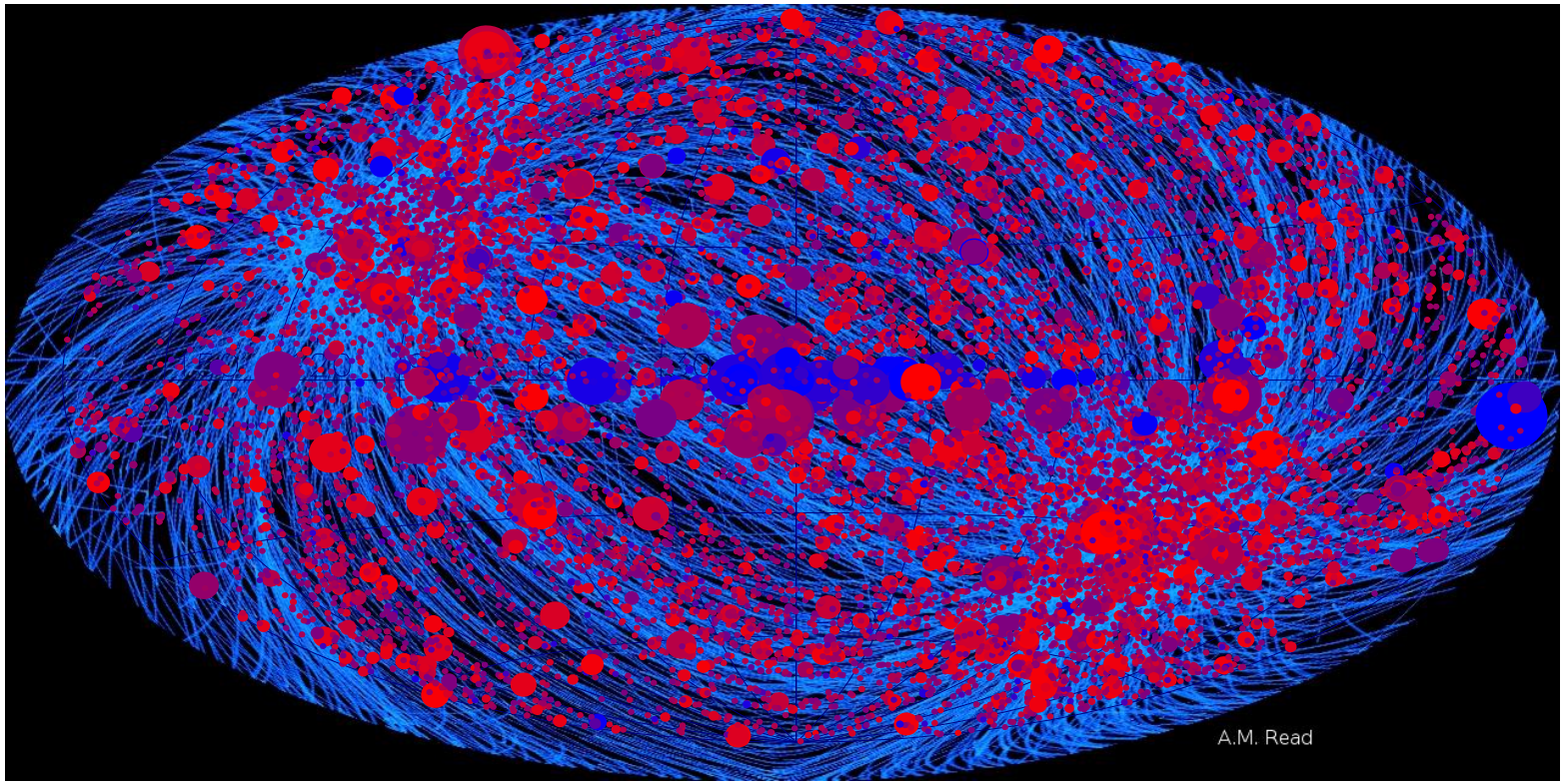
XMM-Newton slew survey status and prospects

