The XMM-Newton Slew Survey

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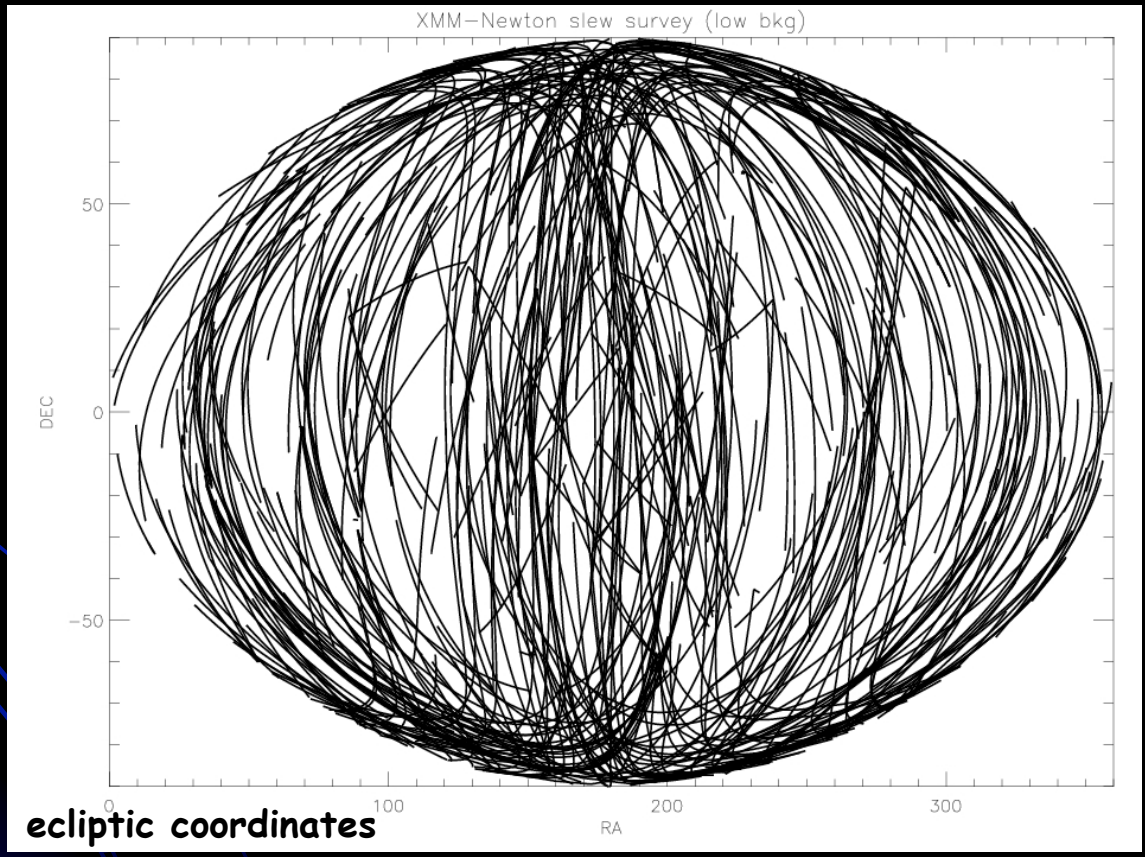
Slew observations

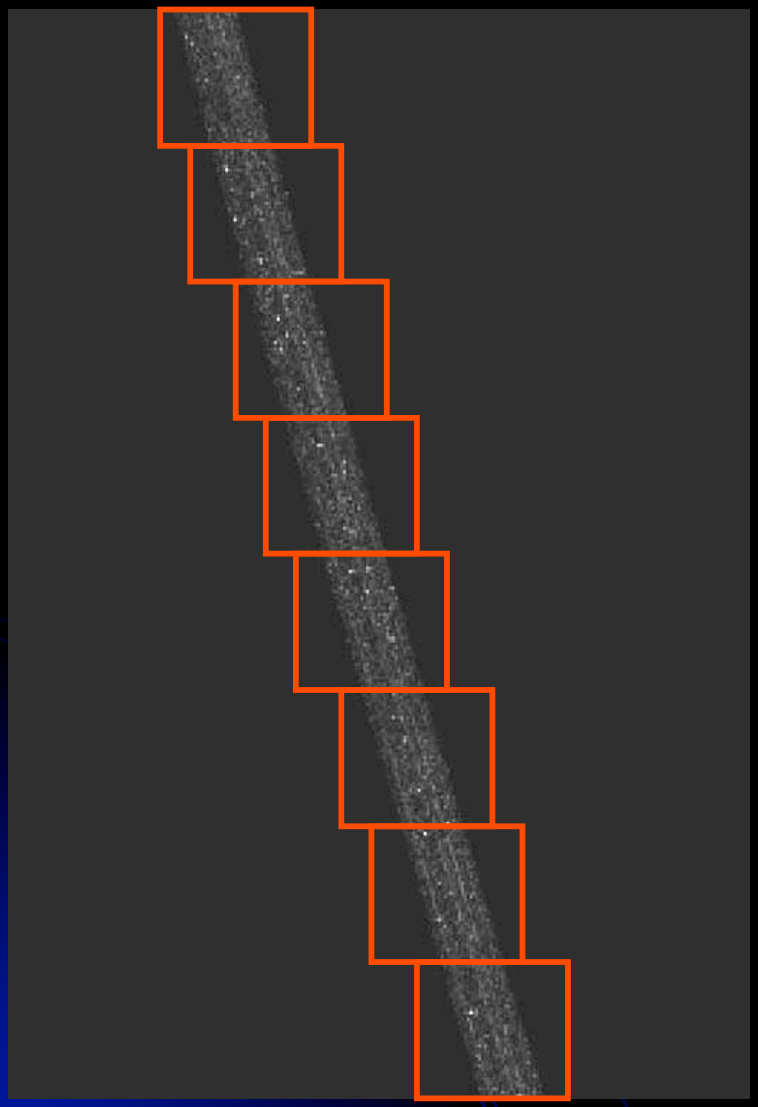
Overview

- PN exposures in Medium filter in FF, eFF and LW modes
- Open-slew speed = 90 degrees / hour, i.e. on-source time up to 14 s
- Very low background of average ~0.1 c/arcmin^2
- Area covered to date ~6300 deg^2 (~15% of sky)



ecliptic coordinates

Data processing



- Three bands:
  - ★ soft band (0.2-2 keV)
  - ★ hard band (2-12 keV)
  - ★ total band (0.2-12 keV)

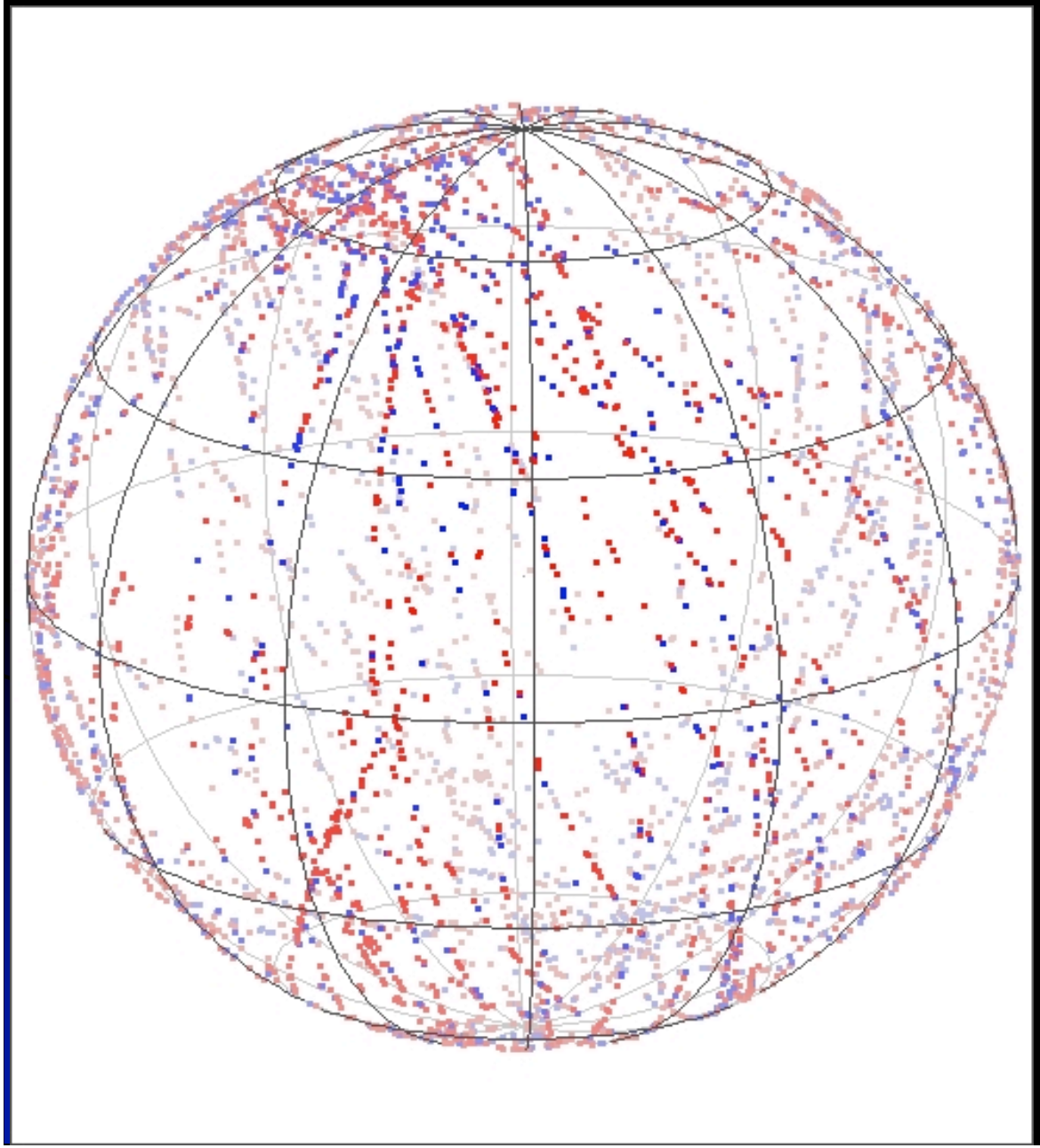
- Subdivision into 1 square degree images. Special Attitude file. Creation of Images and exposure maps.

