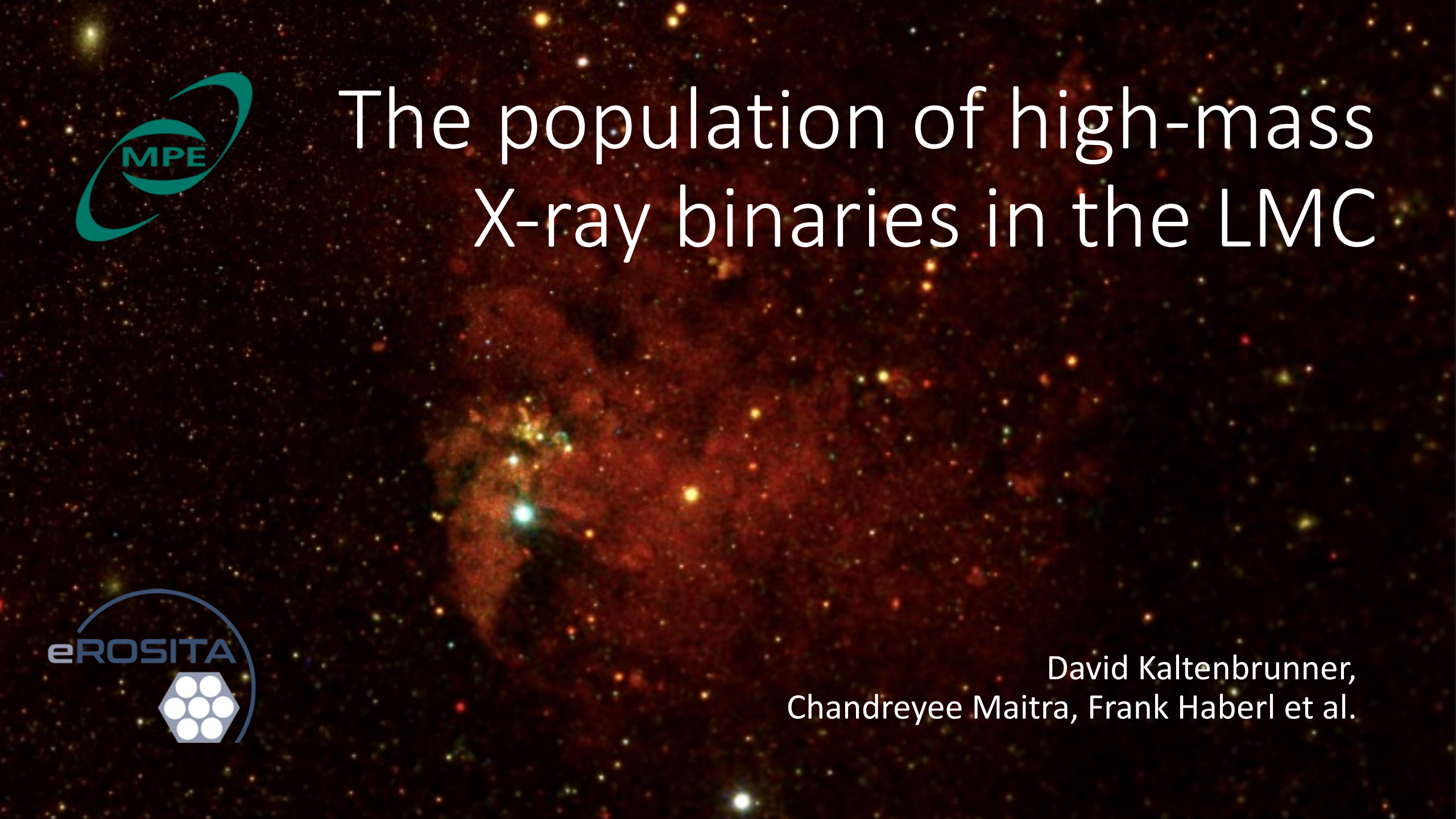
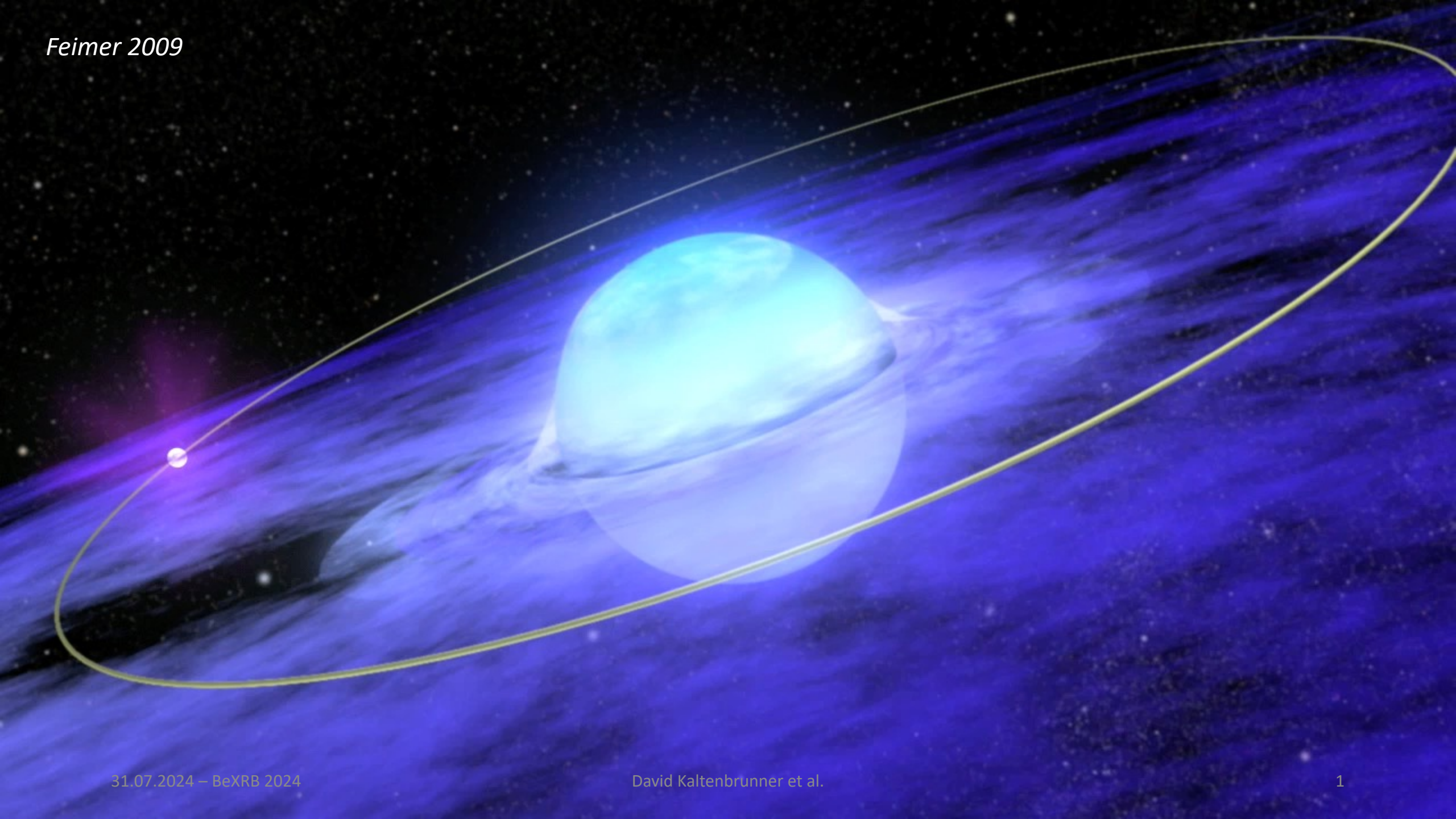
