



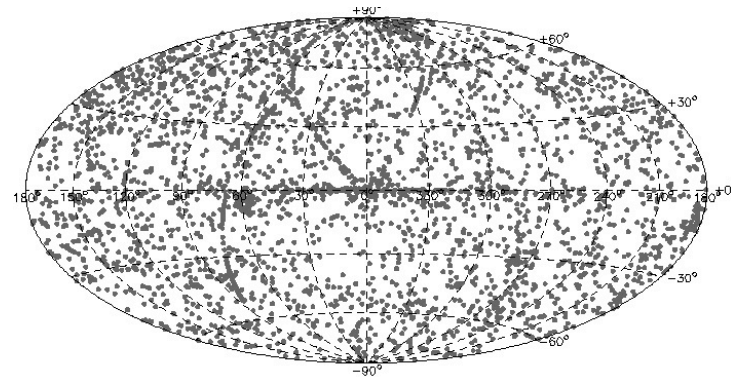
# Statistical properties of a sample of serendipitous X-ray sources in deep Swift GRB pointings

Paolo Giommi  
ASI

# Swift observations

archive content as of June 2008

- 14,500 observations
- 3,380 distinct pointings
- ~300 sq deg of sky (< 1%)

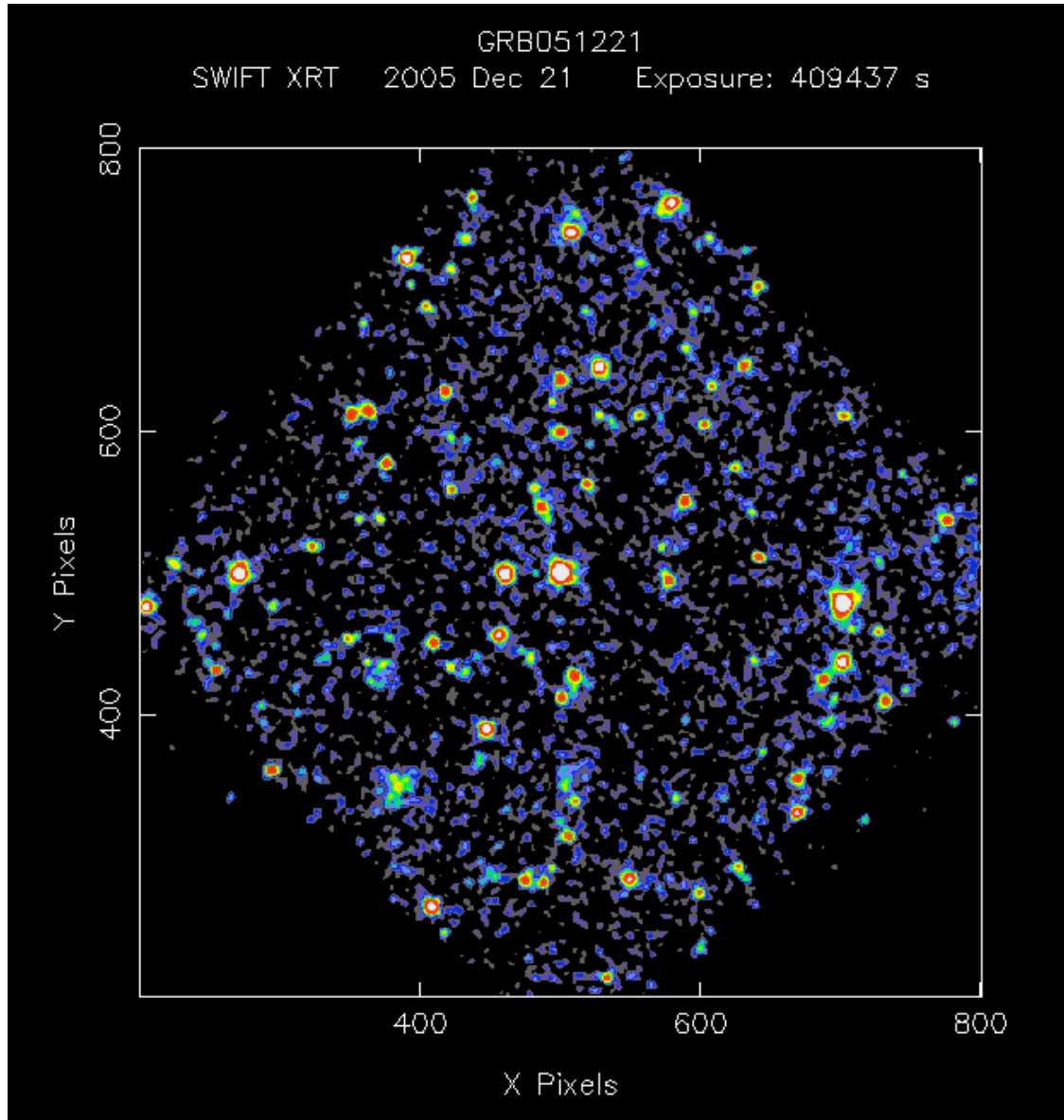


More than 300 GRB detected and followed up  
for several days/weeks with the X-ray Telescope