- Source searching performed using a near standard pipeline.

- Detections in different bands are merged to produce unique source entries.

- Flagging spurious sources.

- Source identification.



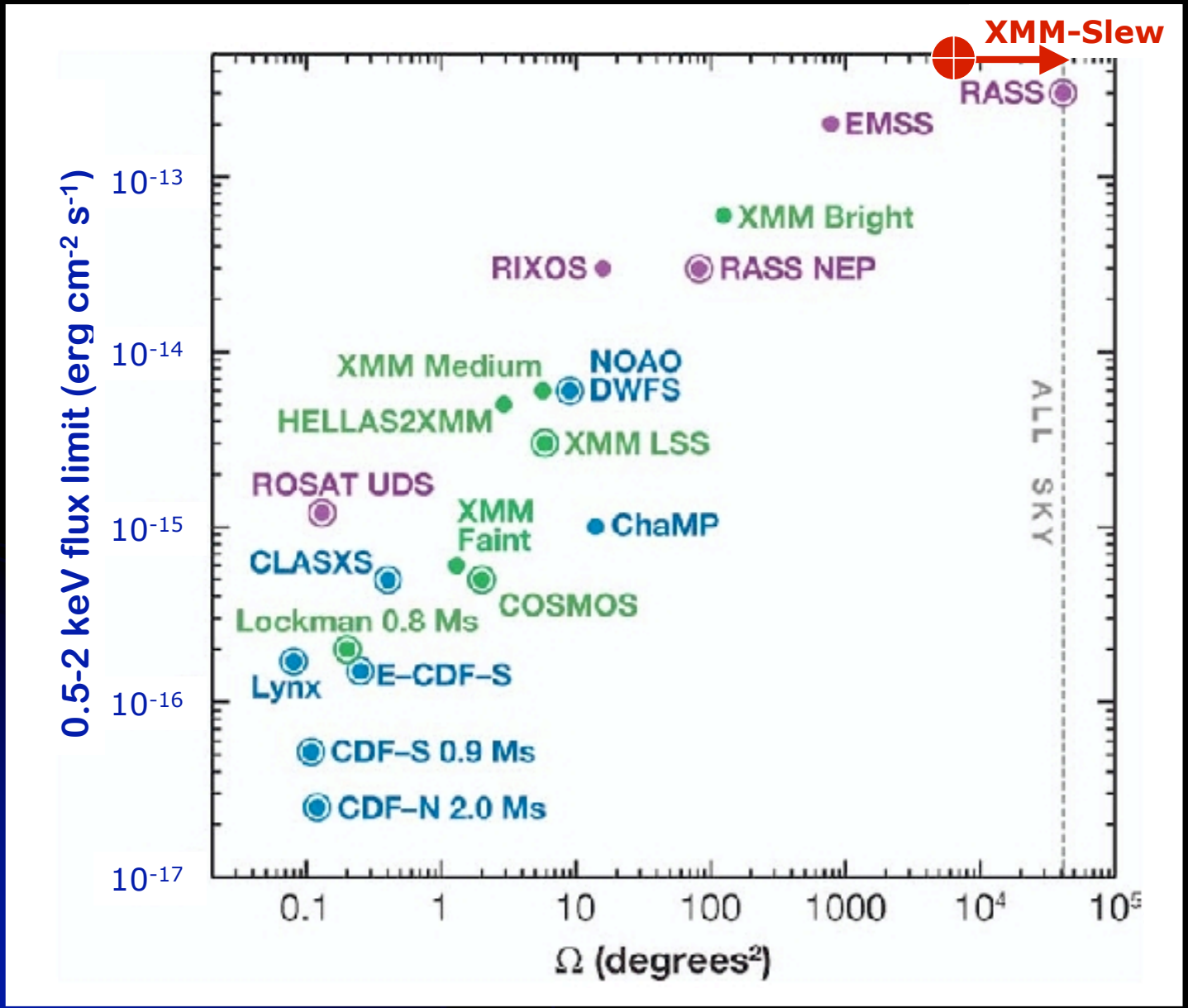
The XMMSL1 Catalogue

Full Catalogue: 5200 sources
(ID 47%) (RASS 32%)
DET_ML>8, ~6250 deg2

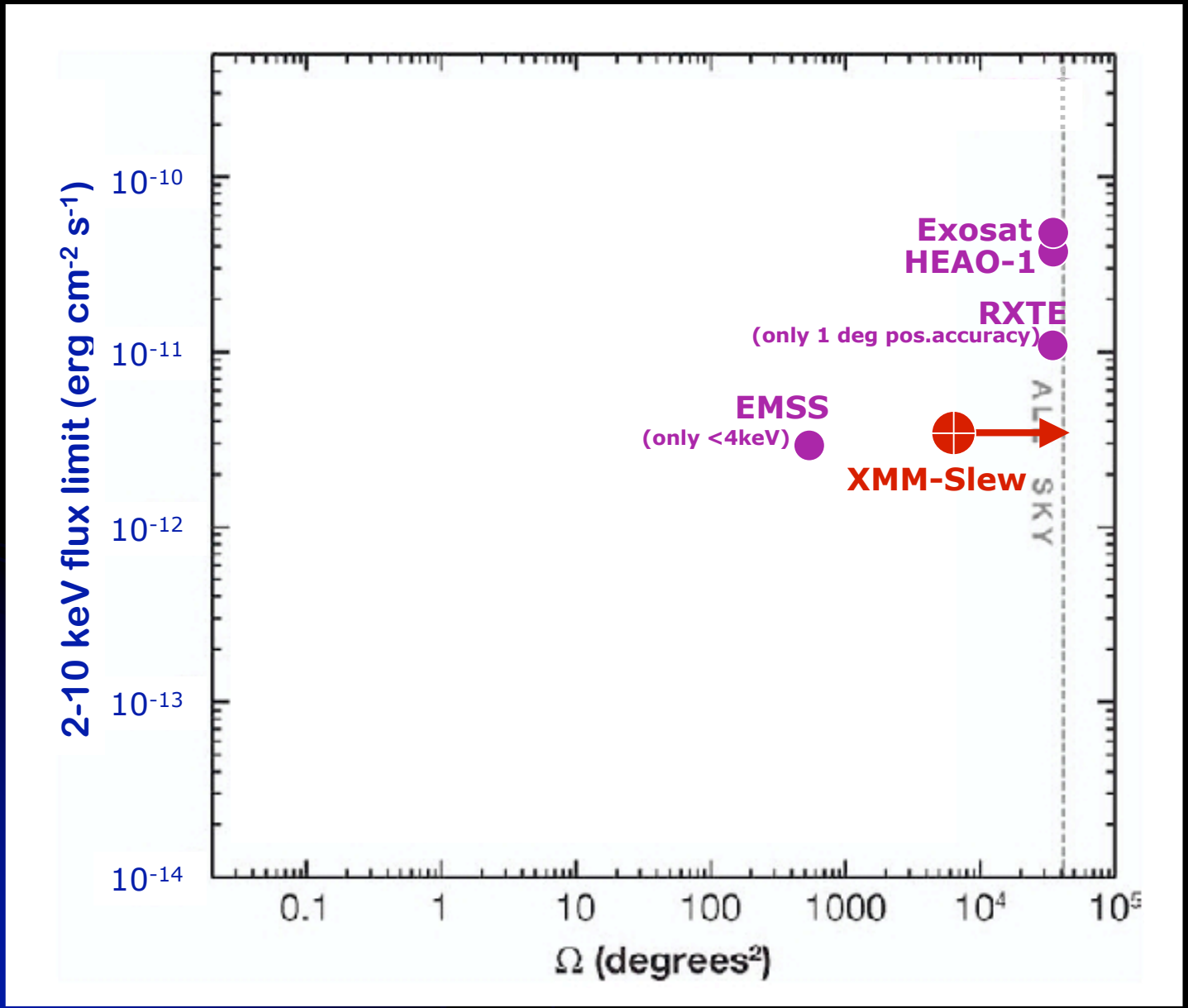
Clean Catalogue: 2713 sources
(ID 71%) (RASS 51%)
DET_ML>14 + (DET_ML>10 + BG_RATE<3)

Released on
May 2006

Survey Characteristics – Soft Band



Survey Characteristics - Hard Band



Identifications

Cross-correlation of source list with Simbad, NED, HEASARC, RASS etc.

Counterparts found for >50% of sources.

