The evolution of star forming galaxies with the WFXT

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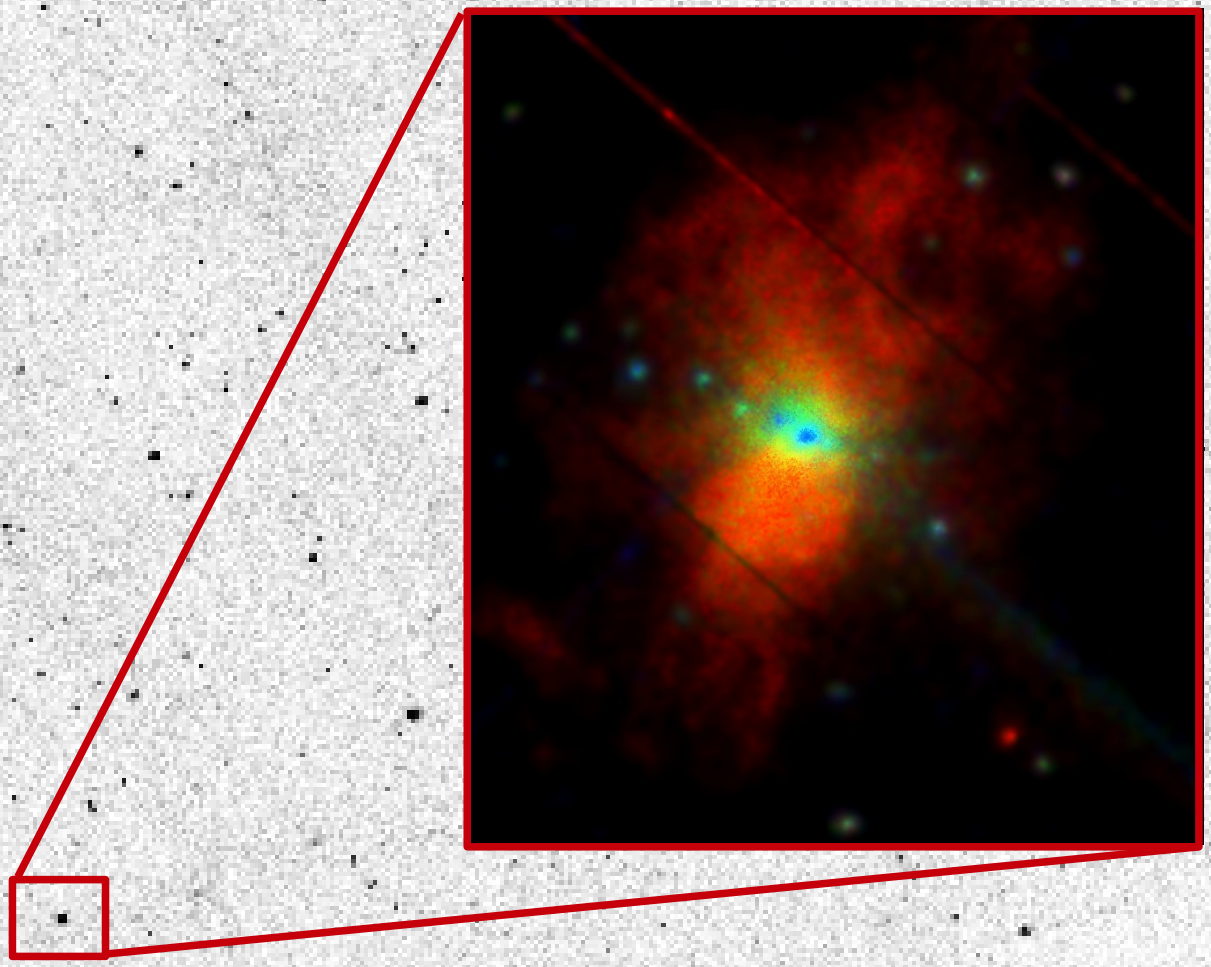
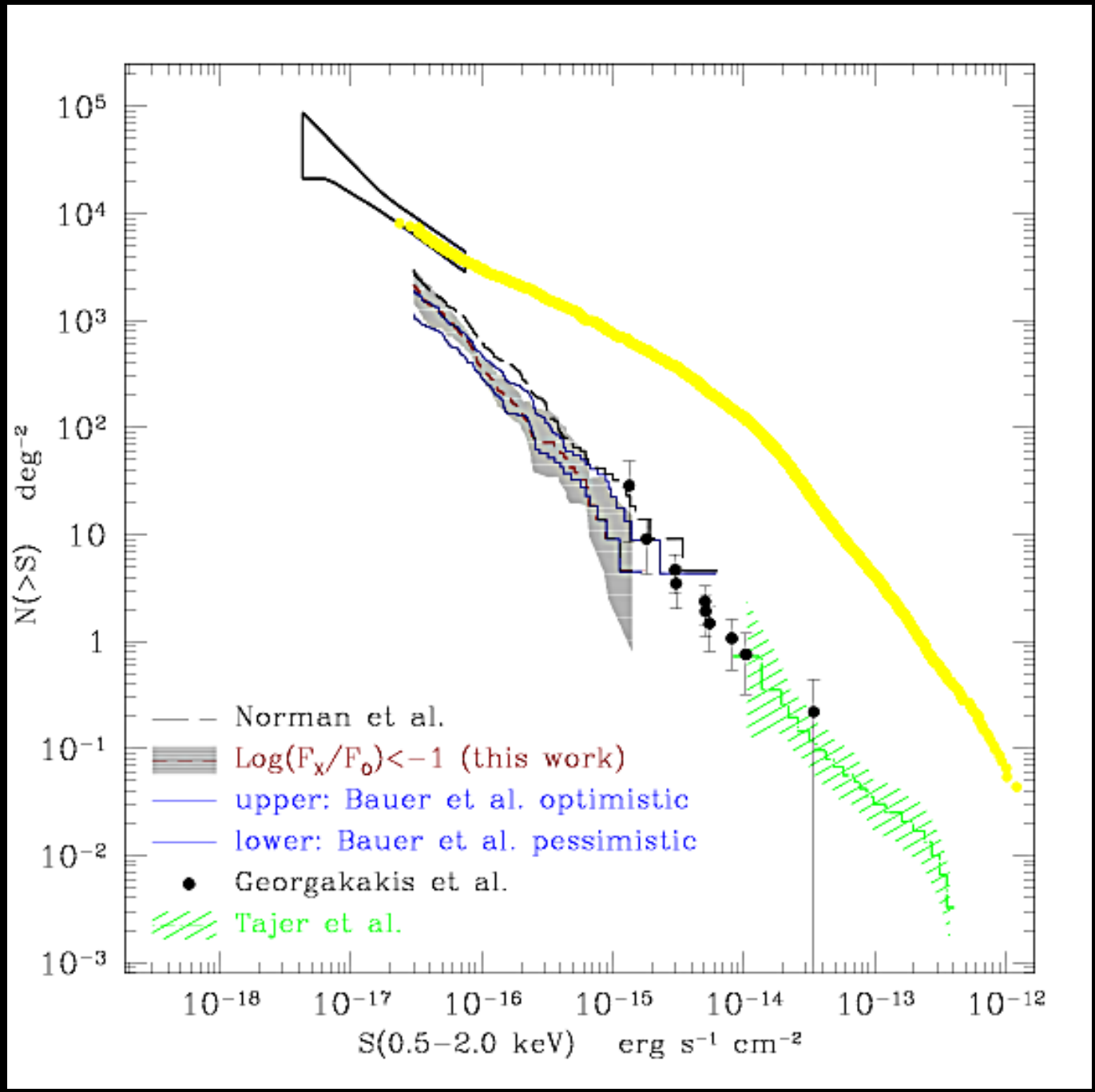
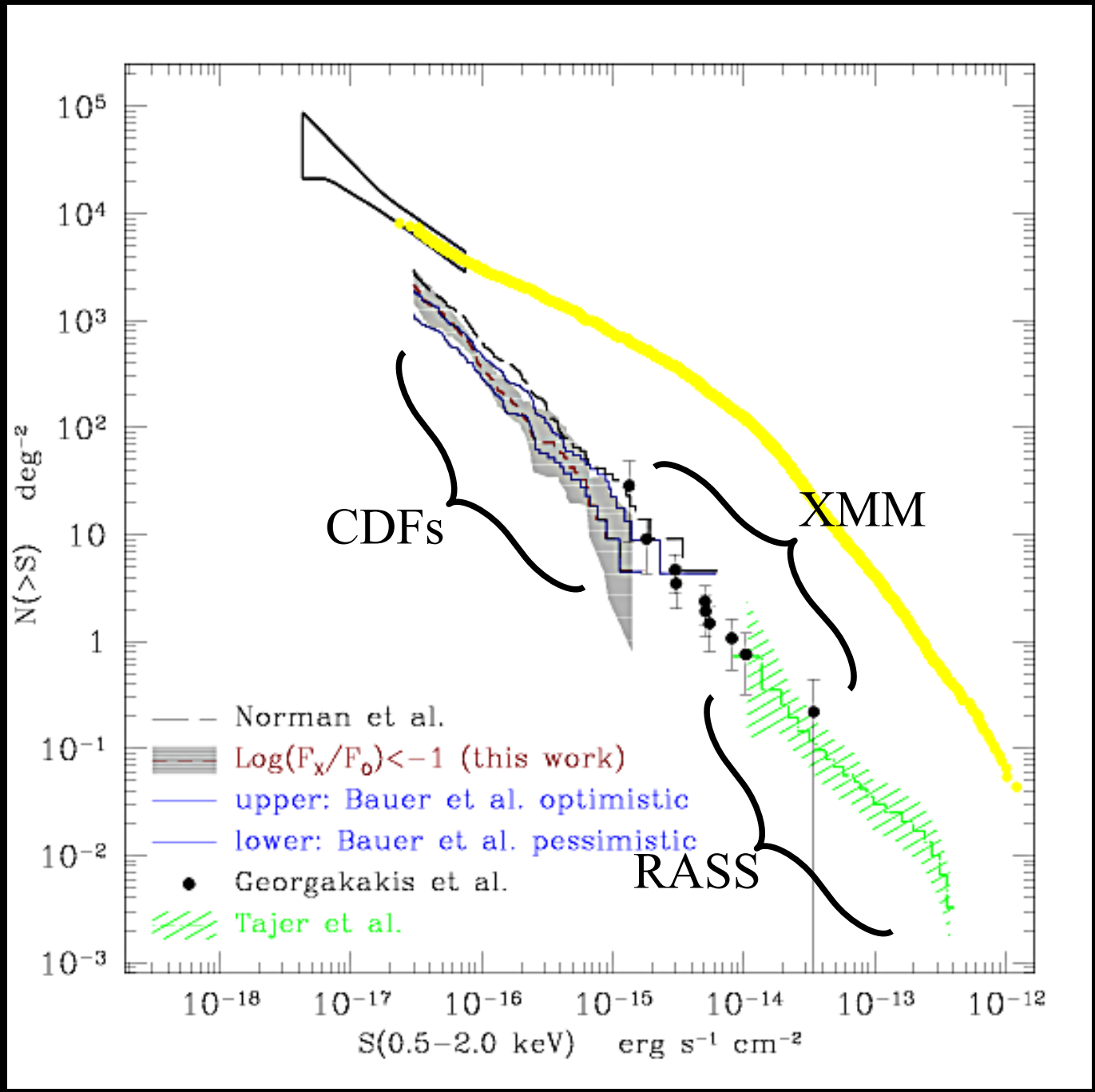


