

The SIX-survey

(*Swift*/BAT + INTEGRAL/IBIS hard X-ray survey)

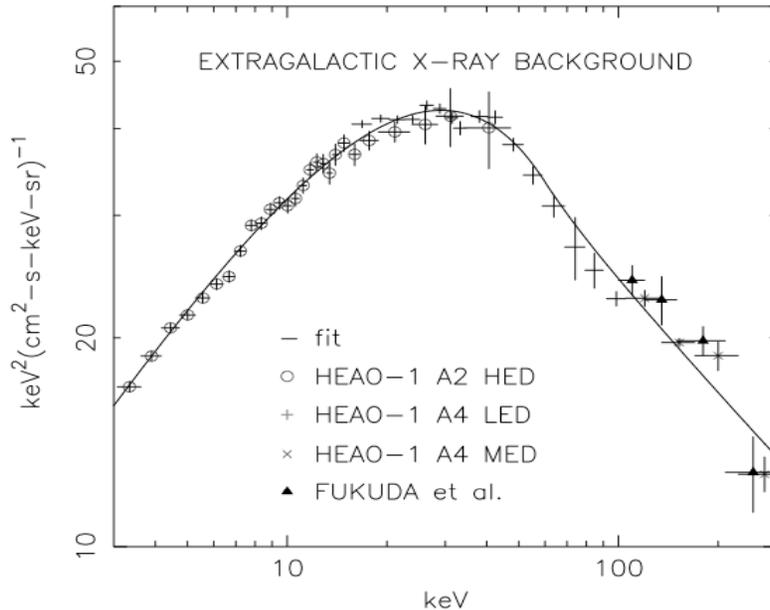
■ Eugenio Bottacini (MPE)

and

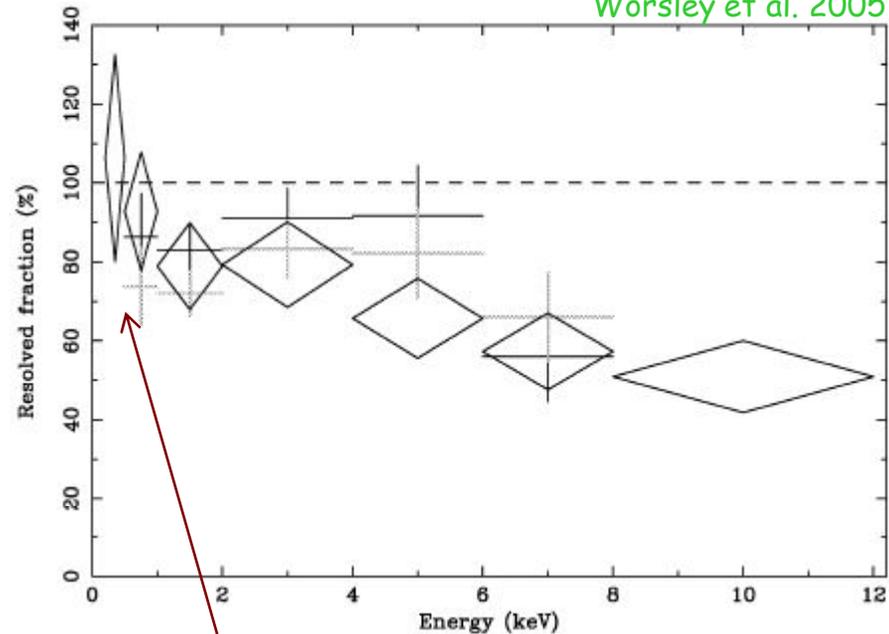
■ Marco Ajello (SLAC/KIPAC)

Cosmic X-ray Background

Gruber et al. 1999



Worsley et al. 2005

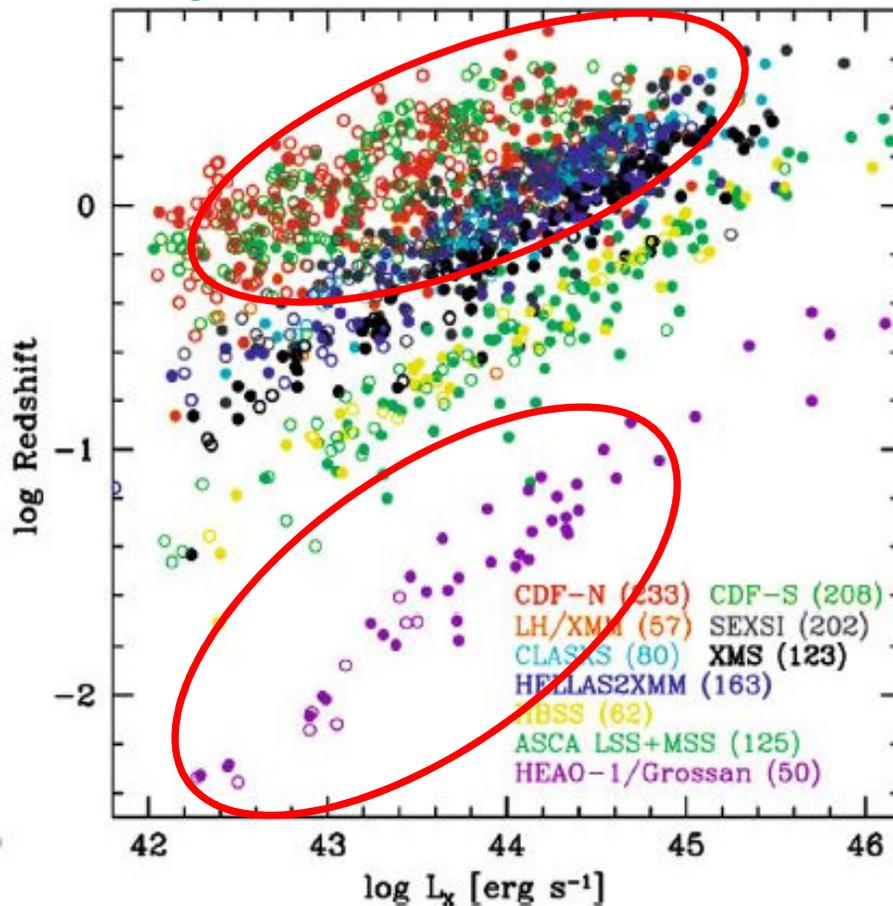


- Spectrum of diffuse extragalactic X-ray emission peaks at ~30 keV
- Large fraction of CXB resolved in point-like sources
- Population synthesis models explain CXB

