricci+16





Hard to identify

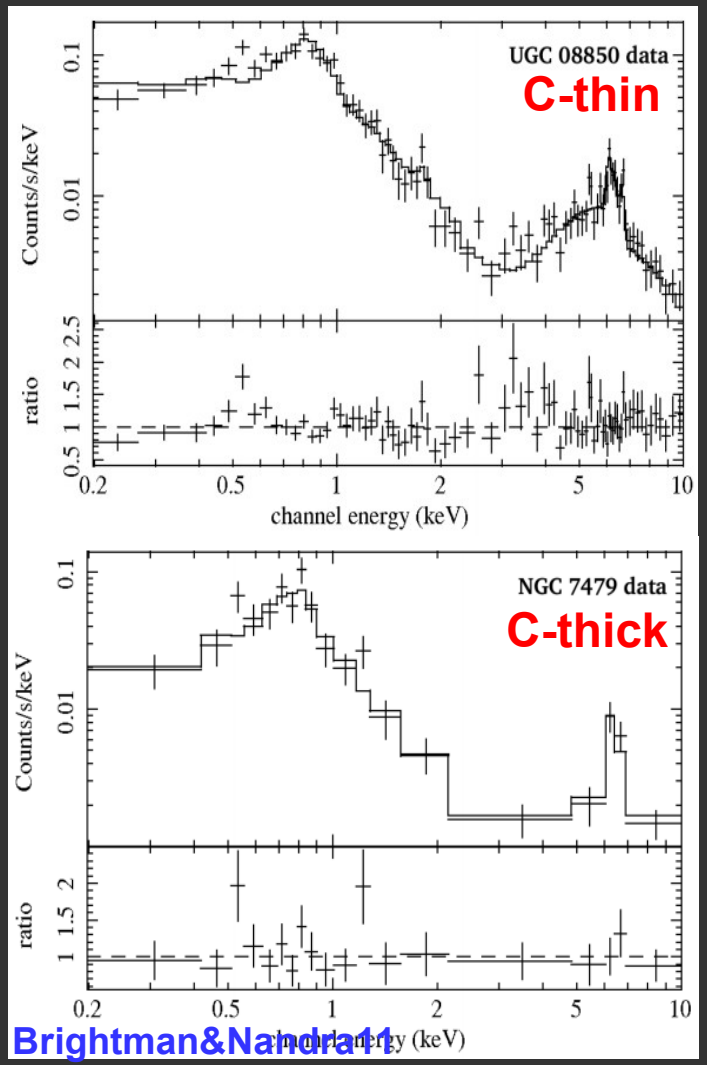


Murphy&Yaqoob09

- Factor **50-100 fainter in 2-10 keV** w.r.t. unobscured
(→ undetected or low X-ray counts)

- Complex spectra

Hard to identify



Brightman&Nandra11

- Factor **50-100 fainter in 2-10 keV** w.r.t. unobscured
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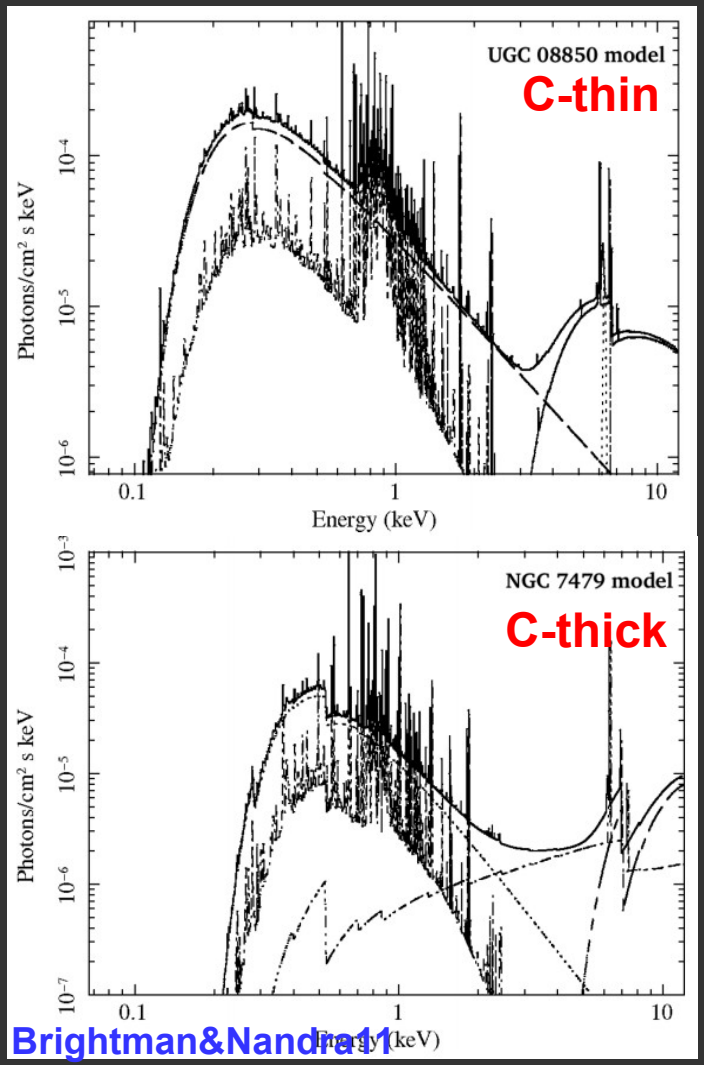
- Complex spectra