X-ray number counts of star forming galaxies



Ranalli et al. 2005
A&A 440, 23

X-ray number counts of star forming galaxies



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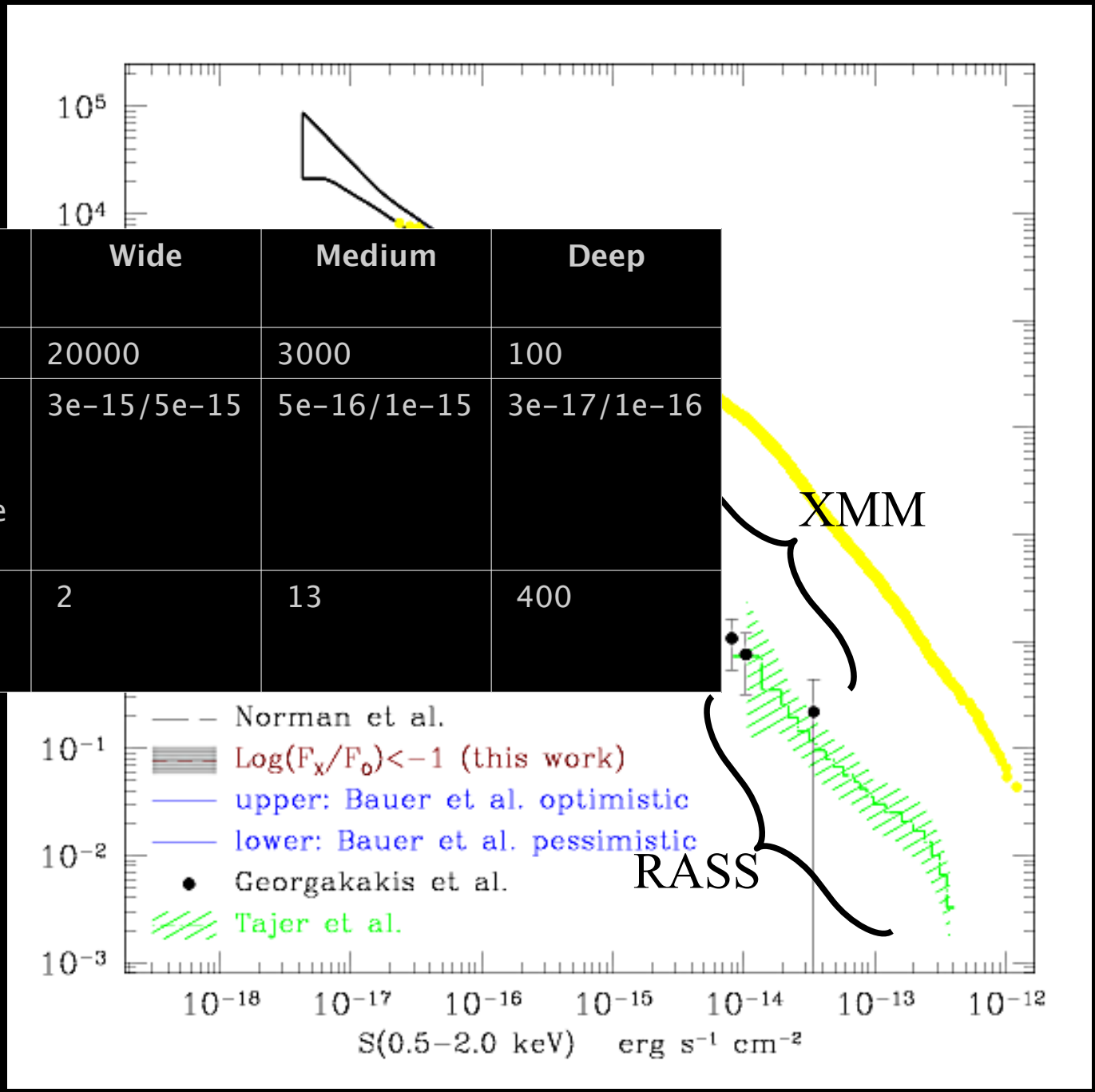
X-ray number counts of star forming galaxies

	Wide	Medium	Deep
Area (deg^2)	20000	3000	100
Limiting flux, point sources (goal/requirement)	3e-15/5e-15	5e-16/1e-15	3e-17/1e-16
Mean Exposure Time (ks)	2	13	400



Ranalli et al. 2005
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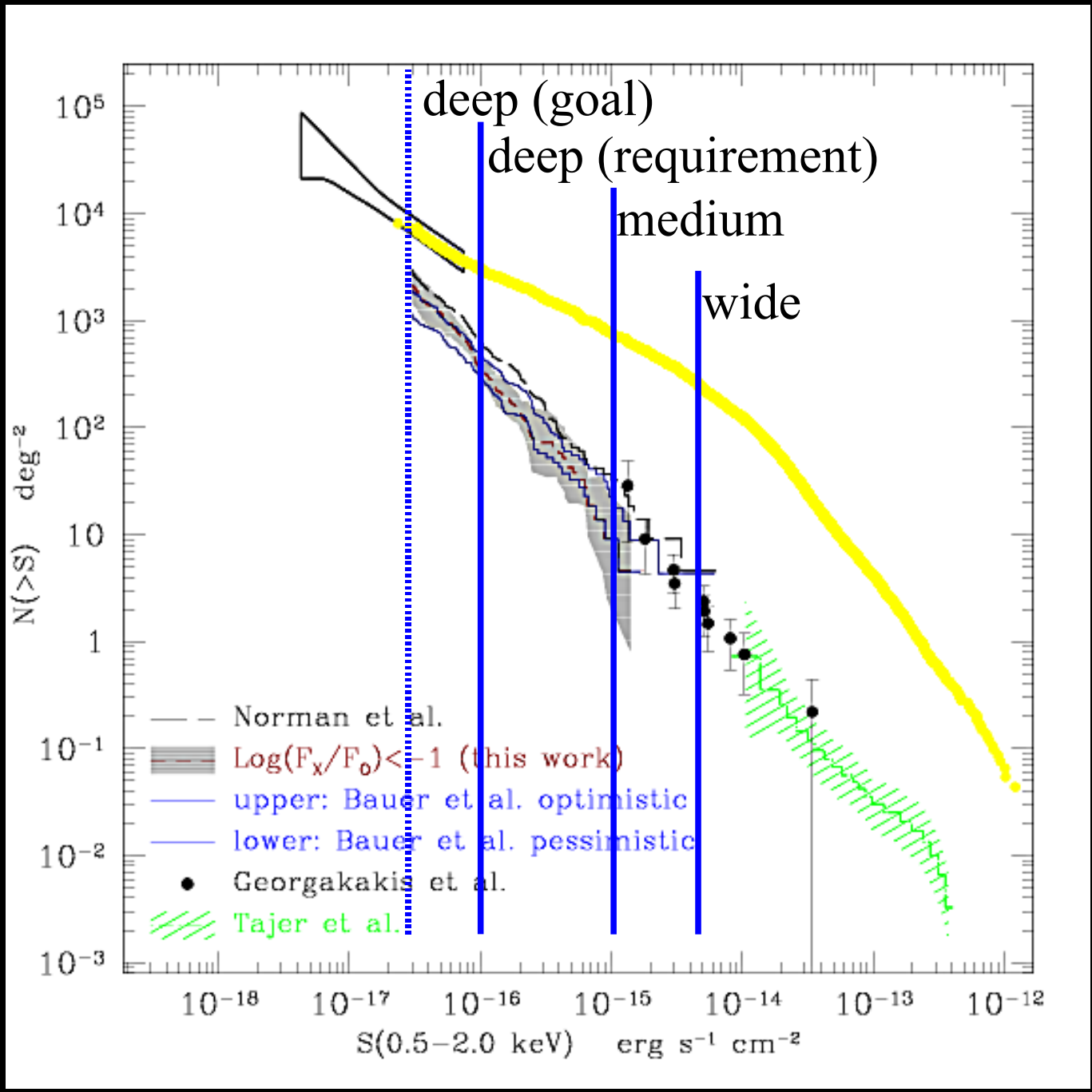
X-ray number counts of star forming galaxies

Flux limits will be similar to the Chandra/XMM ones

but large area implies large number of detections:

10^4-10^5 galaxies per survey; what L and z will they have?



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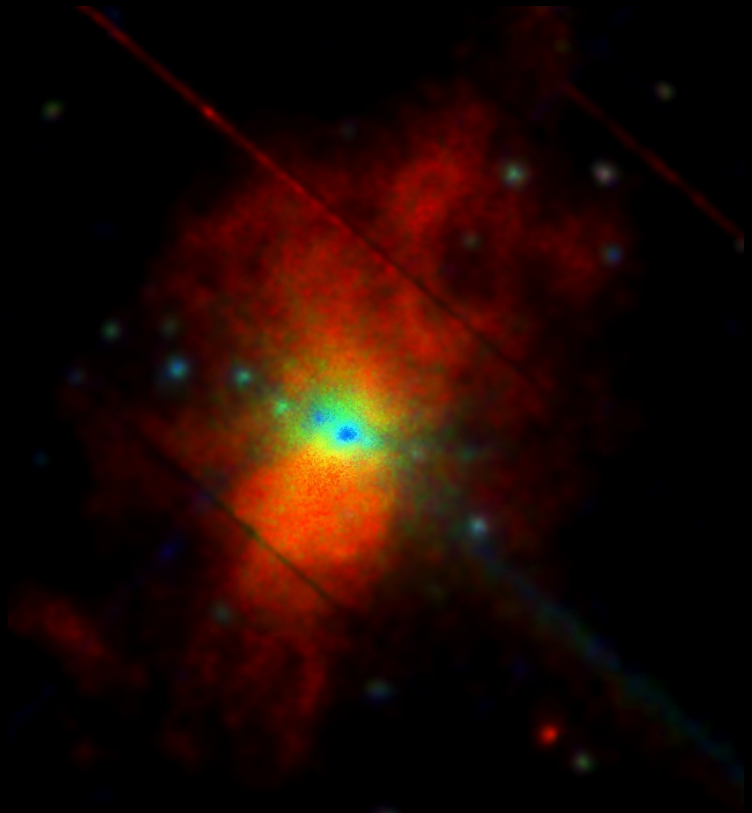
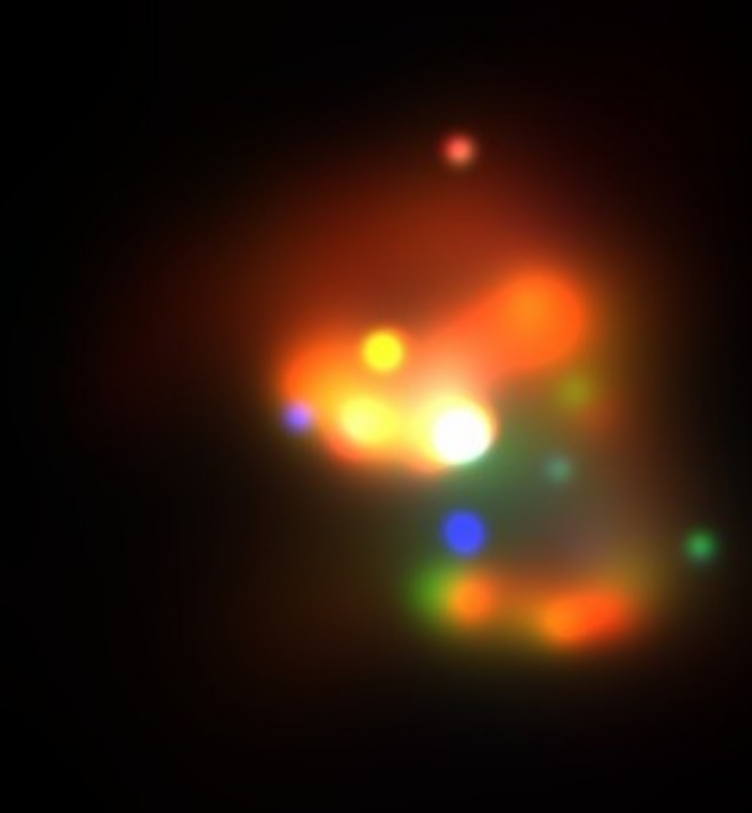
Template star forming galaxies



