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Statistical properties of AGN in the eROSITA – All-Sky Survey

Alex Kolodzig (MPA), Marat Gilfanov (MPA,IKI),
Rashid Sunyaev (MPA,IKI), Sergey Sazonov (IKI)

Survey Sensitivity

- Exposure Time 2.3 ksec (at 90% observing efficiency)
- PSF (HEW) Soft: 30" Hard: 40"
- Background MPE (as of 06/2011)
- Assuming: ~40 false detections/survey
 - Net Counts ~9 cts/PSF(d=HEW)
 - **Soft Band** ~ **1.1×10^{-14} erg s⁻¹ cm⁻²**
 - **Hard Band** ~ **2.1×10^{-13} erg s⁻¹ cm⁻²**

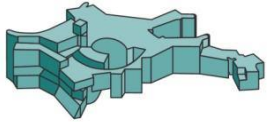
($N_{\text{H}} = 3 \times 10^{20}$ cm⁻², photon index = 1.9,
response: erosita_iv_7telfov_ff.rsp)

Ecliptic poles

- Extreme Case:

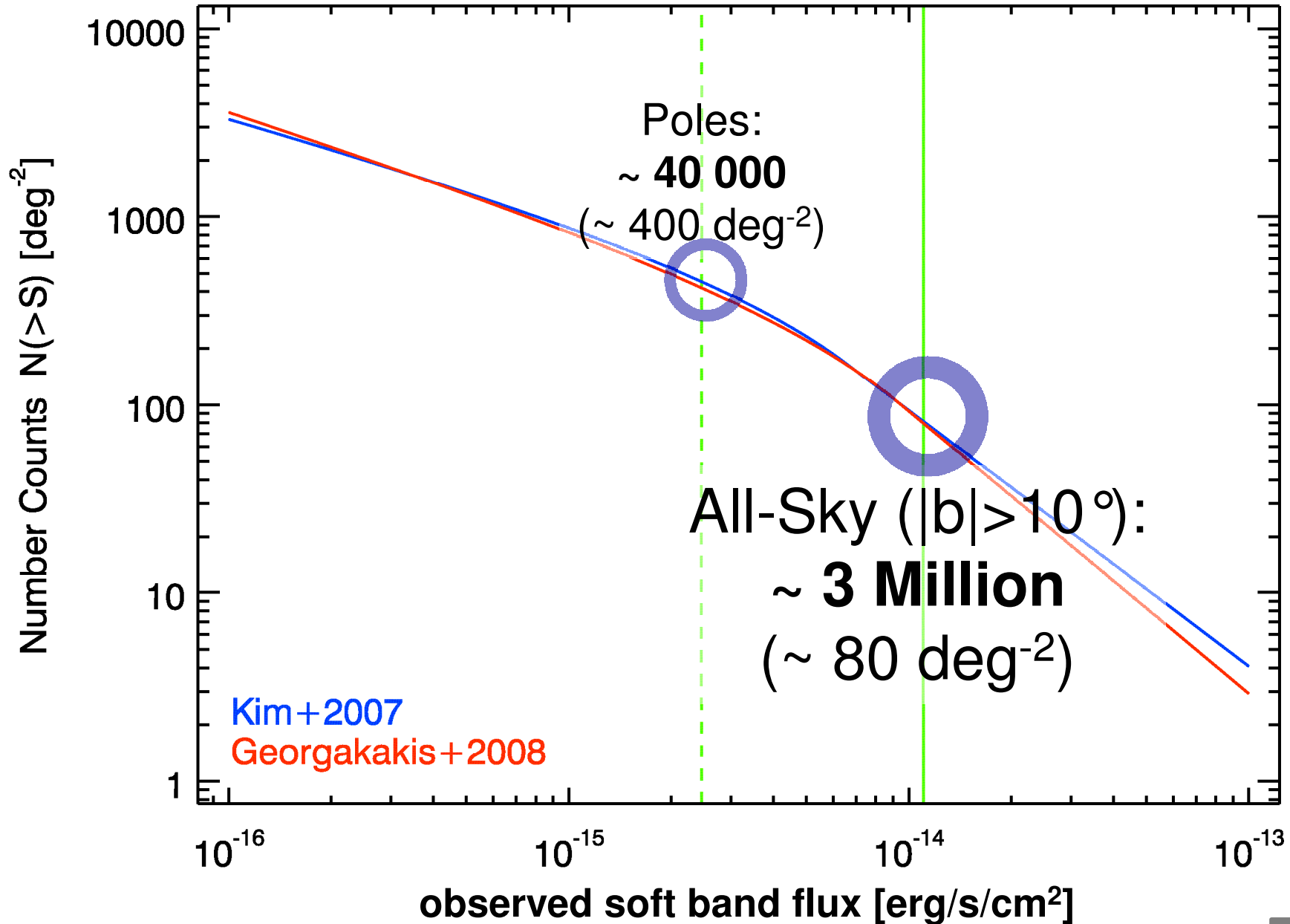
- Confusion Level 1 Source every 40 Beams ($d=HEW$)
- with number counts of Kim+2007 and Georgakakis+2008:
 - Exposure time ~ 40 ksec
 - Net Counts ~ 35 cts/PSF($d=HEW$)
 - **Soft Band** $\sim 2.5 \times 10^{-15} \text{ erg s}^{-1} \text{ cm}^{-2}$
 - **Hard Band** $\sim 4.7 \times 10^{-14} \text{ erg s}^{-1} \text{ cm}^{-2}$
- Solid Angle $\sim 100 \text{ deg}^2$ (J. Robrade)
(Average for Sun-pointing)