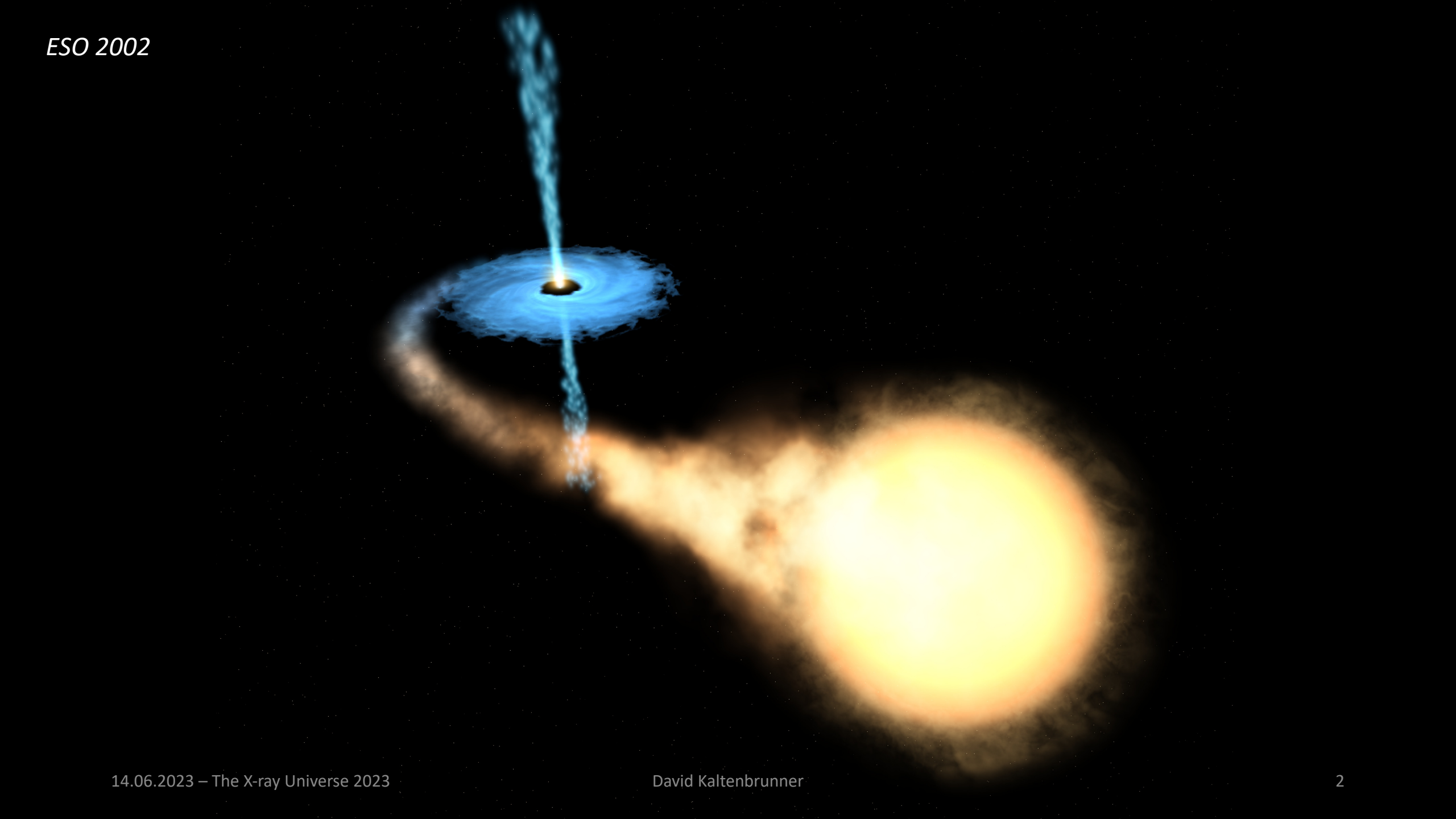