- With small differences between N_H<~10^{24} and N_H>~10^{24}

Hard to identify



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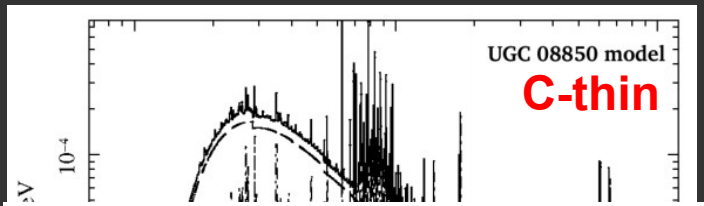
(→ undetected or low X-ray counts)

- Complex spectra

- With small differences between N_H<~10^{24} and N_H>~10^{24}

- plus scattered/thermal emission in the soft band

Hard to identify



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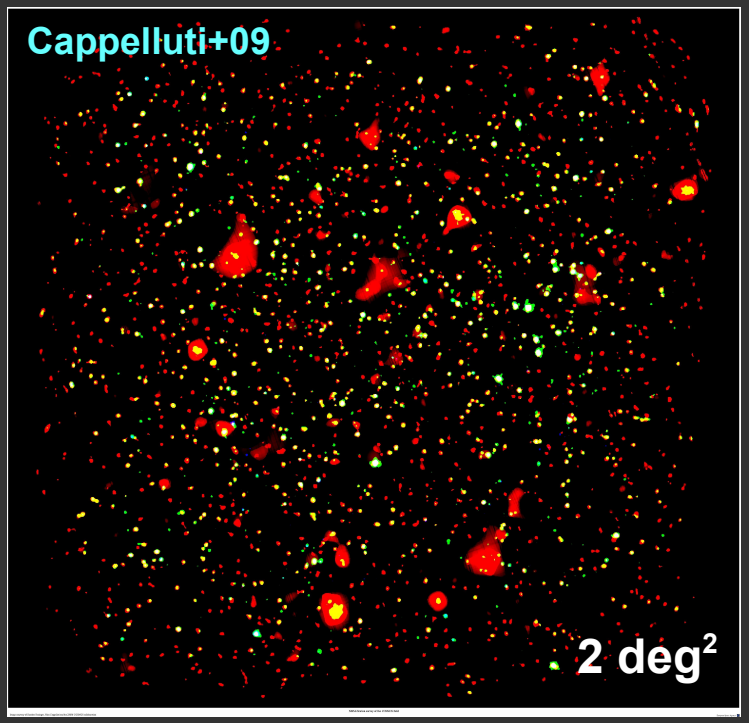
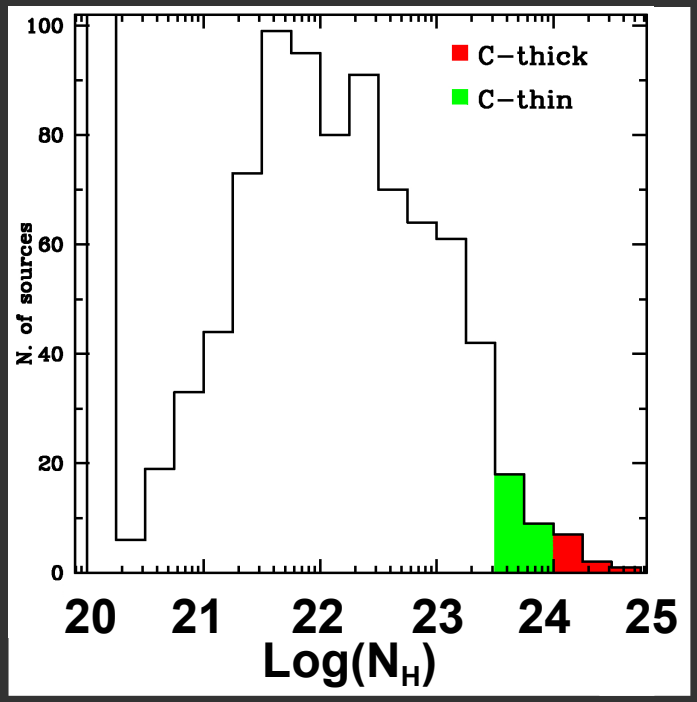
ID210	us	T06	C11	B12	I12	G13
30	heavily	–	–	–	heavily	–
44	unabsorbed	CThick	–	heavily	–	–
48	moderately	–	–	–	–	heavily
64	heavily	–	–	–	heavily	–
66	heavily	–	–	–	–	secure-CThick
106	moderately	CThick	–	heavily	–	–
114	heavily	–	–	–	heavily	–
144	heavily	CThick	CThick	heavily	heavily	secure-CThick
147	heavily	CThick	CThick	heavily	–	secure-CThick
155	moderately	CThick	–	heavily	–	–
180	heavily	–	–	–	heavily	heavily
214	heavily	–	–	–	–	heavily
222	unabsorbed	–	–	–	–	heavily
245	heavily	–	–	–	heavily	heavily
289	moderately	–	–	–	–	heavily
324	unabsorbed	–	–	–	–	secure-CThick