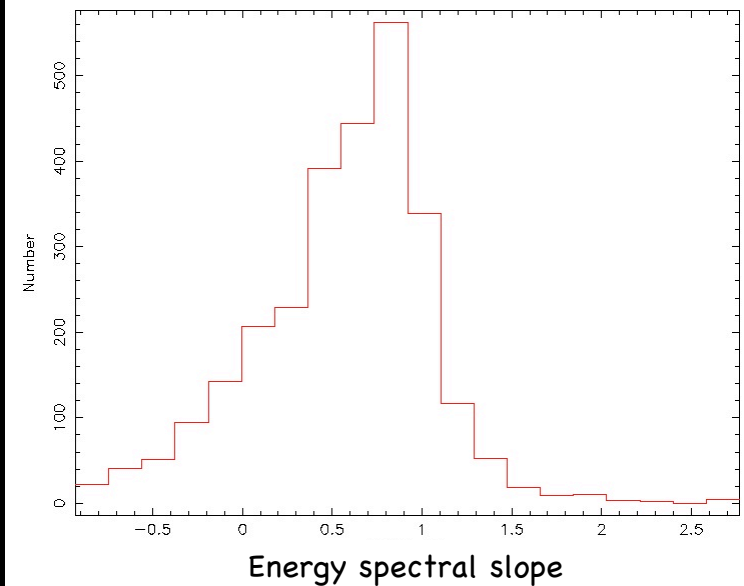
Unique database of optical/UV X-ray simultaneous data



# Swift XRT serendipitous sources in GRBs pointings : the “*perfect*” serendipitous survey



Most X-ray sources  
are radio quiet QSOs  
Only ~1 blazar/field  
expected with  
radio flux > 10 mJy!



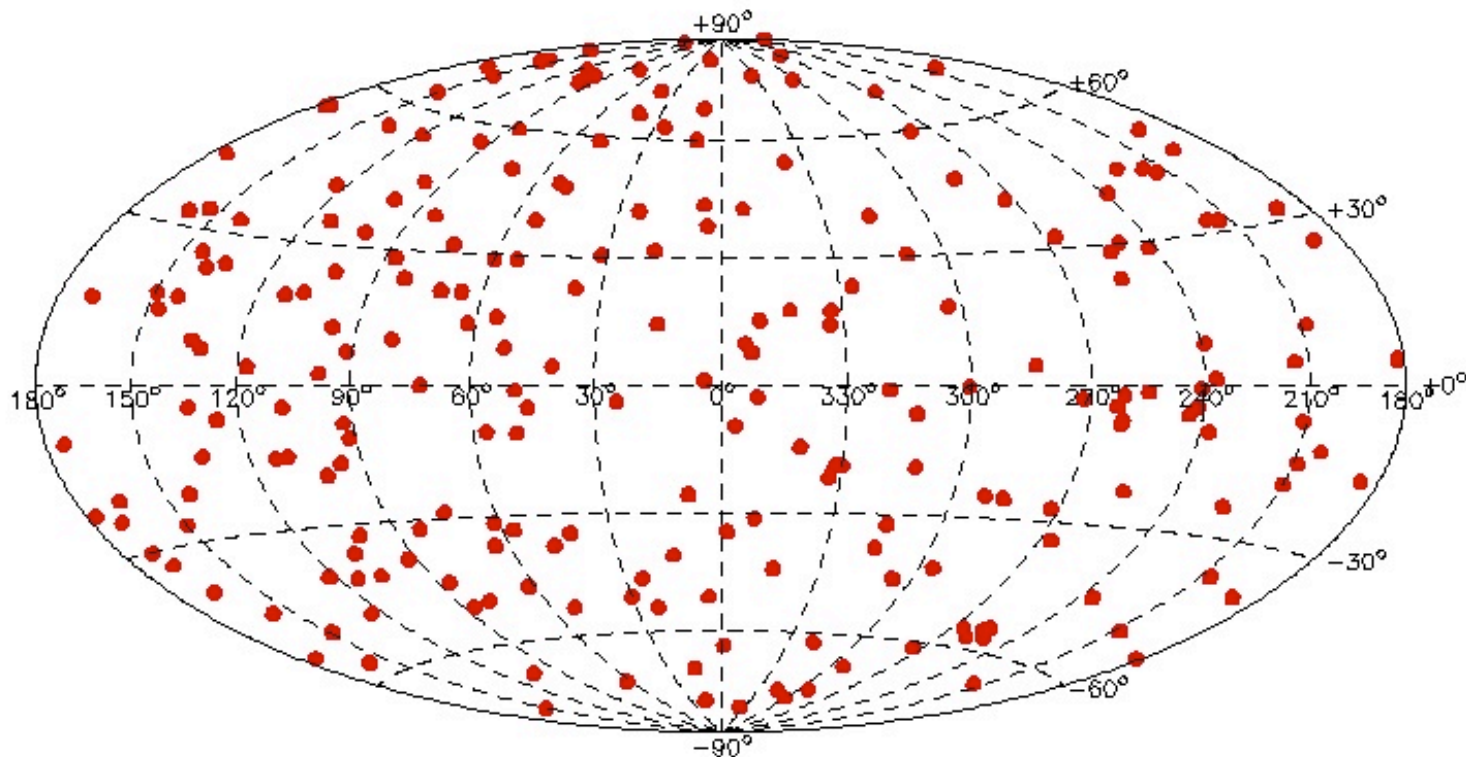
# Swift XRT serendipitous survey in GRB deep fields