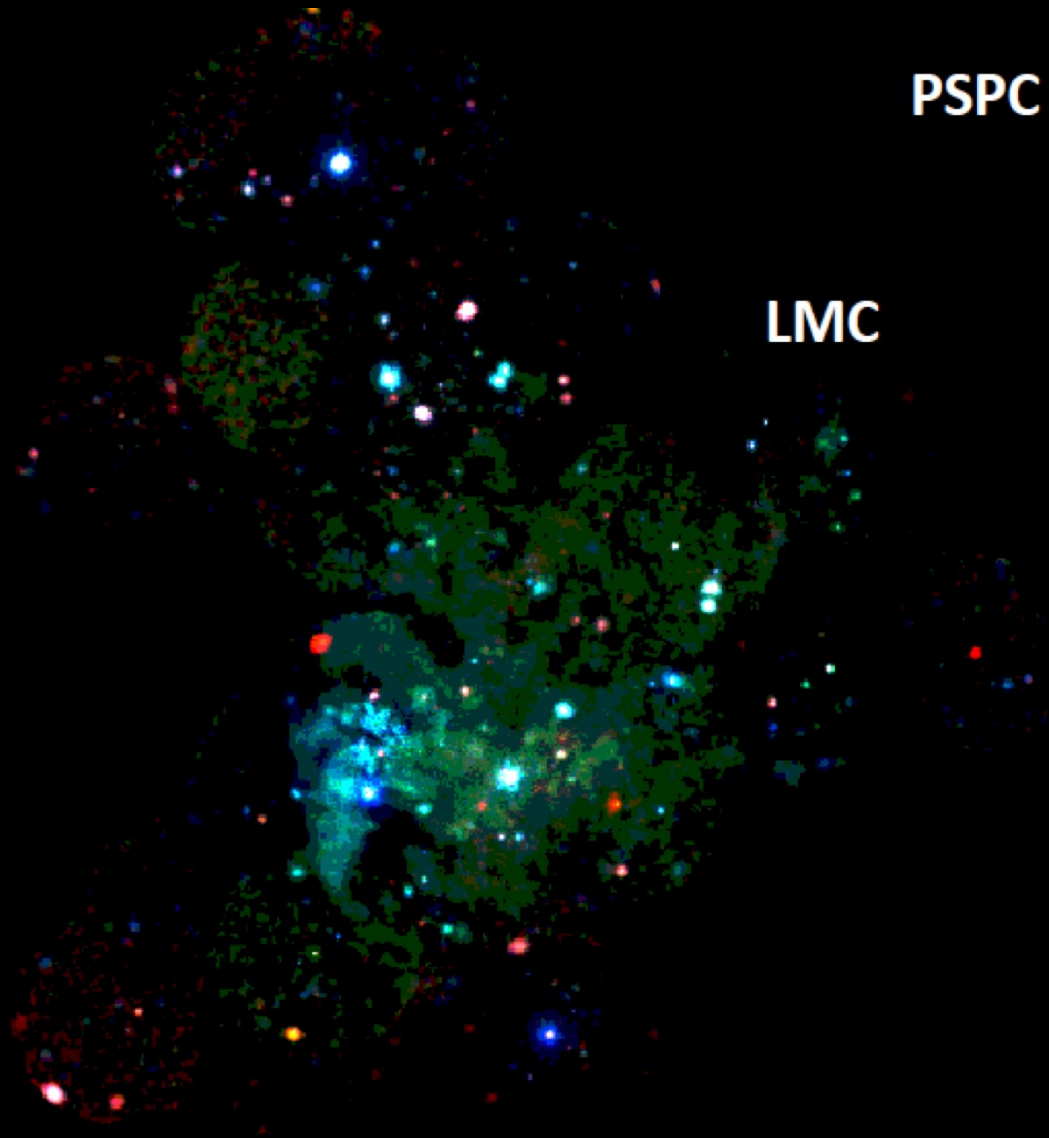
The population of high-mass X-ray binaries in the LMC