Mean positional error ~8''

AGN: 425

Galaxies: 467

Clusters : 72

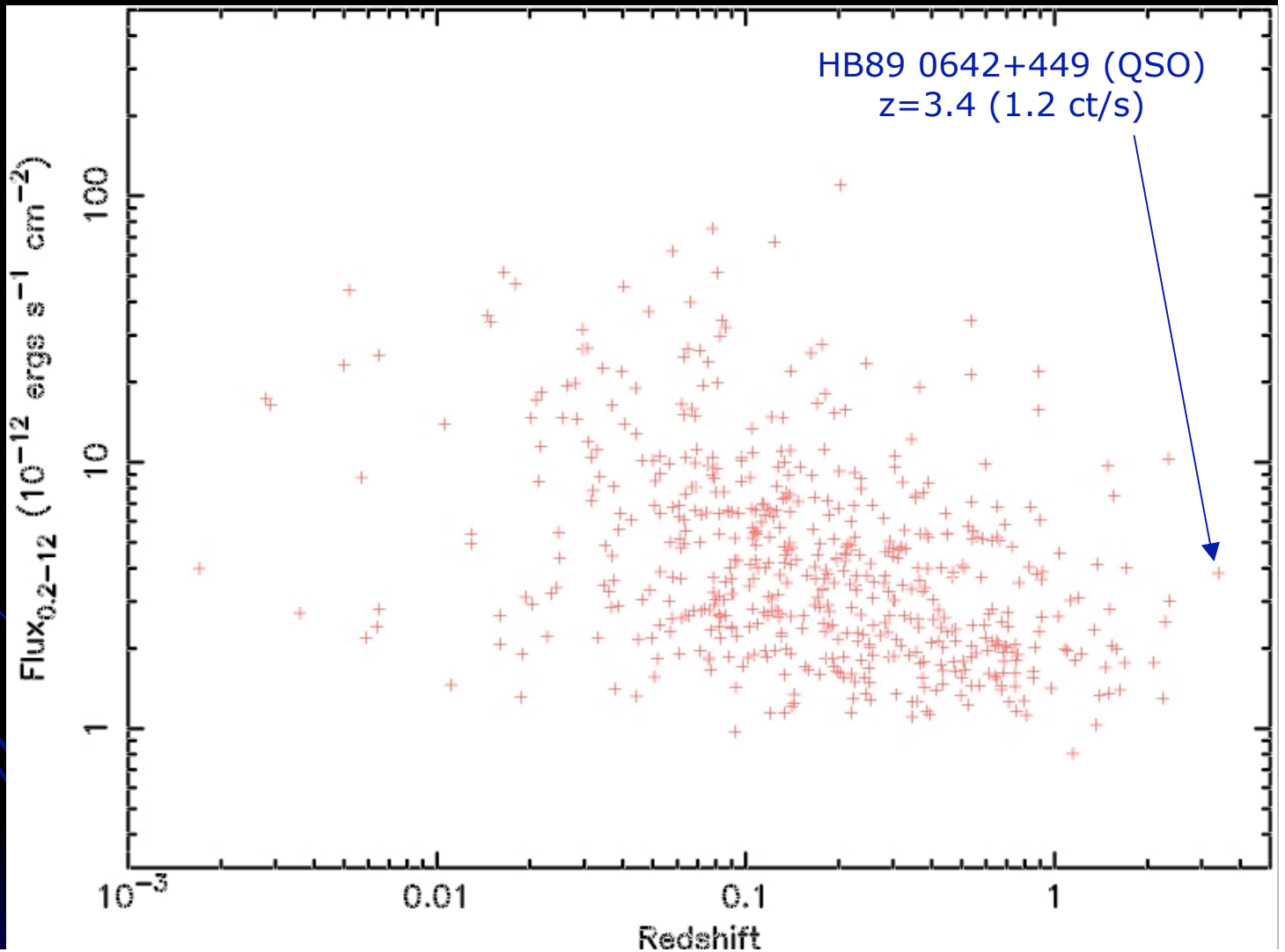
Variable stars: 62

SNR: 14

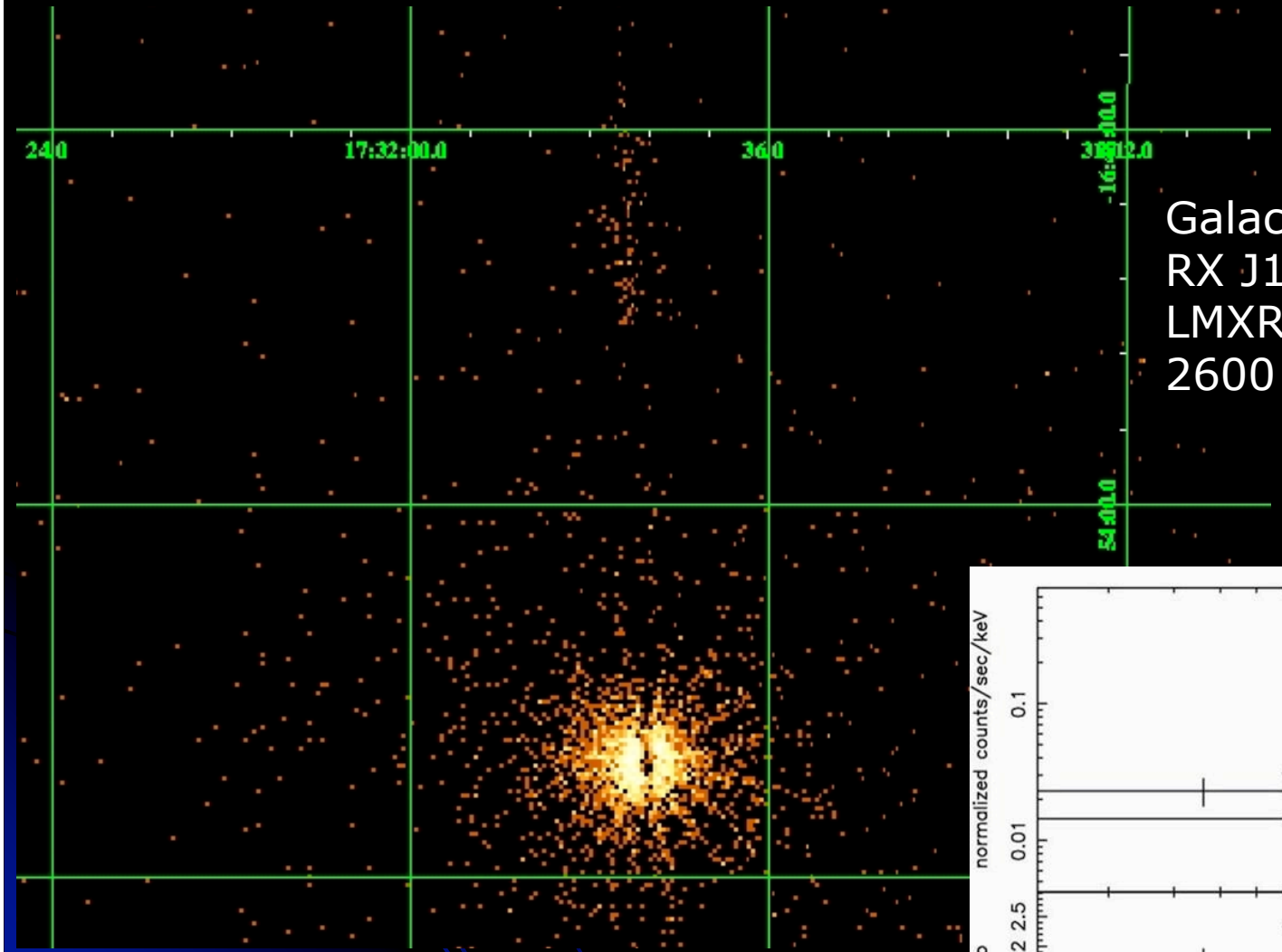
LMXB: 8

HMXB: 5

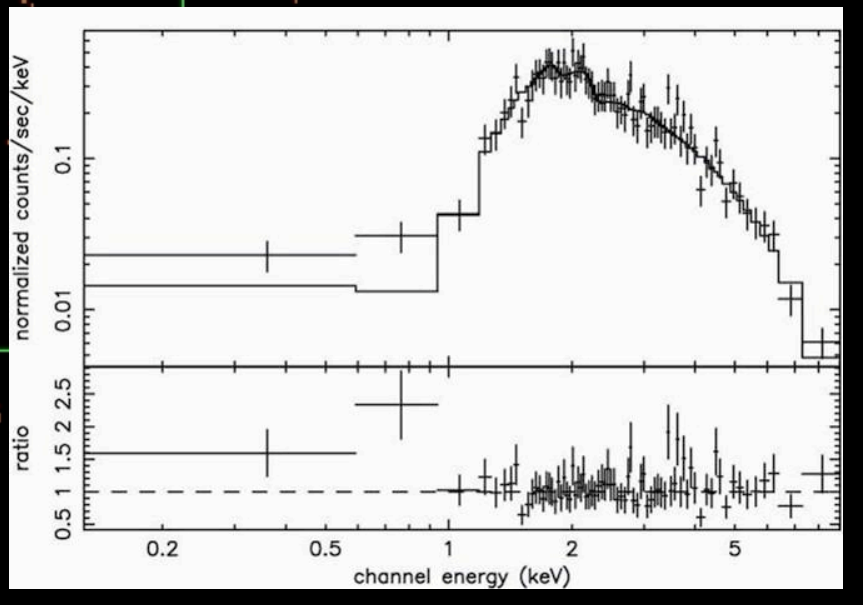
WD: 2

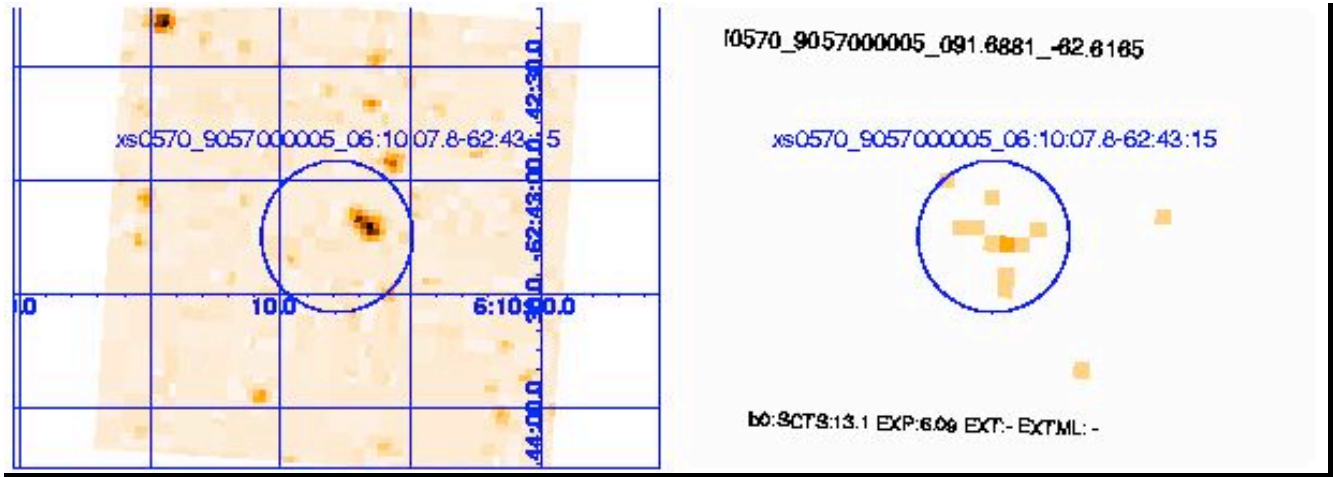


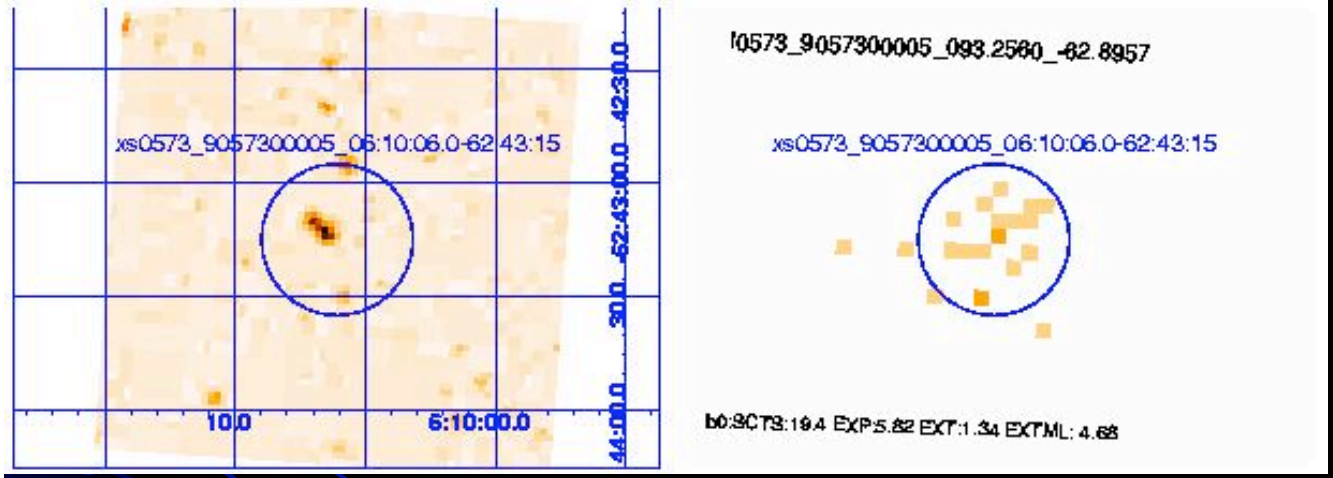