XMMSL2 - summary



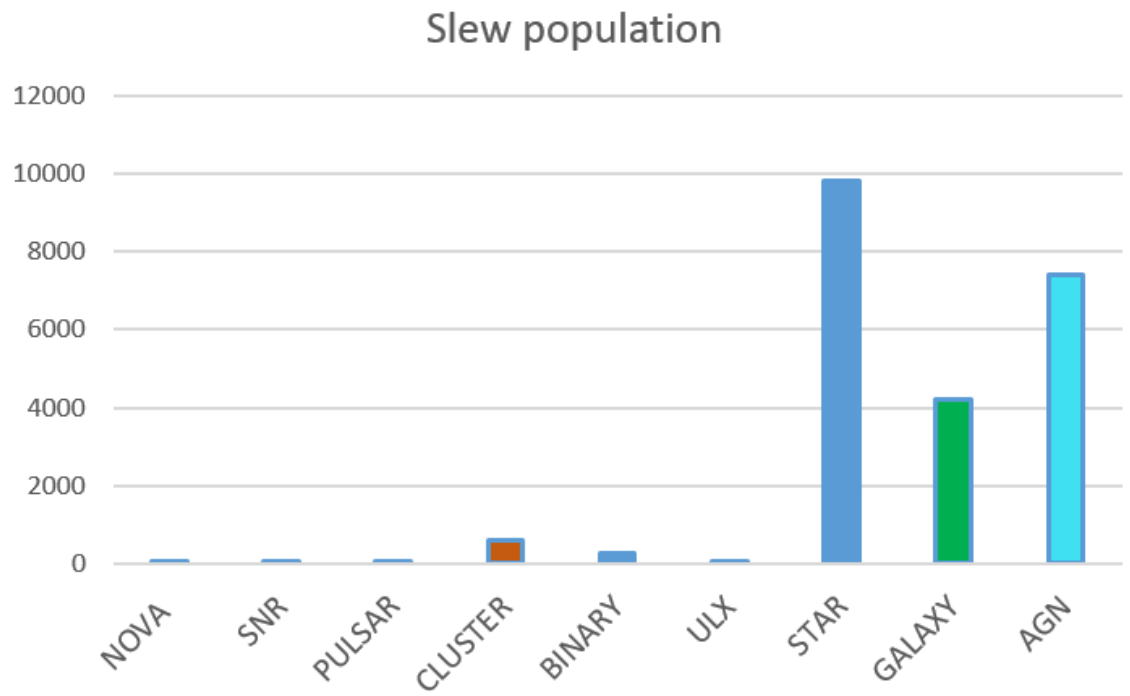
- XMMSL2 catalogue in XSA
- 2114 slews from 2002 to end 2014
- Revolutions 314 - 2758
- Area=65,000 deg^2
- 85% of sky seen at least once
- 72000 detections
- 29000 unique CLEAN sources

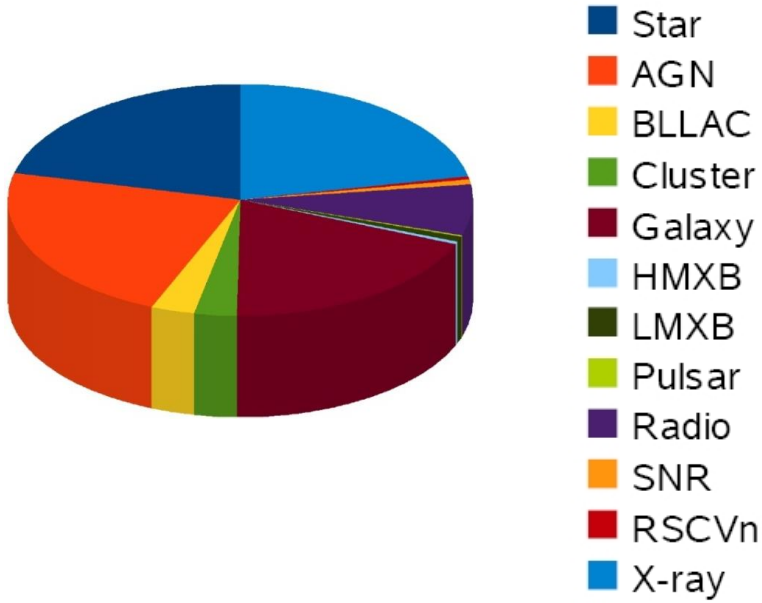
0.2 – 2 keV band : $F_{0.2\text{-}2}>6x10^{-13}$ cgs
2 – 12 keV band : $F_{2\text{-}12}>4x10^{-12}$ cgs