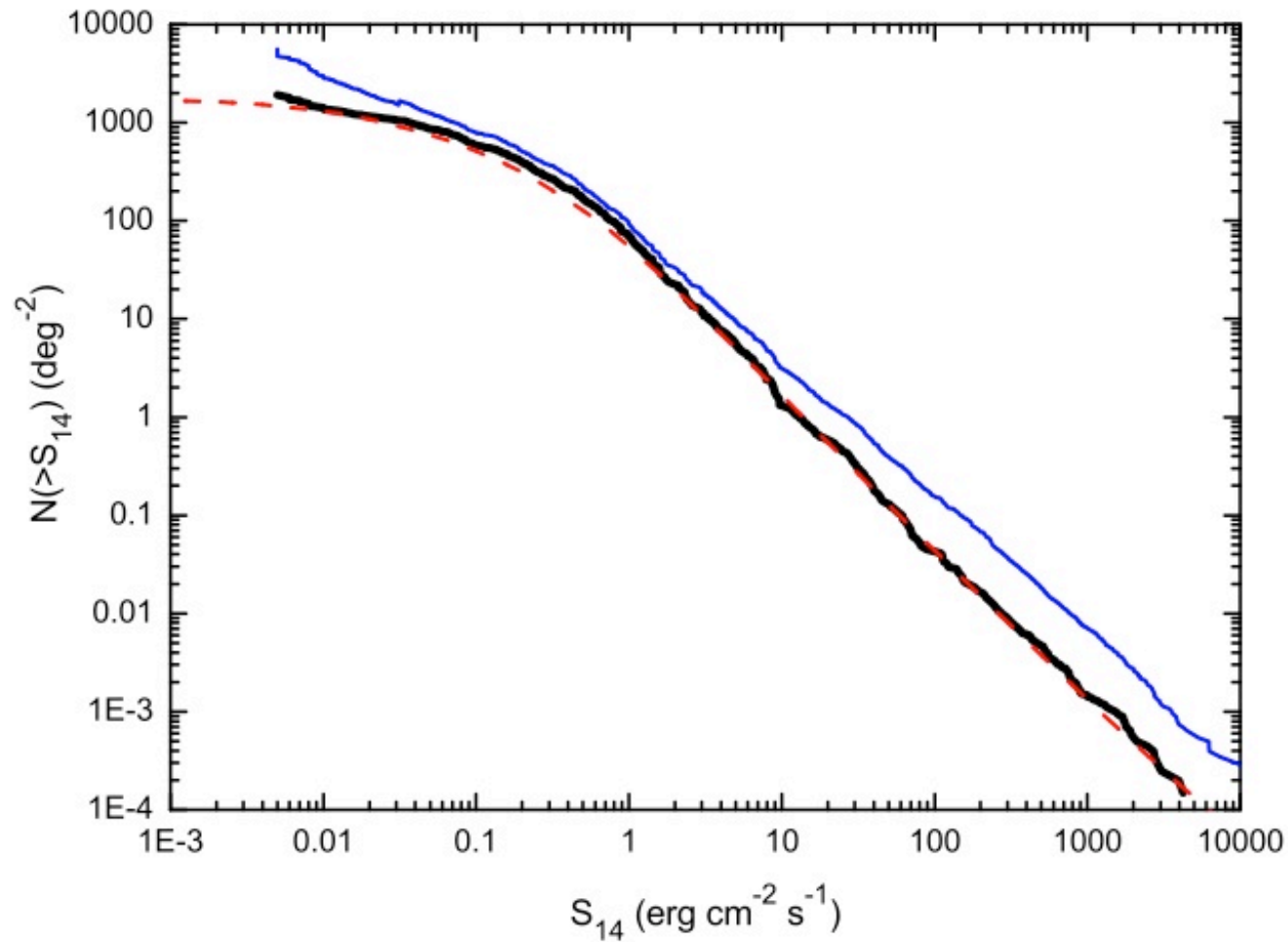
235 deep ( $10^4$ - $10^6$  seconds) GRB exposures analyzed