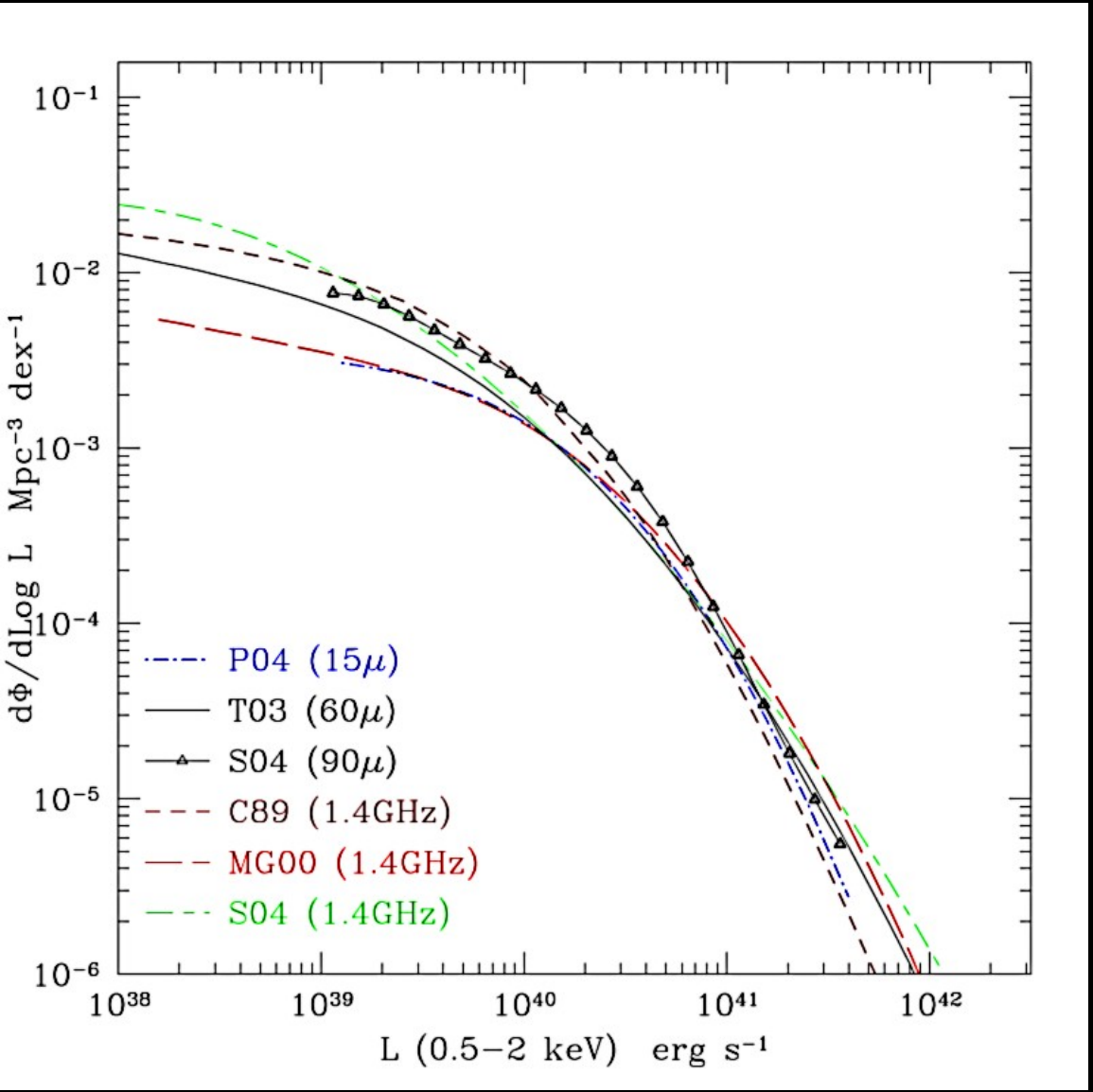
M82
$L_X \sim 10^{40}$, SFR~3 Mo/yr



NGC 3256
$L_X \sim 10^{41}$, SFR~30 Mo/yr

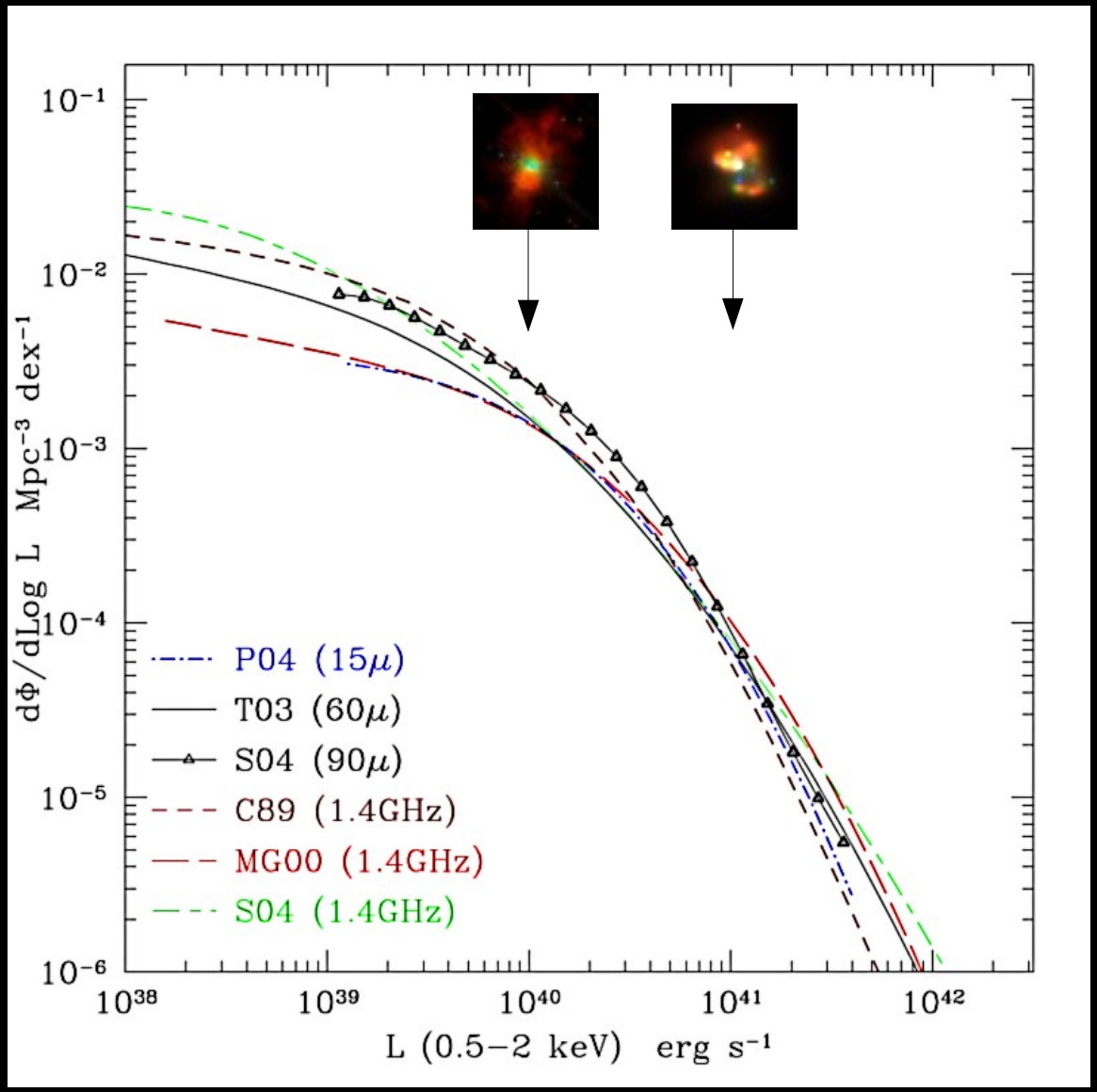
Would their far-universe counterparts be detected with WFXT?
How many? Up to what redshift?