Castello'-Mor+13

How many CT in XMM-COSMOS?

~1200 AGN with >30 counts
Rich multi-λ coverage
Deeper Chandra data to test the selection





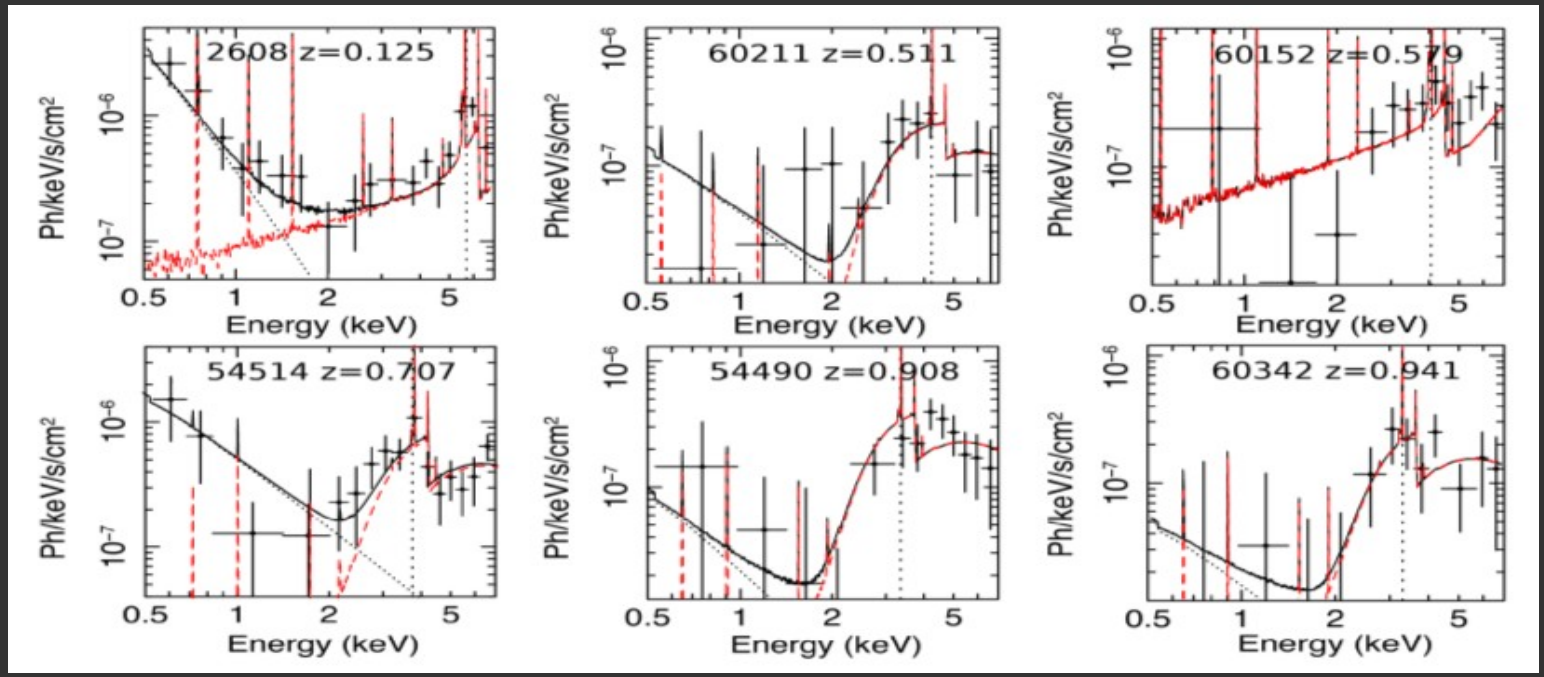
10 CT candidates
29 highly obscured but C-thin
Lanzuisi et al. 2015 A&A 573, A137

Pure X-ray selection

- **Deeper Chandra data** from CCOSMOS-Legacy Civano+16

- More refined models Mytorus, BNTorus....