Picture Credits:
MPE



AGN Number Counts

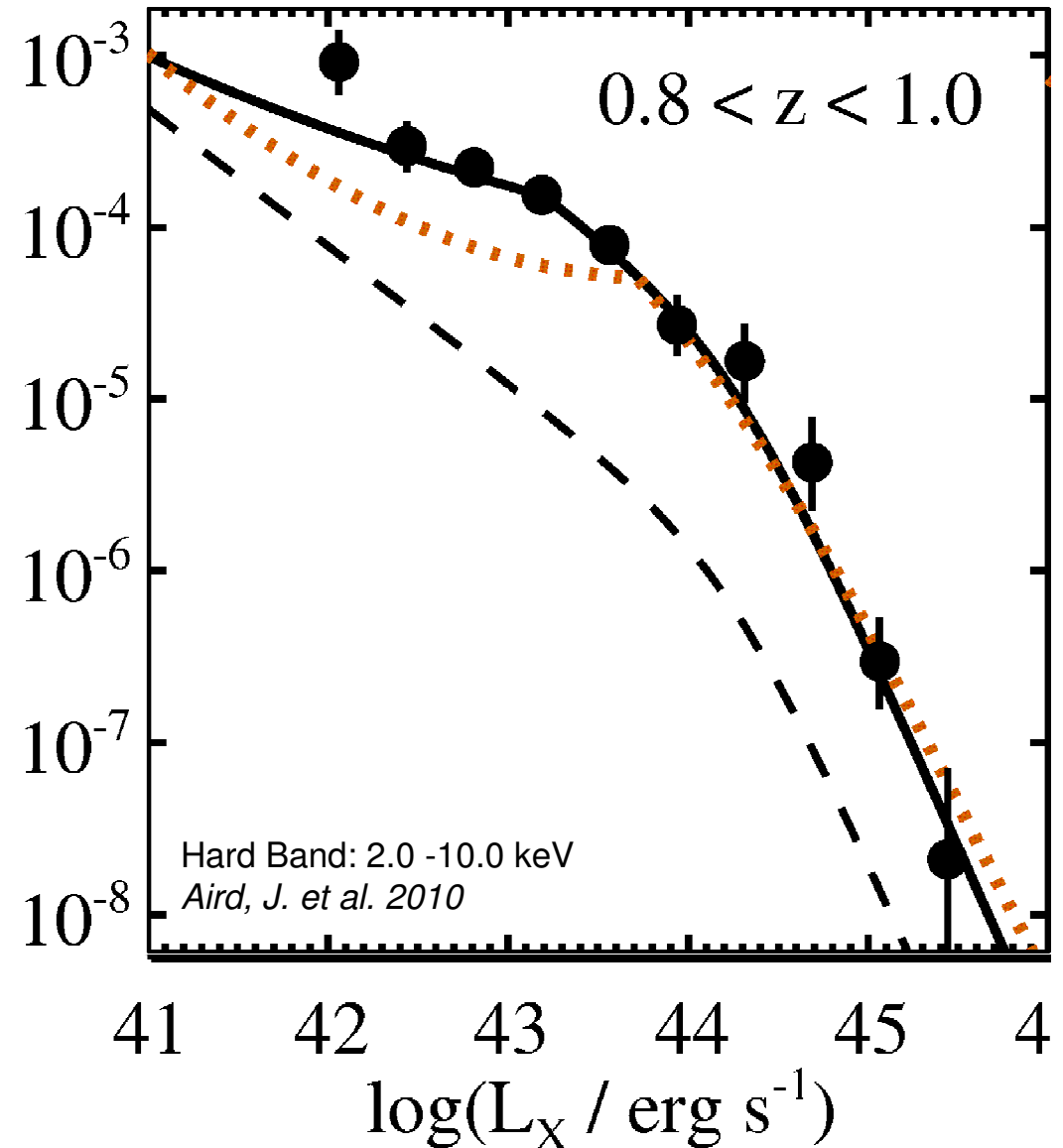
soft band



X-ray Luminosity Function (XLF)

- Definition:

$$\phi(L, z) = \frac{d\Phi(L, z)}{d\log L}$$
- Model:
 - Luminosity-Dependent Density Evolution (LDDE)
- XLF choice:
 - Soft: Hasinger+2005
 - Hard: Aird+2010
 - for unobscured AGN
- K-correction:
 - power law with photon index = 1.9