- < 2 keV resolved
- Resolved fraction decreases with energy
- obscured AGN still undetected

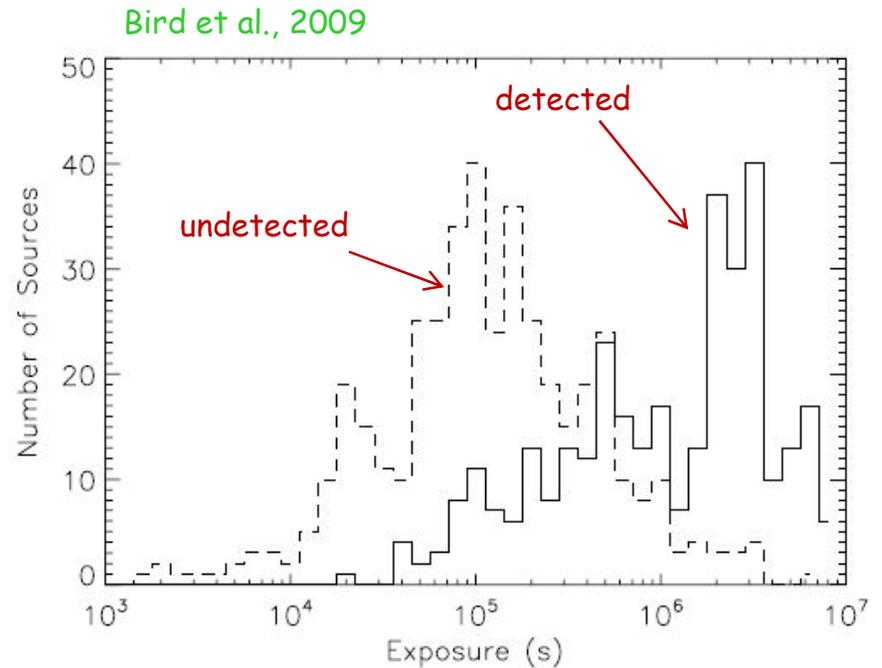
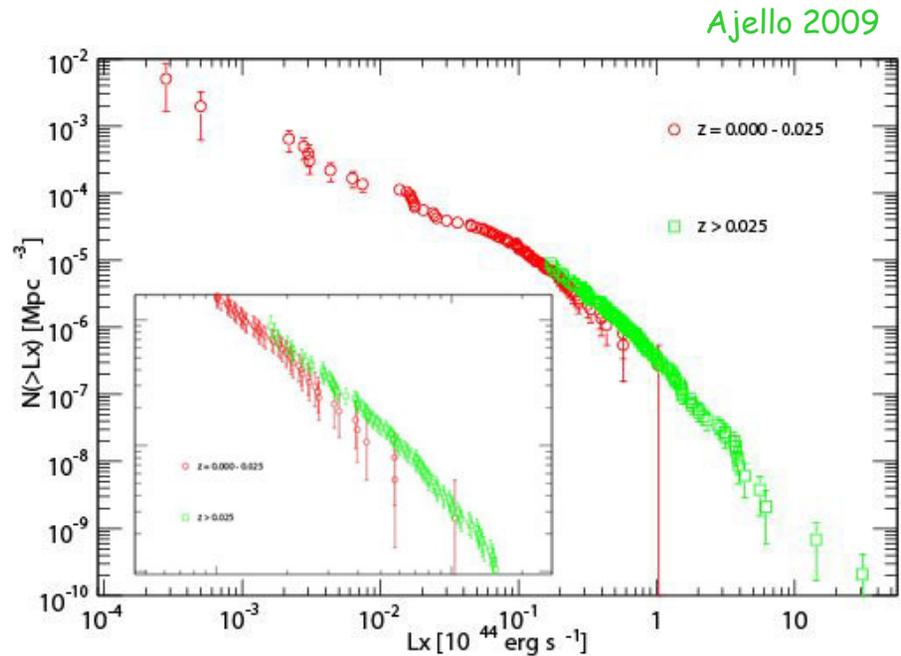
Current X-ray surveys

Hasinger 2008



- A large fraction of absorbed AGN predicted
- 2 - 10 keV band least affected by absorption
- Phase-space: luminosity - redshift
- low- L_x - low- z sparsely sampled
- > 10 keV: $\sim 10^{-13}$ erg cm⁻² s⁻¹