David Kaltenbrunner,
Chandreyee Maitra, Frank Haberl et al.


Feimer 2009

ESO 2002

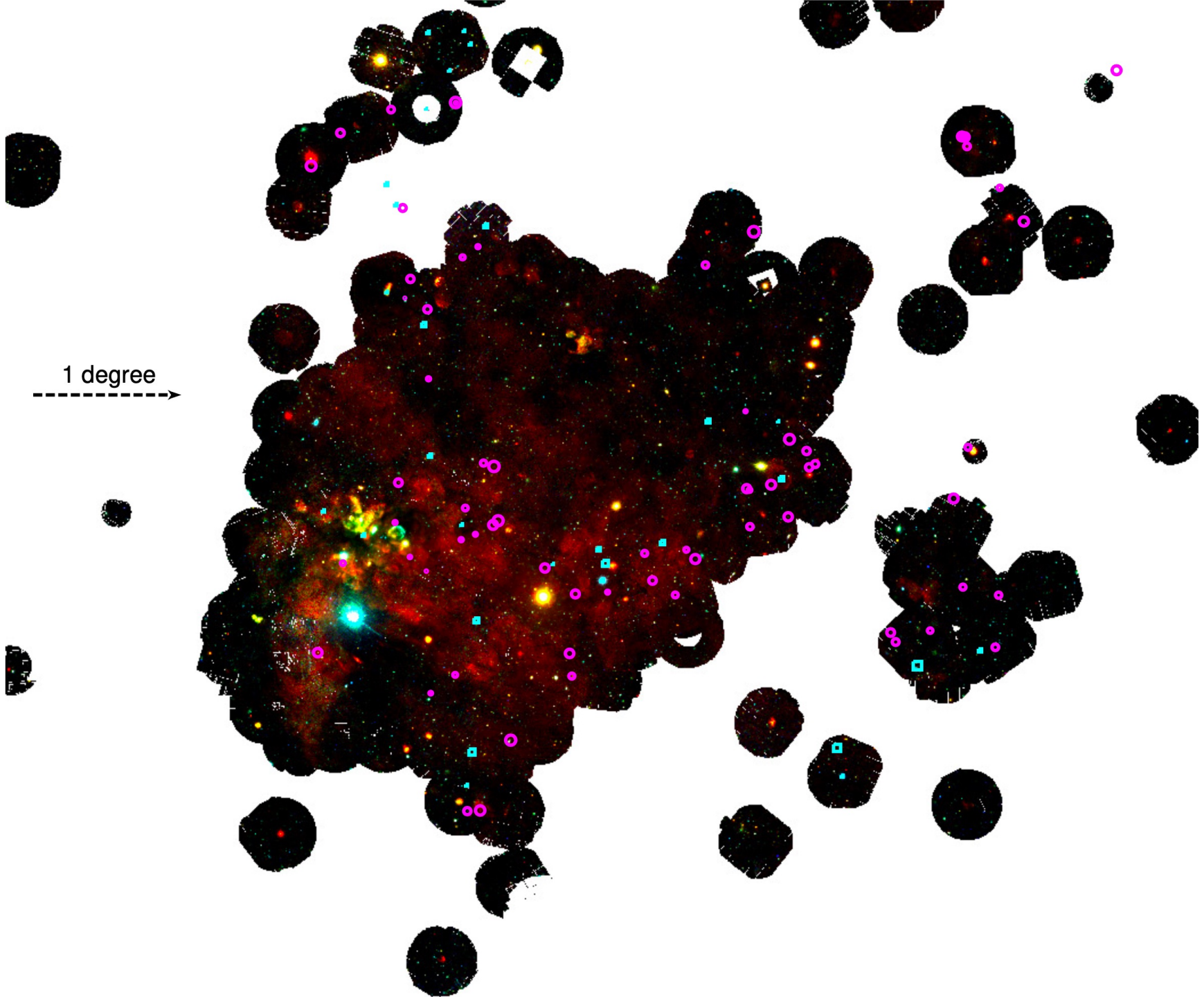




59 deg^2
750 sources
(Haberl et al. 1999)