Location accuracy: 7” (1-sigma)

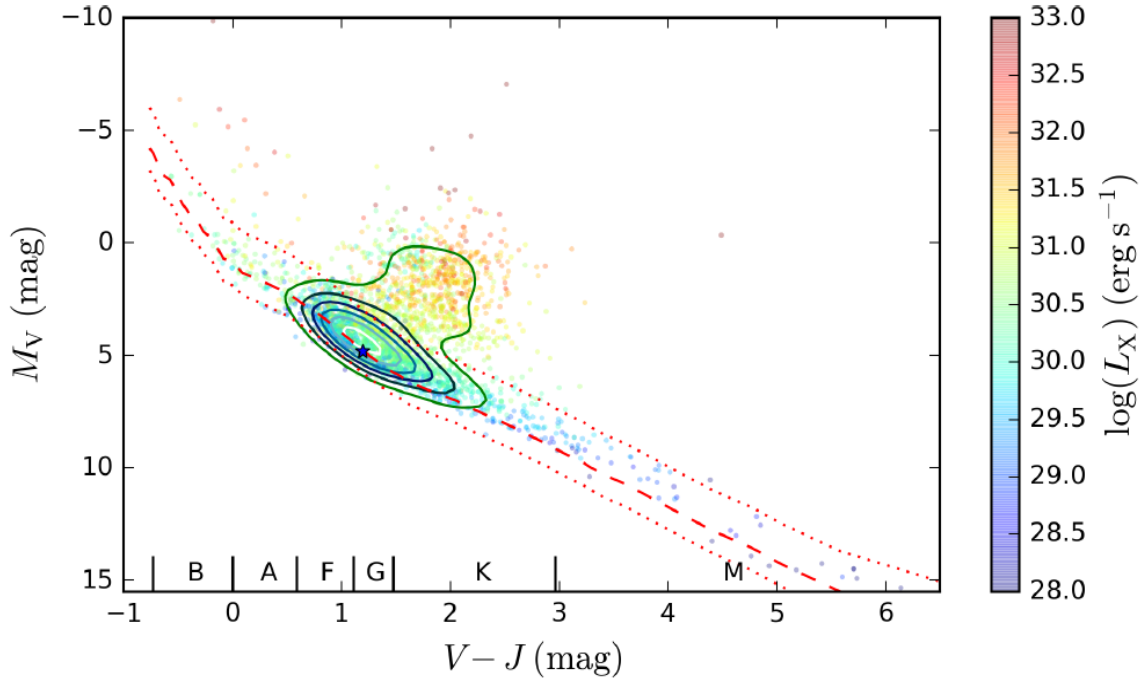
XMMSL2 Source population

- Cross-correlation with SIMBAD and NED identified 75% of sources with a population dominated by Stars, AGN, Galaxies and “X-ray sources”





Stellar Content



X-corr of XMMSL2 with Gaia DR1

Black points – src with >17 XMMSL2 counts

Stars with known parallax distance. Lines denote main sequence

Freund et al. 2018

Most of the stellar XMMSL2 sources are late-type dwarfs with an outer convection zone.

Only about 75% of the XMMSL2 stellar sources have a RASS identification.

Hence, a substantial portion of the stellar XMMSL2 sources are previously unknown X-ray sources caught in an active or flaring state.