~7,600 sources detected with off-axis  $< 10$  arcmin

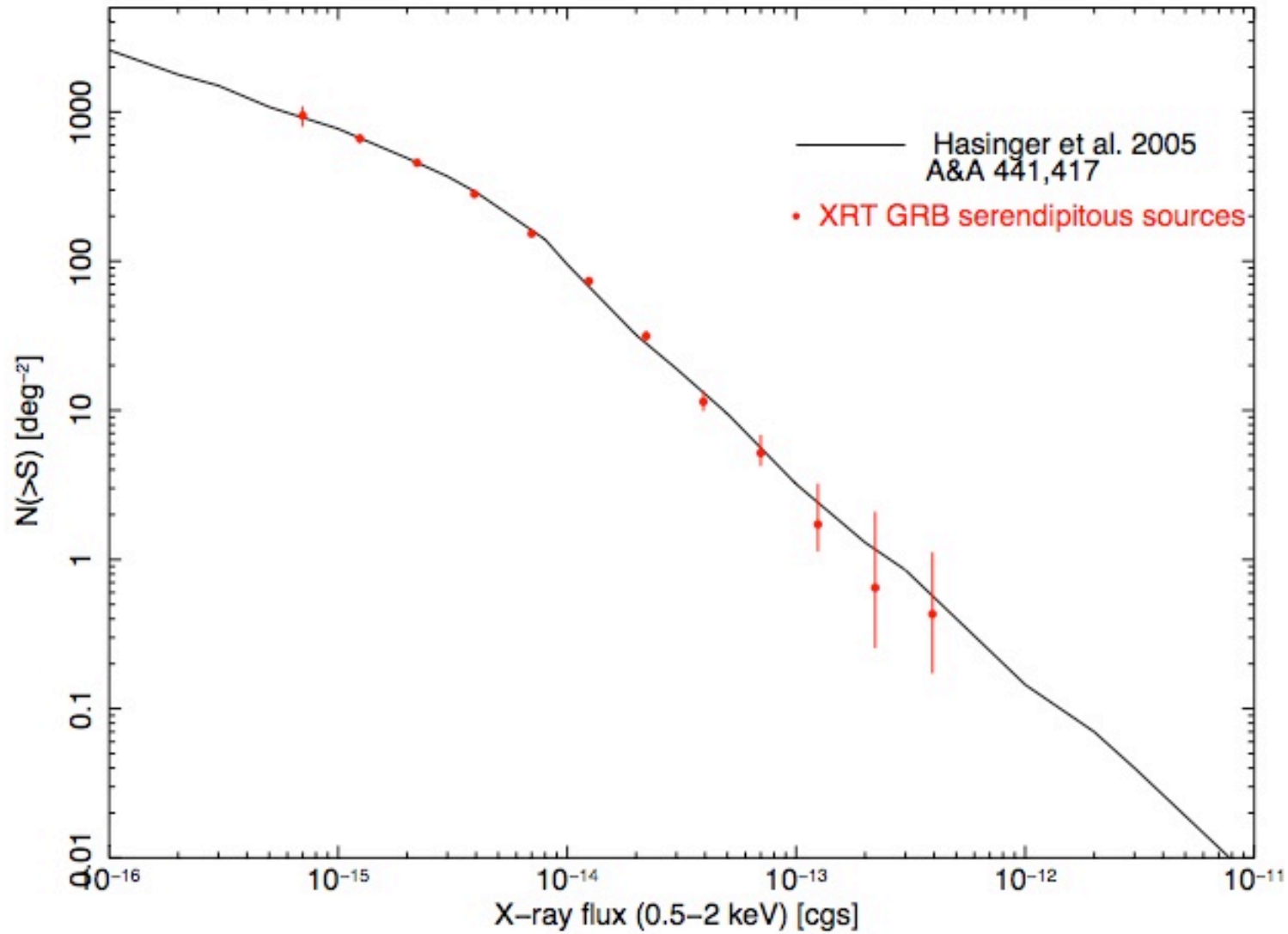
Positional uncertainty 3-5 arcsecs.

160 fields are at  $|b_{II}| > 20$  : ~5,600 sources





**Fig. 3.** (a) Cumulative number counts  $N(>S)$  for the total sample (upper thin line) and the AGN-1 subsample (lower thick line). (b) Differential number counts of the total sample of X-ray sources (open squares) and the AGN-1 subsample (filled squares). The dot-dashed lines refer to broken powerlaw fits to the differential source counts (see text). The dashed red line shows the prediction for type-1 AGN based on the model described in in section 5.