BAT and IBIS/ISGRI

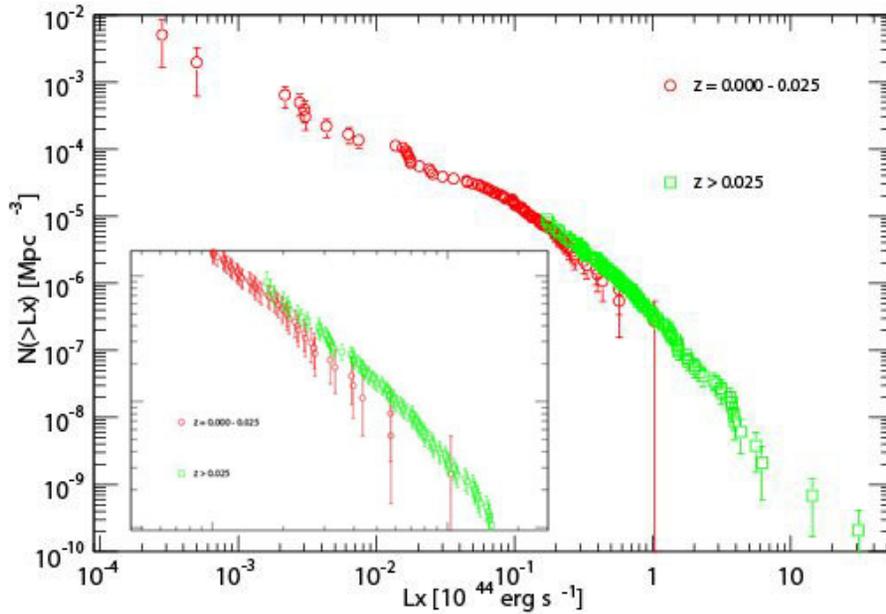


- Luminosity function of 200 BAT AGN in 2 redshift bins
- The shift at 2σ

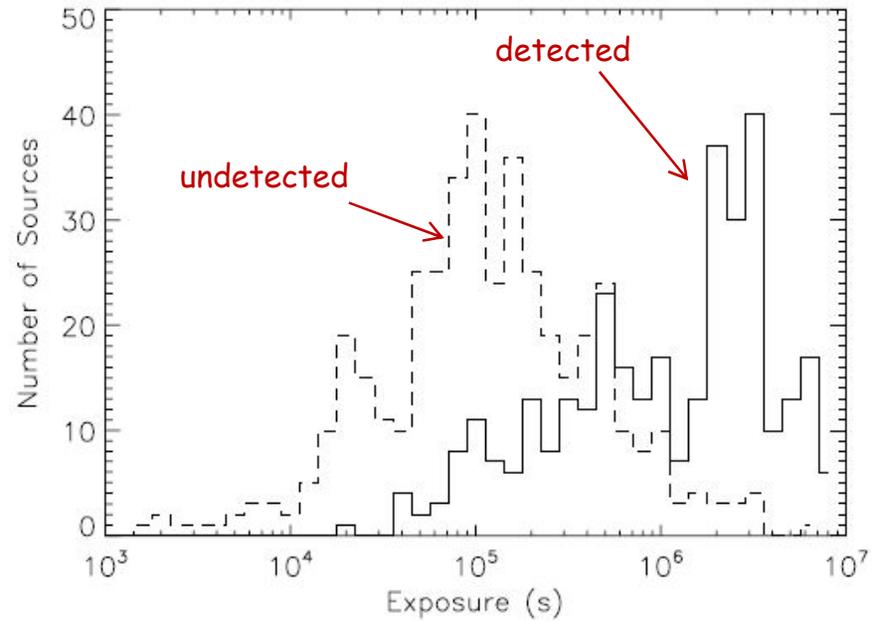
Exposure of BAT sources by
IBIS/ISGRI

BAT and IBIS/ISGRI

Ajello 2009



Bird et al., 2009

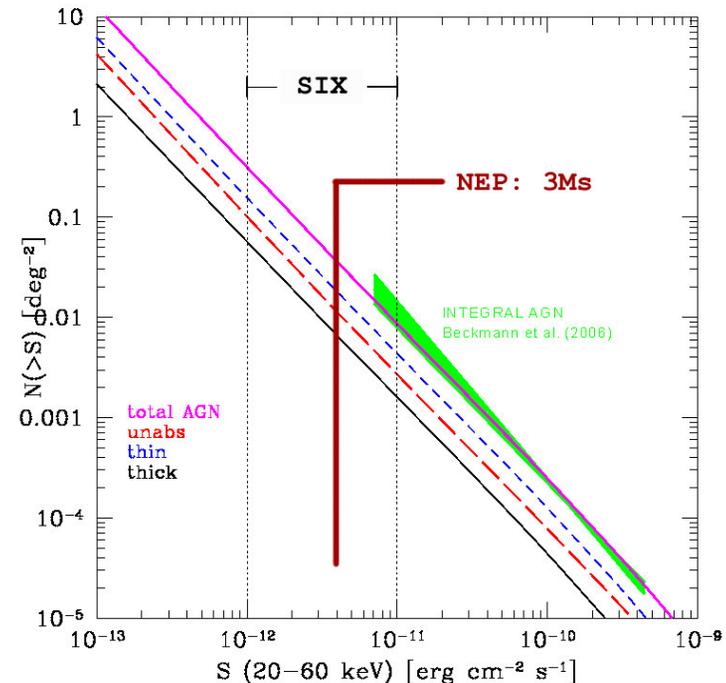


How to increase the exposure?

