The stellar population in the XMM-Newton slew survey

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ABSTRACT:
We search for stars among XMM-Newton slew transients. The source identification process comprises a systematic search for multi-wavelength photometry using V0 tools and dedicated spectroscopic follow-up.

Photometric multi-wavelength counterparts:
• search in 2MASS, WISE, GALEX, Swift, SDSS, UCAC4, Tycho2 and NVSS using TOPCAT with match radius of 15"

--> 72 X-ray sources have a single counterpart,
42 X-ray sources have more than one counterpart,
5 X-ray sources have no counterpart

• selection of unique counterpart to the X-ray source aided by visual inspection of images and catalogued positions in ALADIN (see BOX 2)

Optical spectroscopy:
• 34 slew transients observed with the R1000R grism of OSIRIS@GTC (wavelength range ~ 3600–7500Å, R~1000) (see BOX 3)
• deriving spectral types by comparison to templates from the "MILES library" (http://miles.iac.es)

Analysis:
• photometric distance from V, J mags for 61 transients and spectroscopic distance for 32 transients (with calibrations from "Allen’s Astrophysical Quantities", Cox 2000); photometric spectral type from V-J for 41 transients (see BOX 3)
• spectral energy distribution with VOSA yields $T_{\text{eff}}$ and $L_{\text{bol}}$ for stellar counterparts (see BOX 4)
• color-color and color-magnitude diagrams separate stars from other astronomical objects (see BOX 5)

X-ray flux from different satellites compared in BOX 6

Sample selection from XMMSL1 DR3 catalog:
1.) count rate in XMM slew > 70 times ROSAT count rate
2.) during slew >6 counts in soft band (0.2-2 keV)
3.) remove obvious extragalactic sources

--> 119 X-ray transients


BOX 1
Maximum of flux ratio between XMM slew soft band and ROSAT; most objects have only an upper limit in ROSAT. Green is the distribution for confirmed stars from our spectroscopic follow-up (see BOX 3).

BOX 2 Examples of optical images at the position of XMM slew transients (red x-point and error box with 15" radius); multi-wavelength counterparts are overplotted.

In cases with more than one possible identification we selected the one with a Swift or GALEX counterpart, if there is no such counterpart then we selected the brightest 2MASS or WISE object.

BOX 3 Examples of OSIRIS spectra

Spectral type distribution:
Spectroscopically we find 19 M-stars, 9 K-stars, 4 FG-stars, and 2 extragalactic objects. 16 of these have no entry in SIMBAD, 7 were only known as “1RXS J” source. We discriminate between dwarfs and giants for objects without spectroscopy using the distance and log $L$, derived from the V-J color.

BOX 4 Example of SED fit with VOSA.

Data points indicated as “excess” (black) and upper limits (yellow) are not considered in the fitting process.

Y-axis shows flux observed at Earth.SED fits yield $T_{\text{eff}}$ but are insensitive to gravity and metallicity.

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• TOPCAT (Taylor M.B. 2005, ASPC 347, 29)
• ALADIN (Bonavita et al. 2000, A&A 343, 33)


Background image: XMM-Newton X-ray Slew Tracks (courtesy A. Read)