Near real-time Transient Search

SLEW: 9408800002

Exposure start time:17:06:41 2022-04-05
Exposure stop time:18:25:56 2022-04-05
Analysis time: Mon Apr 18 10:52:50 2022

Go to the Main page

Click for a printable version of the table

Results for all listed slews - ASCII format

Histogram of the expected range of ratios :XMM Newton/Rosat

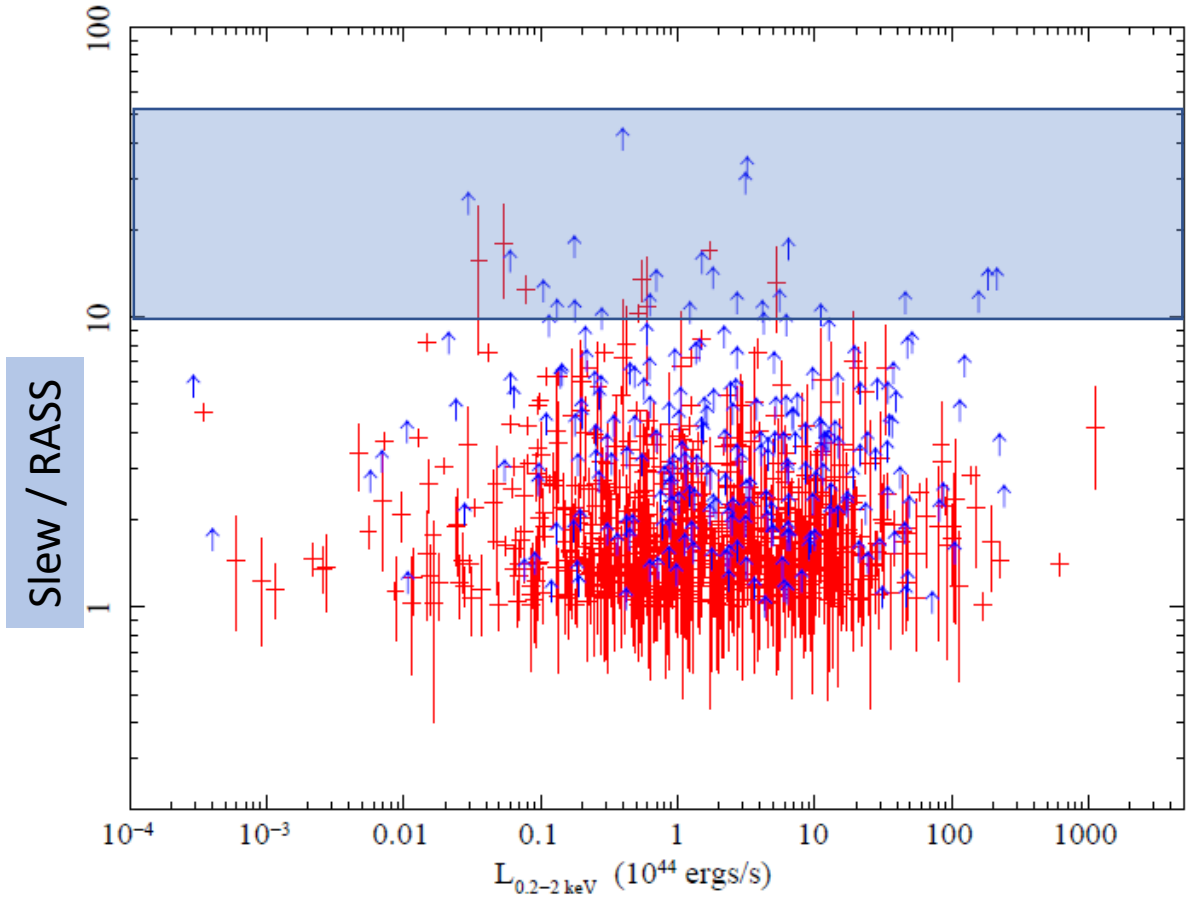
Green: XMM Newton data. Brown: ROSAT and comparison data.