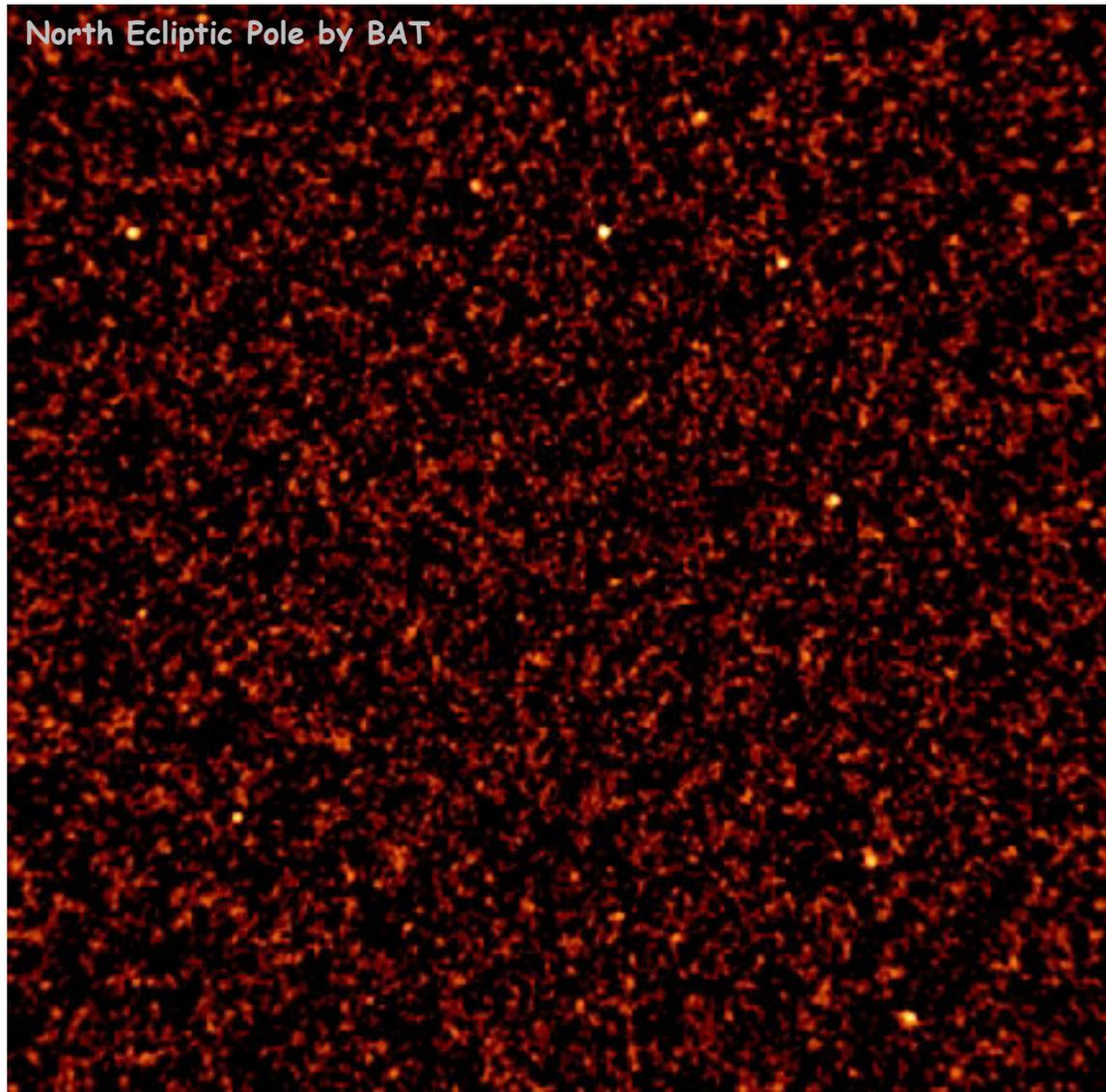
The SIX survey

Performances	BAT	IBIS/ISGRI
PSF (arcmin)	22	12
FOV (deg ²)	4500	400
Energy range (keV)	15 – 200	16 - 300
Sensitivity (mCrab)	0.9 (@ 1 Ms) (Ajello et al. 2007)	0.8 (@ 1 Ms) (Bassani et al. 2006)

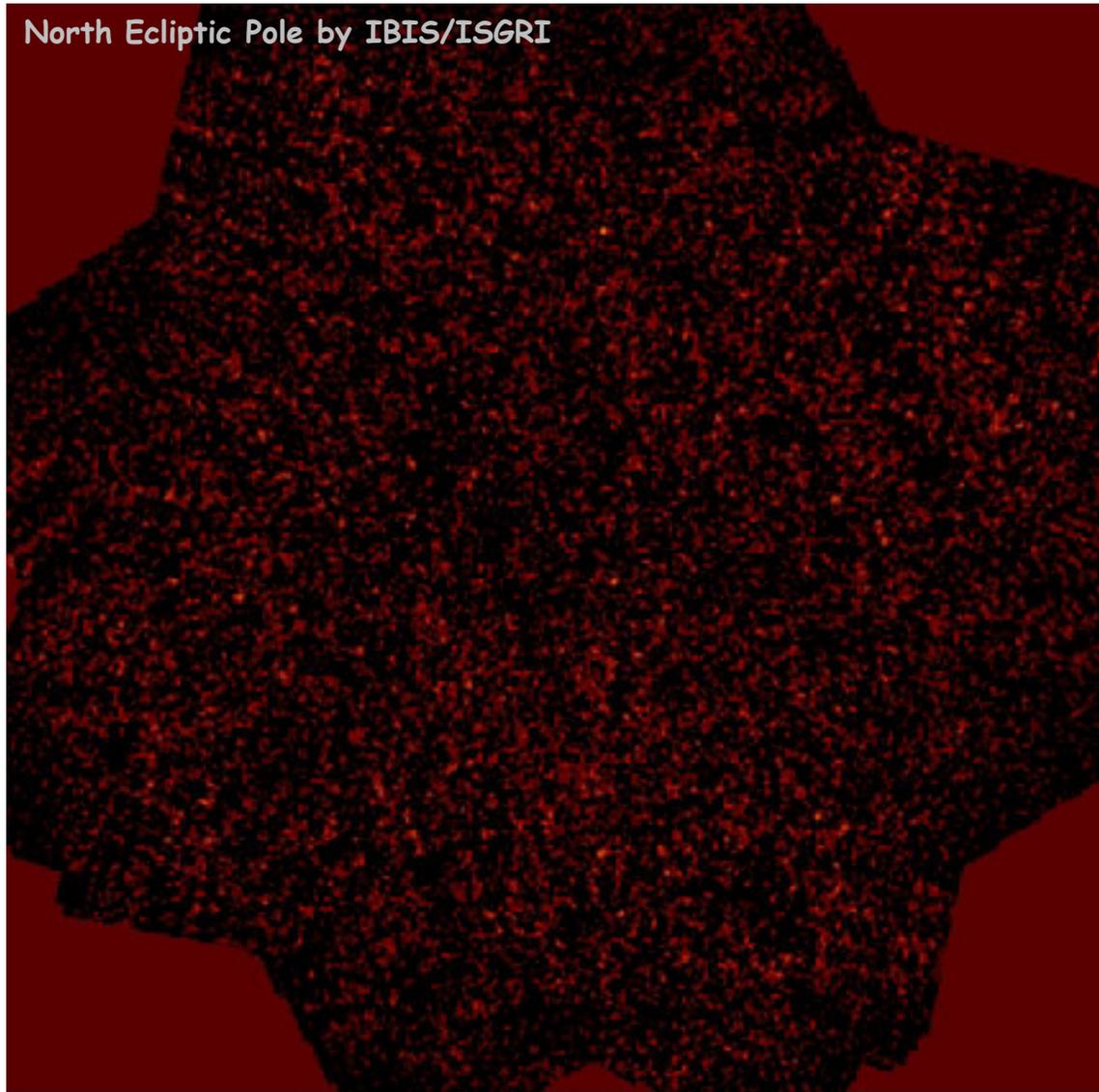
- Merge the independent surveys for selected deep extragalactic fields
- 17- 55 keV
- INTEGRAL Key Program 6 Msec (NEP)