Extremely Bright Sources

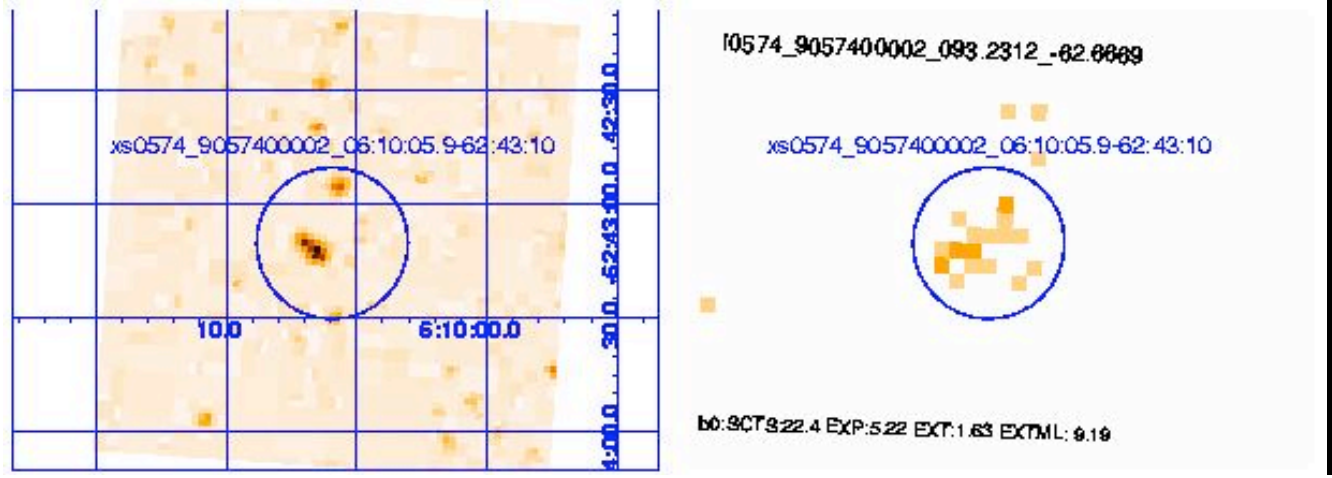


Galactic Plane
RX J173143.6-165736
LMXRB
2600 cts in 8 sec









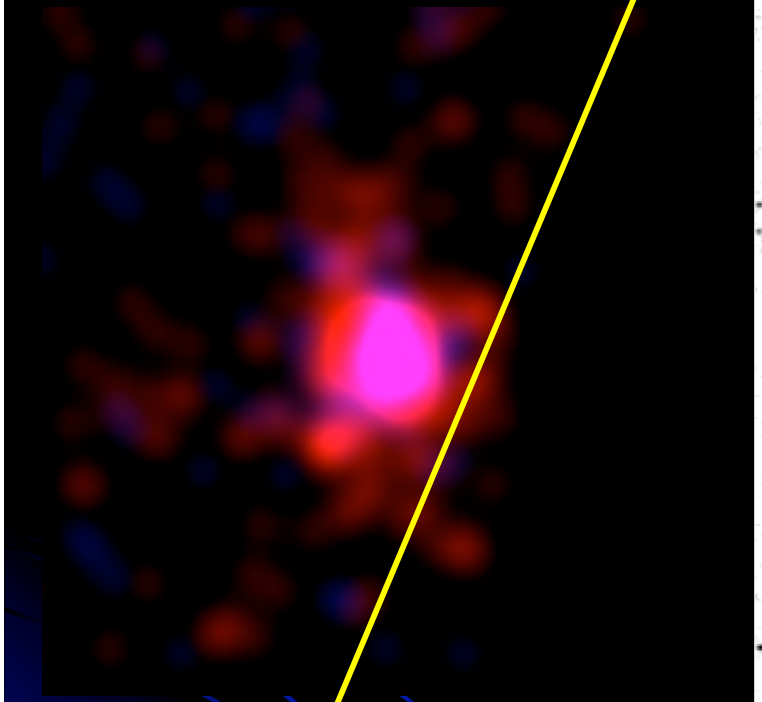
Sources Detected in Multi-Slews

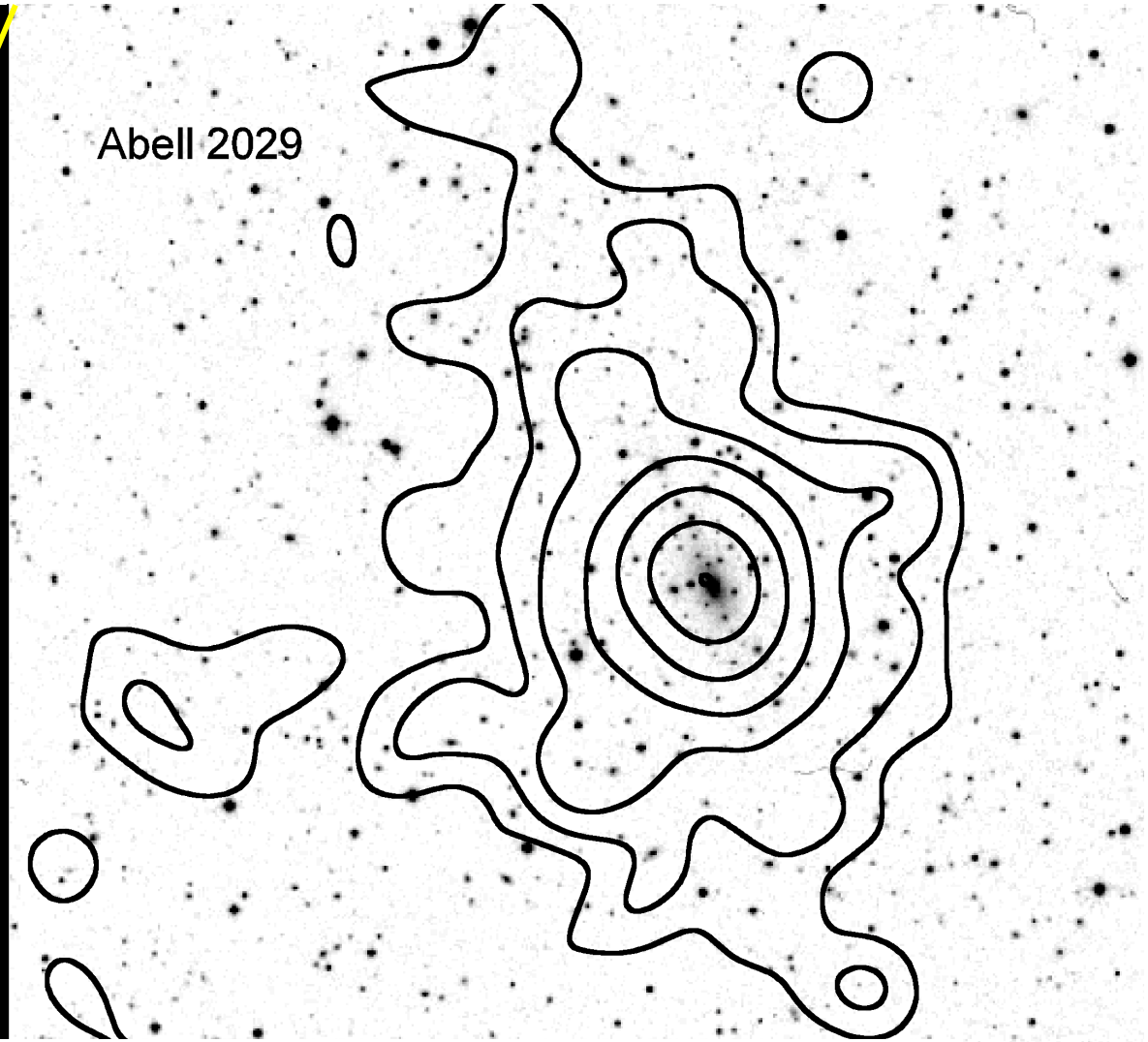
-Source detected in 3 separate slews:
Rev 570
Rev 573
Rev 574

