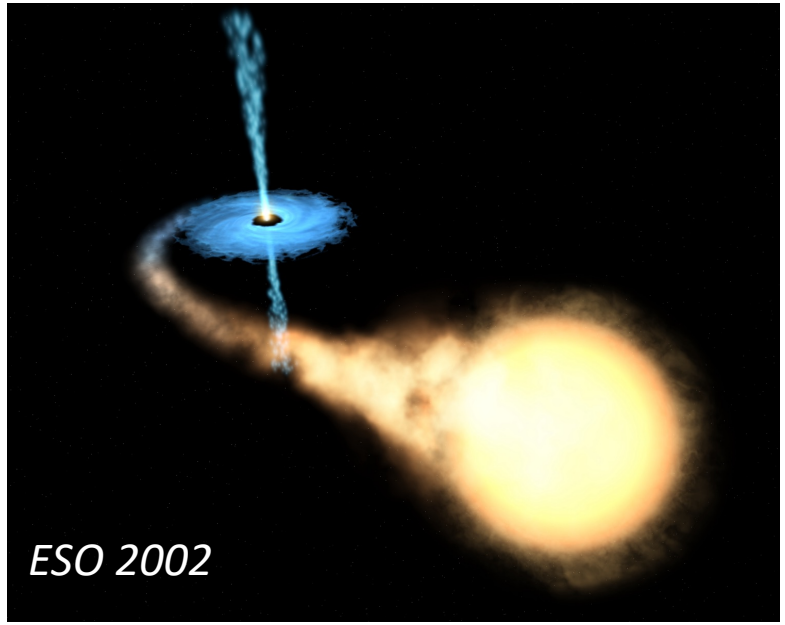
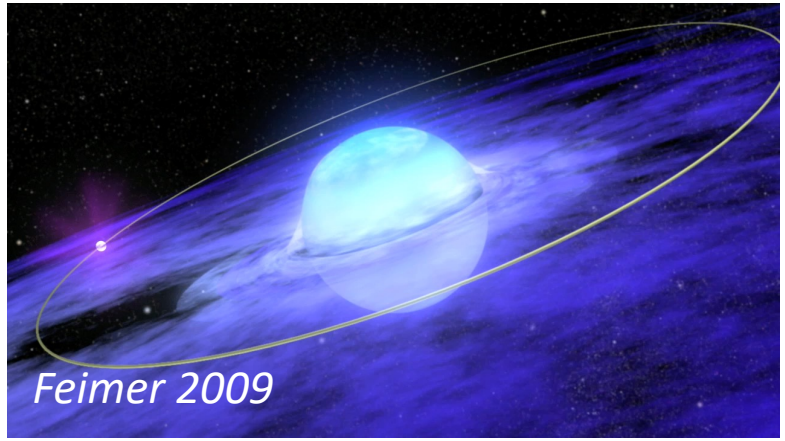
High-mass X-ray binaries in the Large Magellanic Cloud

David Kaltenbrunner,
Chandreyee Maitra, Frank Haberl et al.

What is a HMXB

- Supergiant X-ray binaires
  - P_{orb} ~ few days (Walter+ 2015)
  - L_X ~ $10^{36} - 10^{37}$ erg s^{-1} (Martinez-Nunez+ 2017)
  - Wind-/Discfed
- Be X-ray binaries
  - Mostly quiescent L_X ~ 10^{33} erg s^{-1}
  - Type 1/2 outbursts





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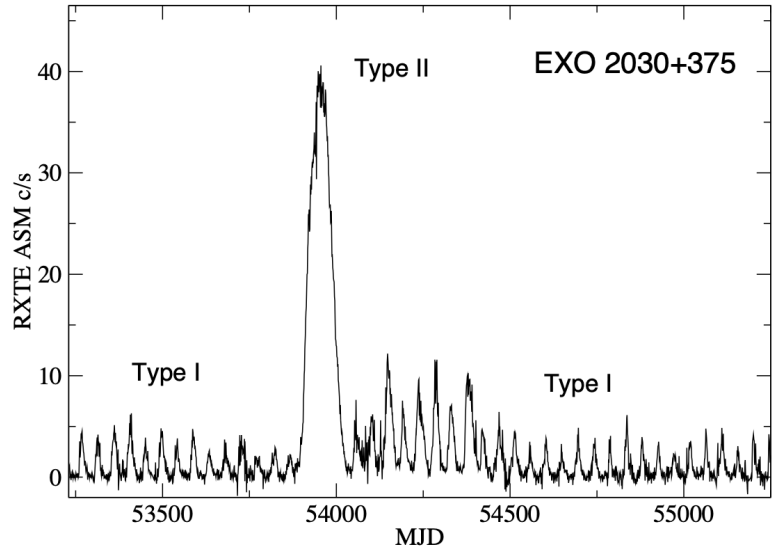