→ 80% detection efficiency



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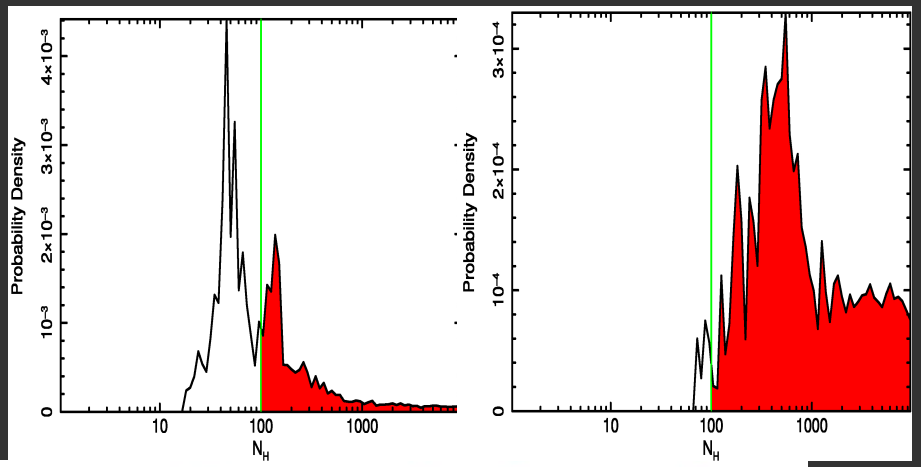