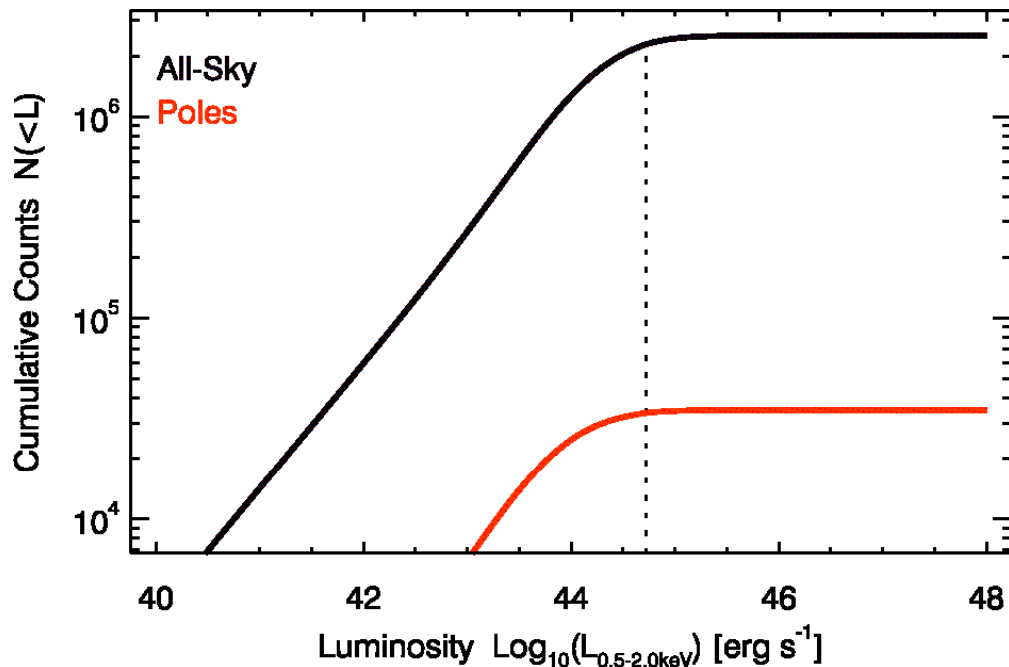


Results:

Luminosity Distribution

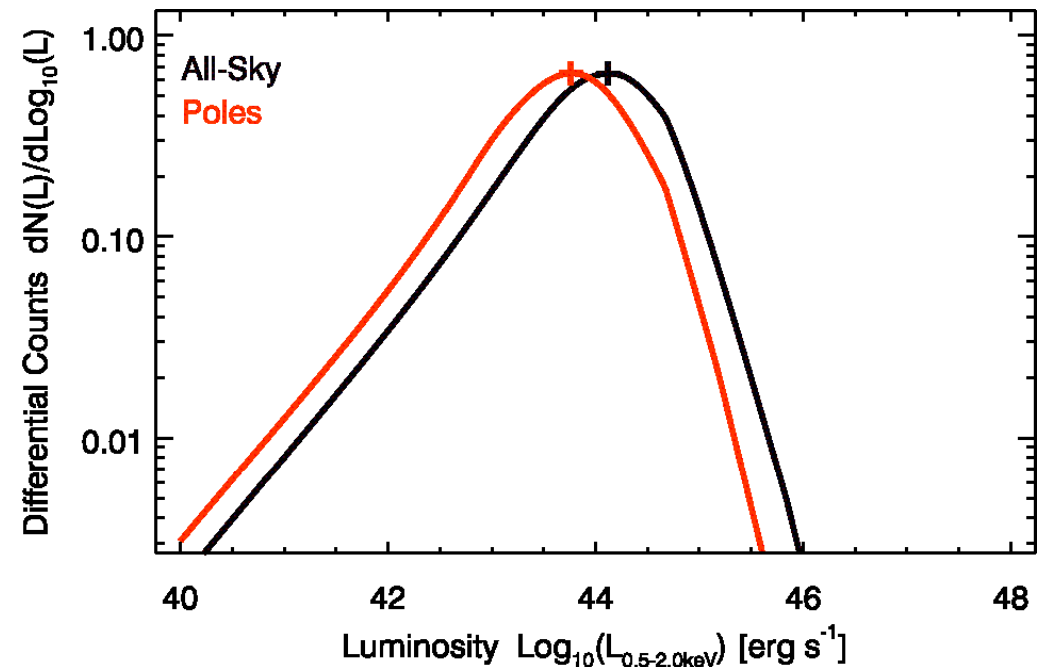
soft band

Cumulative AGN Counts
(y-axis: counts for entire survey)



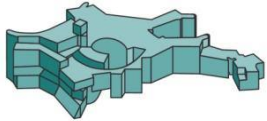
$\sim 10\%: L > 10^{45} \text{ ergs}^{-1}$

Differential AGN Counts
(y-axis: normalized)