XMMNewton_NAME	RA	DEC	SCTS	EXT	DET_ML	RATE	RATE_err	BG (e-4)	R_Cat	RA	DEC	OFFSET arcmin	FLUX RATIO	FLUX RATIO_err	NAME	XMM_IMAGE
XMMSL1 J141255.7+792208	213.2320	79.3690	6.3	0	21.2	0.70	0.30	9.20	b	14 12 56.00	+79 22 04.0	0.08	1.37	0.60	RX J1412.9+7922:[ZEH2003] 03	Image
XMMSL1 J141256.0+792209	213.2331	79.3692	6.9	0	27.8	0.77	0.31	2.51	b	14 12 56.00	+79 22 04.0	0.09	1.49	0.62	RX J1412.9+7922:[ZEH2003] 03	Image
XMMSL1 J180915.3+580108	272.3138	58.0191	6.1	0	22.6	0.91	0.38	1.39	f	18 09 16.20	+58 00 57.0	0.23	8.35	3.83	WISEA J180915.61+580102.7	Image
XMMSL1 J182932.1+484445	277.3839	48.7461	20.9	0	106.0	2.57	0.57	1.24	b	18 29 32.30	+48 44 47.0	0.03	2.35	0.54	3C 380	Image
XMMSL1 J182932.1+484445	277.3839	48.7461	20.9	0	106.0	2.57	0.57	1.24	p	18 29 32.13	+48 44 46.0	0.00	2.25	0.51	3C 380	Image
XMMSL1 J184446.2+373622	281.1923	37.6064	11.5	0	56.2	1.15	0.35	2.29	b	18 44 46.11	+37 36 20.0	0.05	0.72	0.23	1RXS J184446.1+373620	Image
XMMSL1 J184653.9+361650	281.7244	36.2807	6.4	0	35.3	0.97	0.39	1.80	f	18 46 53.50	+36 16 51.0	0.07	3.78	1.73	1RXS J184653.5+361651	Image

http://xmm.esac.esa.int/external/xmm_products/slew_results/web_slew.shtml

Raw slew data made available after 8-12 days. Since 2009, processed automatically, compared with RASS and results made available on web page.