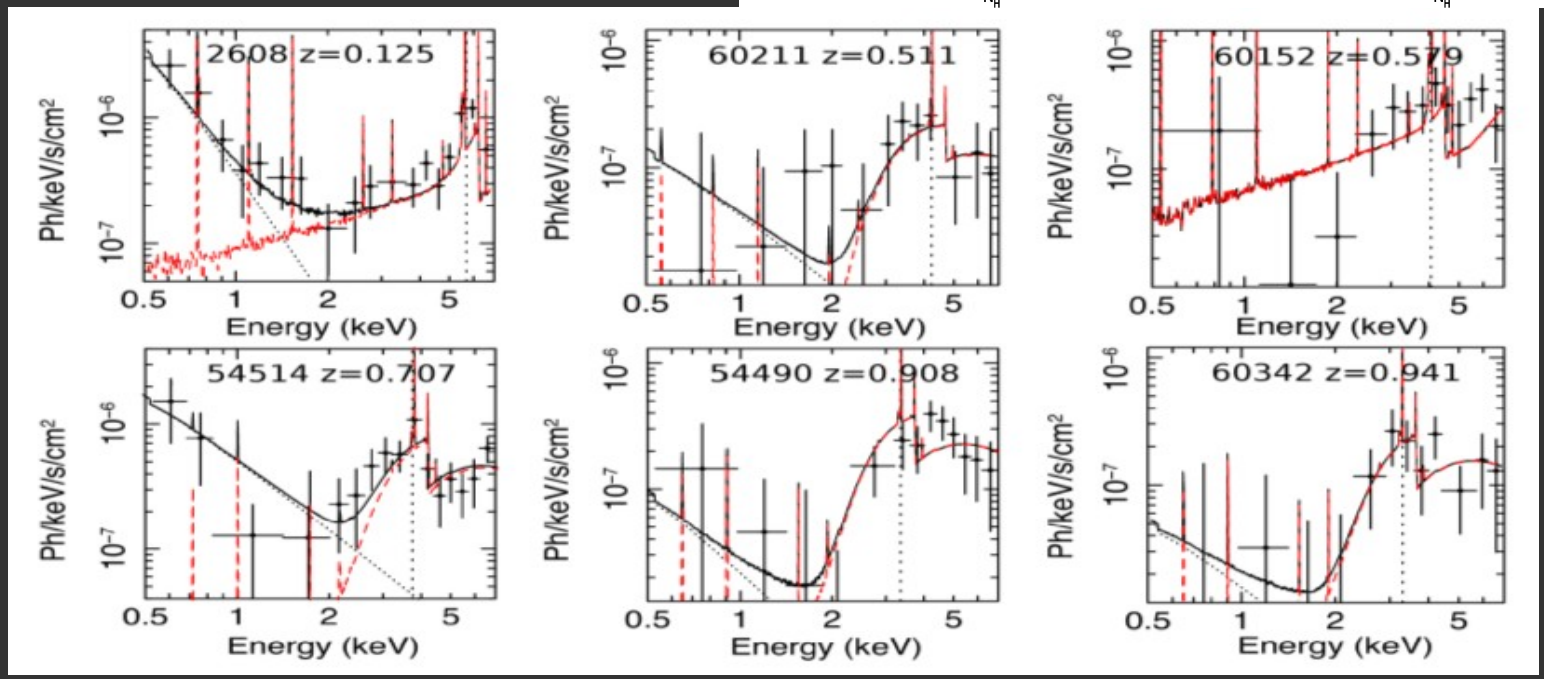
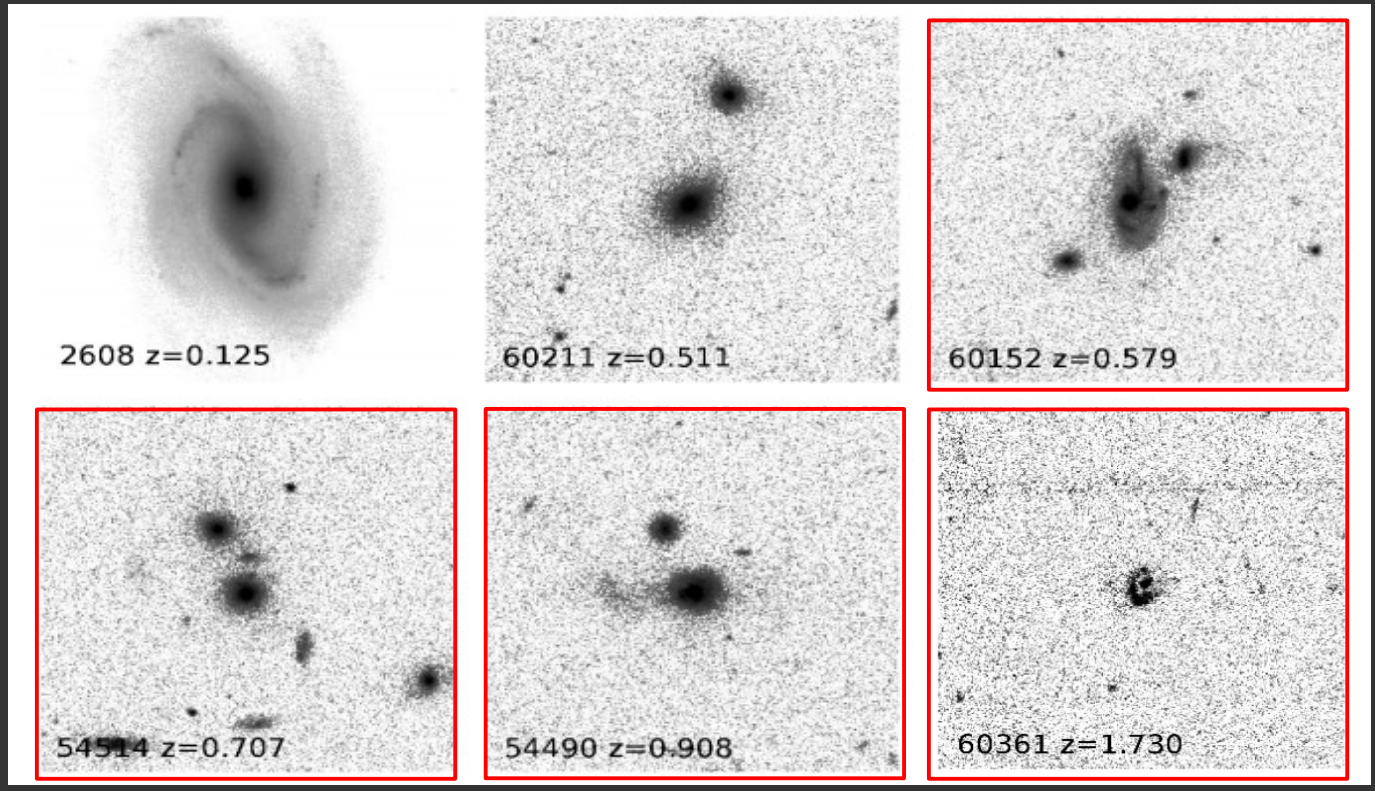