A prediction for a local XLF

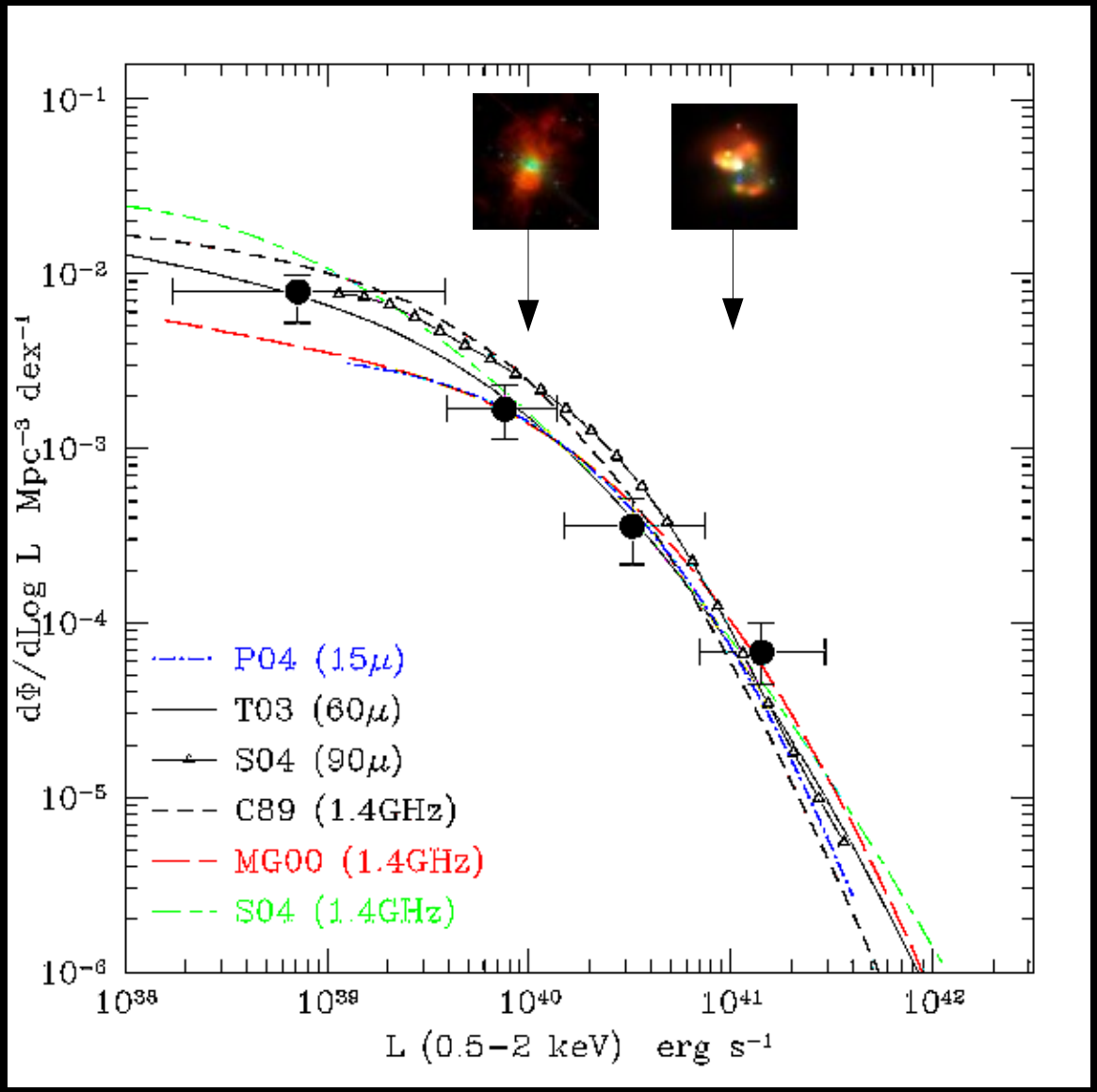


Local X-ray LFs are obtained by convolving the FIR/radio LFs with the FIR/radio/X-ray correlations

Template objects have luminosities around the knee of the luminosity



Observational LF: the normal ($F_X/F_{OPT}<10^{-2}$) galaxy LF by Georgantoupoulos et al. (2005)



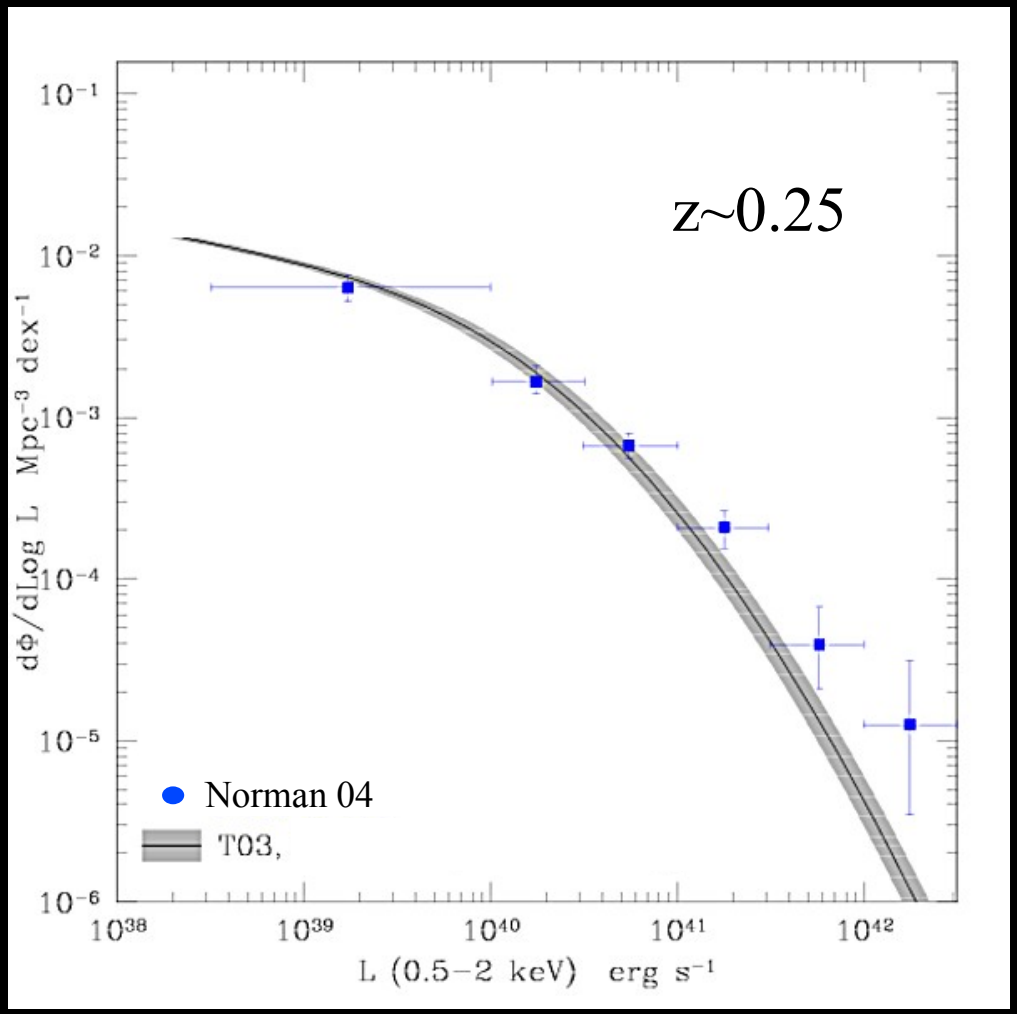
28 galaxies from XMM archival obs. on SDSS fields

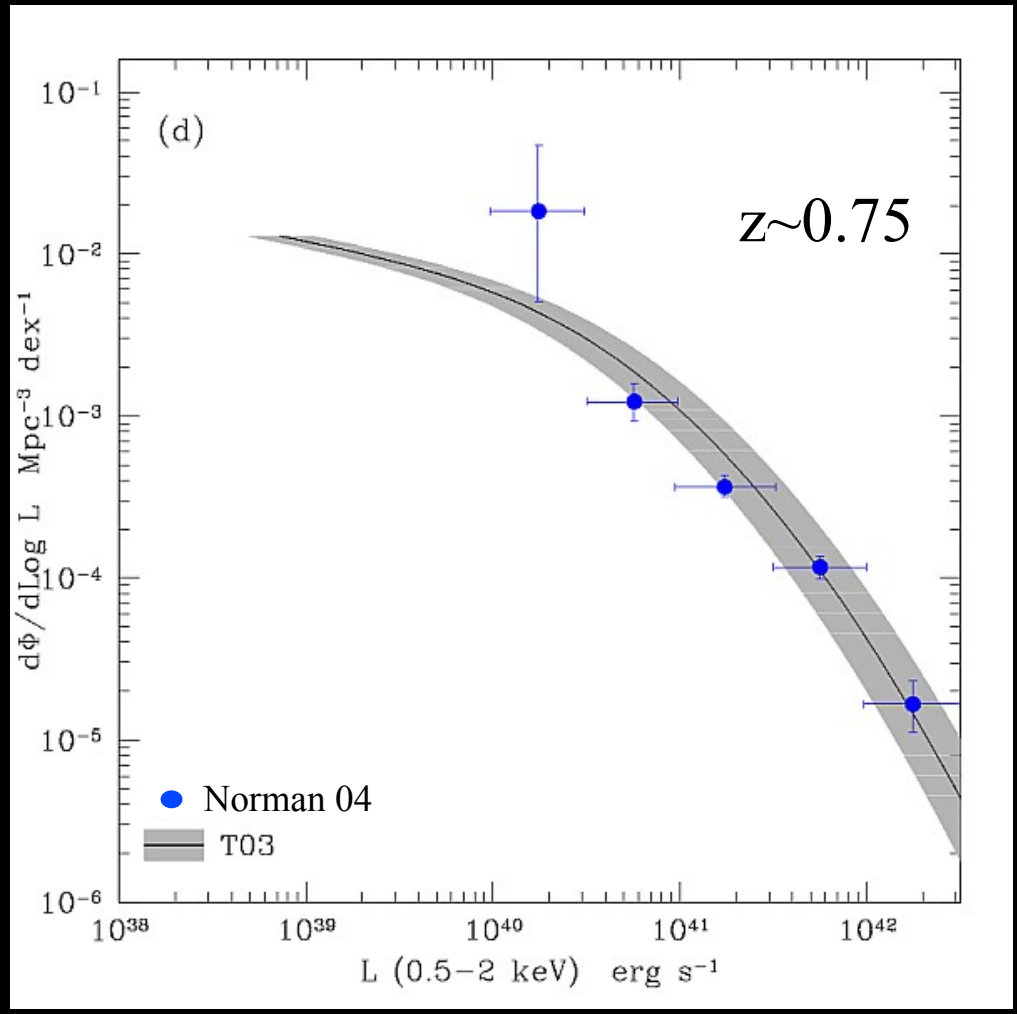
+

18 galaxies with z<0.22 from the Chandra Deep Fields

High redshift determination of the LF (Norman et al. 2004) (208 objects from CDFN+CDFS)

luminosity evolution $L \propto (1+z)^{2.7}$ is an adequate description of current data, but cannot say more than this