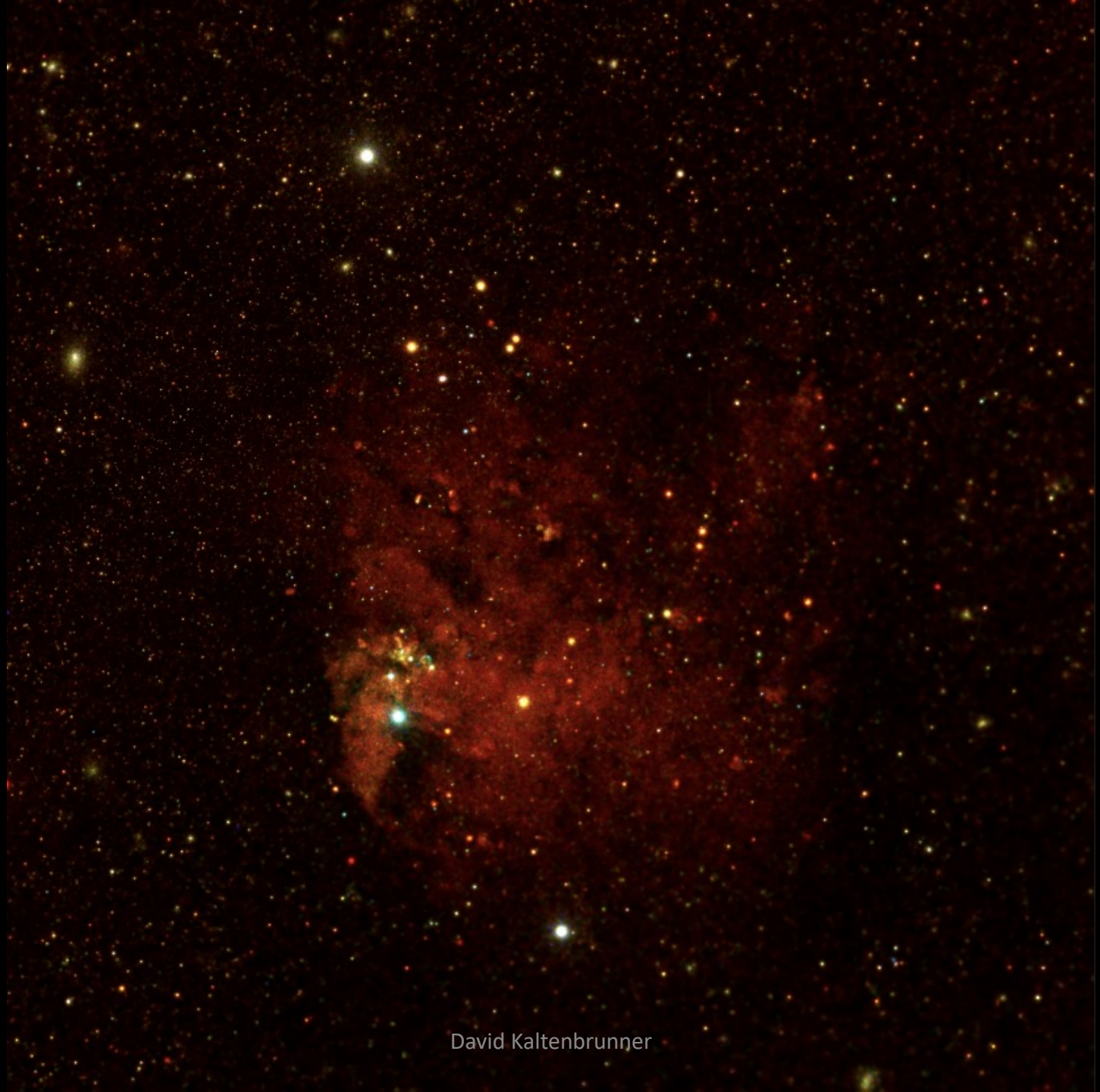
0.1-2.4 keV

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



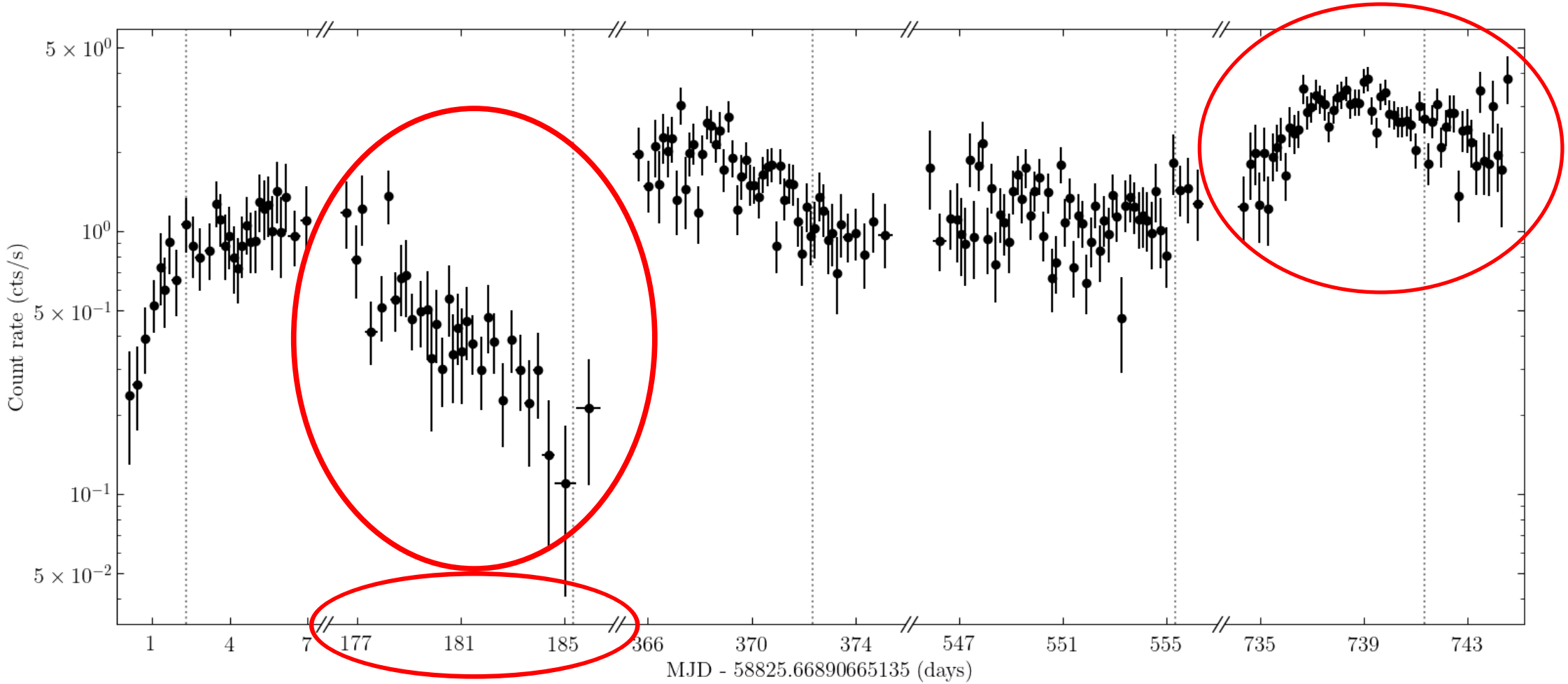
eRASS1 image of LMC
0.2-1.0 keV
1.0-2.0 keV
2.0-4.5 keV

Motivation and Goal

- Closest star forming galaxies
- Low foreground absorption
- Distance is well determined
- HMXBs in LMC not probed systematically yet

- Build complete census of a flux limited sample
- Study star formation rate - HMXB correlation
- Probe accretion on very long timescales (2 years)