Point Source Variability

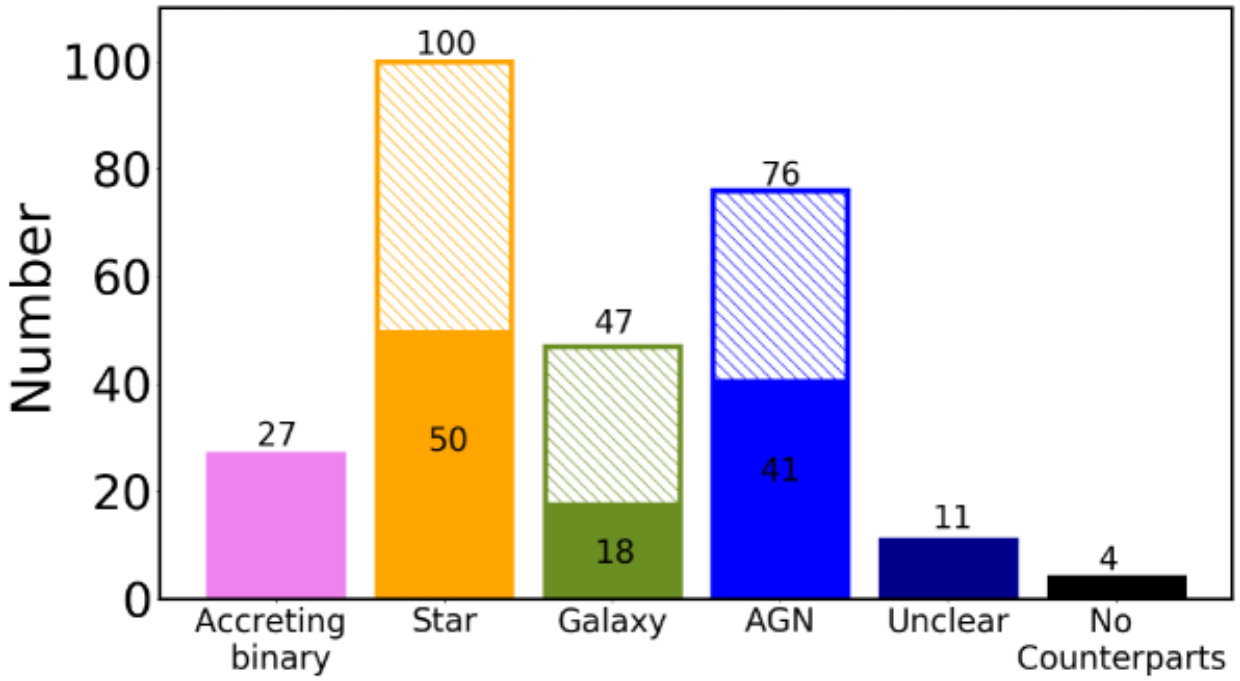


Compare with RASS to look for long-term variability

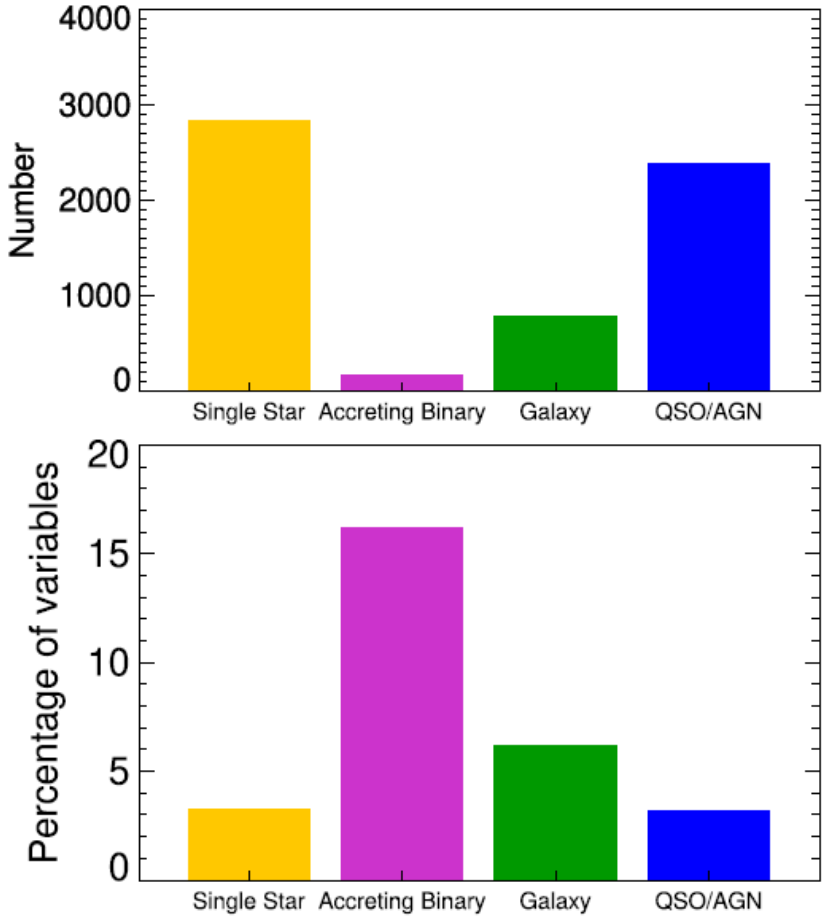
Form sample of objects with XMM_slew / RASS flux ratio>10

➡ ~1-2 transients per month.