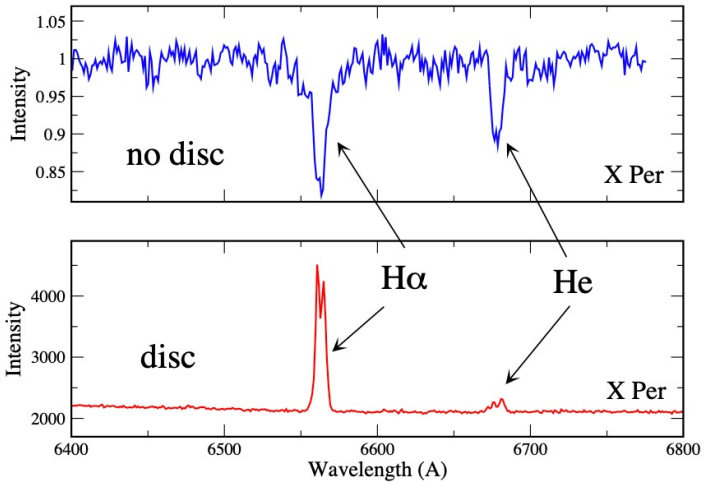

Both from Reig 2011

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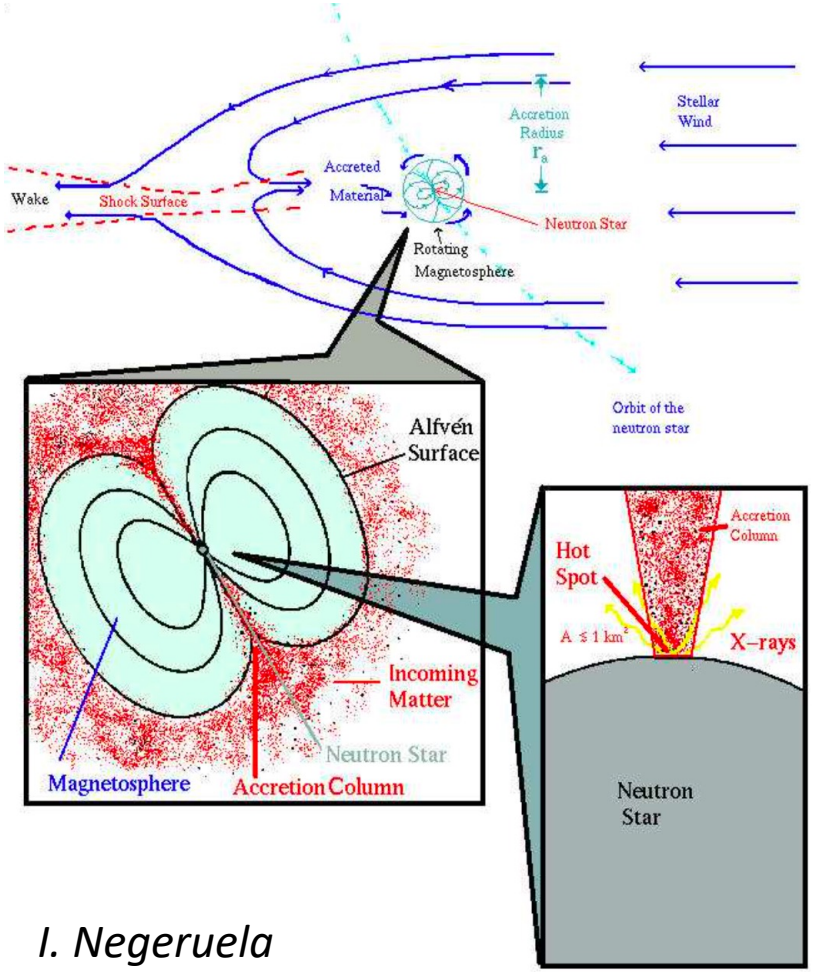
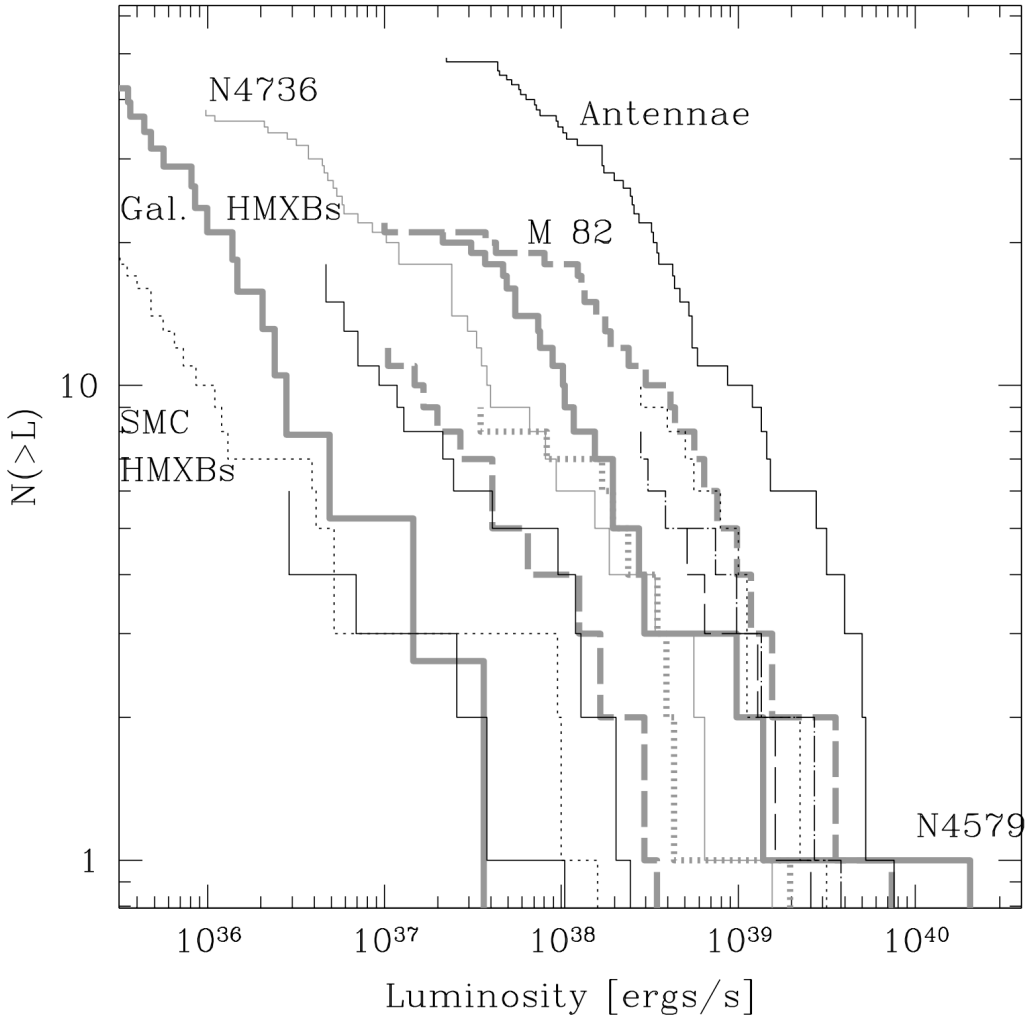