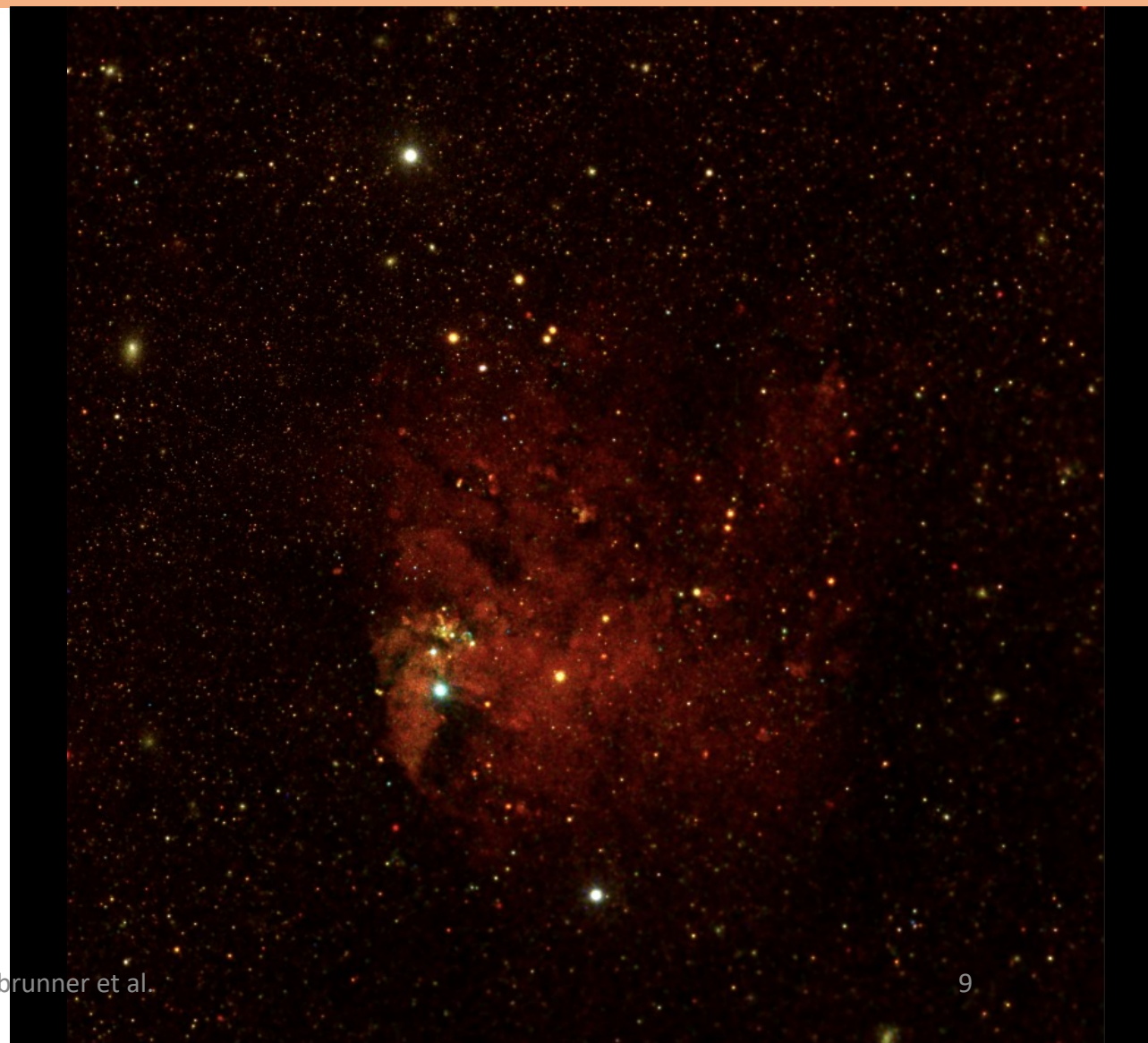
Scientific Goal



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

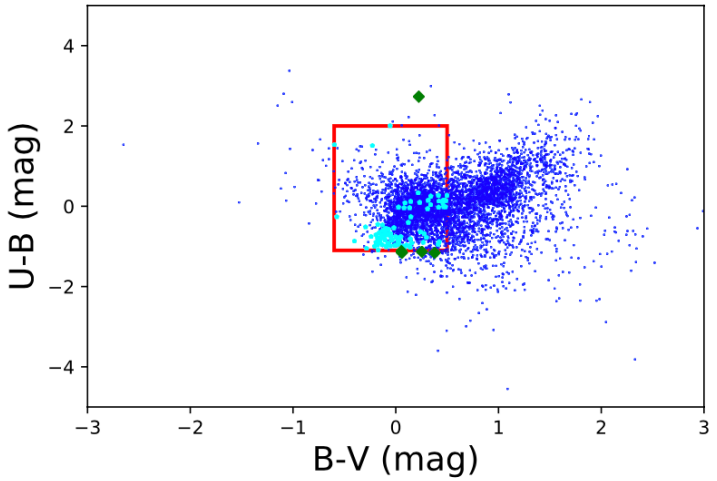
eRASS1 Source Catalogue

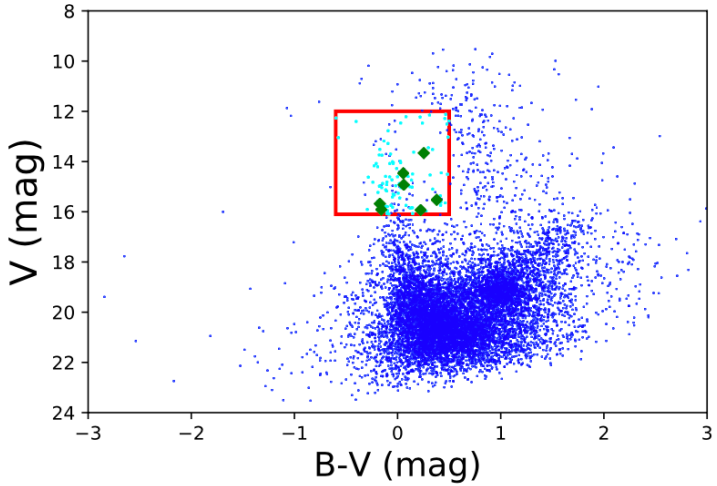
- eRASS1 point sources
  - EXT_LIKE = 0
- Reducing spurious sources and chance coincidences
  - POS_ERR < 9.8’’
  - DET_LIKE_0 > 20. (for new ones)
  - Correlate with X-ray AGN and foreground star catalogues



Optical Counterpart

- MCPS
  - 4-band (UBVI) photometric survey
  - 12.0 < V < 16.1 mag
  - -0.6 < B-V < 0.5 mag
- VMC
  - 3-band NIR photometric survey
  - 12.8 < Y < 16.6 mag
  - -0.126 < Y-J < 0.251 mag
  - -0.142 < J-K_S < 0.485 mag
- Gaia proper motion selection





Kaltenbrunner+ in prep.; MCPS color-magnitude selection for Be/SG stars

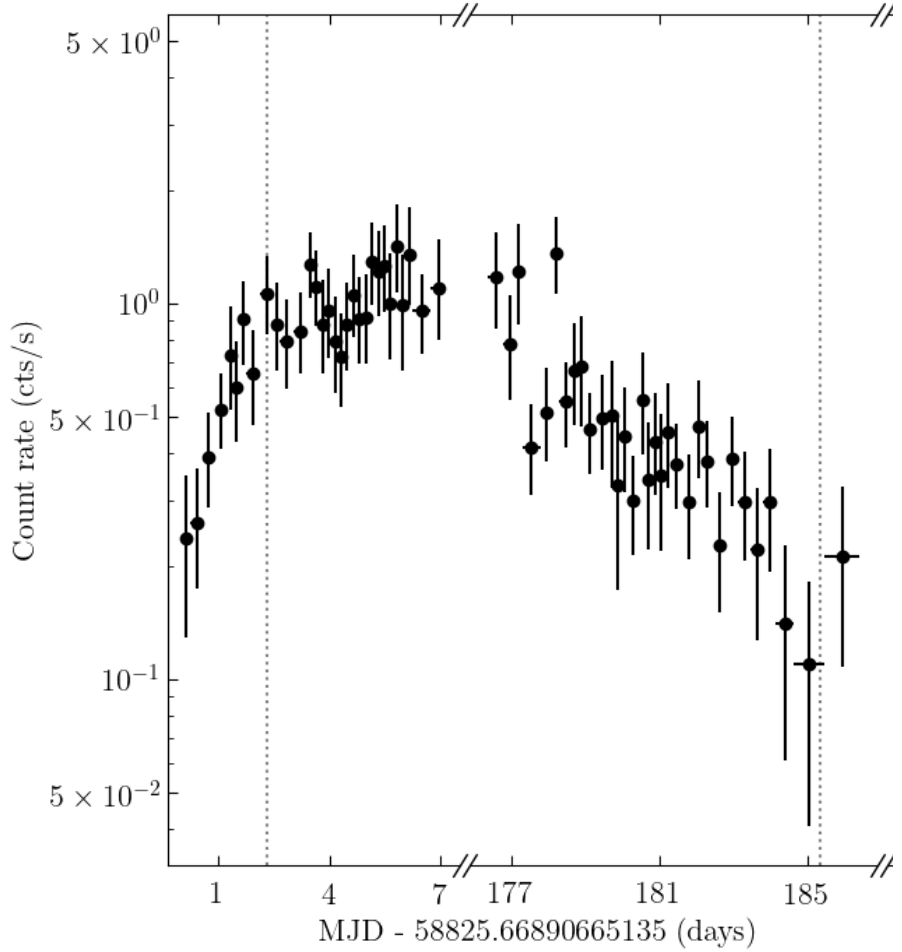
Flags for new Candidates

- Parameters from known sample to evaluate new candidates
- X-ray properties > Compact Object
- Optical/IR properties > Be (or SG) star