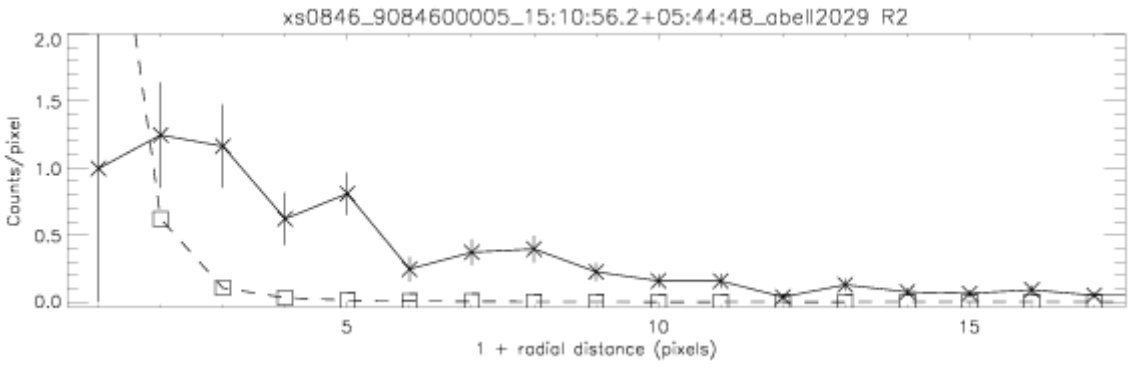
- Evidence for variability (factor ~2)

105 sources seen in more than one slew

Extended Sources

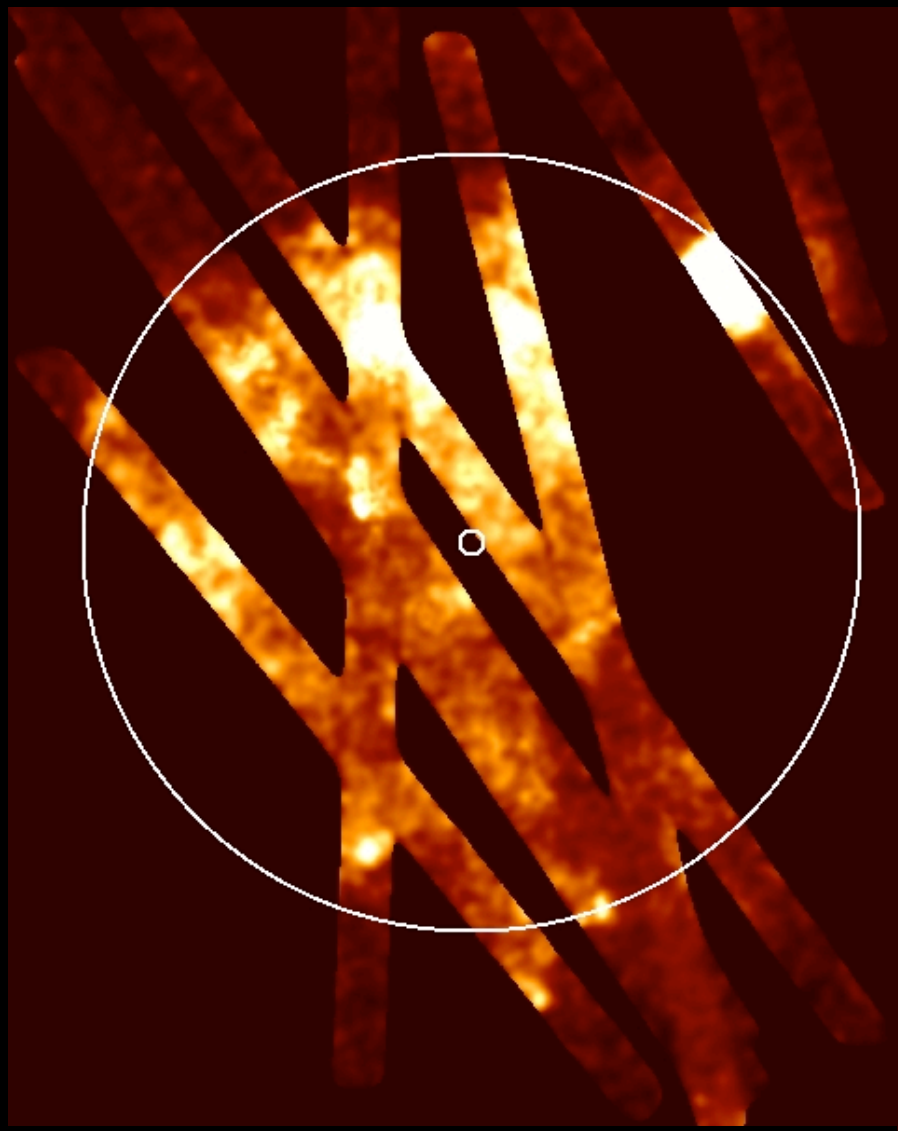






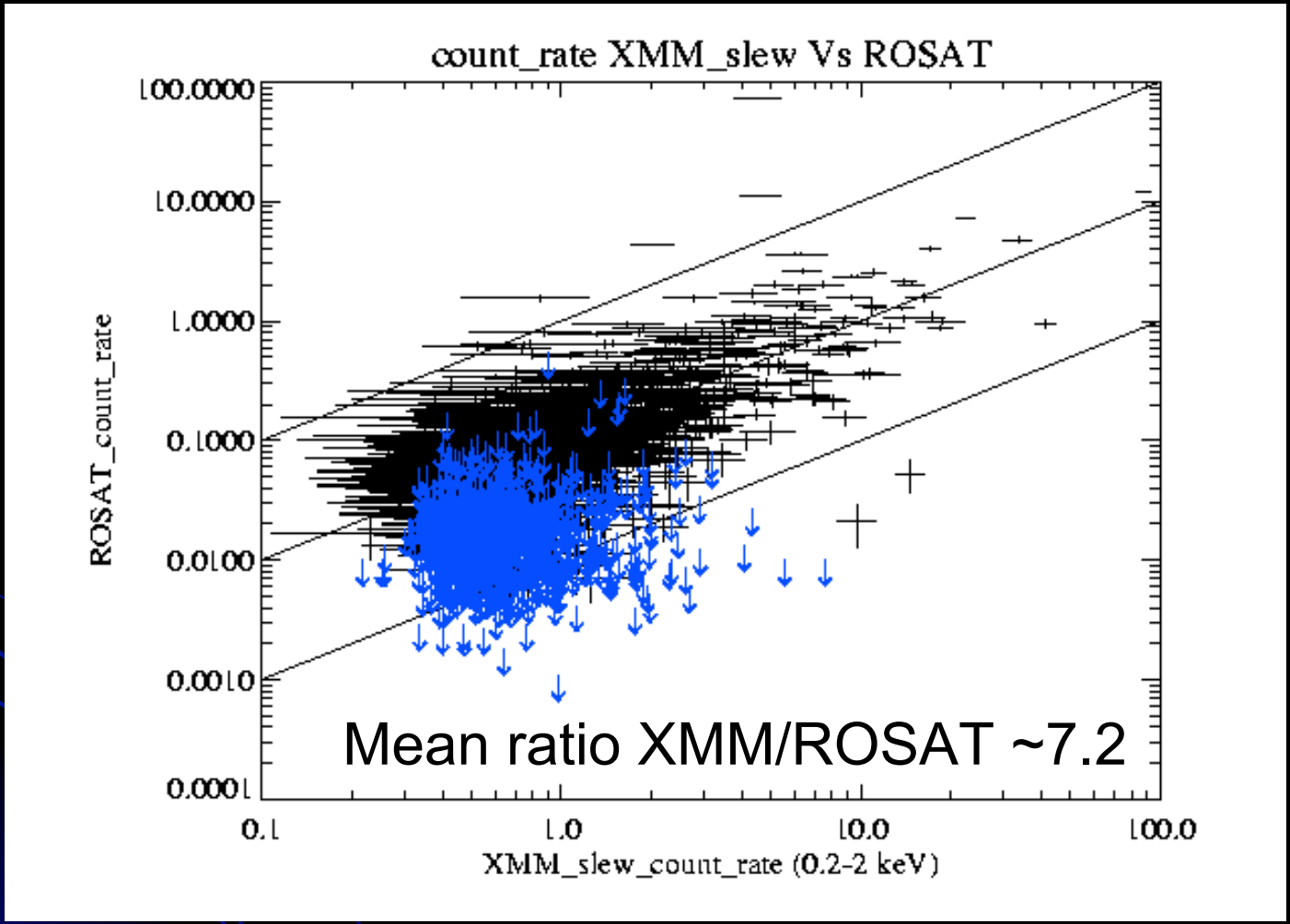
Vela Supernova Remnant

ROSAT

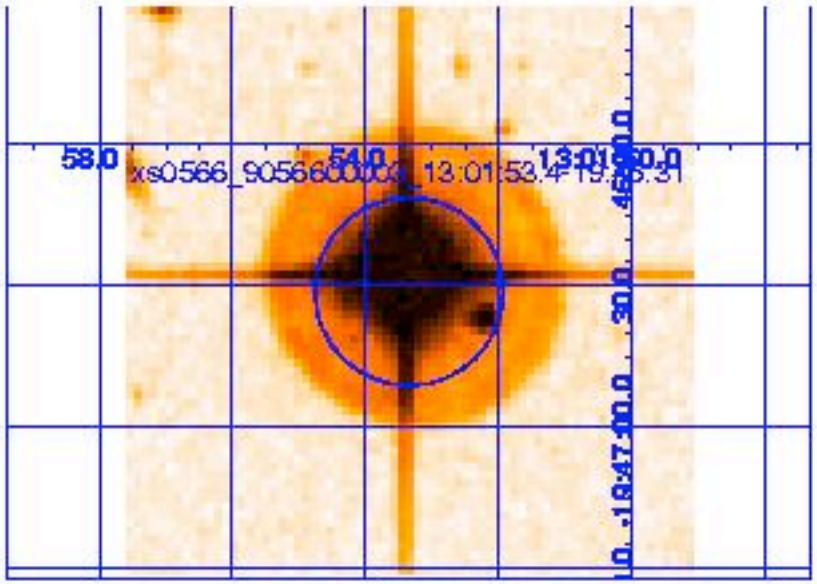


XMM-Newton Slew
~½ hour observing time !