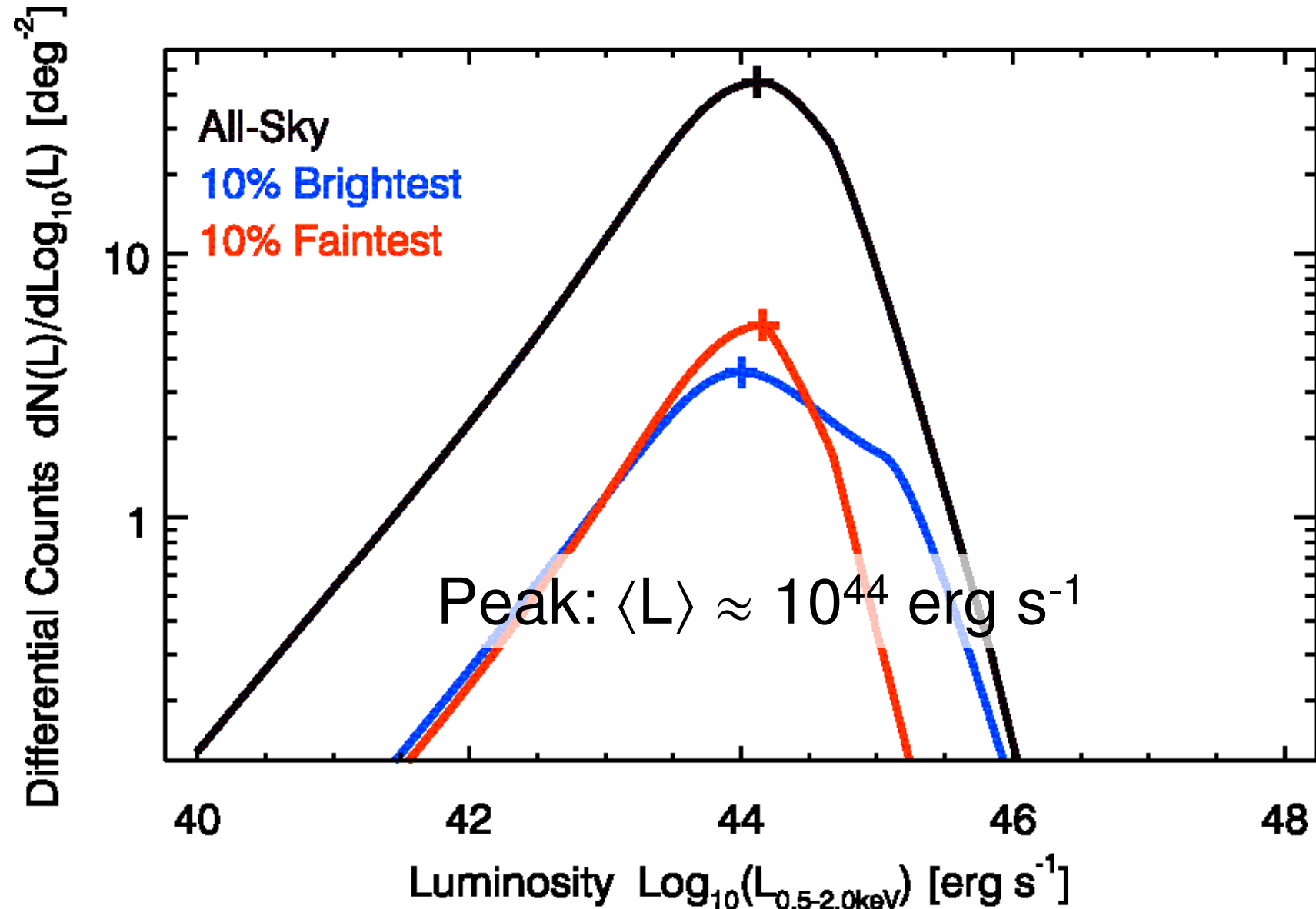
Peak: $L \approx 10^{44.1} \text{ ergs}^{-1}$

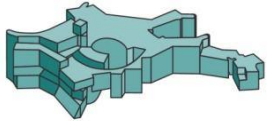
Peak: $L \approx 10^{43.8} \text{ ergs}^{-1}$