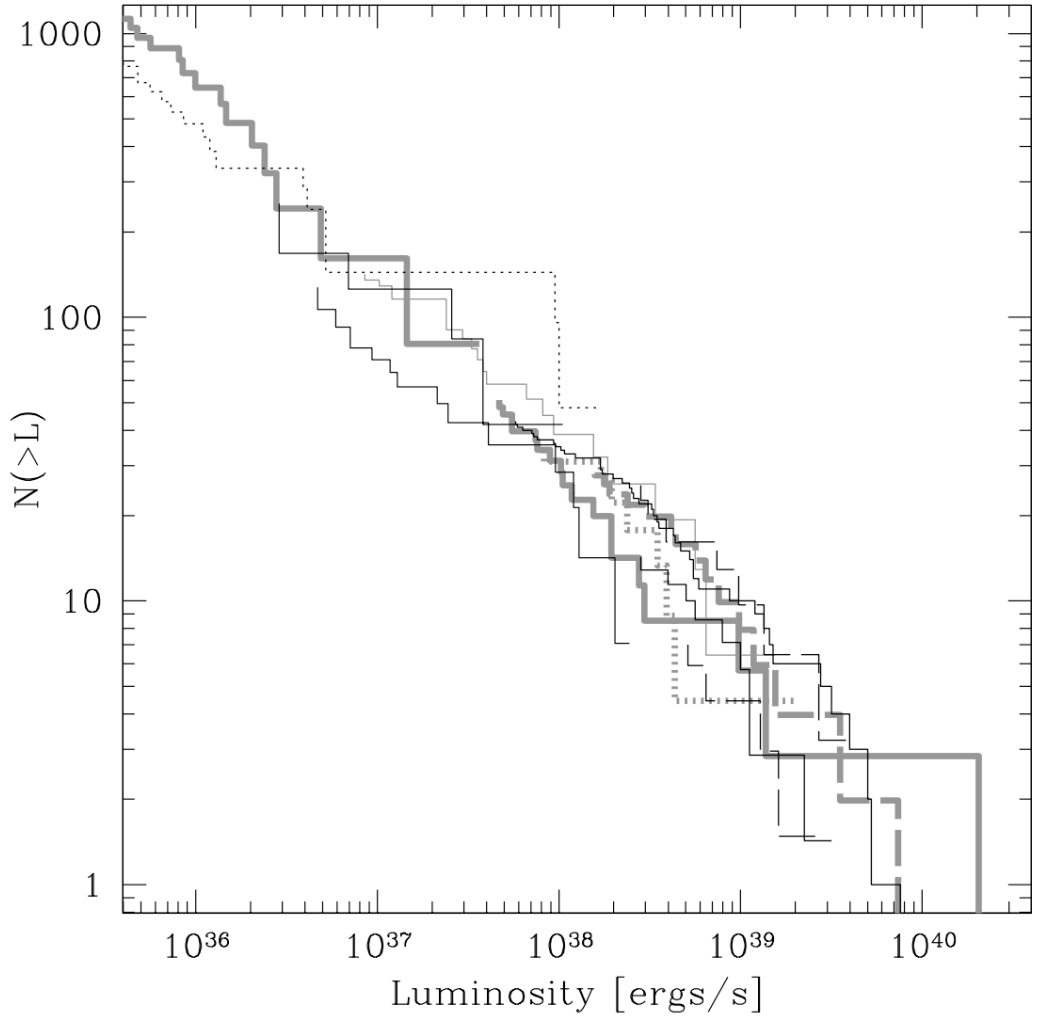
I. Negeruela

Luminosity Functions

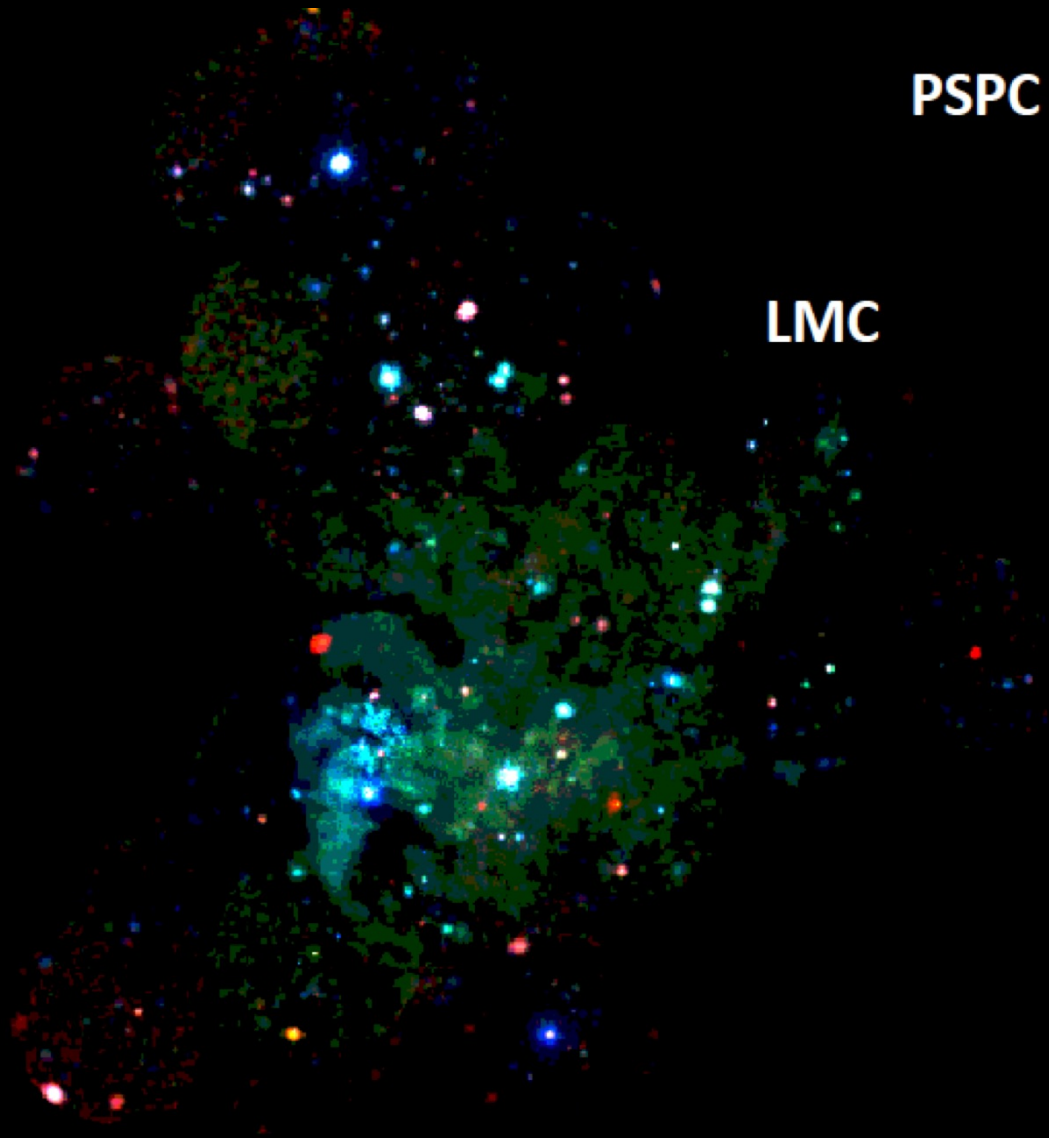


Grimm+2003; Fig. 1 left; XLF of nearby galaxies

Luminosity Functions