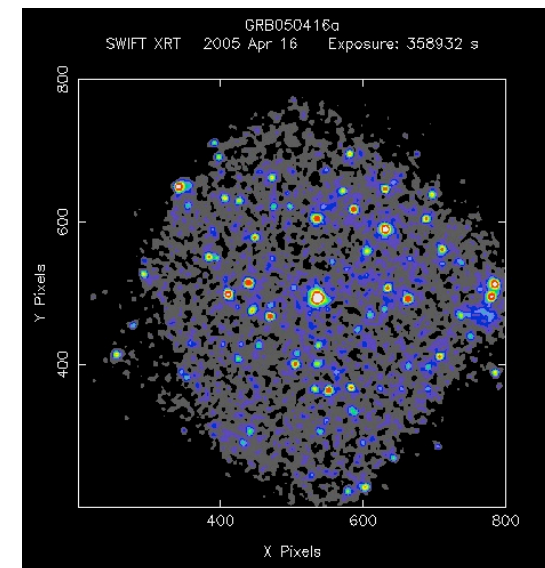


# The sample for this exercise

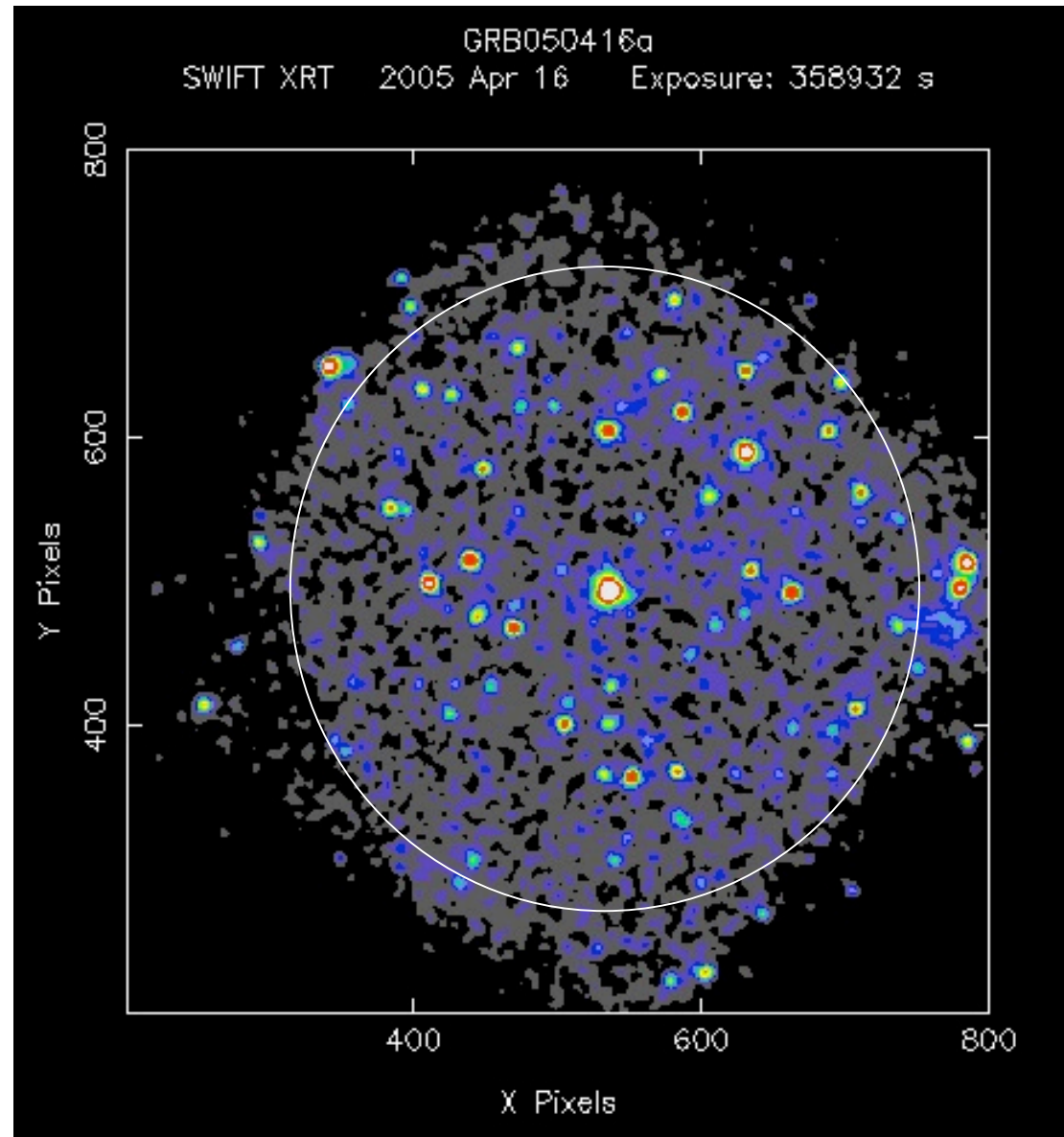
5 fields in areas of the sky  
covered by the Sloan Digital Sky  
Survey (SDSS)

