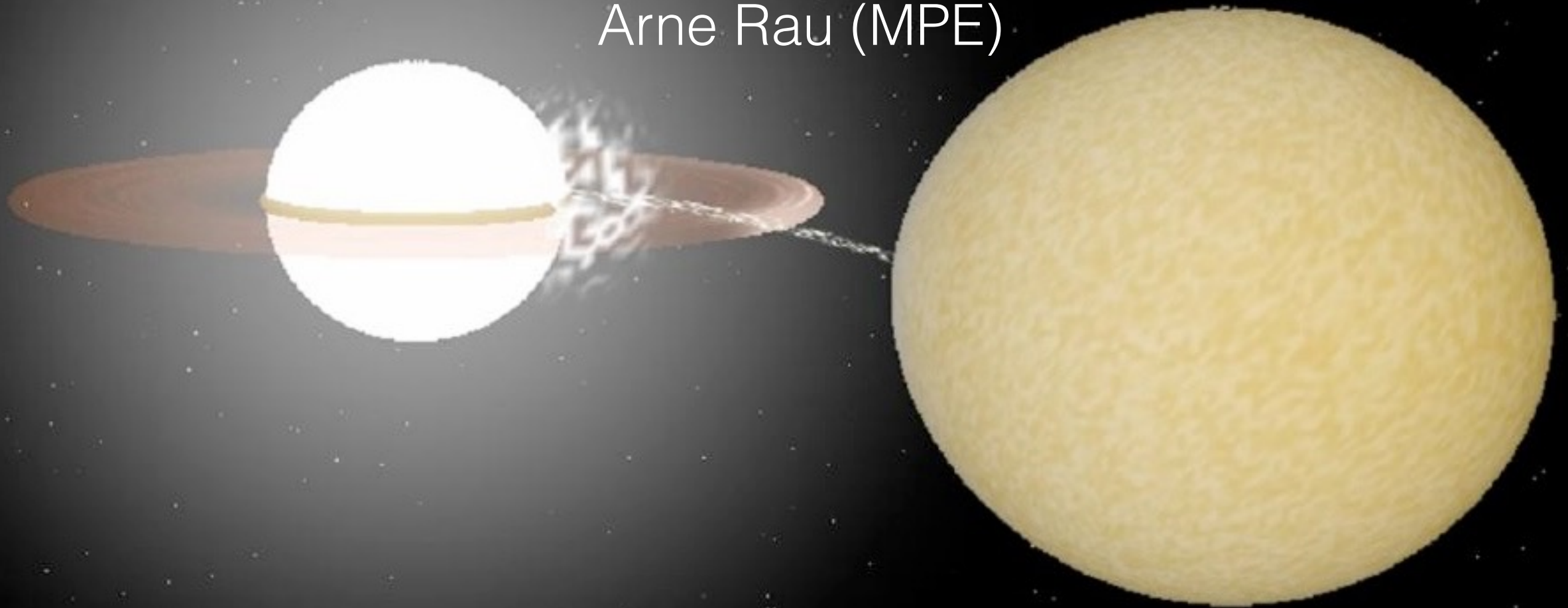# Prospects for detecting the shortest-period AM CVn systems in the eROSITA all-sky survey
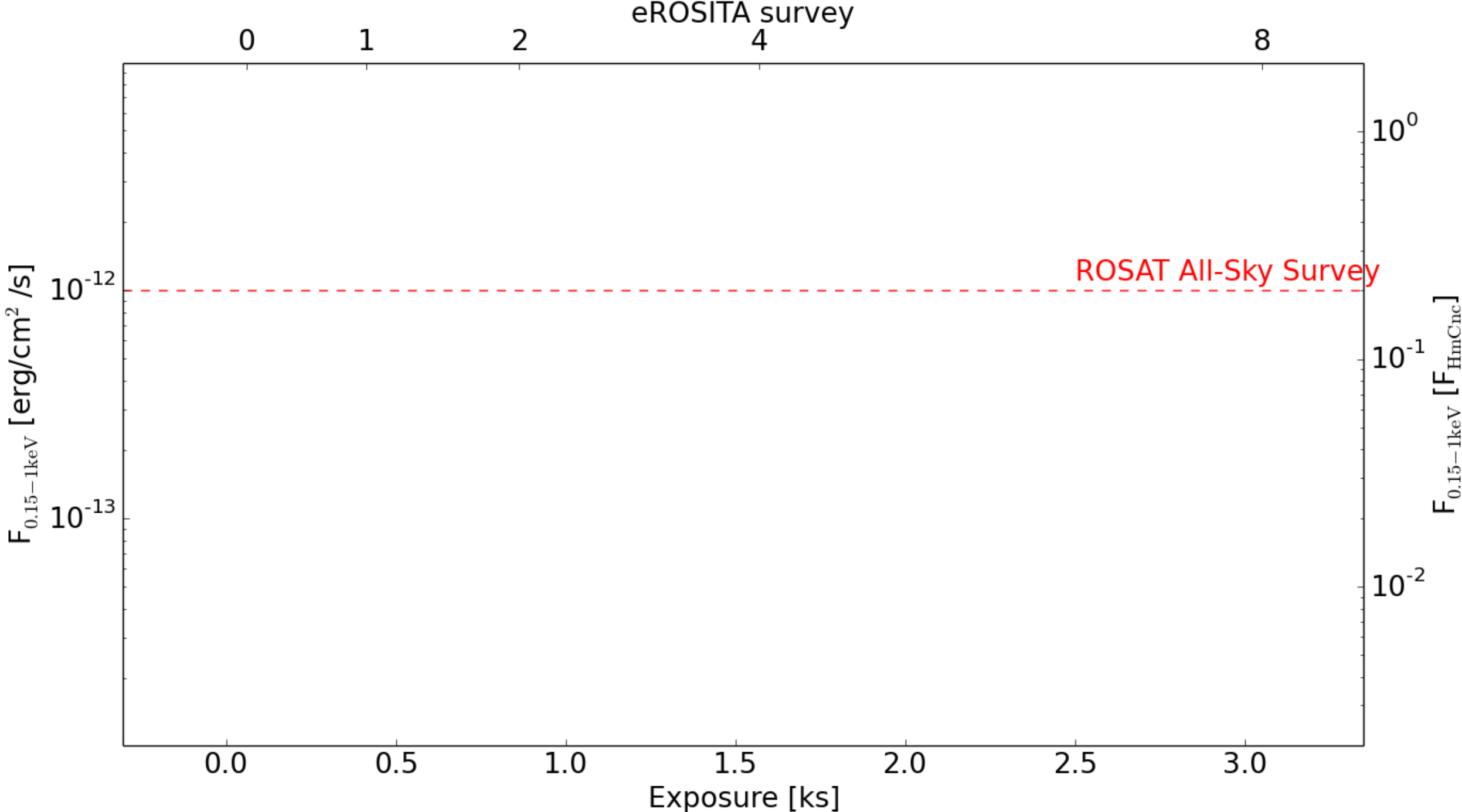
Arne Rau (MPE)

The example of HM Cnc