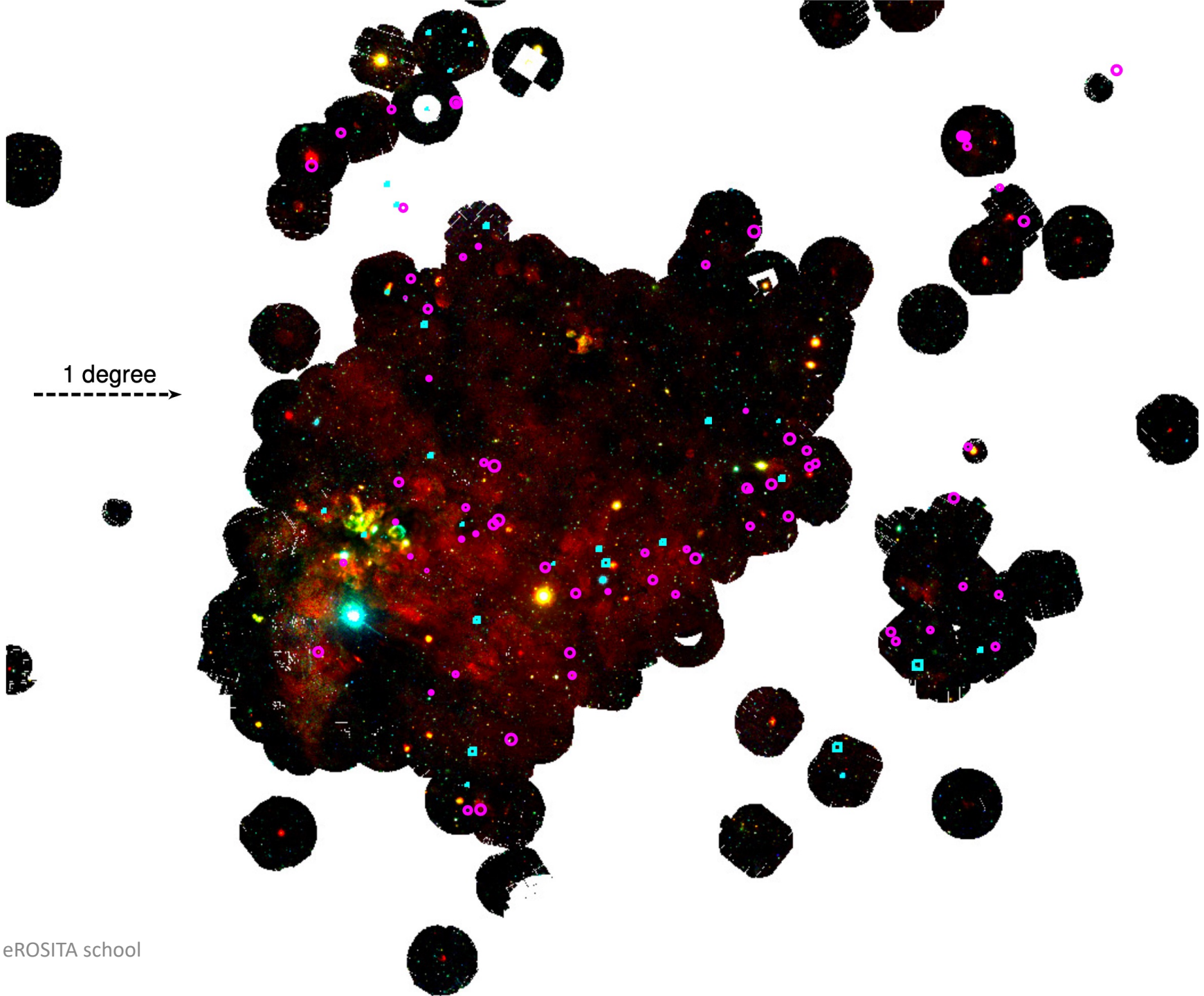
Grimm+2003; Fig. 1 right; XLF of nearby galaxies scaled by SFR relative to Antennae



59 deg^2
750 sources
(Haberl et al. 1999)