Host properties

35-45% of merging/disturbed systems
(w.r.t ~15-20% for X-ray selected AGN)
see also Kocevski+15, Del Moro+16



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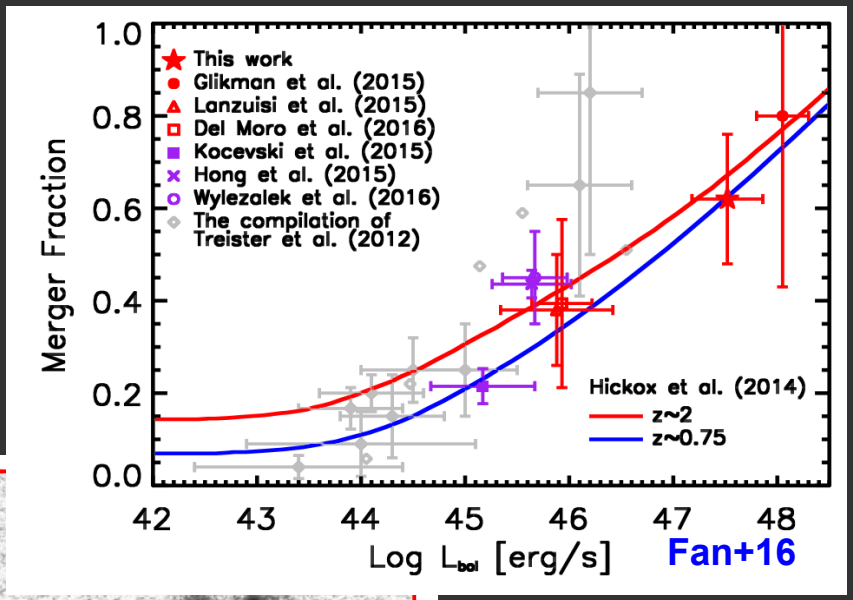
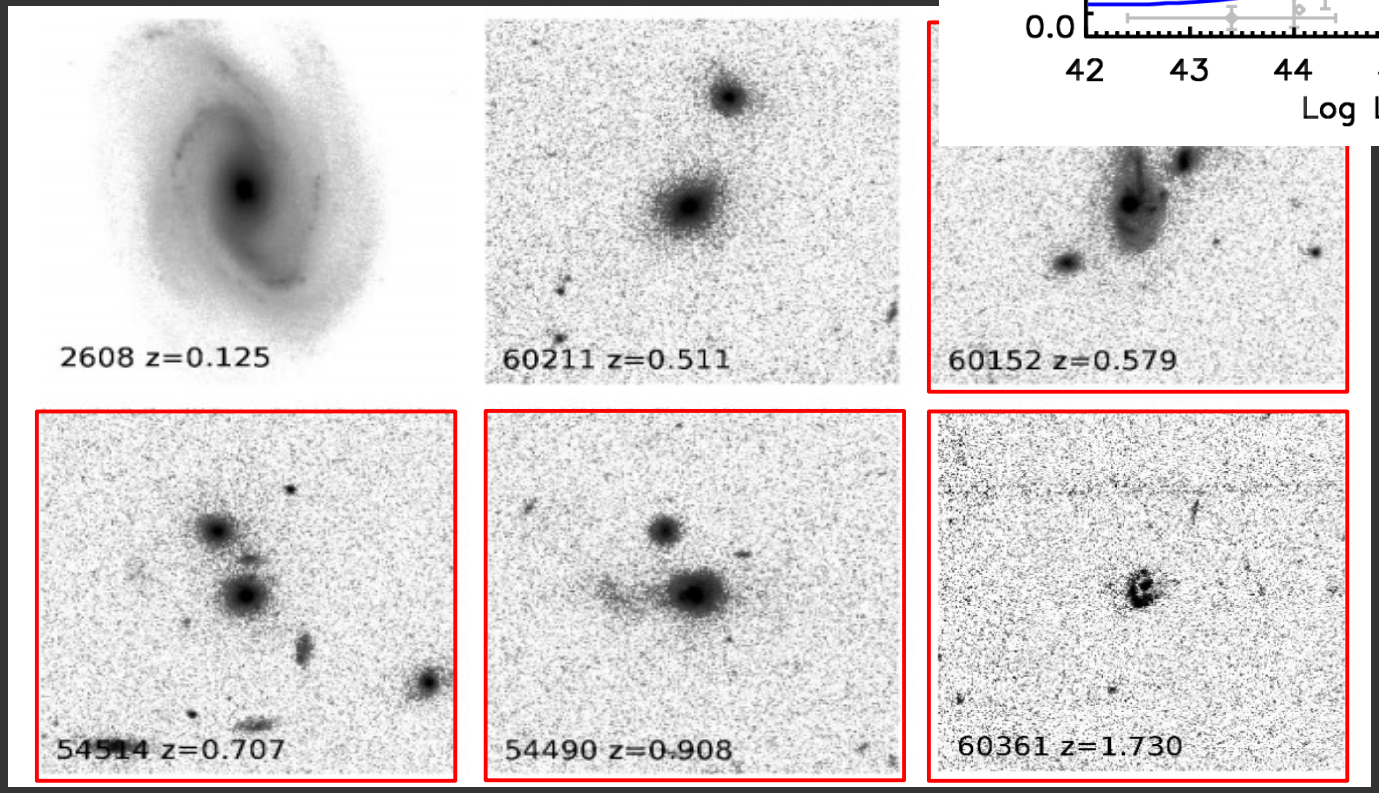




Comparison with XRB models

Number counts consistent with XRB models (e.g. Akylas+12).