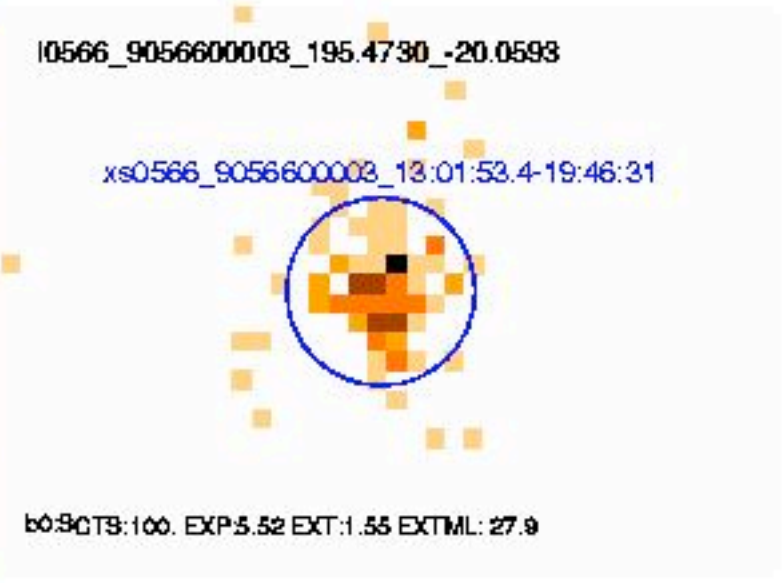
Correlations with ROSAT



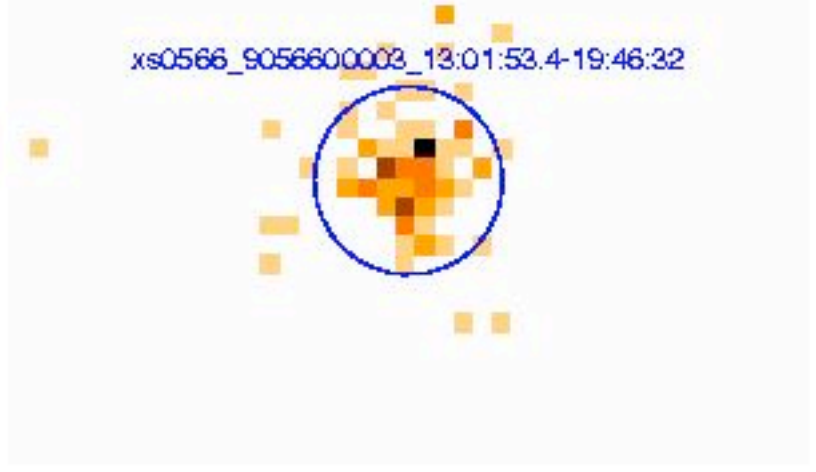
DSS Image 2’×2’



Total band (0.2-12 keV)

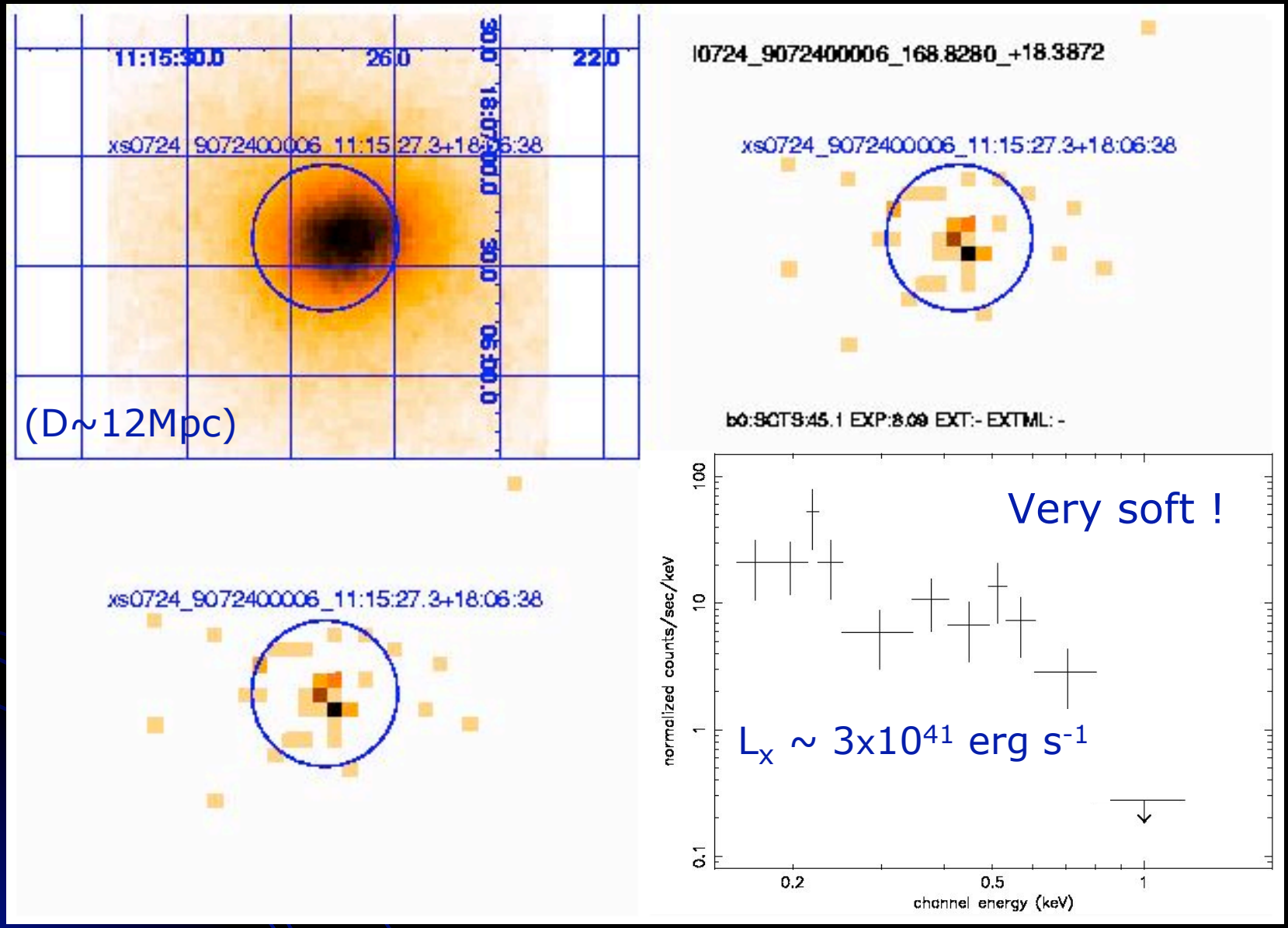


Soft band (0.2-2 keV)



Hard band (2-12 keV)

Variable star UY Vir : Slew/RASS count rate ratio=240



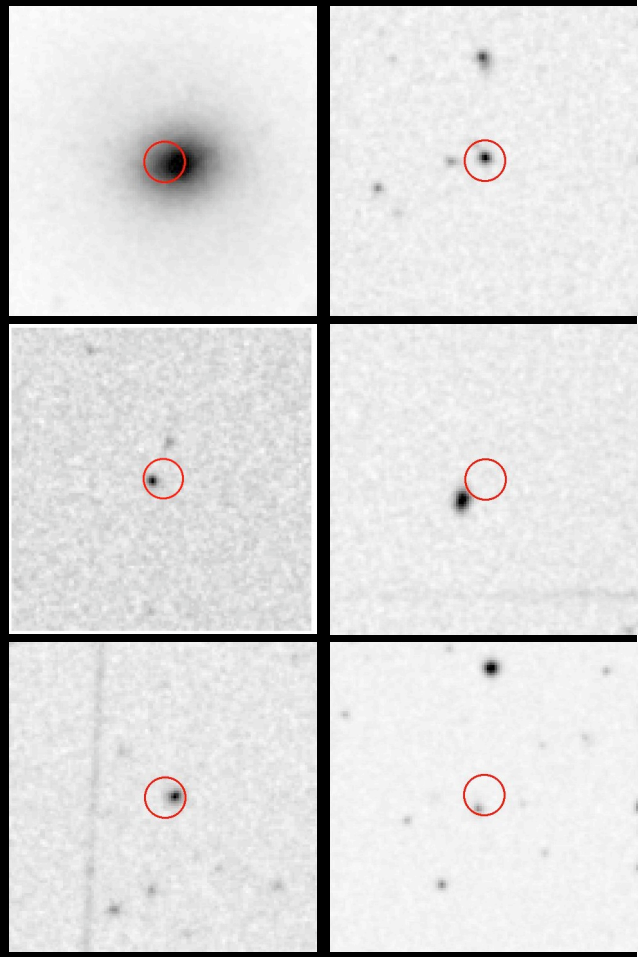
NGC 3599 – Slew/RASS count rate ratio ~500!

Tidal disruption events

- SMBH at the centre of non-active galaxies
- Flaring radiation when a star is tidally disrupted by a SMBH
  - Giant-amplitude non-recurrent variability
  - Ultra soft spectrum
  - Enormous X-ray peak luminosity (up to ~10^{45} erg s^{-1} in maximum)
  - No AGN activity
- Frequency? Distribution of M_{BH}? Galaxy/AGN formation and evolution relation?