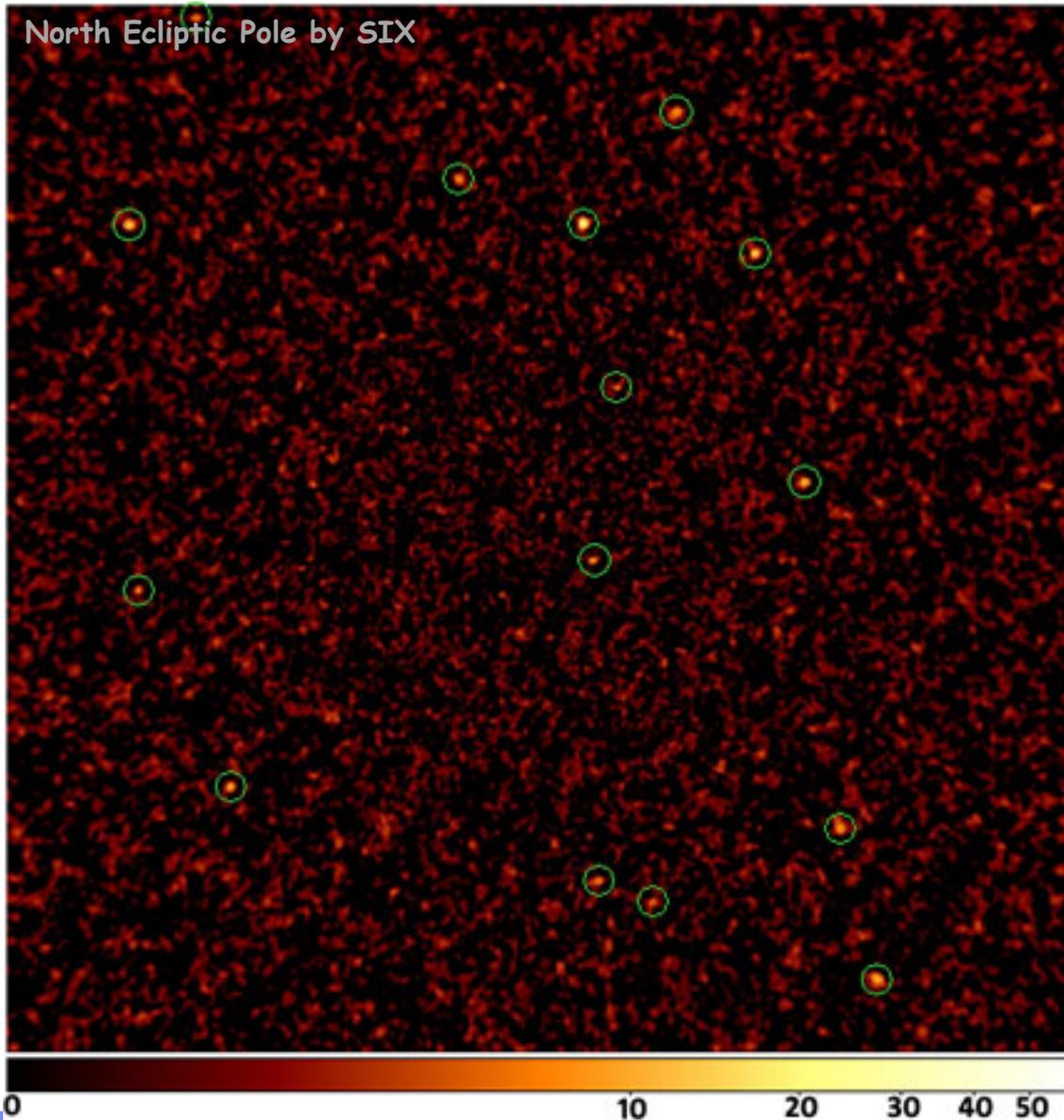
The SIX survey - NEP example



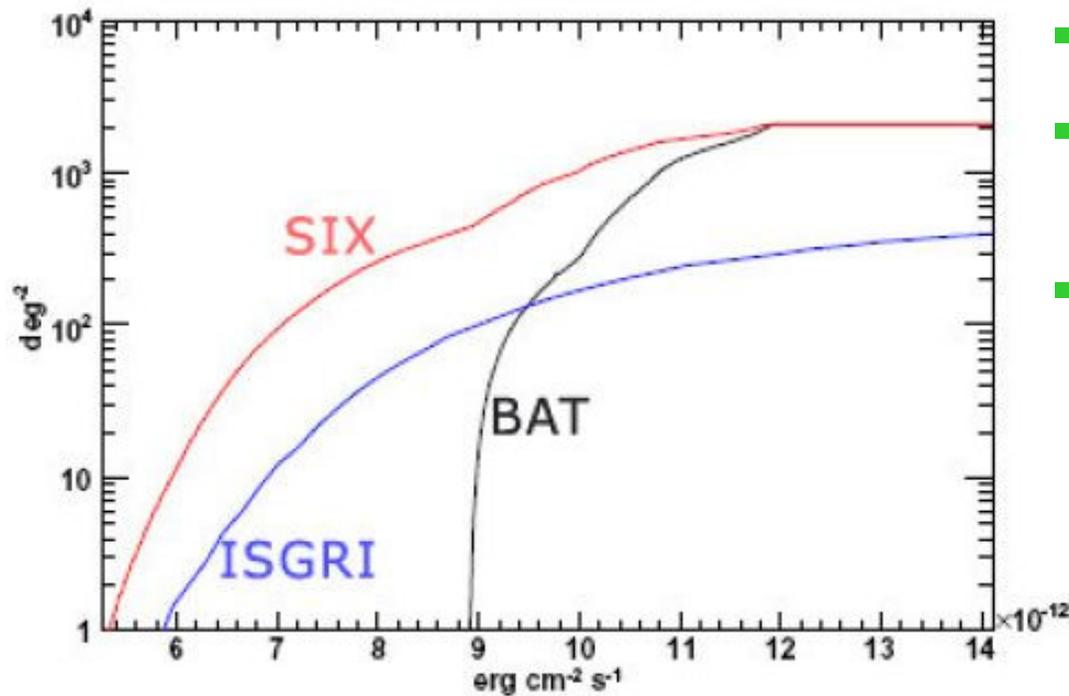
The SIX survey - NEP example



The SIX survey - NEP example