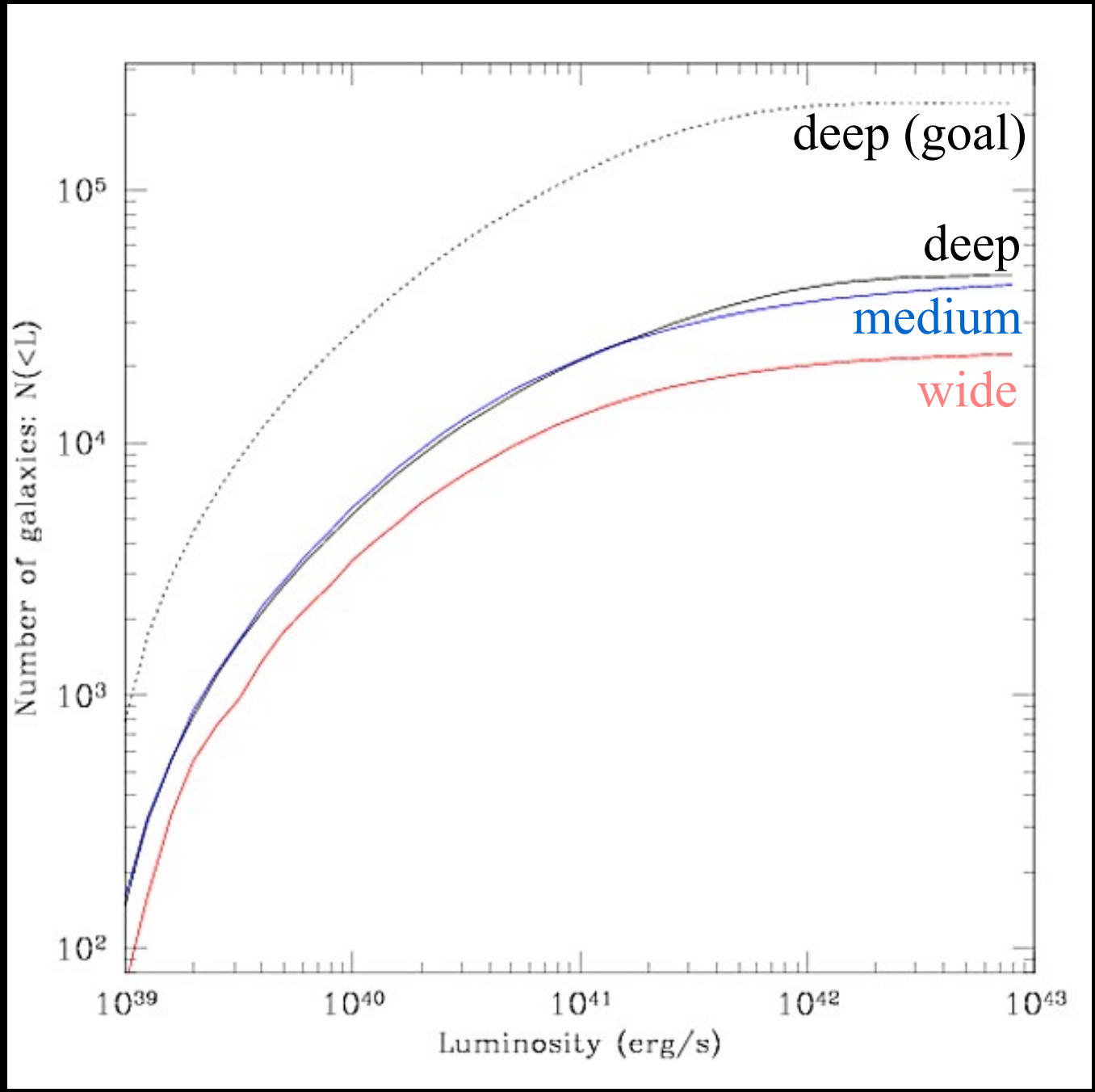




Properties of the WFXT galaxies: expected luminosity distribution (cumulative)

About 10^5 galaxies
Should be detected

reaching the goal
flux limit should
improve statistics
by a factor ~5

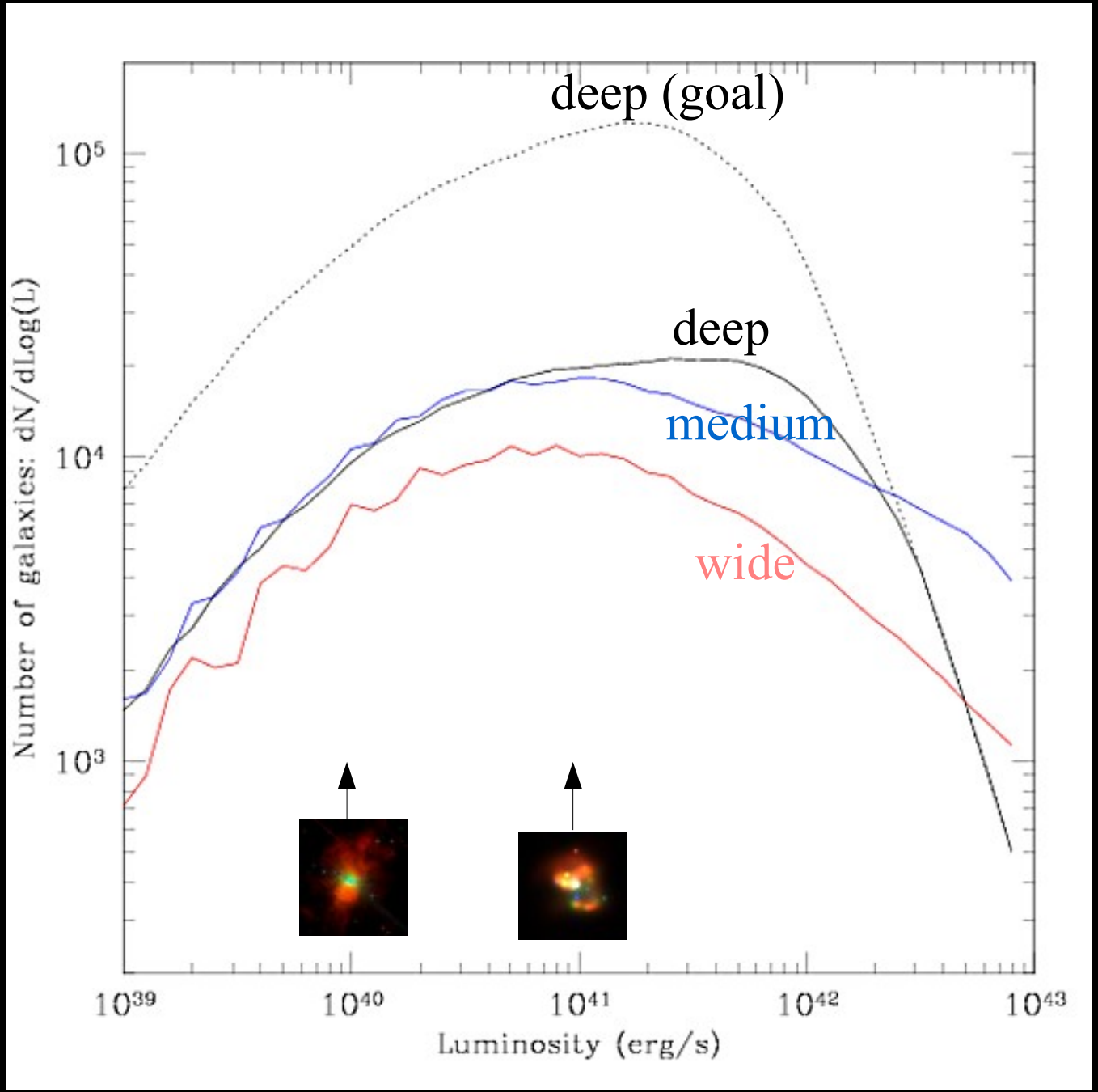


Properties of the WFXT galaxies: expected luminosity distribution (differential)

The knee of the LF should be very well sampled

Also good sampling of the SB-AGN transition region $10^{42}<L<10^{43}$

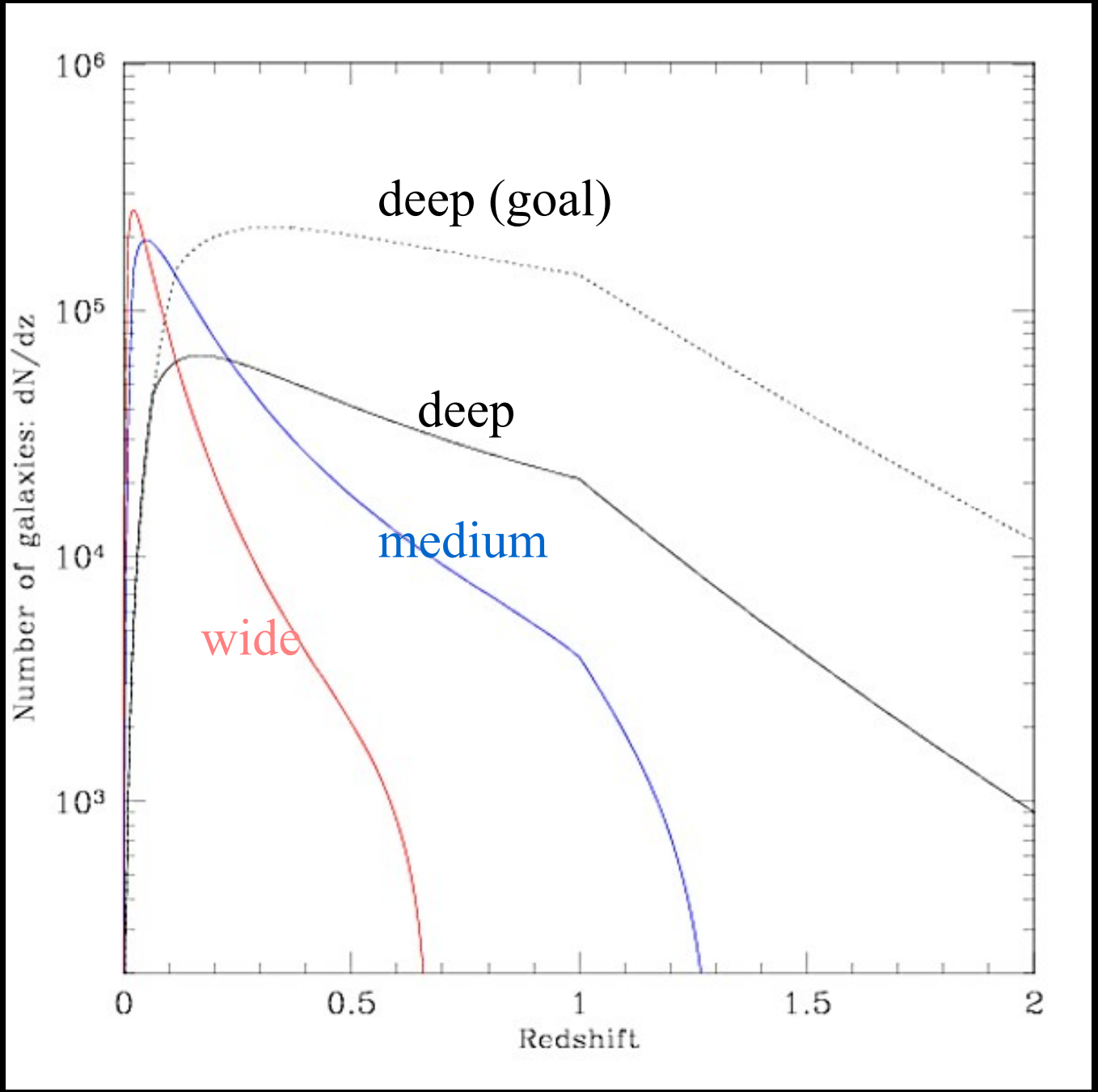
But up to what redshift can we determine the LF evolution?