(with help from Th. Brandt, Th. Dauser, Tom Dwelly, Ch. Grossberger, J. Wilms & H. Brunner)

(eROSITA_DE Consortium Meeting, Tübingen, Sep 25-27 2016)

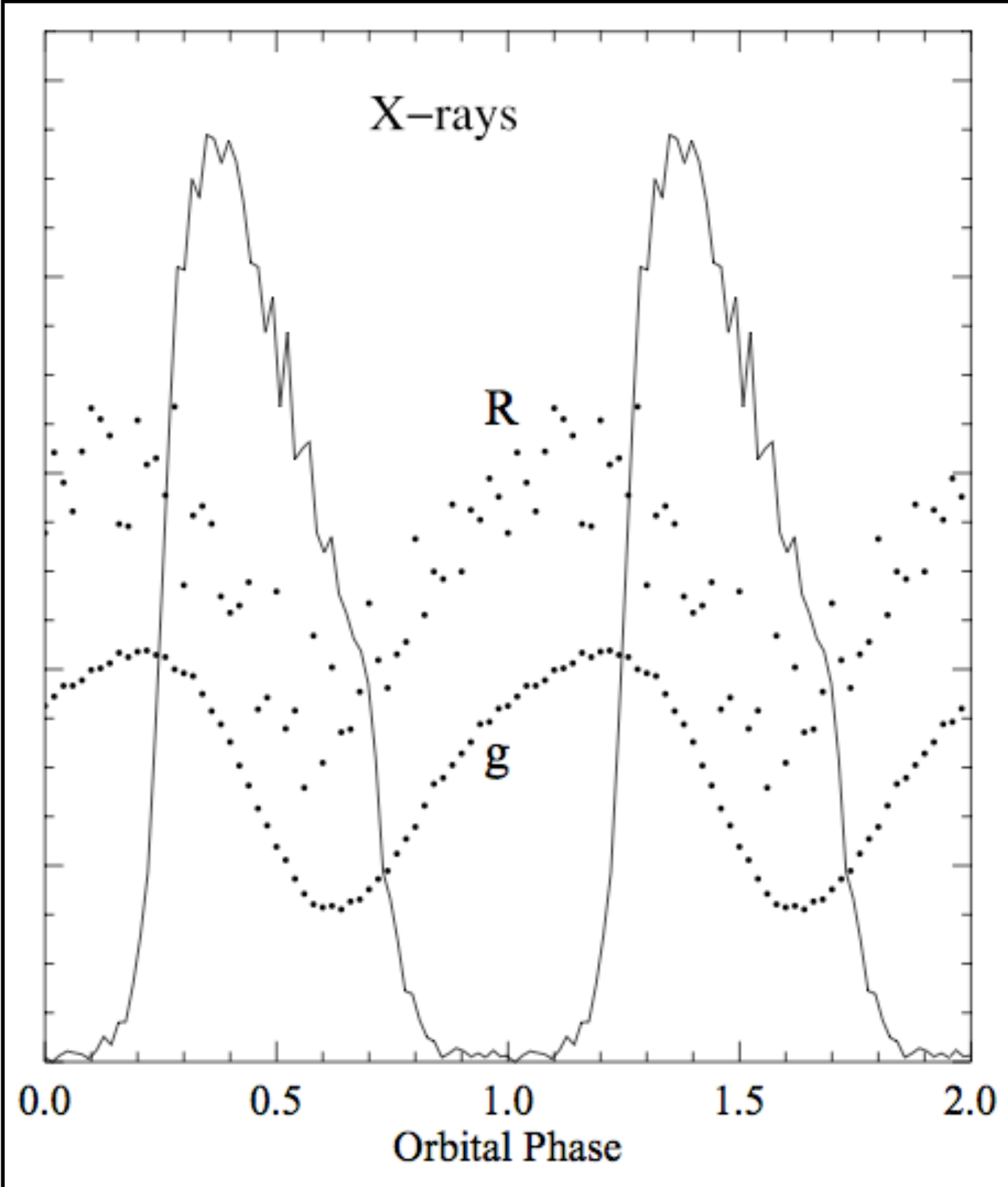# To which flux limit will eROSITA detect (and select) RXJ0806-like sources in eRASS 0,1, 2, 4 & 8?

RXJ0806+1527 - Discovered in ROSAT pointed observations as 100% variable HRI source with shrinking 5.4min period.