Variable Source Populations



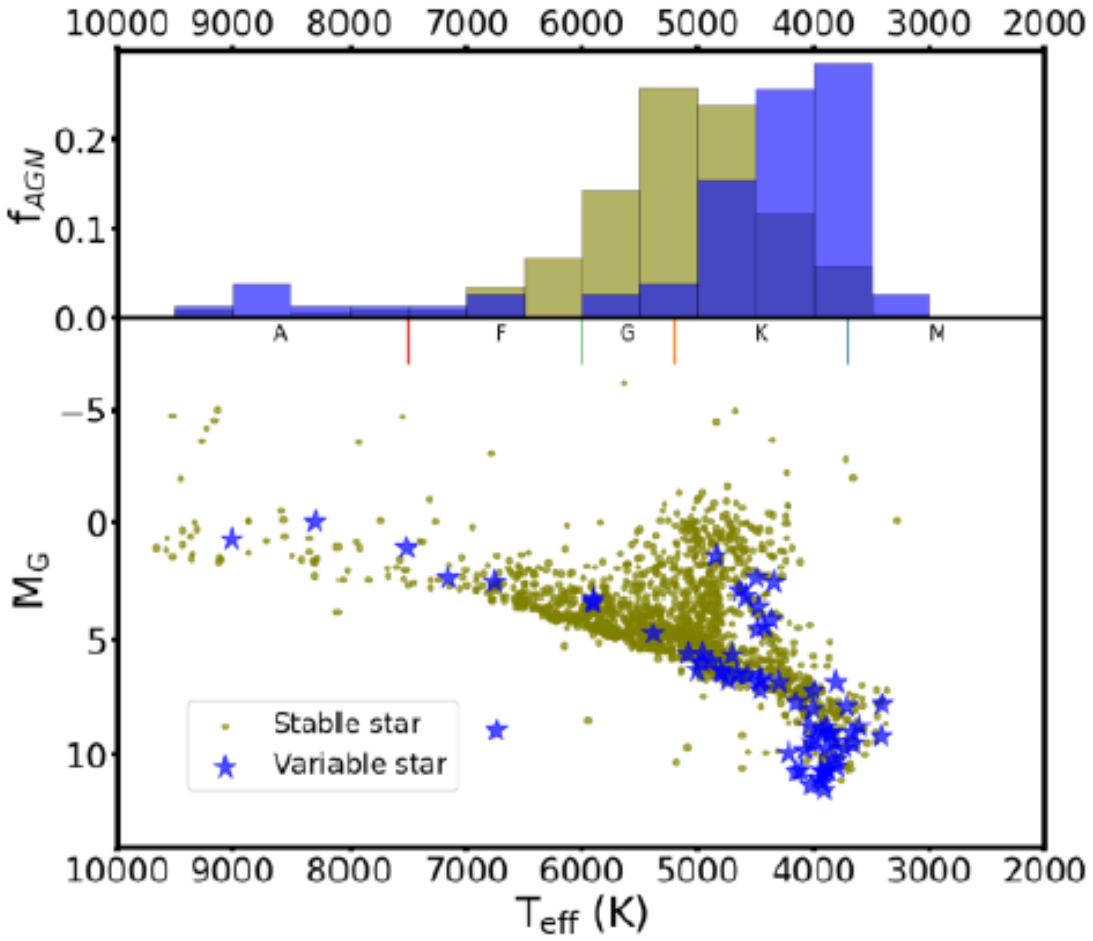
Li et al. 2022



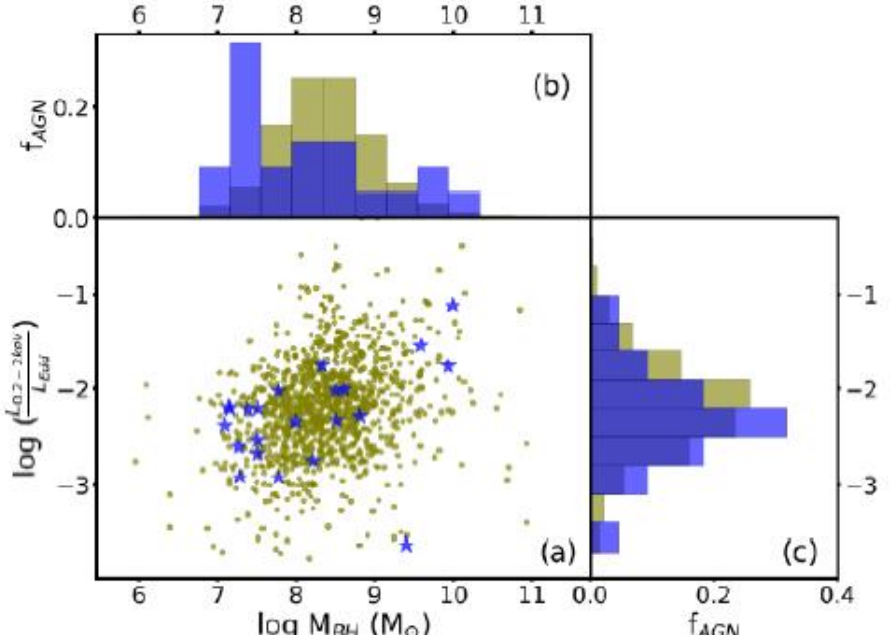
Sample of 265 sources showing factor 10+ flux increase from ROSAT survey to XMM-Newton slew.