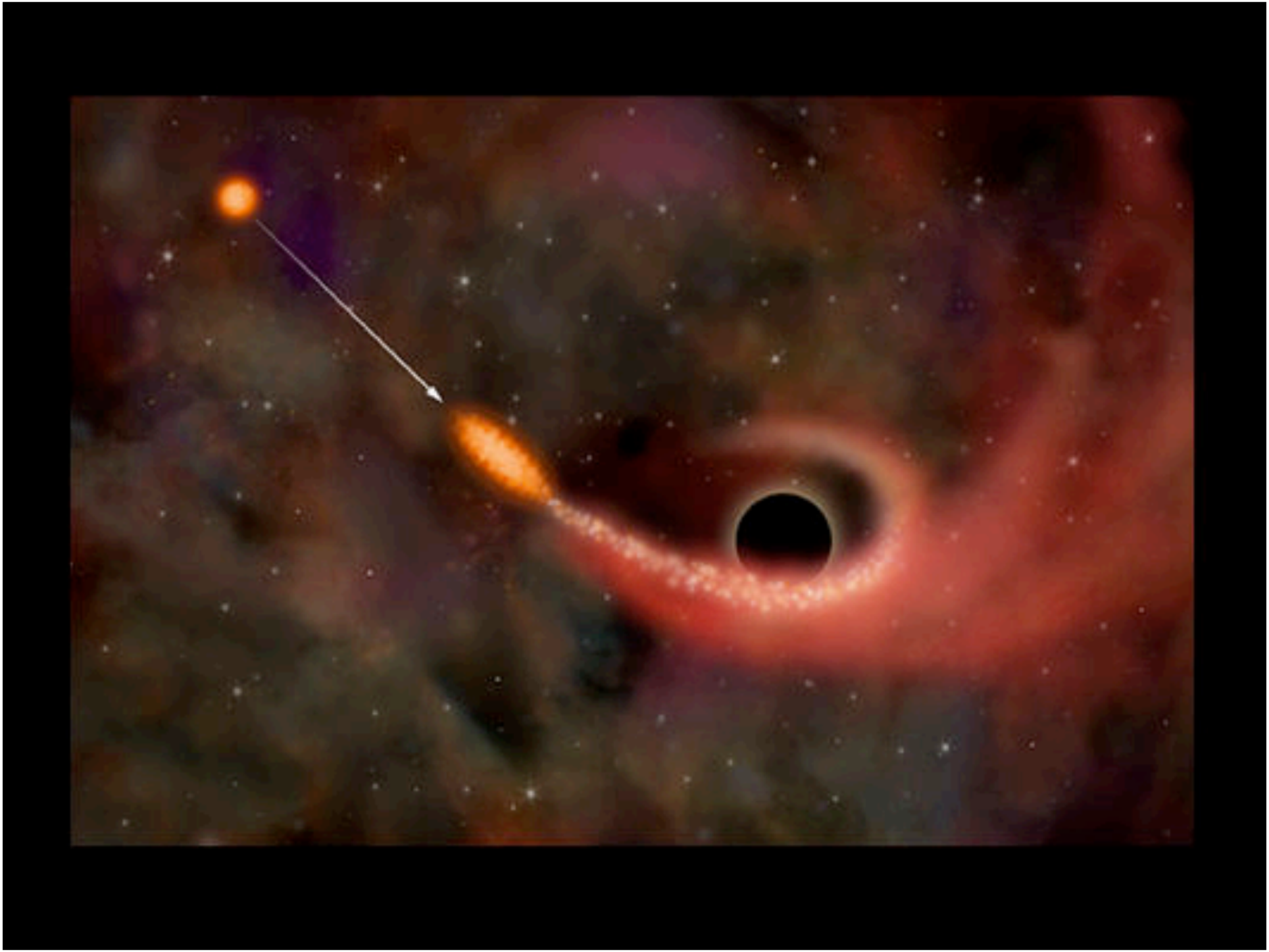
Candidates from the Slew Survey

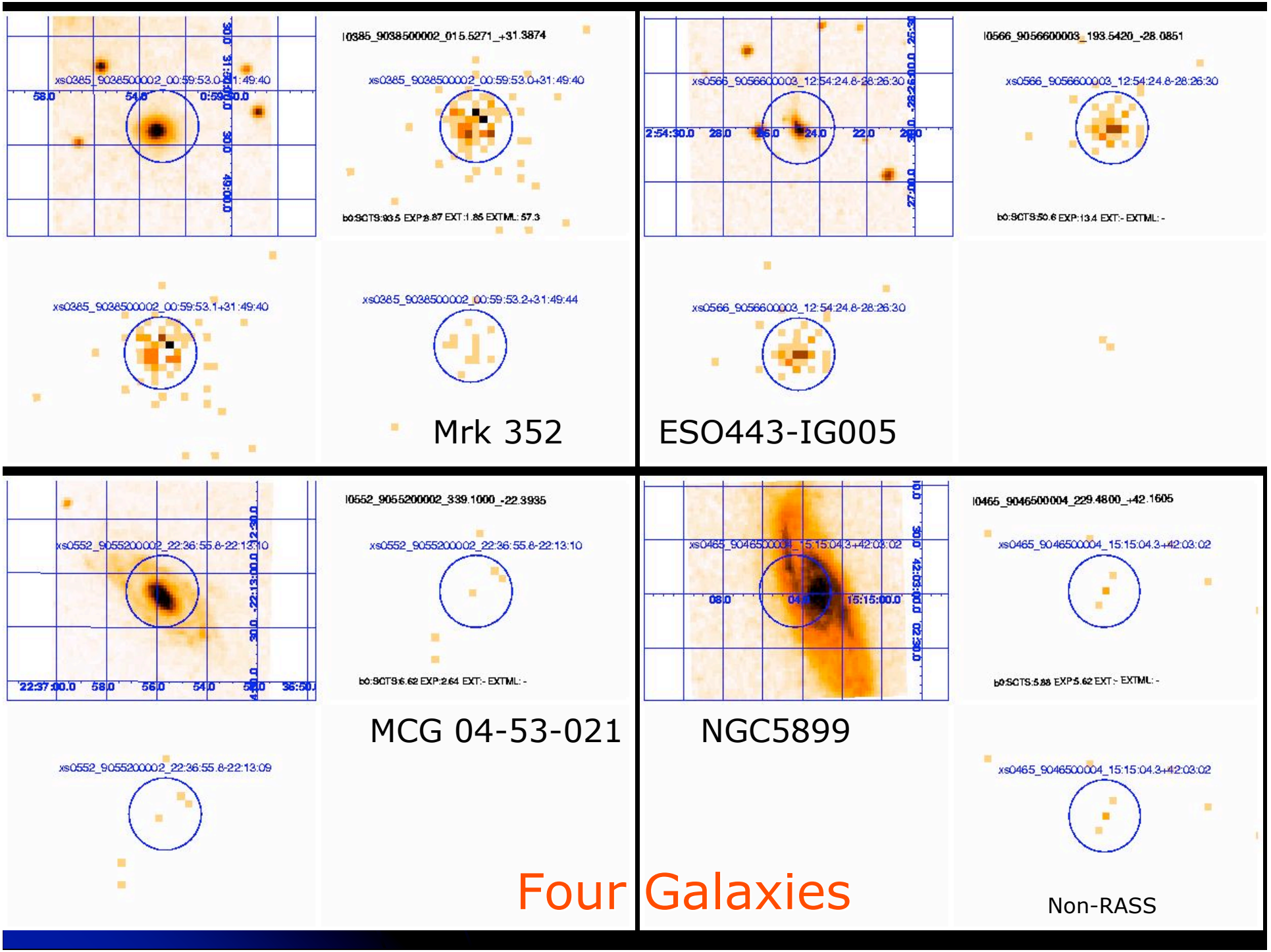
- Six slew-soft sources with a galaxy identification a factor 36-186 brighter in XMM with respect to RASS upper limits
- Three of them have known z: Lx ~ 10^{41} – 10^{44} erg s^{-1}, consistent with tidal disruption model
- Follow-up observations are needed