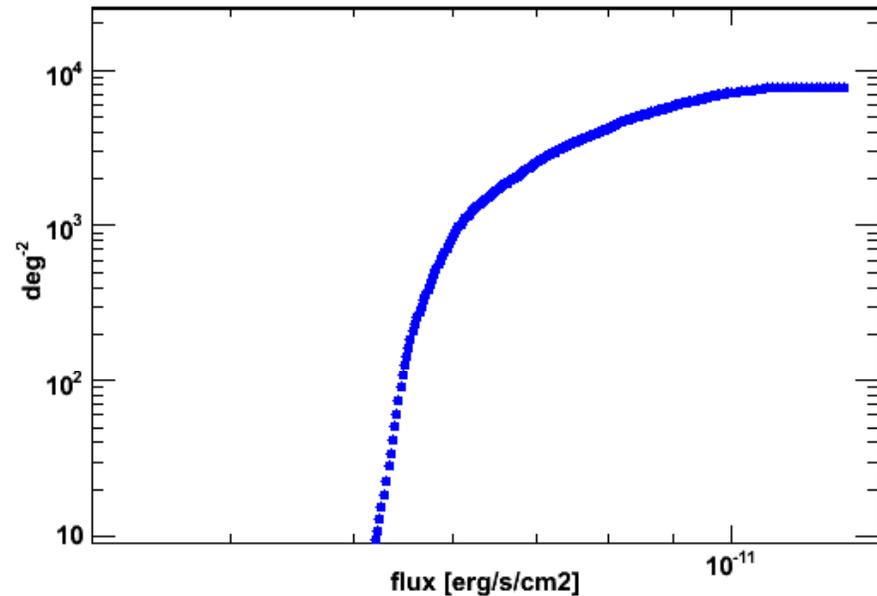
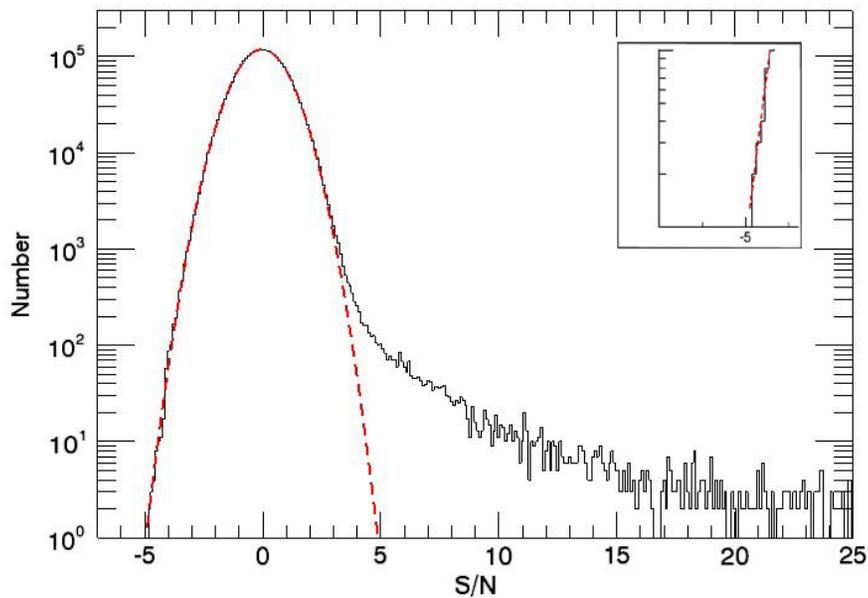


The SIX survey - NEP example



- NEP sky coverage
- Different pointing strategies
- $\sim 10^{-12}$ erg cm⁻² s⁻¹