Properties of the WFXT galaxies: expected redshift distribution

the medium and deep surveys should probe galaxies up to z~1 and 2

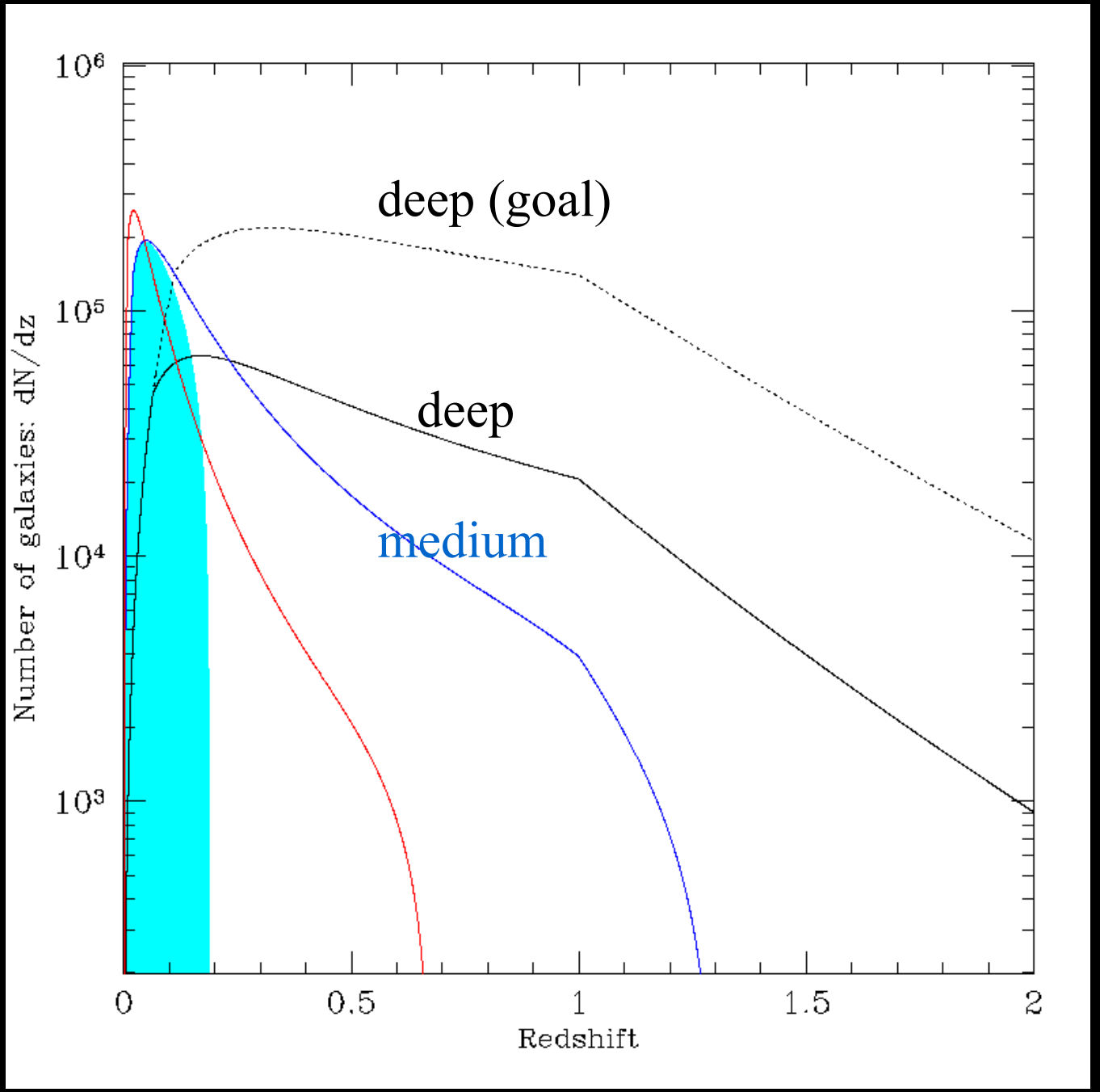
But the most distant galaxies will also be the most luminous ones



Properties of the WFXT galaxies: expected redshift distribution

Considering $L<10^{41}$:

– the medium survey will cover $z<0.2$



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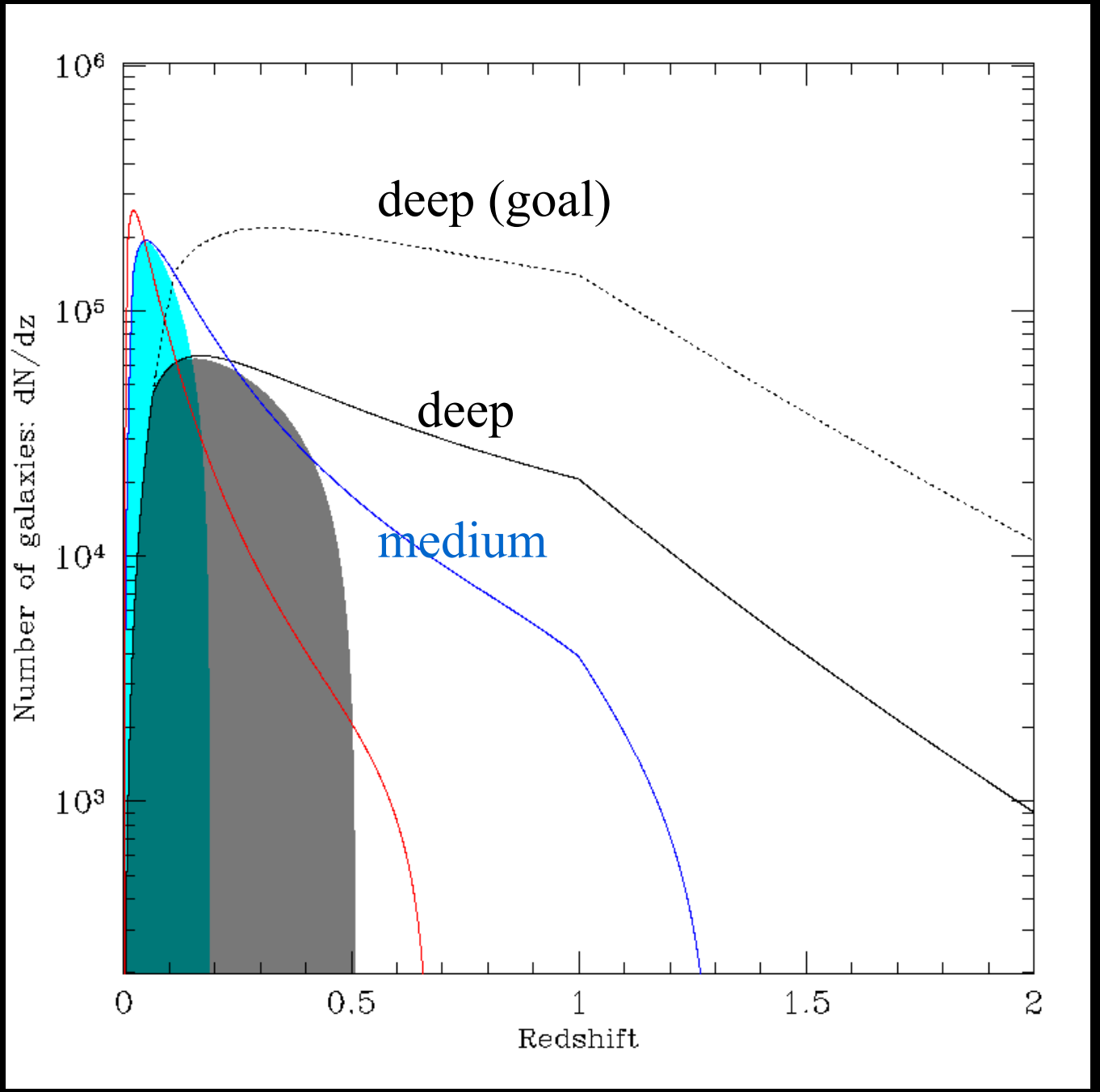


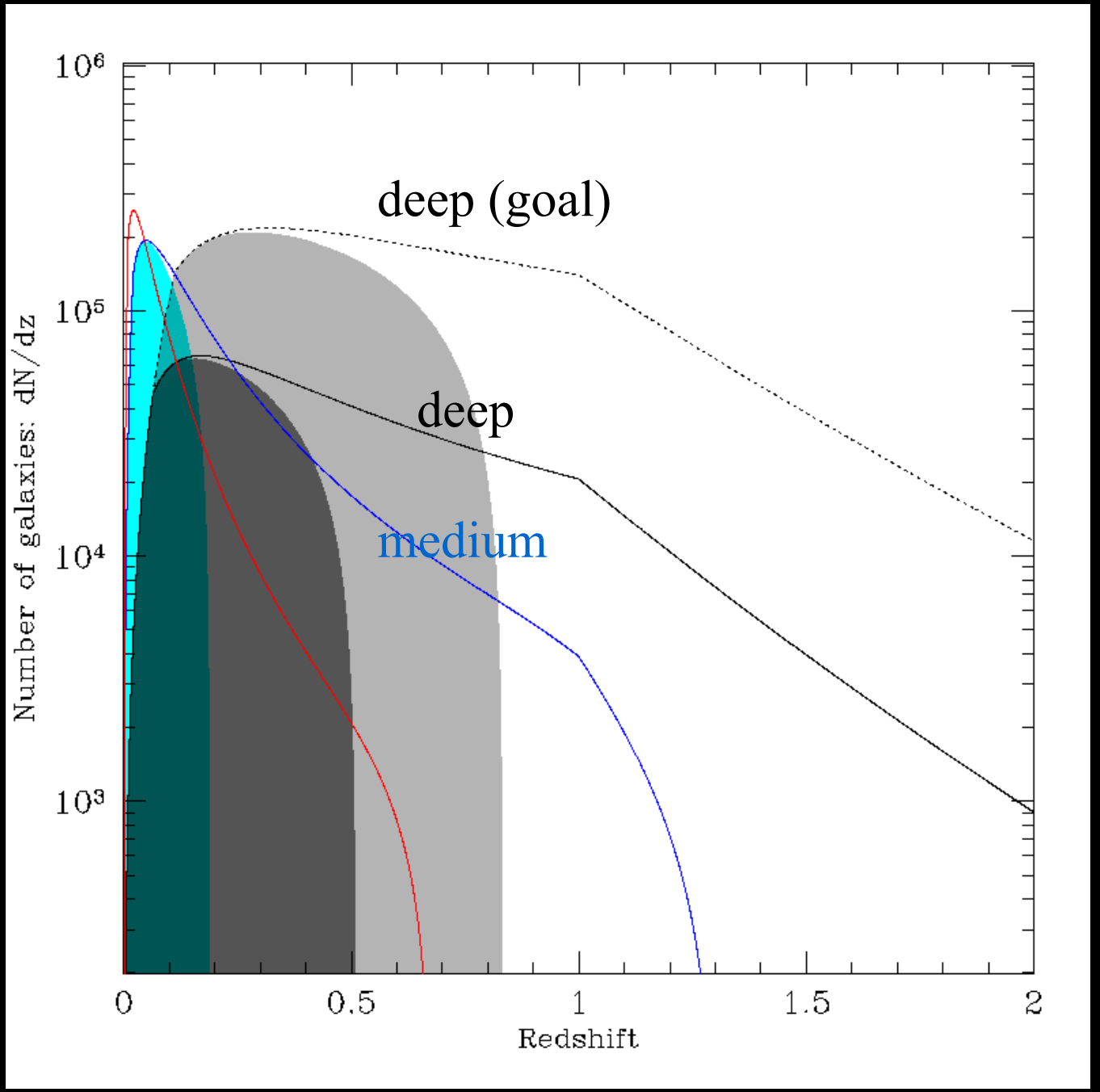
Properties of the WFXT galaxies: expected redshift distribution