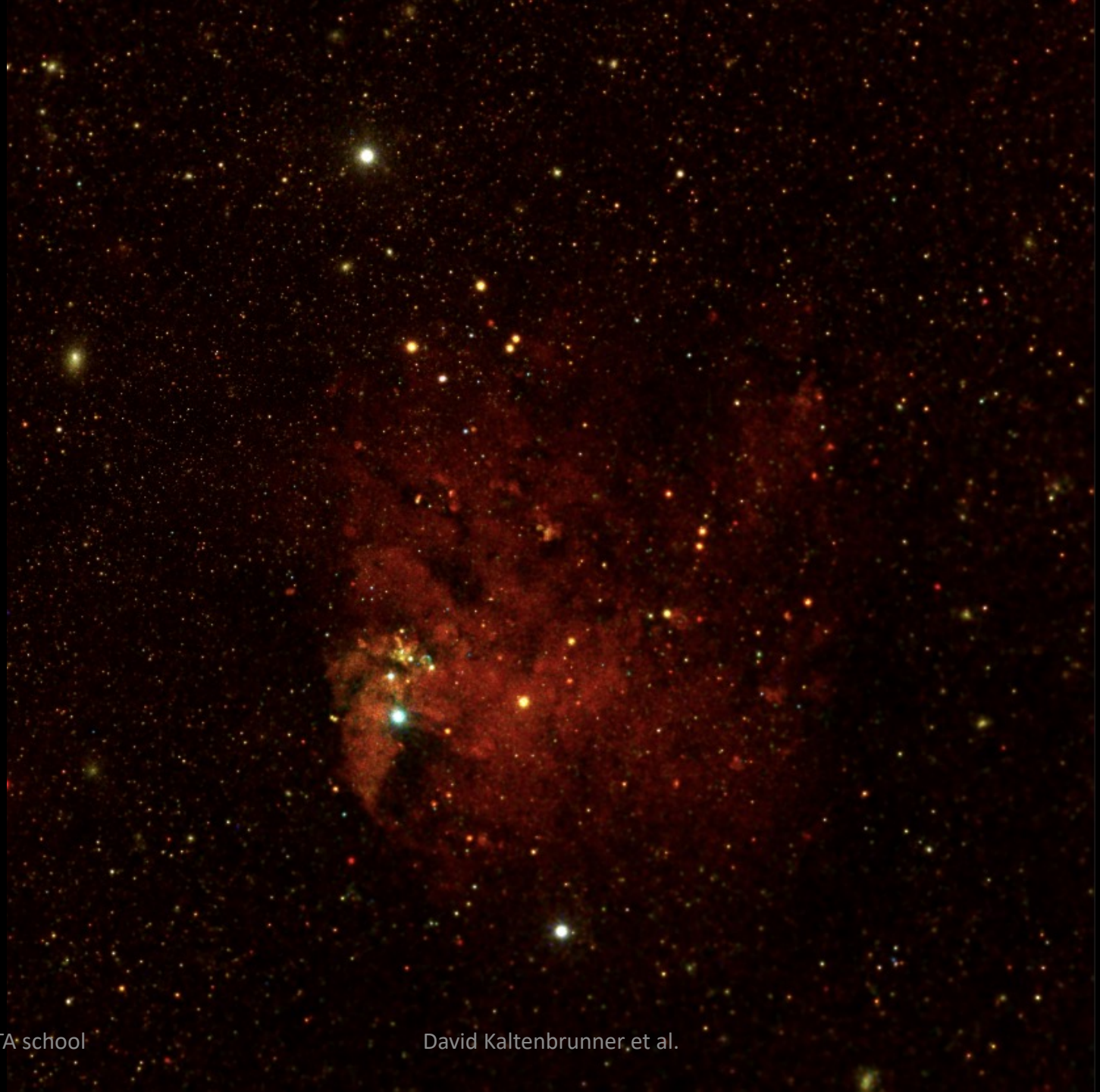
0.1-2.4 keV

Mosaic image of all XMM-Newton observations used in LMC survey



The mirror systems collect high-energy