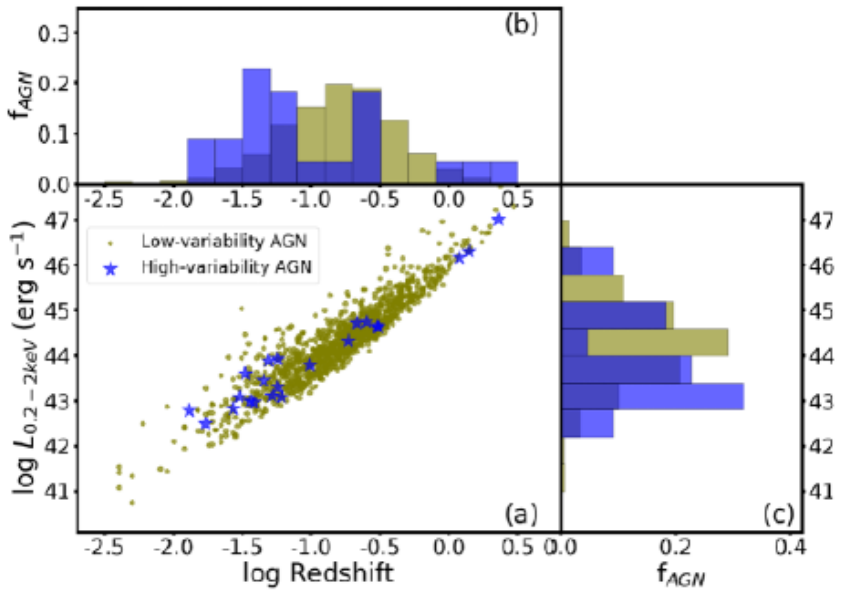
Extended cross-matching identified 94%

Variable Source Population - details



Li et al. 2022





Li et al. 2022, Strotjohann et al . 2016

Variable stars – cooler than average
Variable AGN – lower luminosity, redshift and BH mass than average

Spectacular individual variable sources

- Tidal Disruption Events
- Novae
- High-variability AGN
- QPEs in AGN (GSN 069, 2MASS J0249)
- Flare Stars
- Supernovae

The future is bright

- 7 years of data (2015-2022) uncatalogued – ~40,000 deg^2
- Work is needed to collate into a source list, screen, sanitise and publish it.
- Benefits:
  - 5000 new sources
  - Interesting new transients
  - More points on light curves
  - Close to full sky coverage, large structures (eRosita has done it for the MPE sky – only 50% of sky public).

- The XMM-Newton slew survey remains the best X-ray transient finder currently operating

How to make an update to the slew catalogue

Set of scripts using: postgres/SQL, csh, IDL

- Import source lists from recent observations into temporary tables
- Combine into a single database table
- Mark some obvious spurious ones and set the quality flags
- Set obs dates, fluxes, hardness ratios, mode-id etc…
- Make unique names for sources observed in multiple observations
- Do basic counterpart identification run (Simbad, NED…) and set id and id_type
- Set the background level for the image where the src was found
- Sanity check and flag sources found in high background regions, close to bright sources etc… (screening)
- Update quality flags and set “CLEAN_SAMPLE” flag for the good quality sources.
- Merge with XMMSL2 to make XMMSL2_DELTA1 [say that we don’t have manpower]

Who can do it ?

- XMMSL2 was made by members of SOC in their science time and by the EPIC consortium. There are now insufficient resources at SOC to update the slew catalogue.

- The SOC would be very happy to give significant help to any other group who would like to benefit from the opportunity to take this task over