Considering $L<10^{41}$ (knee of the LF)

- the medium survey will cover $z<0.2$

- deep: $z<0.5$

- only the deep (goal) will reach $z\sim0.8$

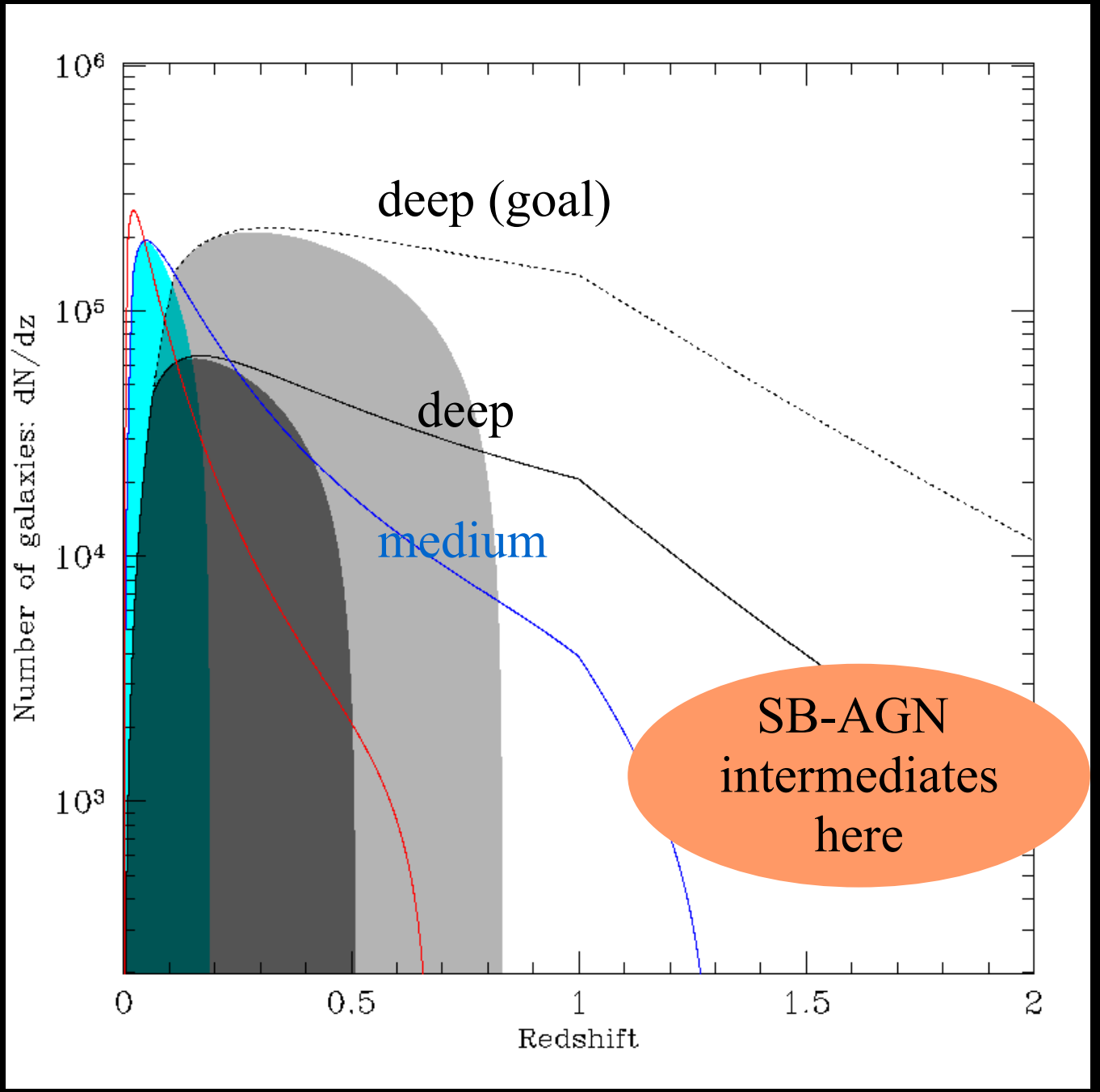


Properties of the WFXT galaxies: expected redshift distribution

The high-z objects will have L>1041

Thus many LLAGN candidates, and SB-AGN intermediate objects are expected

How to tell them apart?



Star forming galaxies vs. AGN

- large numbers of objects => need automatic classification

- current approaches:

  * narrow band photometry in many bands (COMBO17) equivalent to low-resolution spectrum; classification is a by-product of photo-z

  * multi-band photometry, magnitudes in syntetic bands, diagnostic diagrams (V. Smolcic work in COSMOS)

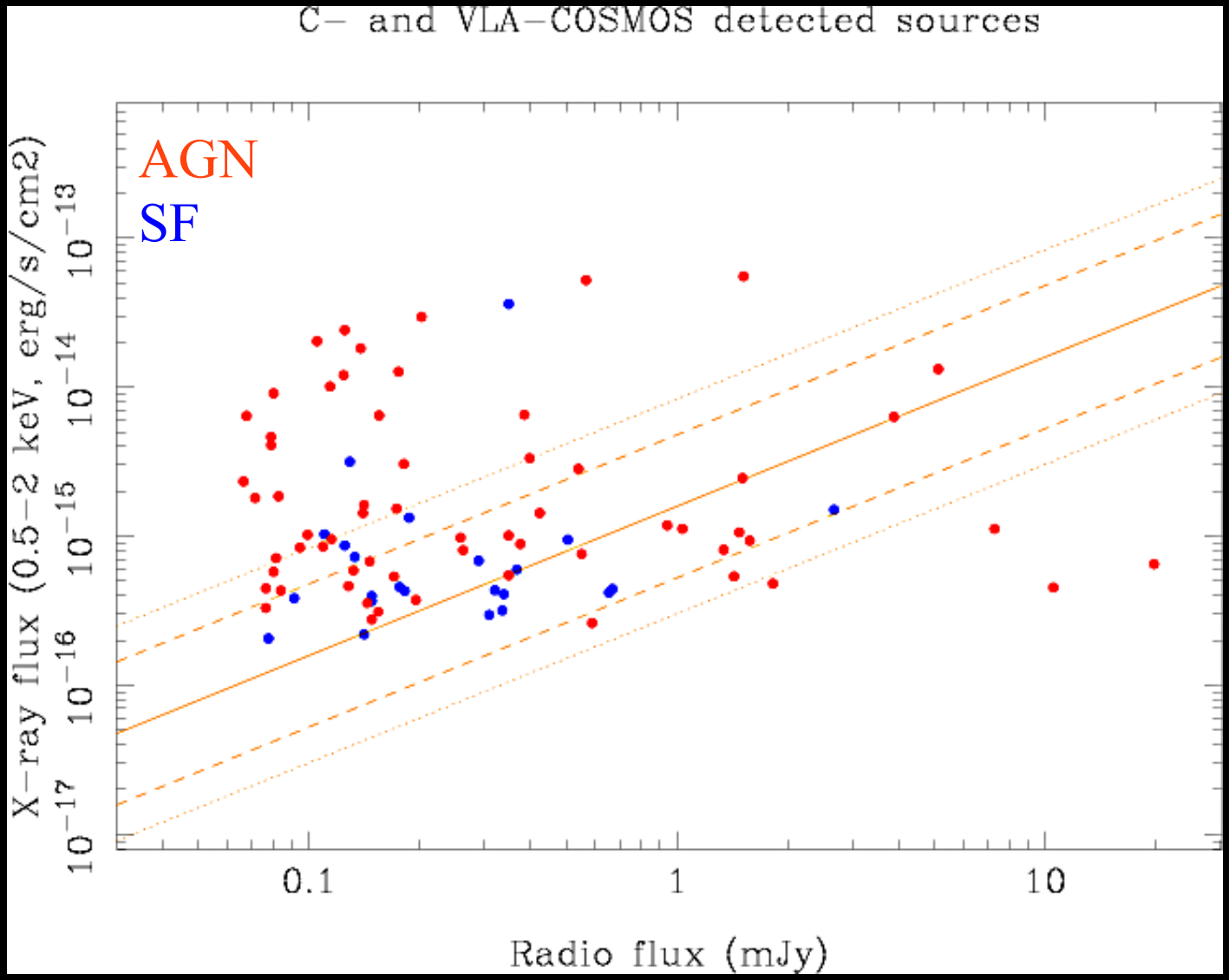
Star forming galaxies vs. AGN

multi-band photometry, magnitudes in syntetic bands, diagnostic diagrams (V. Smolcic work in COSMOS):