photons and focus them on the CCD X-ray cameras.

DLR



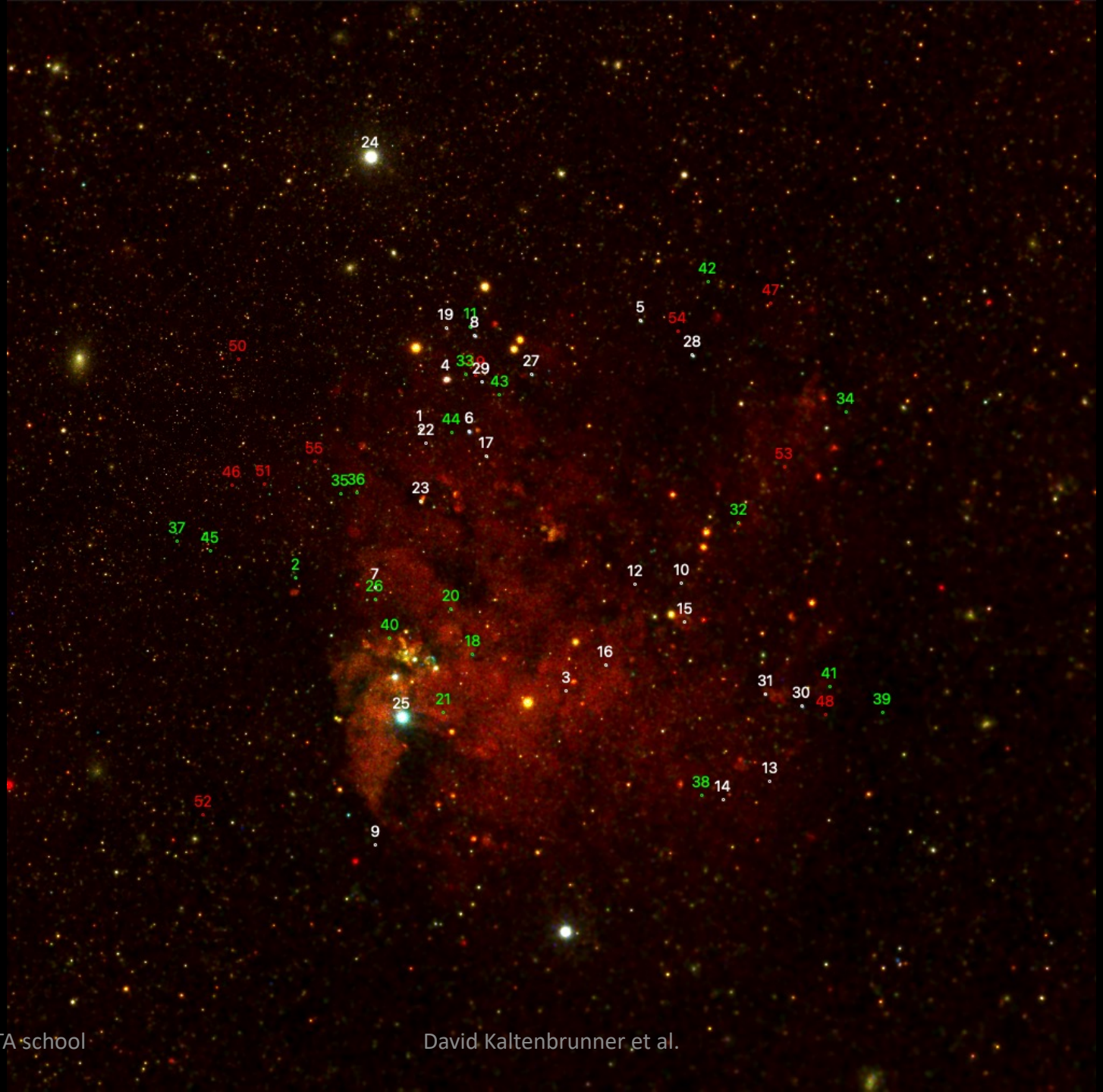
eRASS1 image of LMC
0.2-1.0 keV
1.0-2.0 keV
2.0-4.5 keV