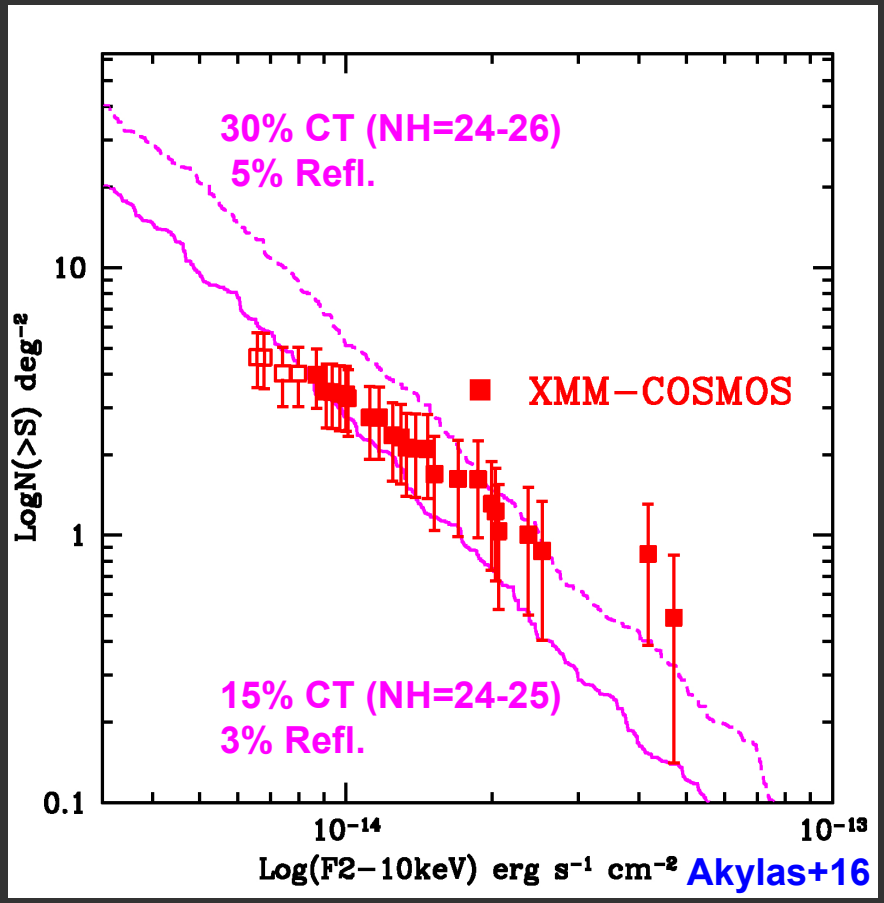
http://indra.astro.noa.gr/xrb.html

But:

- highly uncertain CT fraction especially at $N_H > 10^{25}$ cm^{-2}

e.g. Comastri+15

- highly uncertain refl. Fraction



Conclusions

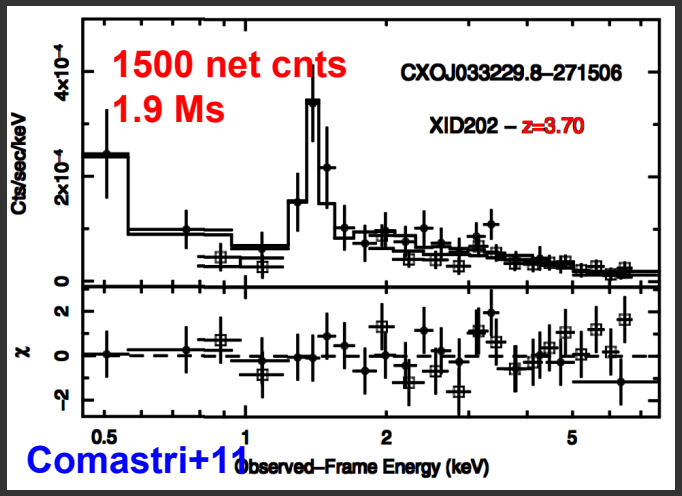
1st step: Detection

Chandra is more efficient at fain fluxes
e.g. Cosmos-Legacy (4.6Ms) has 60-70 CT candidates
vs. 10 in XMM-Cosmos (1.5Ms)

2nd step: Charactherization

Deep XMM obs. allow to put real constrain on N_H and refl. fraction

As it is possible at z=0 with >10keV data
e.g. Ricci+16, Koss+16, Akylas+16



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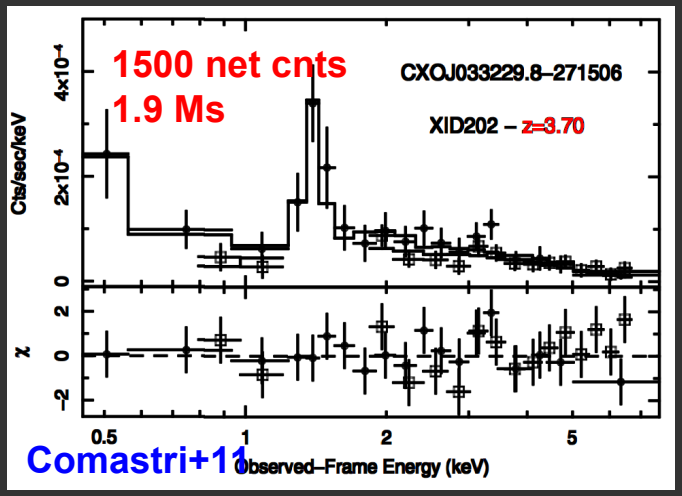