240 X-ray sources

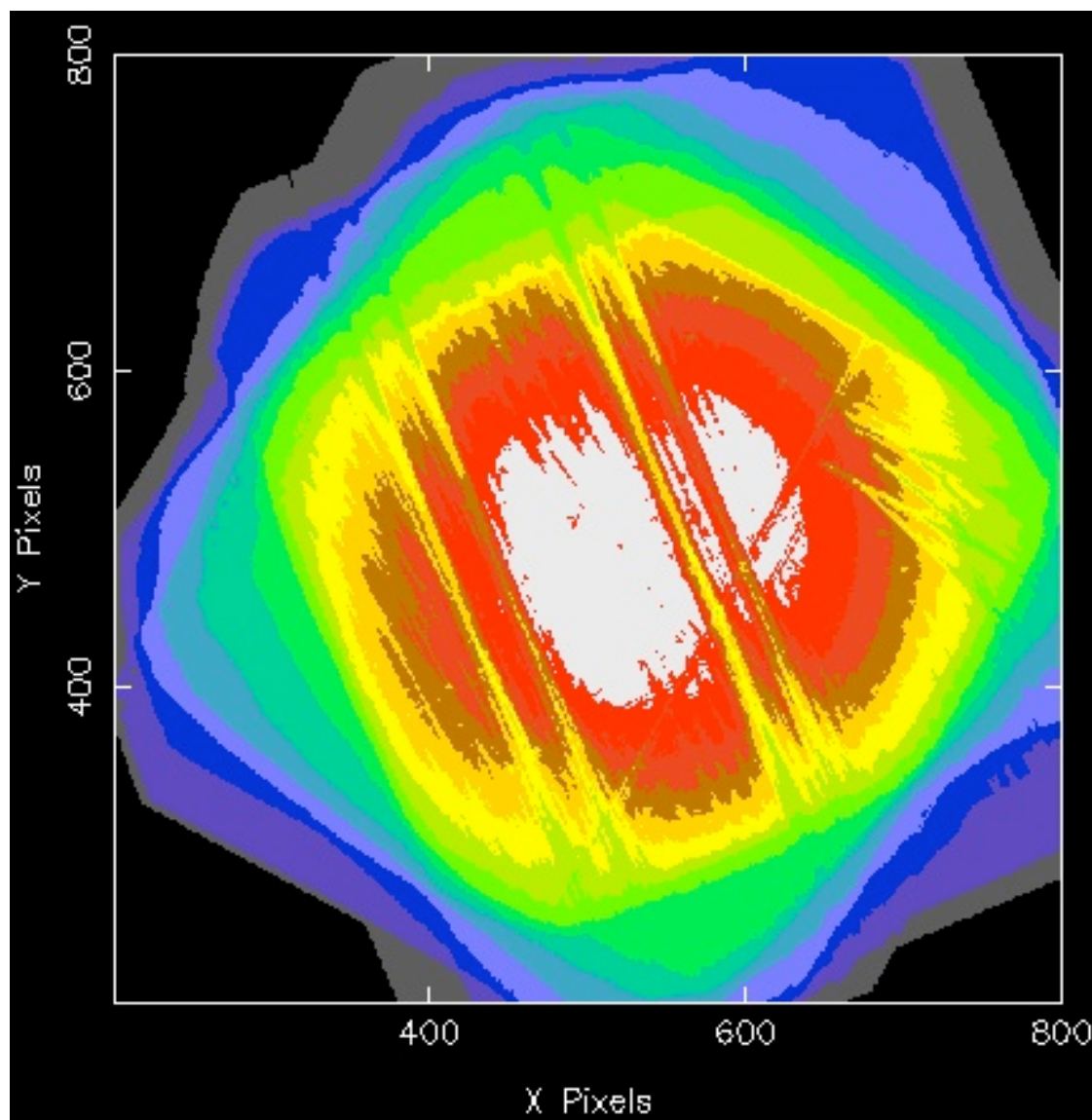
GRB 050416A  
GRB 050416B  
GRB 060908  
GRB 060904A  
GRB 050802