X-ray Properties

- Spectrum
  - Powerlaw index < 1.3*
- Variability
  - Short and long term
  - Sample median factor of ~26 over all eRASS

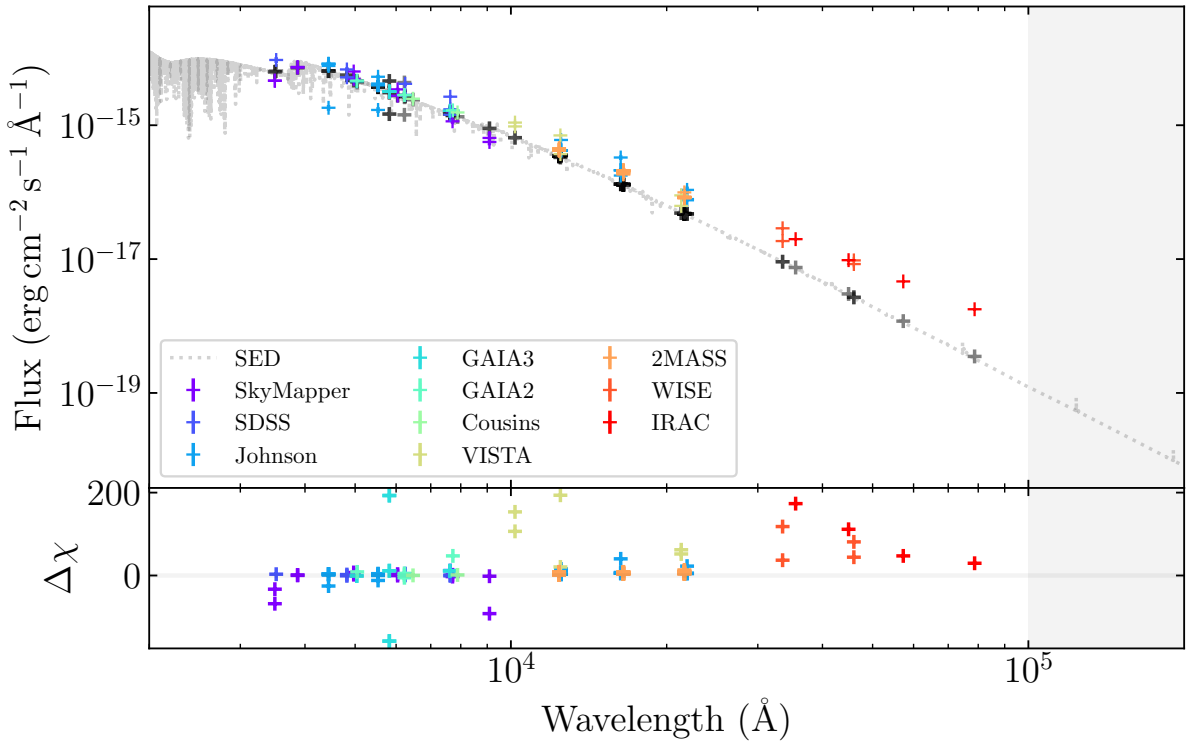
**Haberl&Sturm 2016*



Haberl+2023; eRASSU050810.4−660653 eRASS:4 lightcurve

Optical/IR Properties

- Variability
  - OGLE lightcurves
  - Orbital period
- Hα emission
- Color-Magnitude Plots
  - Gaia catalogue
  - 2MASS and SAGE survey
- SED fitting