25/55 known HMXB (from Antoniou&Zezas 2016 and own list)

20 good candidates

9 uncertain candidates

5 rejected



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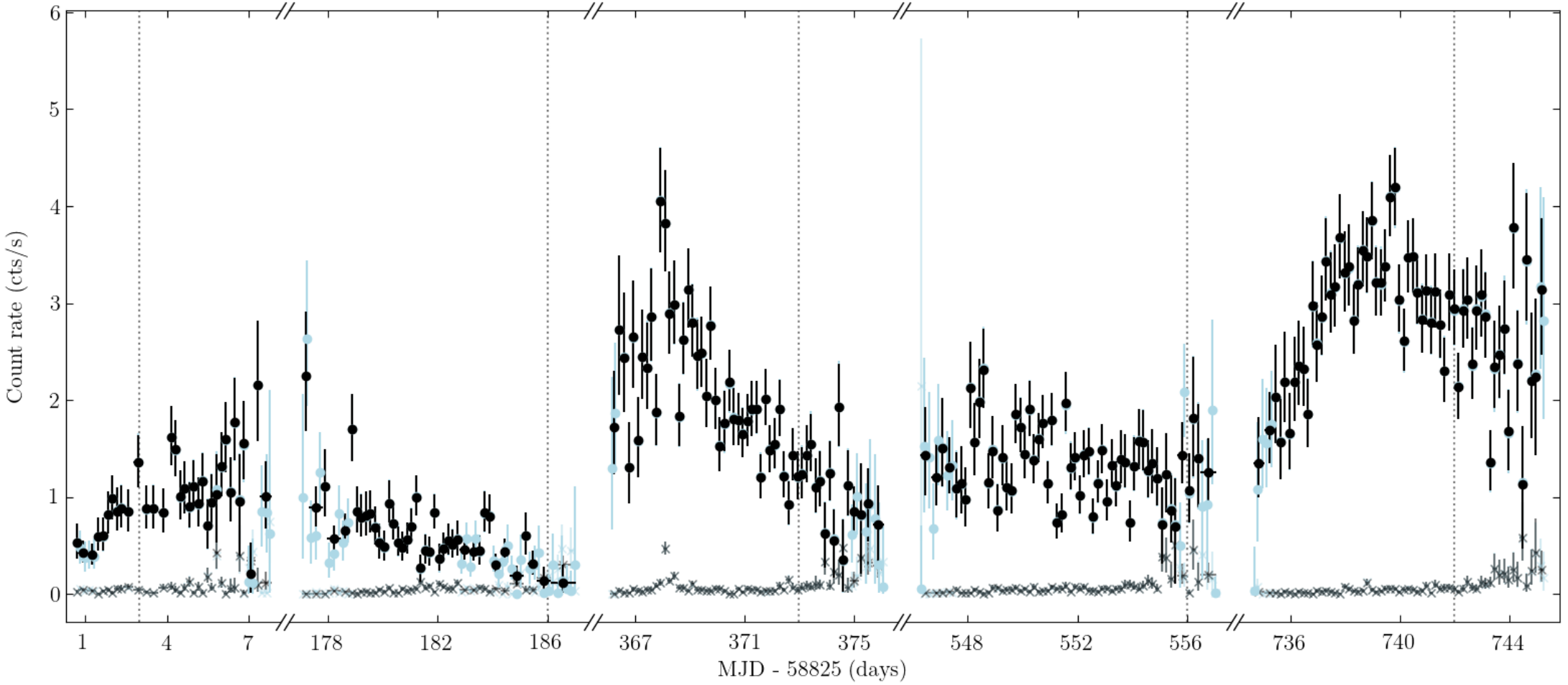
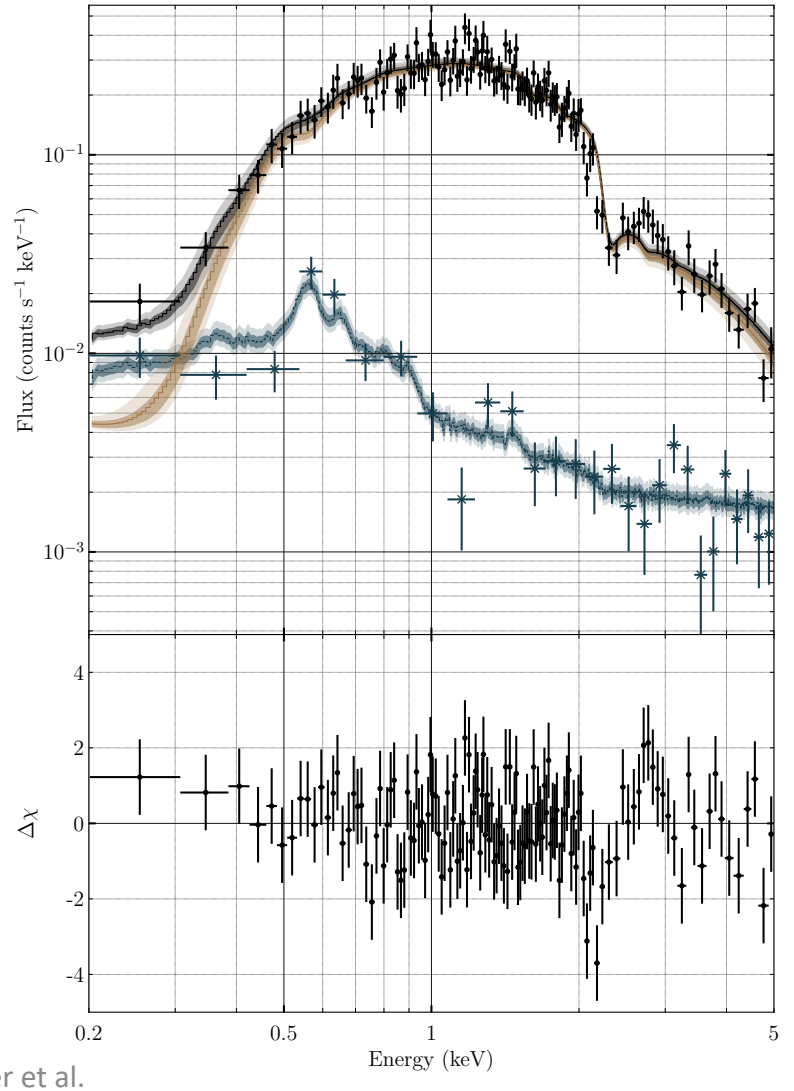
Examples - BeXRB