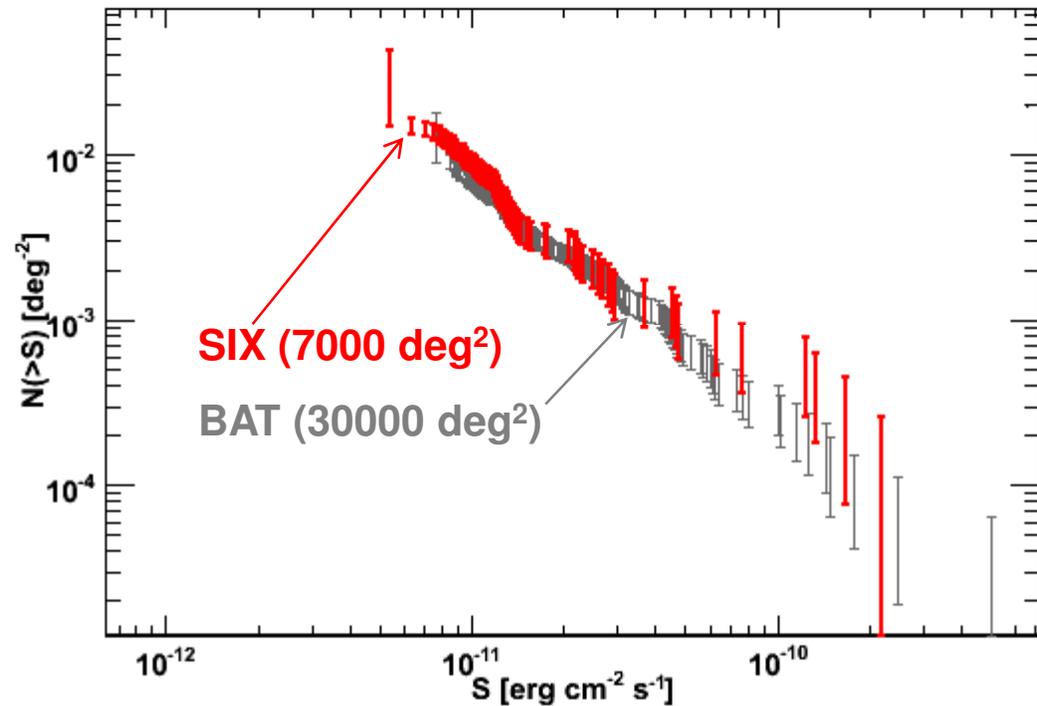
The SIX survey - performances



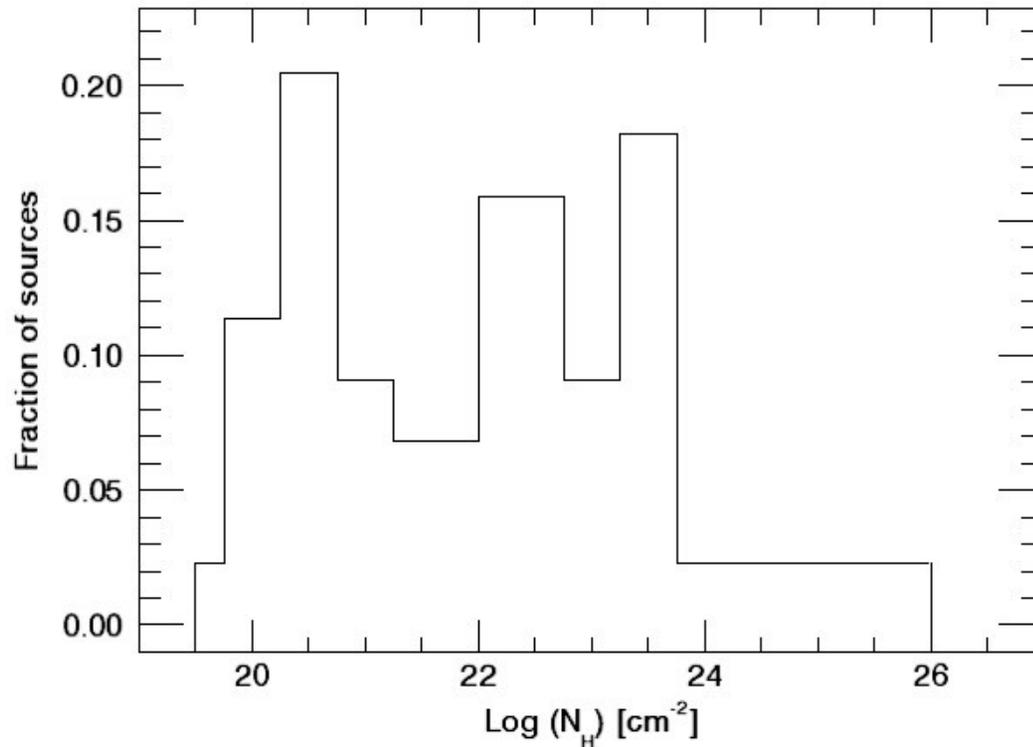
- 7000 deg² six-surveyed
- Pixel significance distribution
- $\sigma = 1.0$
- SIX sky coverage
- Complete to $\sim 1\text{mCrab}$