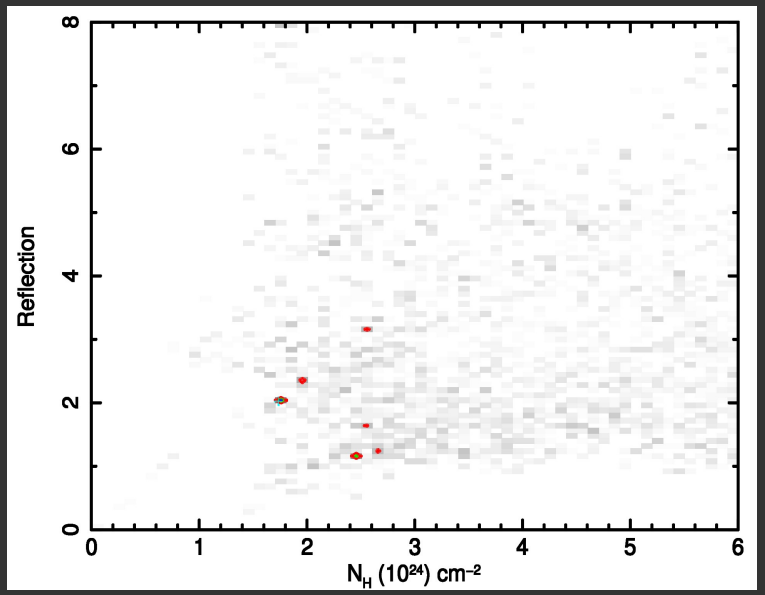

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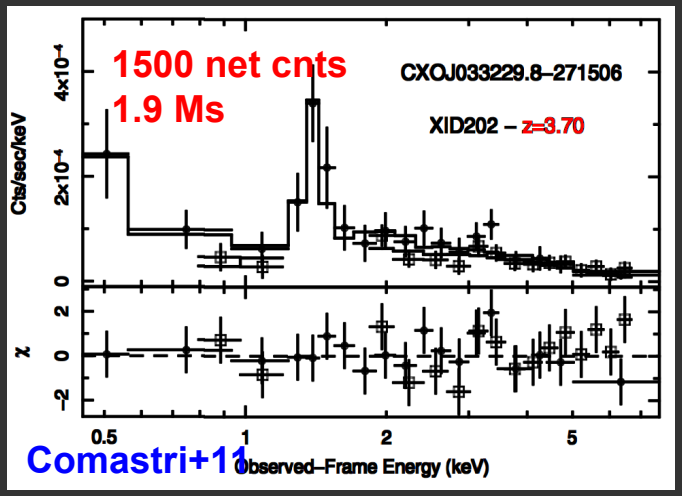

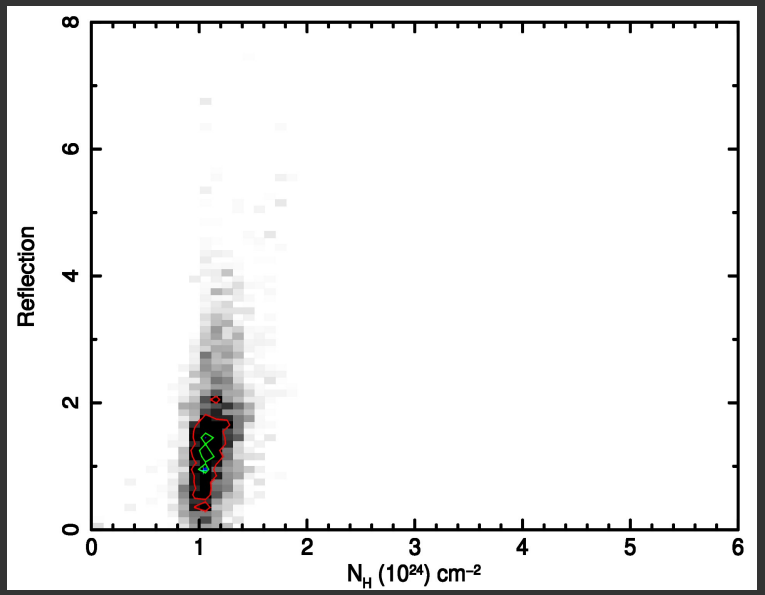

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Covering the full COSMOS (or SXDS, or AEGIS) with **0.5 Ms *average, effective* expo** would take ~5 Ms/deg^2 and the number of CT at high z would still be small...

Targeting 10-20 good (X-Luminous) candidates (from XXL, Stripe82 etc..) with deep exposures would build the **CT reference sample at high-z!**