Haberl+2023; eRASSUJ050810.4–660653 eRASS:4 lightcurve

Examples - BeXRB

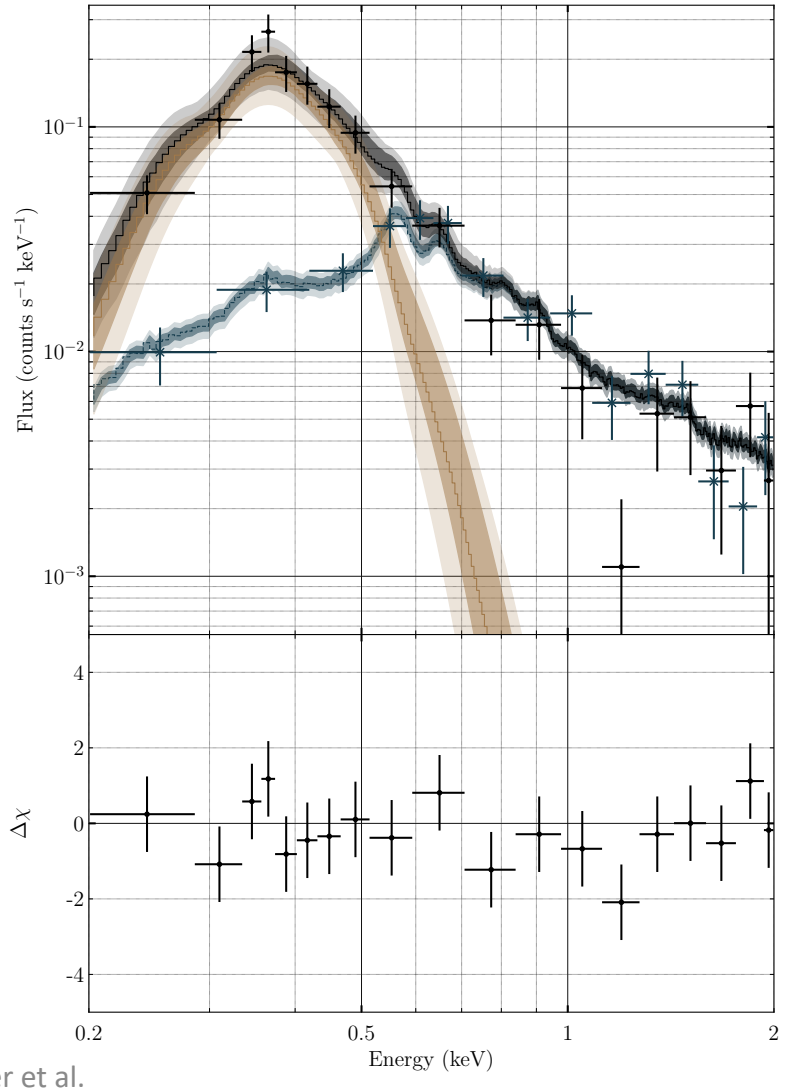
- High variability in lightcurve
- Absorbed powerlaw spectrum
- Absorption:
  - Foreground: $\sim 6 \times 10^{20} \mathrm{cm}^{-2}$
  - Local: can be up to 3 orders of magnitude larger
- Powerlaw index typically <1.3



Haberl+2023; eRASSU050810.4–660653 eRASS:4 spectrum

Examples - BeWD

- White dwarf as compact companion
- Absorbed blackbody spectrum
- Temperature ~ 100 eV
- Emission radius ~ 50 km



Kaltenbrunner+ in prep.; eRASS:4 spectrum of typical BeWD candidate