The SIX survey

- ✓ 78 AGN
- ✓ 12 blazars
- ✓ 2 Galaxy Clusters
- ✓ 2 CVs
- ✓ 6 unidentified

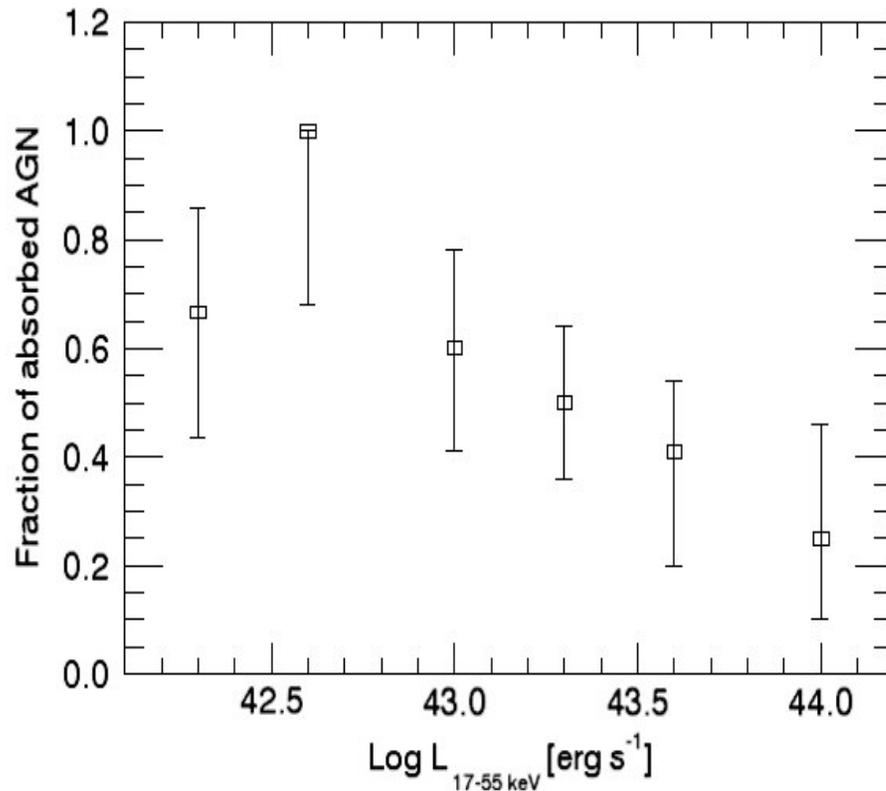


The SIX survey



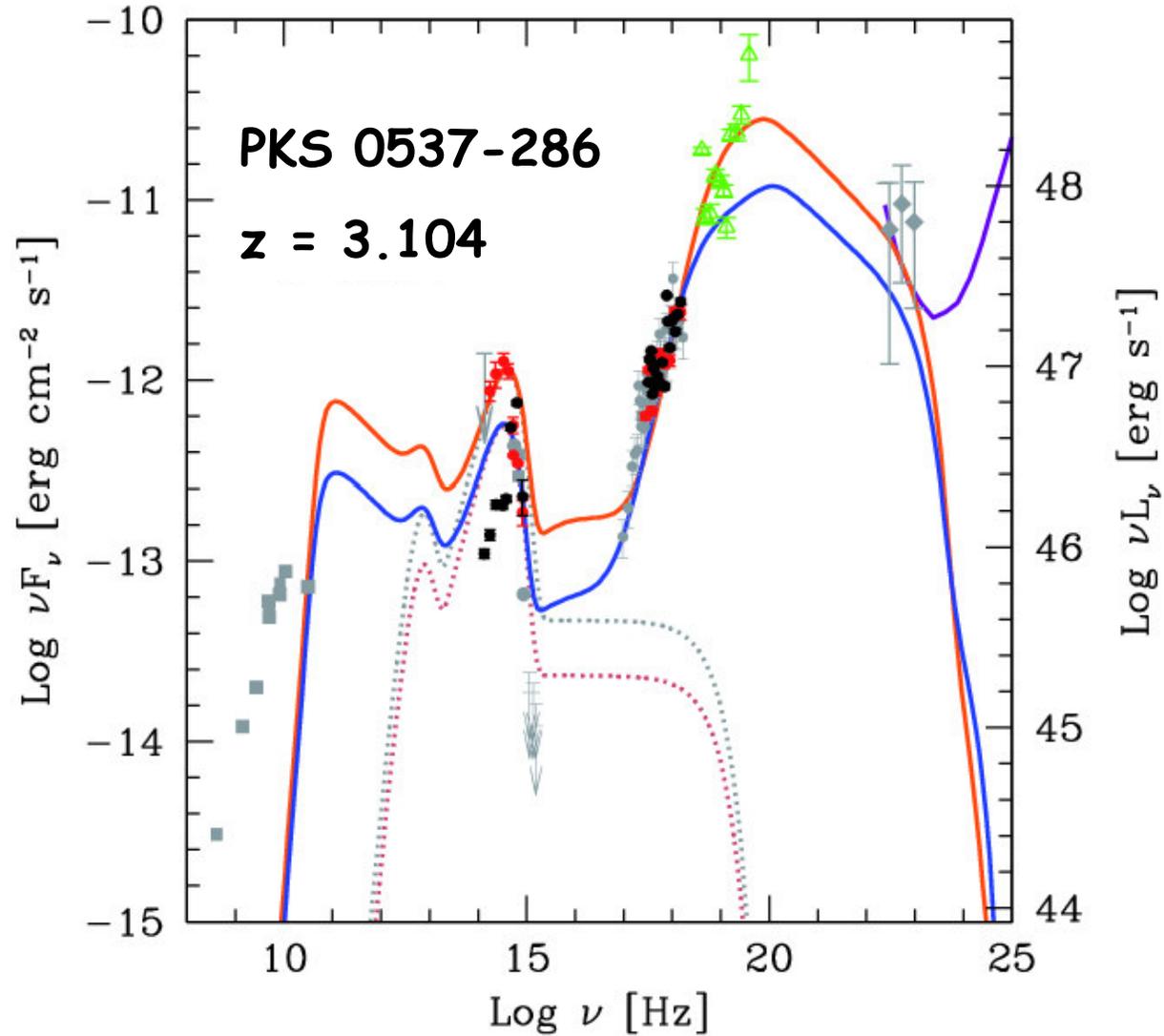
- ✓ 6% C-thick ($N_H > 1.4 \times 10^{24}$)
- ✓ 50% absorbed ($N_H > 10^{22}$)
- ✓ Upper limit C-thick: 20%
- ✓ Upper limit absorbed: 70%
- ✓ Consistent with other results

The SIX survey



- ✓ 75% AGN absorbed
- ✓ 50% observed
- ✓ Different covering factor
- ✓ Anti-correlation L_x - absorbed AGN

INTERMEZZO



Bottacini, 2009, accepted A&A

Conclusions

- ✓ **SIX is making a complete census of the local Universe**
- ✓ **Source density $\sim 0.01 \text{ deg}^{-2}$ at $\sim 1\text{mCrab}$**
- ✓ **Compton-thick AGN are being detected**
- ✓ **Are the 6 unidentified sources Compton-thick?**
- ✓ **We are merging more sky areas!**