Luminosity Distribution

soft band

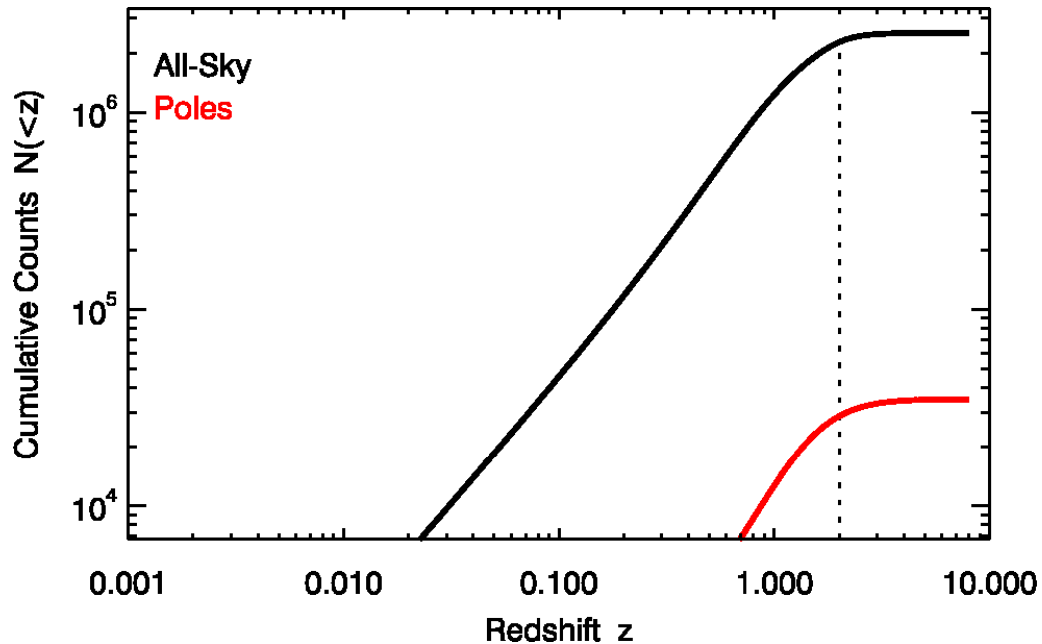




Redshift Distribution

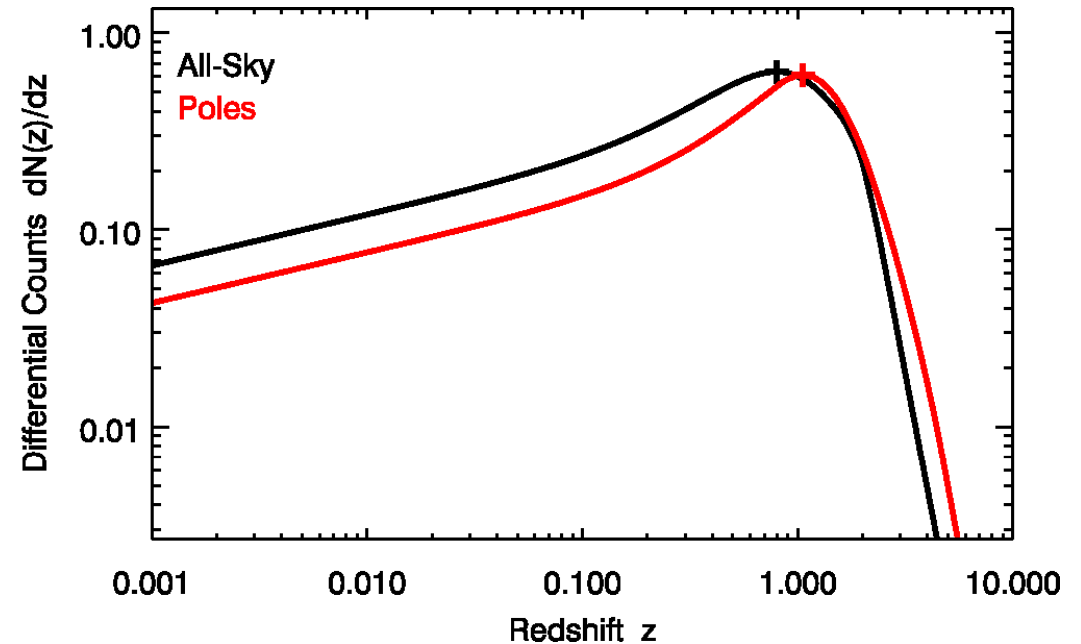
soft band

Cumulative AGN Counts
(y-axis: counts for entire survey)



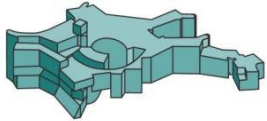
~ 90%: $z < 2.0$

Differential AGN Counts
(y-axis: normalized)