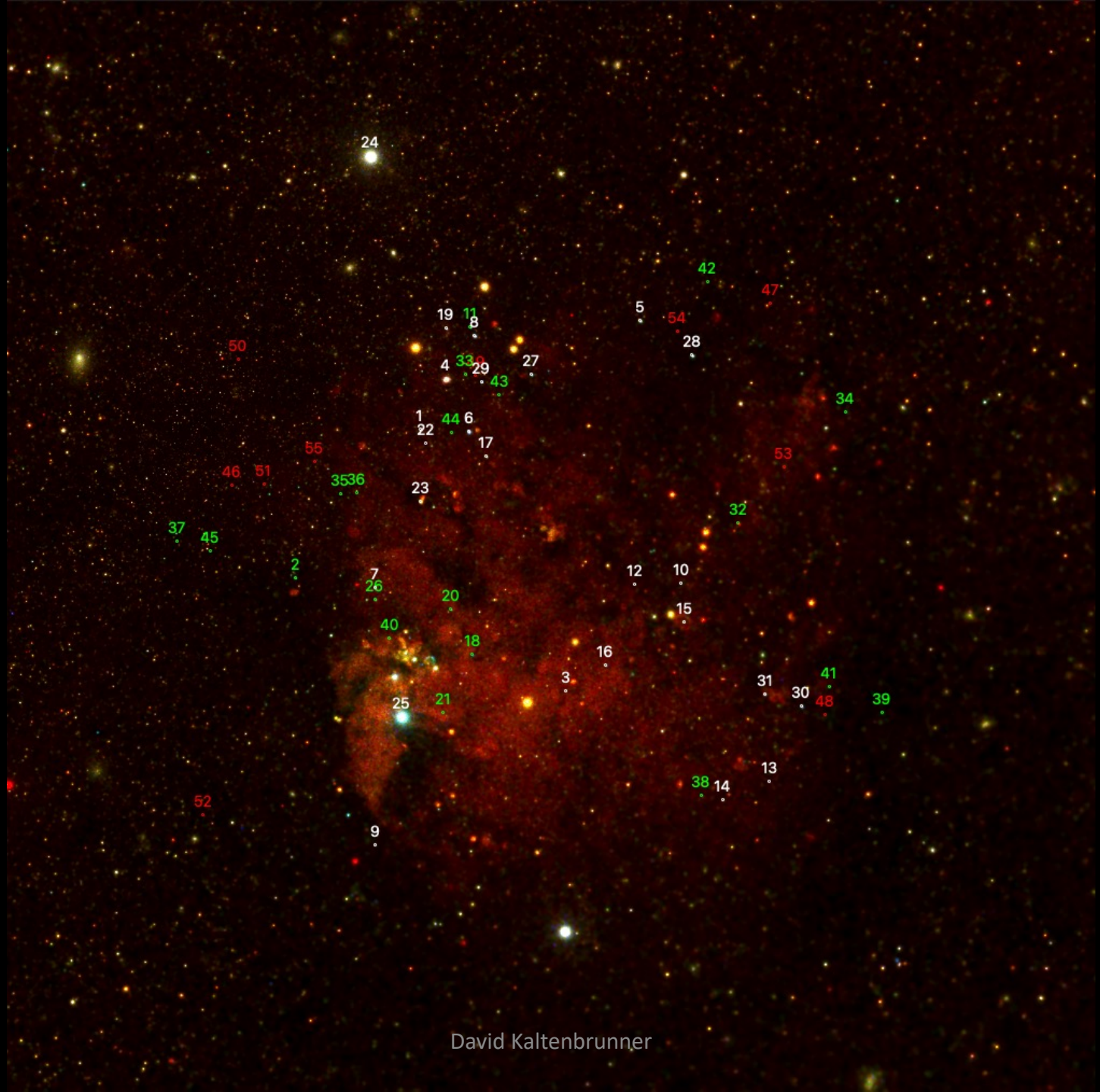
Kaltenbrunner+ in prep.;
SED fit to data public on VizieR within 1'' of the Gaia counterpart done by Julia Bodensteiner

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

20 good candidates

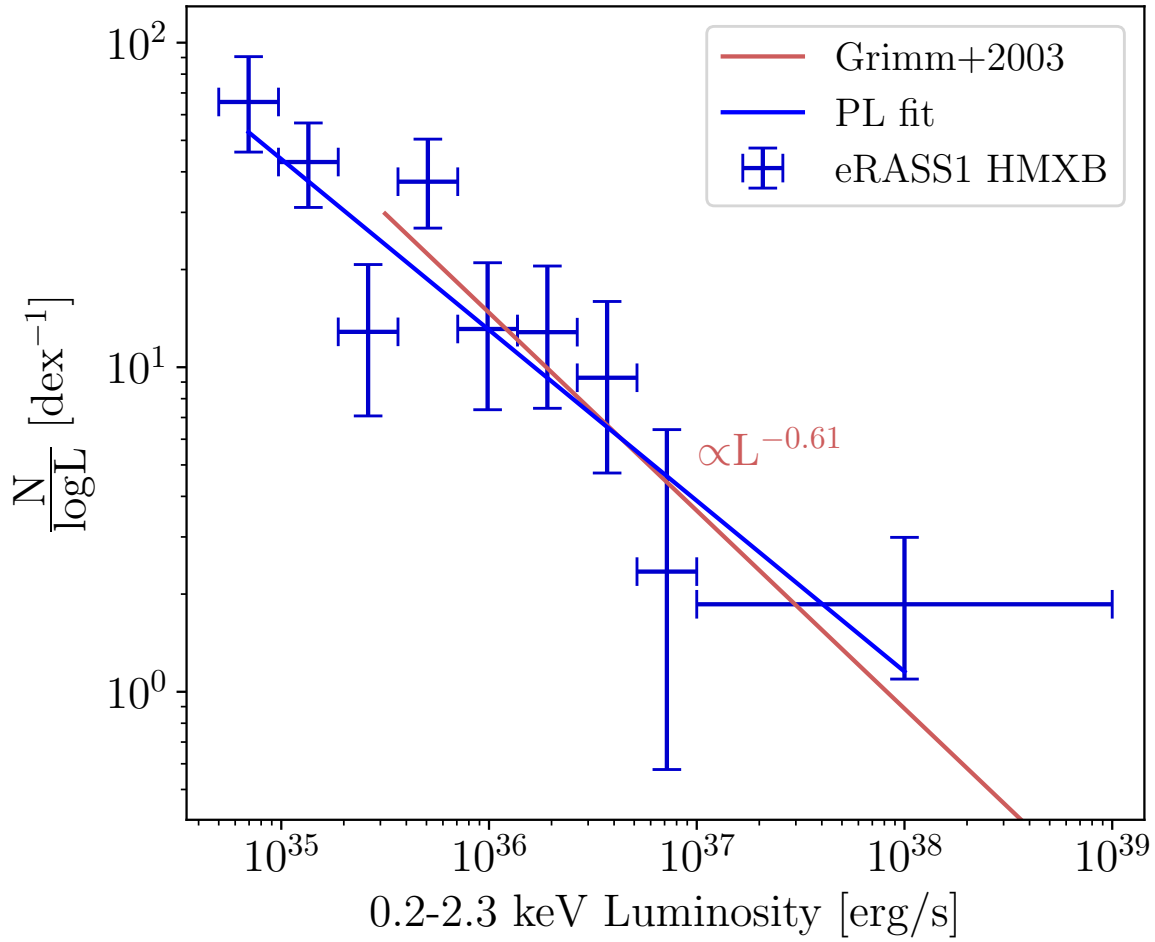
9 uncertain candidates

4 rejected



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

Luminosity Function



Kaltenbrunner+ in prep.; HMXB luminosity function in the LMC

Summary and Outlook

- Take Home Message
  - LMC HMXB catalogue with eRASS1, MCPS and VMC
  - X-ray, optical and IR properties for flags
  - Luminosity function follows prediction from SFR
- Outlook
  - Expand analysis to eRASS:4
  - Compare HMXB positions with SFH
  - Comparison to SMC and MW