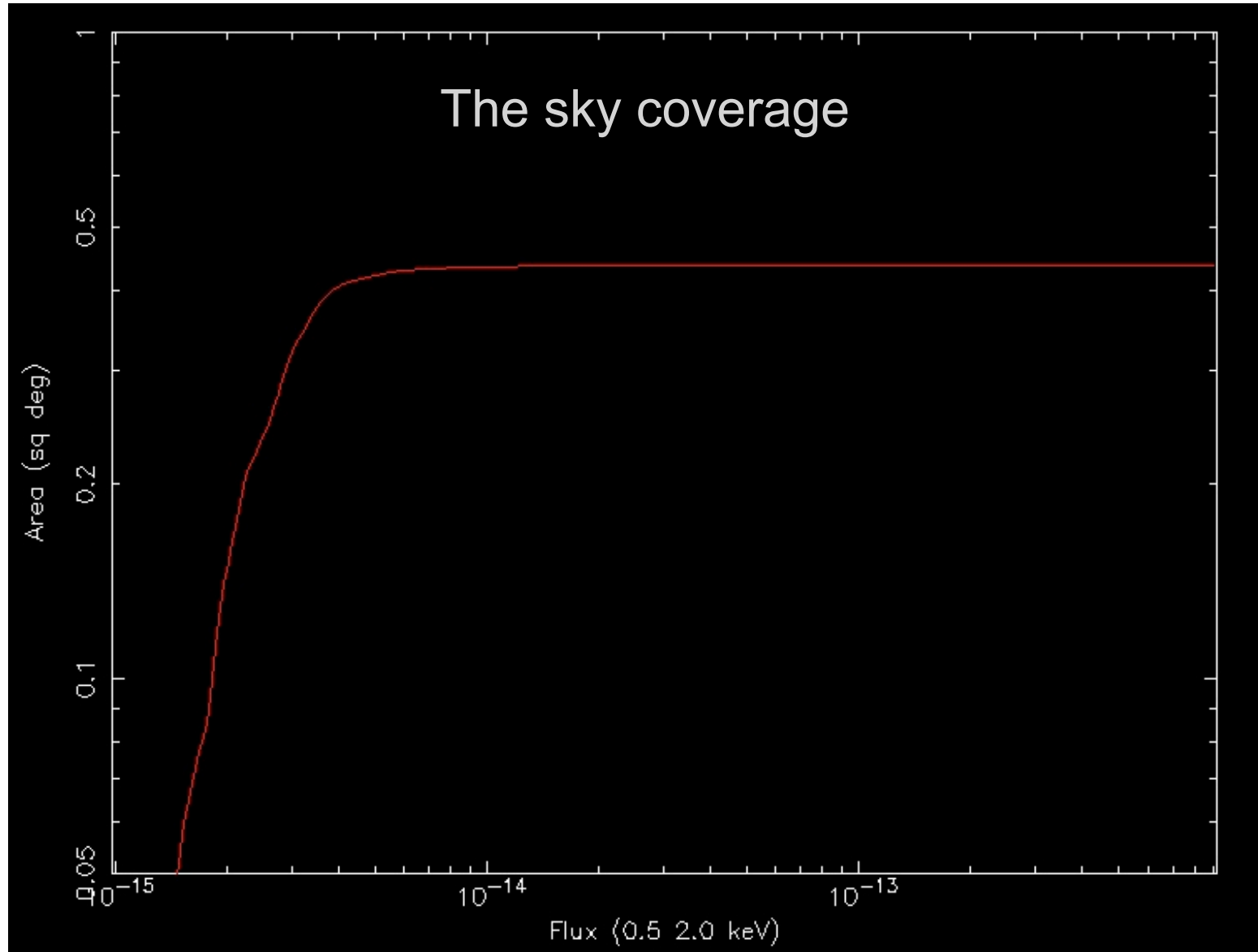














Browser navigation bar showing URL: http://www.asdc.asi.it/urbinoschool/ and search engine: Google. Navigation links include: Ultime notizie, Apple, Notizie, GLAST, ASDC ASI Webmail, SAO/NASA ADS Cust..., Facebook, PAOLO.G

















Available parameters

- Name  Other name
- Ra
- Dec  Z  Vmag
- 20cm Radio flux
- Count rate  Fluxes
- 
- Gal. NH
- Class
- Off axis angle  N.A.
- N.A.
- N.A.  N.A.