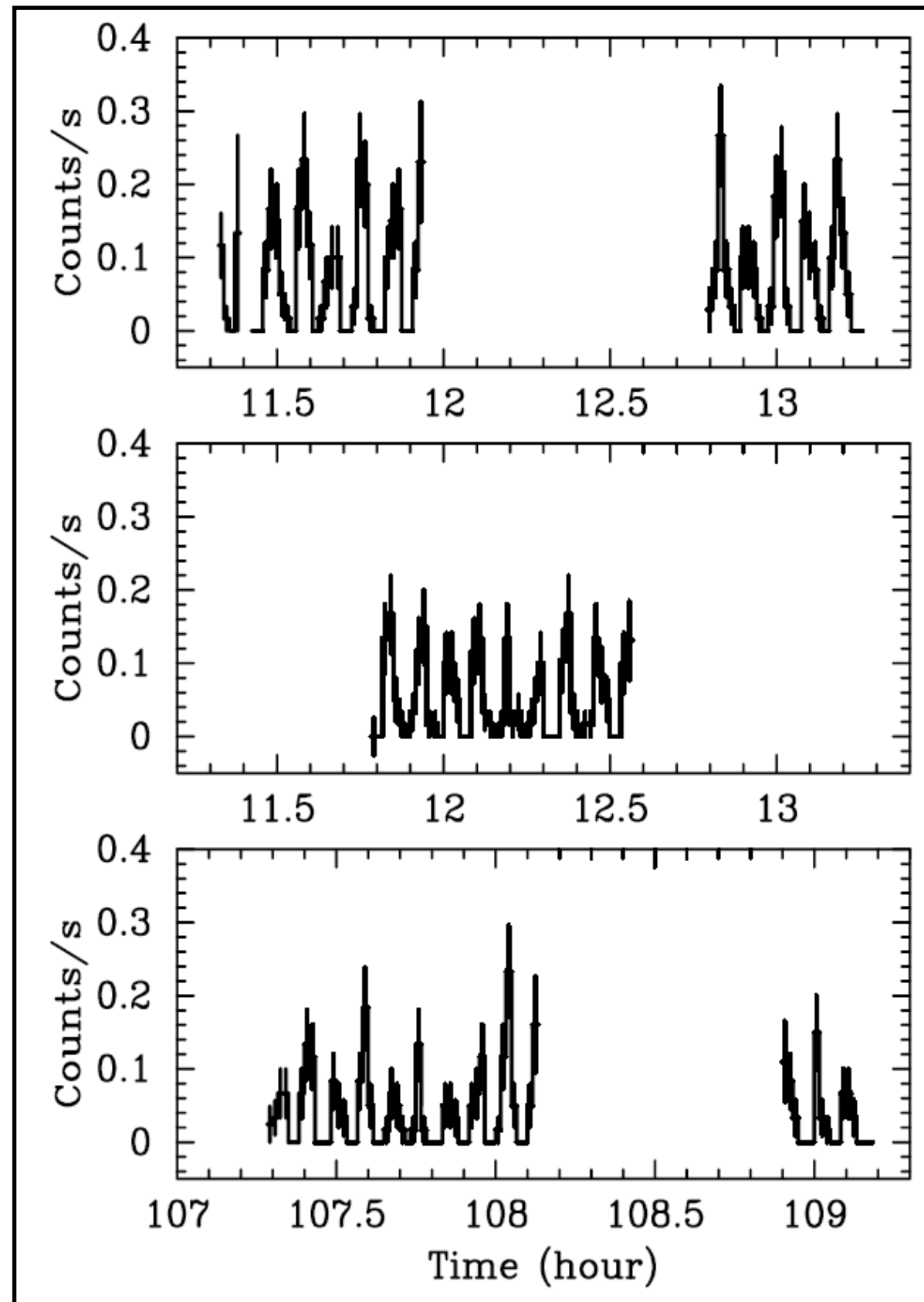