Applied to radio sources in C-COSMOS

Looks primising in separating
33 SF
82 AGN

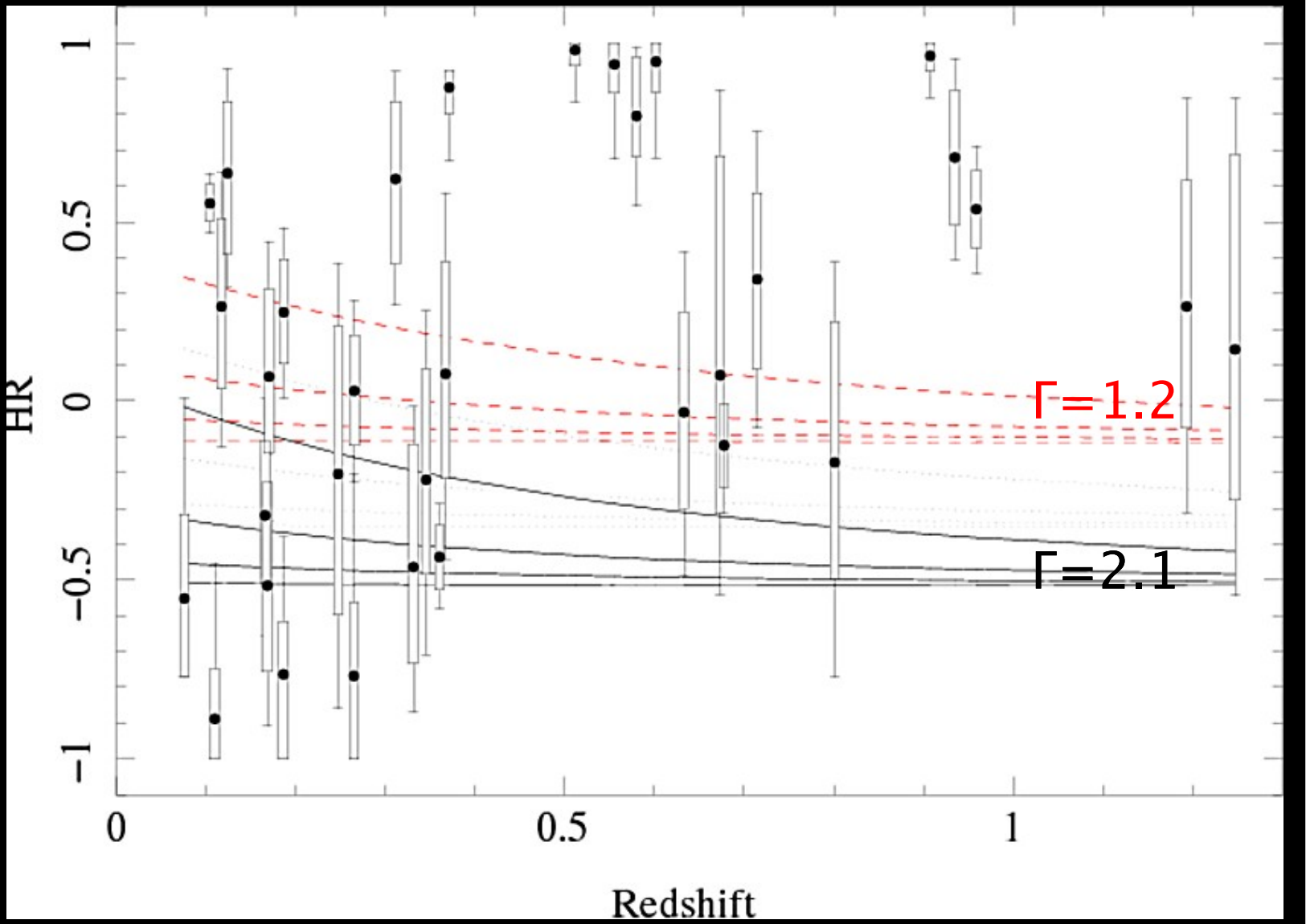
But intermediate objects do exist and they are usually the brightest



Star forming galaxies vs. AGN

multi-band photometry, magnitudes in syntetic bands, diagnostic diagrams (V. Smolcic work in COSMOS):

Too hard HR for being SF



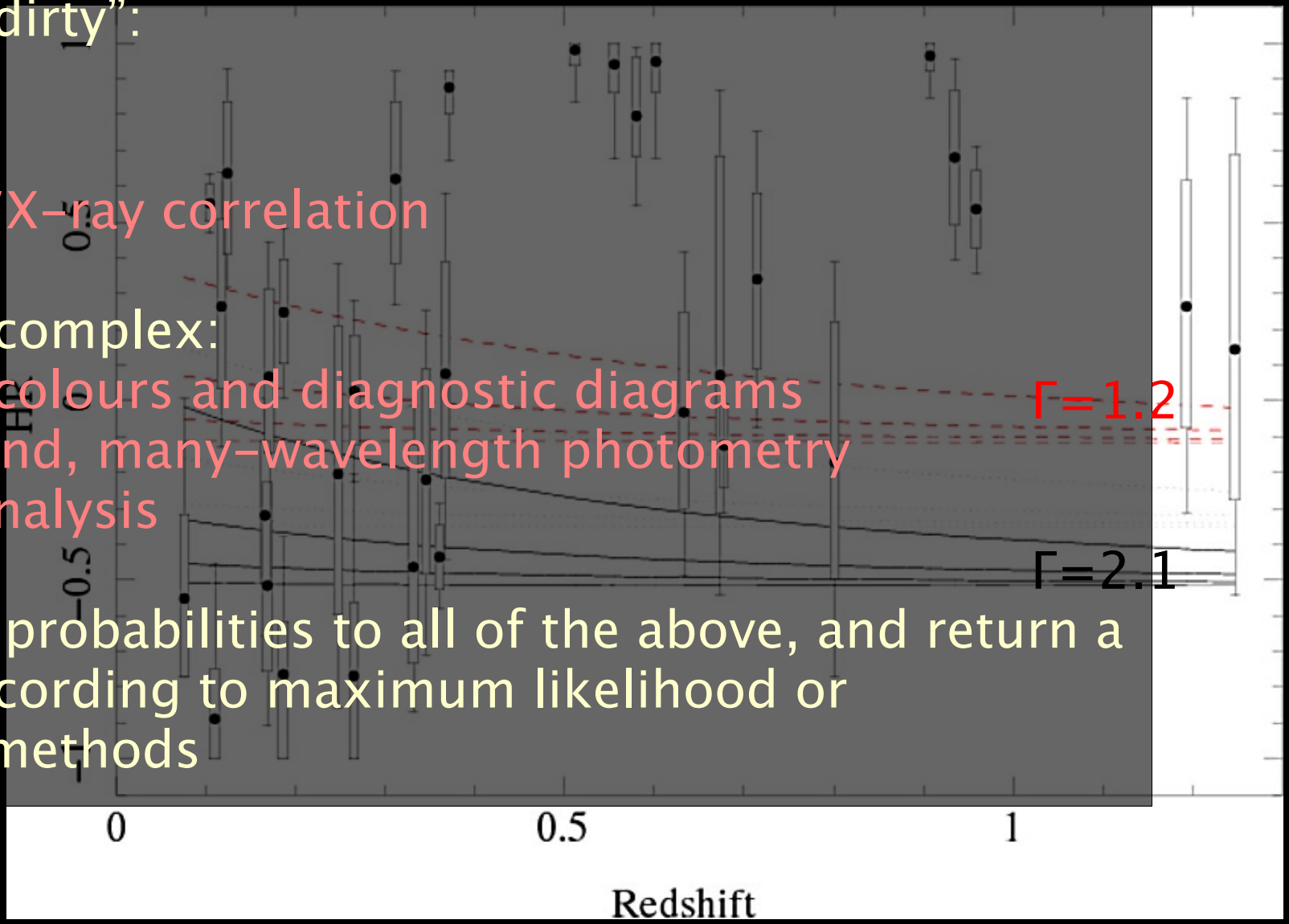
Star forming galaxies vs. AGN

Need to understand and refine automatic selection criteria

"Quick and dirty":
- F_X/F_{opt}
- $L<10^{42}$
- radio/FIR/X-ray correlation

Slower and complex:
- synthetic colours and diagnostic diagrams
- narrow band, many-wavelength photometry
- spectral analysis

- assigning probabilities to all of the above, and return a verdict according to maximum likelihood or Bayesian methods



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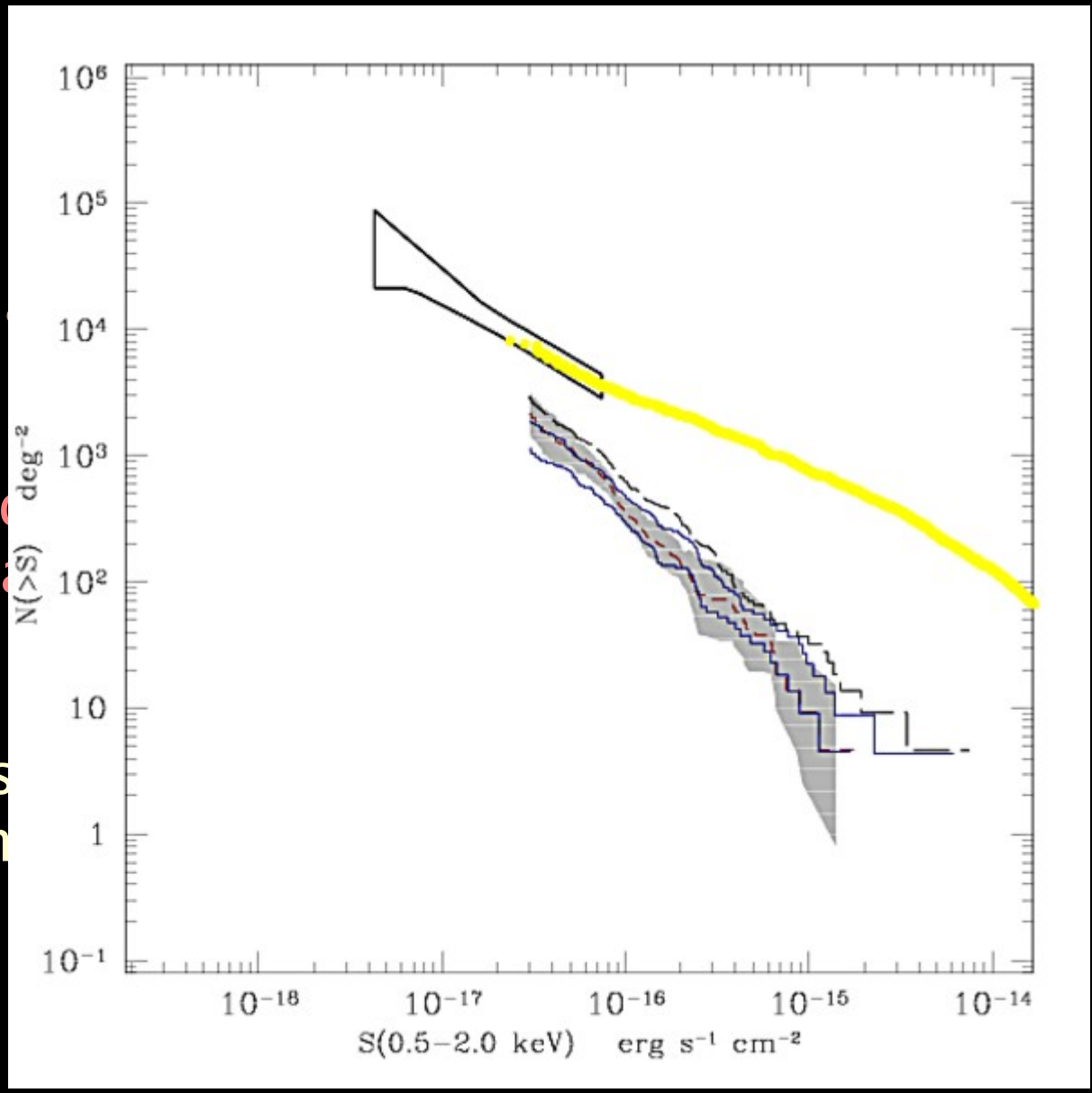

Conclusions

- WFXT very effective in determining LF and evolution at low redshift ($z < \sim 0.5$), with unprecedented statistics

- only high-luminosity tail of LF can be derived at larger z

- biggest problem is object classification:
  * needs to fully understand selection criteria
  * needs multi-wavelength coverage (optical, radio, FIR)
  * needs automated redshift determination
    => WFXT needs to be coordinated with other facilities (LSST and similar)

- look at Chandra-COSMOS: the current survey most similar to WFXT