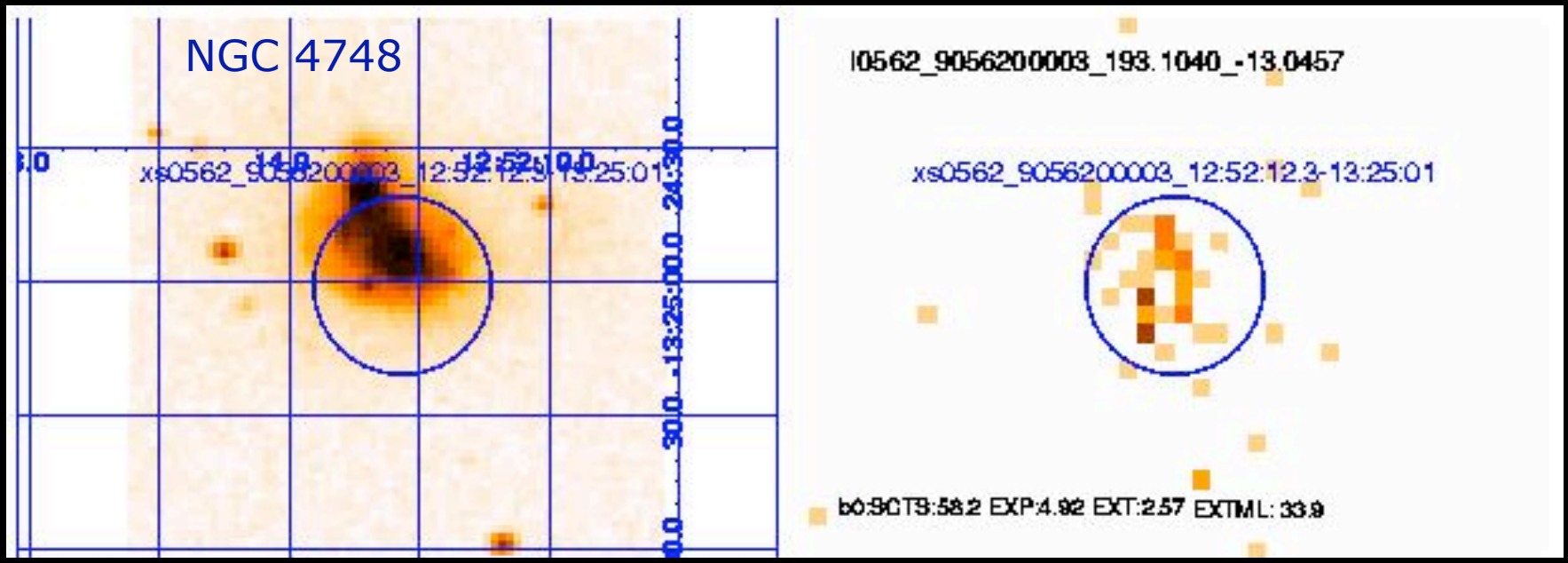
Concluding Remarks

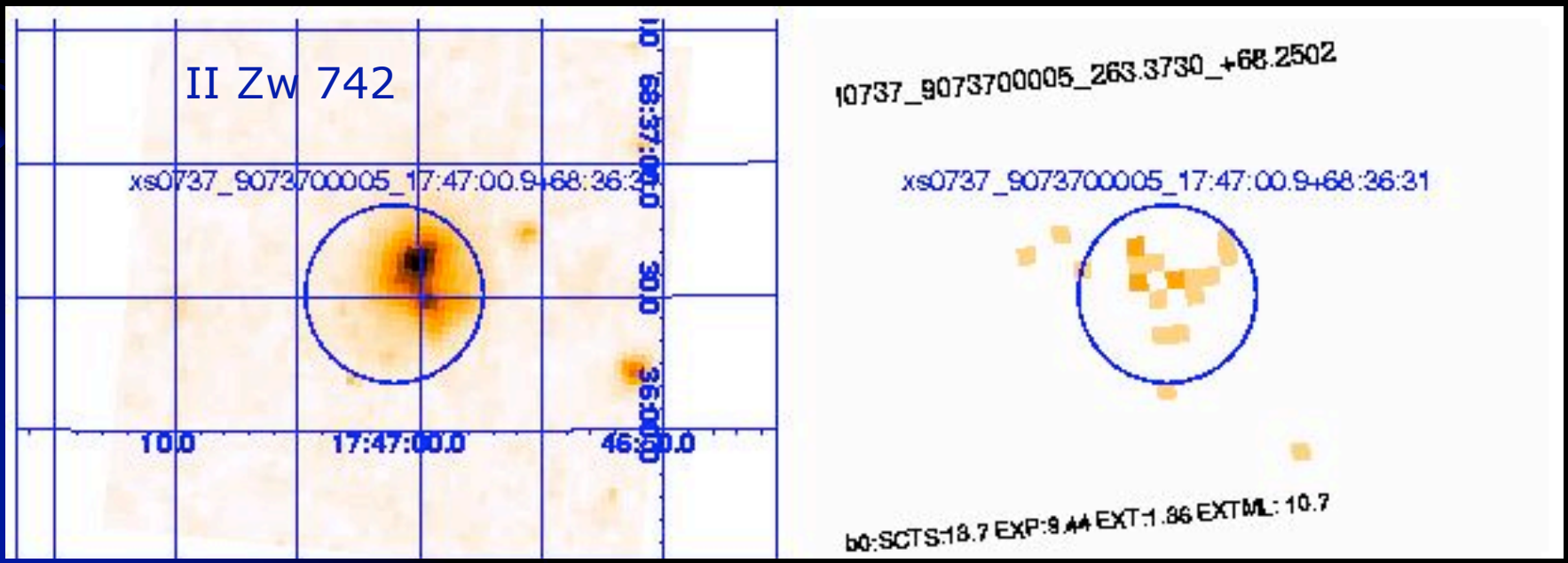
- Catalogue (full and clean) made public on May 2006
- Soft band survey comparable with RASS
- Hard band survey best ever
- ~0.65 sources per square degree over ~15% of the sky
- ~50% of the sources have identifications
- Excellent extended source detection and large area mapping capabilities
- Extremely interesting ROSAT-XMM variability:
  - Tidal disruption events
- To come:
  - Processing of high-BG and problem slews and new slews
  - Whole sky covered in ~few years time
  - Science!!!




Mrk 352
ESO443-IG005
MCG 04-53-021
NGC5899
Four Galaxies
Non-RASS

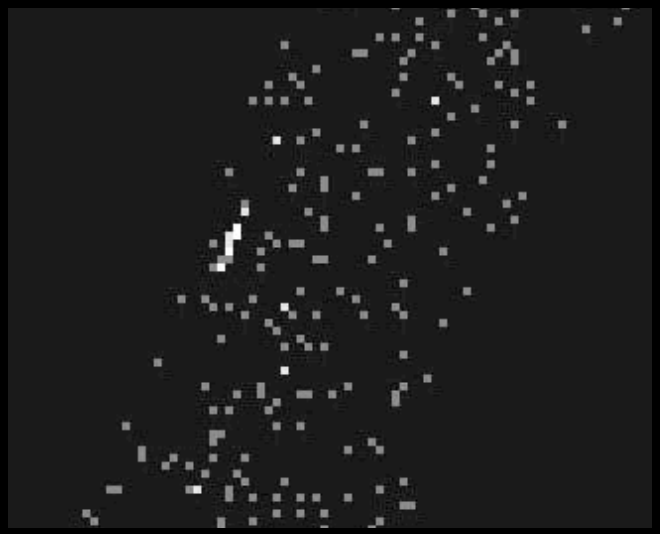
Two Merging Galaxy Pairs





Initial Analysis

MOS



Source extended into a 4 arcmin streak due to 2.6 second frame time

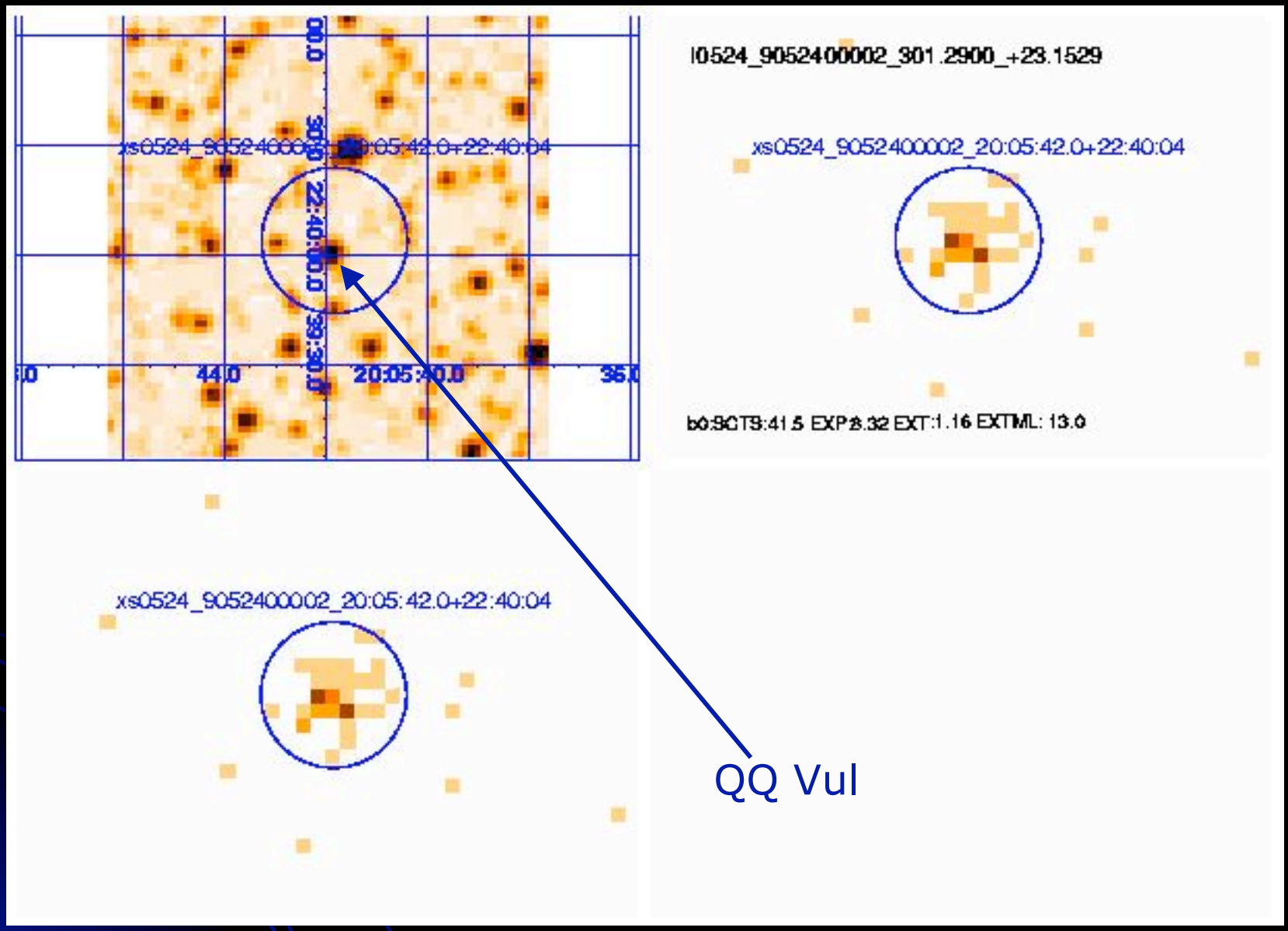
PN

Full frame (73ms) mode streak = 6 arcsecs – not a problem

Extra pn sensitivity + additional MOS background means little to be gained from analysing MOS slews at present

- MOS slews used for calibration
- All PN slews (FF, eFF, LW) larger than 15 minutes down-linked and processed

- Processing details in Pili's poster [A.13]



CV QQ Vul (AM Her-type) Slew/RASS count rate ratio=0.38
- Very soft!