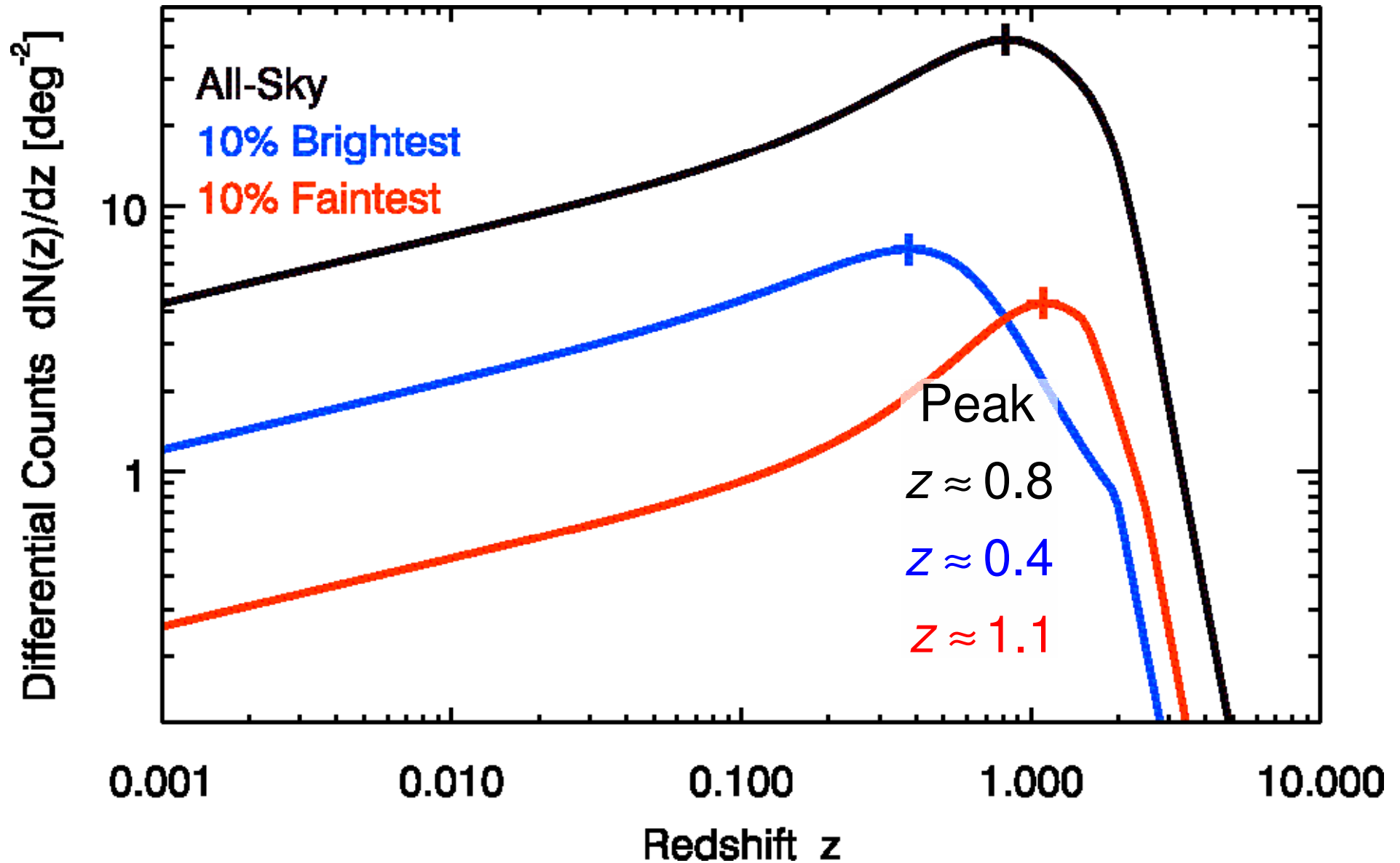
Peak: $z \approx 0.8$

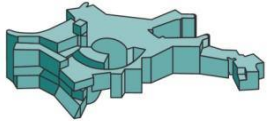
Peak: $z \approx 1.1$



Redshift Distribution

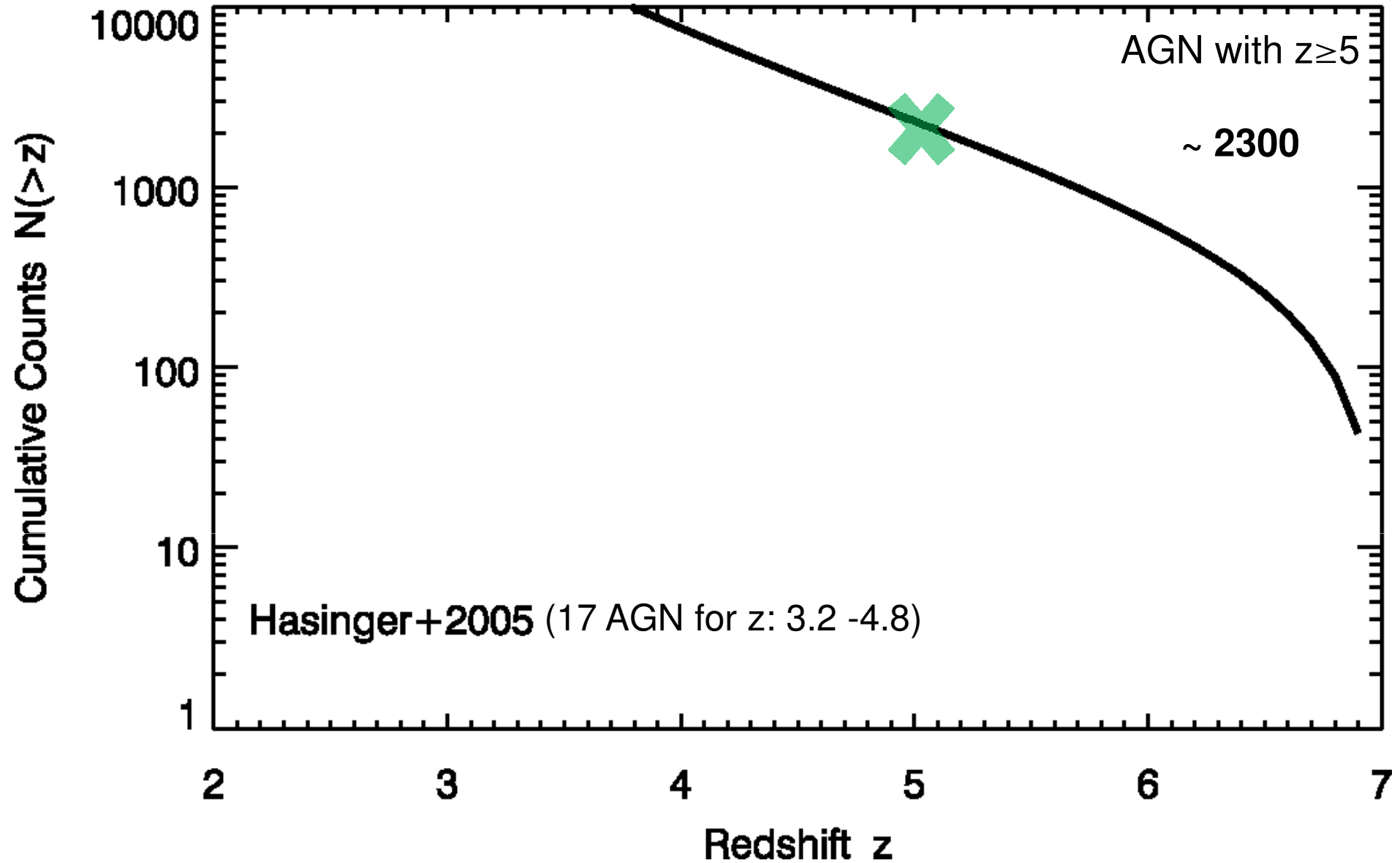
soft band

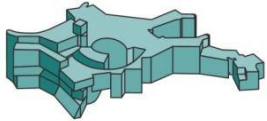




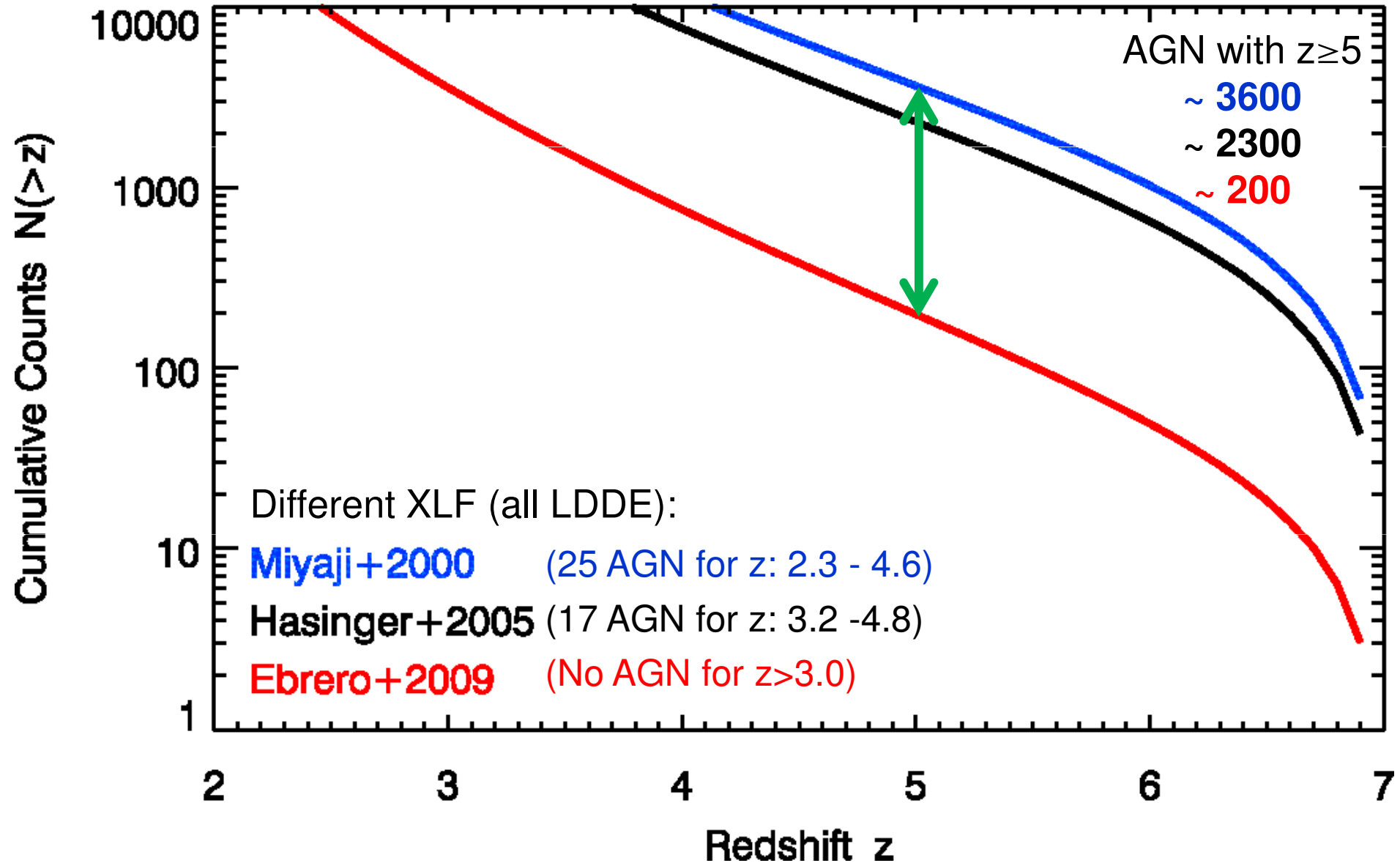
High-Redshift AGN

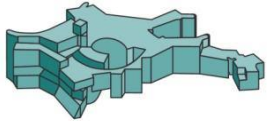