GO

# Sample of XRT serendipitous sources in deep GRB fields for the Urbino School

Reset   Power law energy index for flux calculation

Entry number		Source name <input type="text" value="XRT Name"/>	RA (J2000.0) <input type="text" value="hh mm ss.d"/>	Dec (J2000.0) <input type="text" value="dd mm ss.d"/>	XRT cts <input type="text" value="Cts/s (0.3-10 keV)"/>	XRT fluxes <input type="text" value="Flux 2-10 keV"/>	Hardness ratio <input type="text" value="HR"/>	Off-axis angle arcmin
Subset selection mode: <input type="text" value="inclusive"/>		 	 	 	  <input type="text" value="Stat"/>	  <input type="text" value="Stat"/>	  <input type="text" value="Stat"/>	  <input type="text" value="Stat"/>
<input type="text" value="1"/> <input type="button" value="Select"/>	 <a href="#">Data Explorer</a>	XRT J020643+0023.7	02 06 43.3	+00 23 47.0	0.0023	4.11e-14	99	9.3
<input type="text" value="2"/> <input type="button" value="Select"/>	 <a href="#">Data Explorer</a>	XRT J020644+0017.6	02 06 44.9	+00 17 39.0	0.0005	8.93e-15	-0.028	8.8
<input type="text" value="3"/> <input type="button" value="Select"/>	 <a href="#">Data Explorer</a>	XRT J020652+0021.1	02 06 52.6	+00 21 10.0	0.0006	1.07e-14	-0.186	6.5
<input type="text" value="4"/> <input type="button" value="Select"/>	 <a href="#">Data Explorer</a>	XRT J020654+0019.3	02 06 54.1	+00 19 23.9	0.0003	5.36e-15	99	6.1
<input type="text" value="5"/> <input type="button" value="Select"/>	 <a href="#">Data Explorer</a>	XRT J020654+0012.4	02 06 54.1	+00 12 24.0	0.0004	7.14e-15	99	10.1
<input type="text" value="6"/> <input type="button" value="Select"/>	 <a href="#">Data Explorer</a>	XRT J020701+0021.3	02 07 01.9	+00 21 20.9	0.0028	5e-14	-0.458	4.2
<input type="text" value="7"/> <input type="button" value="Select"/>	 <a href="#">Data Explorer</a>	XRT J020704+0026.9	02 07 04.0	+00 26 57.0	0.0004	7.14e-15	99	7.4

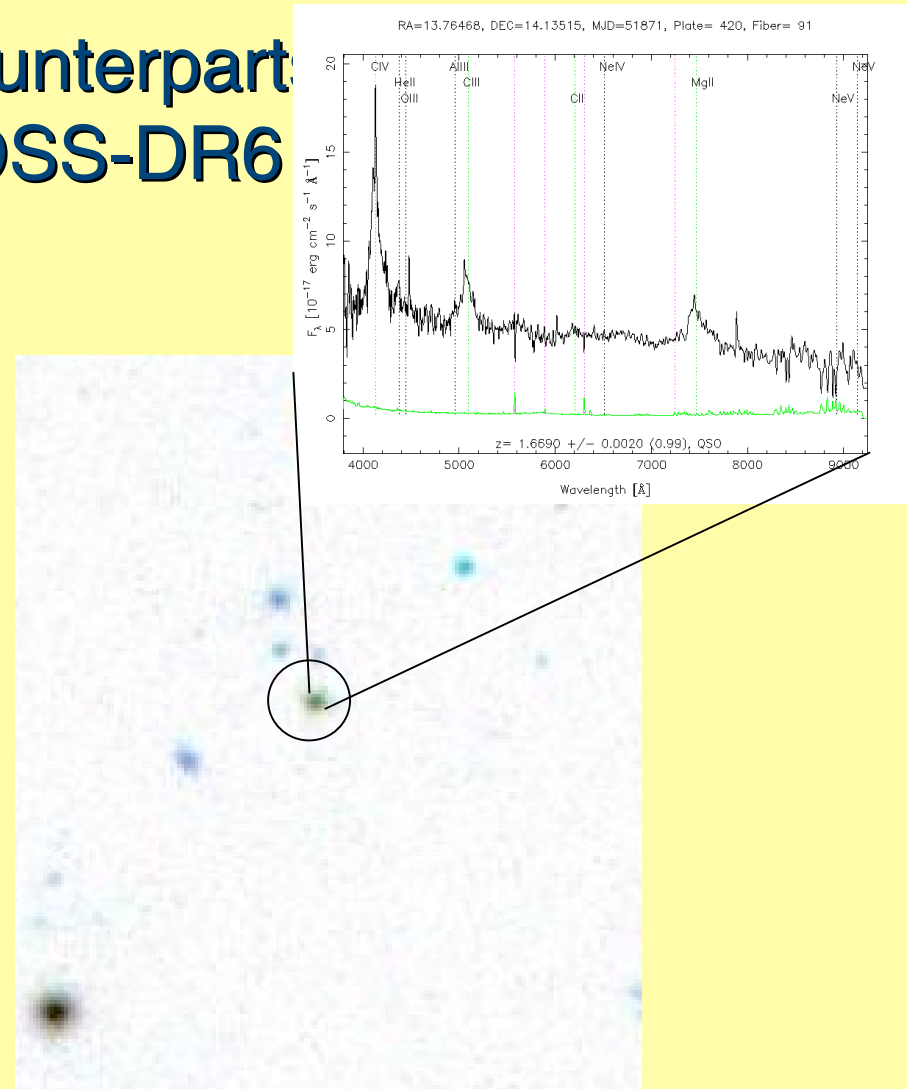
# Optical counterpart in the SDSS-DR6

55  
X-ray/radio associations  
match 107 SDSS-DR6  
objects  
(10 spectra)

Multiple Optical Counterparts  
(Likelihood Ratio)

$$LR = \frac{e^{-\frac{(\Delta_{ox})^2}{\sigma_{ox}}}}{N(\leq m)}$$

- Photometric Redshifts calculation



## Photometric redshift distributions