soft band





High-Redshift AGN soft band





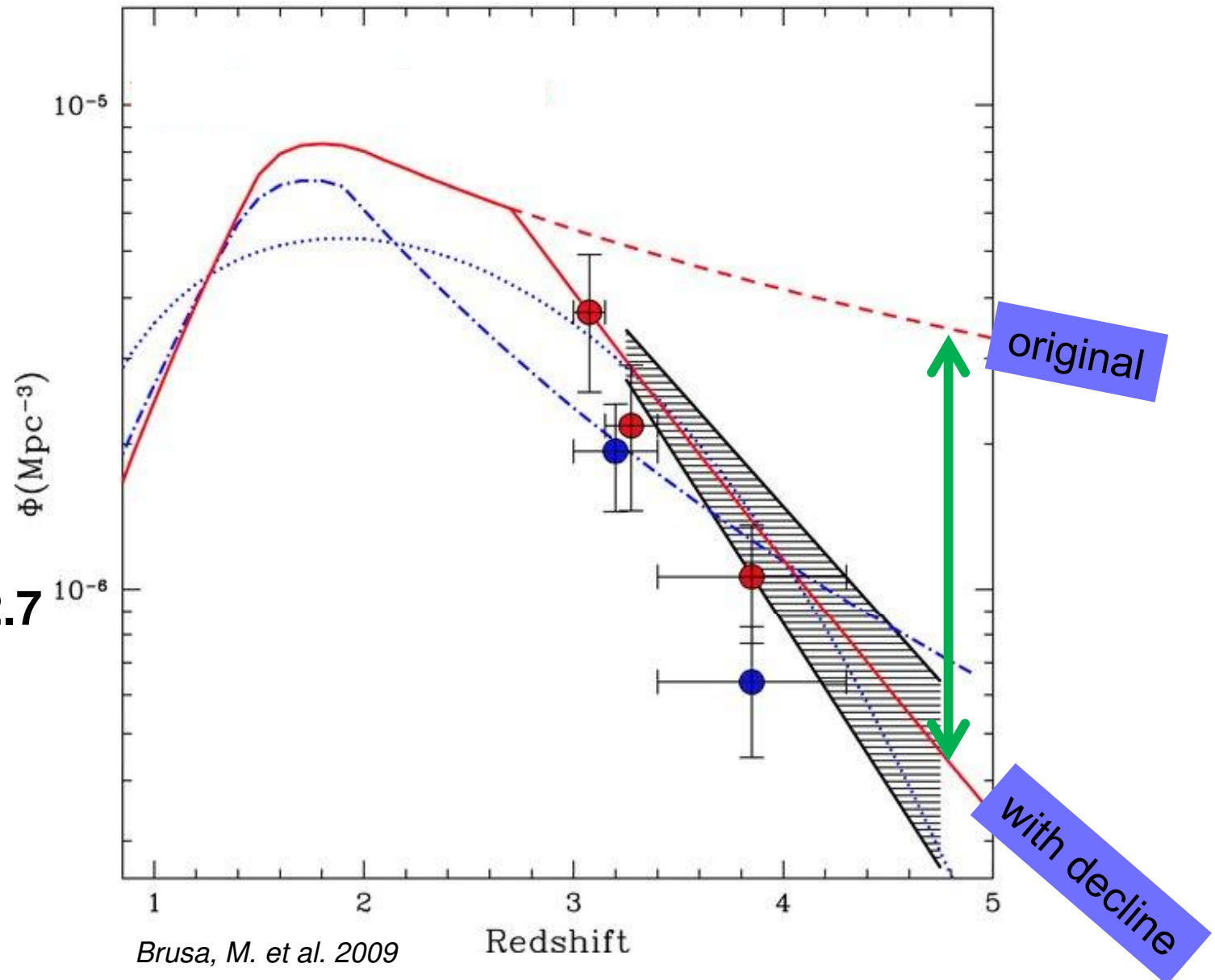
Max-Planck-Institut für
Astrophysik

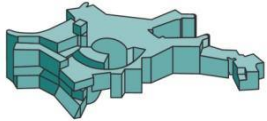
High-Redshift AGN

soft band

Hasinger et al. 2005:
17 AGN for
 $z: 3.2 - 4.8$

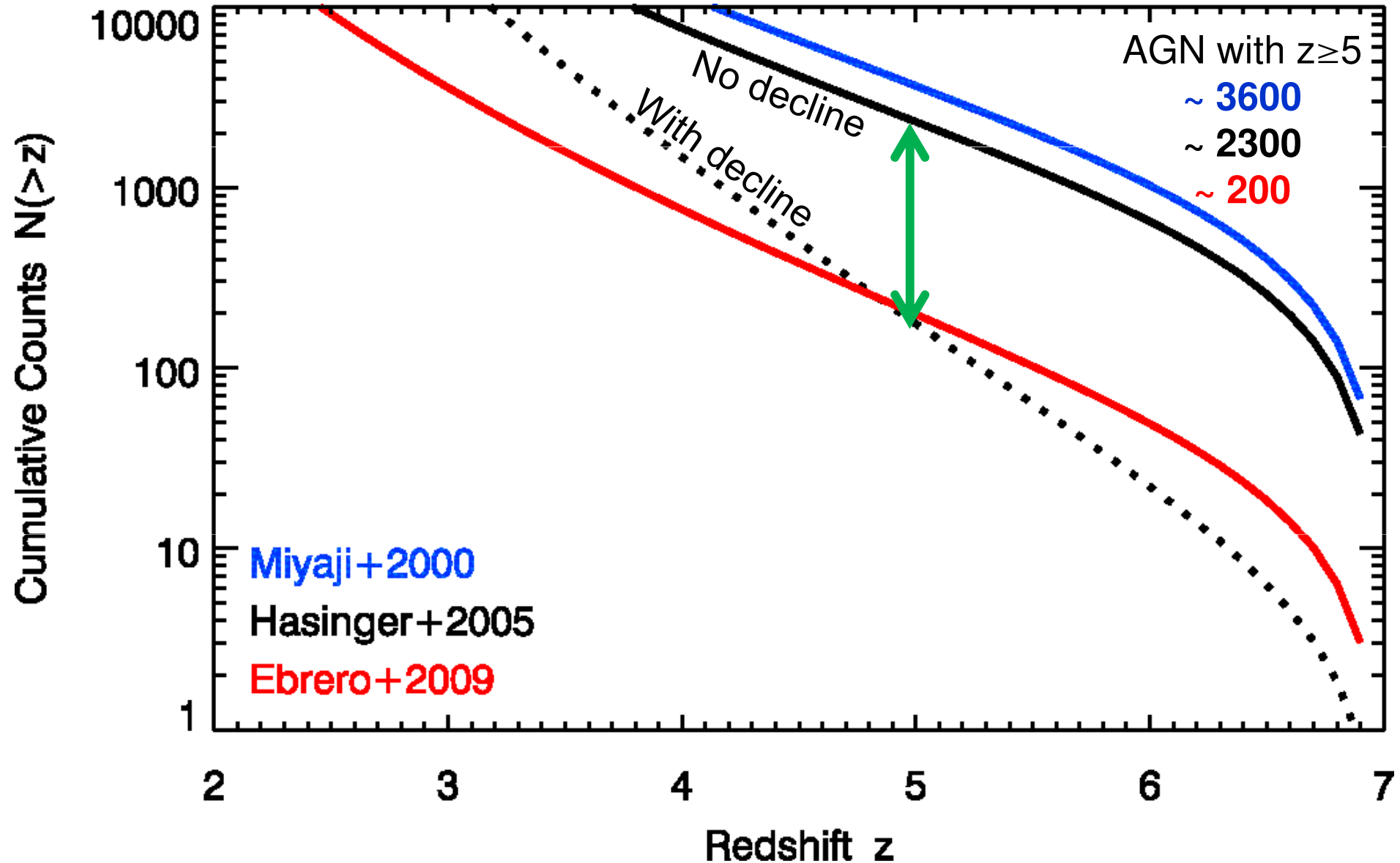
Brusa et al. 2009:
XMM-COSMOS
sample ,
34 AGN for
 $z: 3.0 - 4.5$
→ suggest:
exp. decline for $z > 2.7$





High-Redshift AGN

soft band



Summary

AGN in eRASS (soft band, $|b| > 10^\circ$):

~ 3 Million

90% with $L < 10^{45}$ erg/s and $z < 2.0$

typical: $L \sim 10^{44}$ erg/s and $z \sim 0.8$

10% brightest: $z \sim 0.4$

10% faintest: $z \sim 1.1$

~ $10^2 - 10^3$ AGN with $z \geq 5$

→ A. Kolodzig et al. (2011, in prep.)