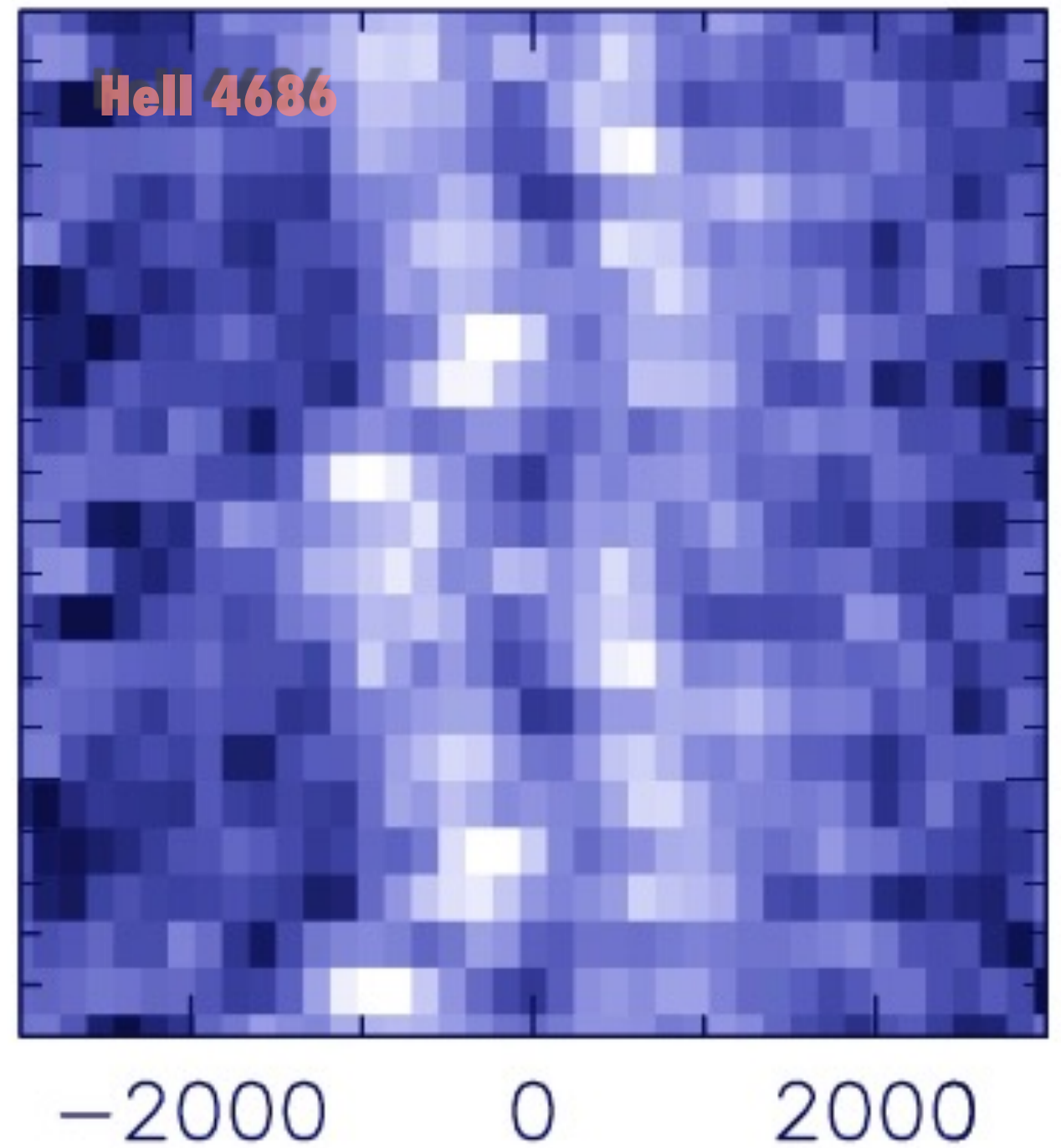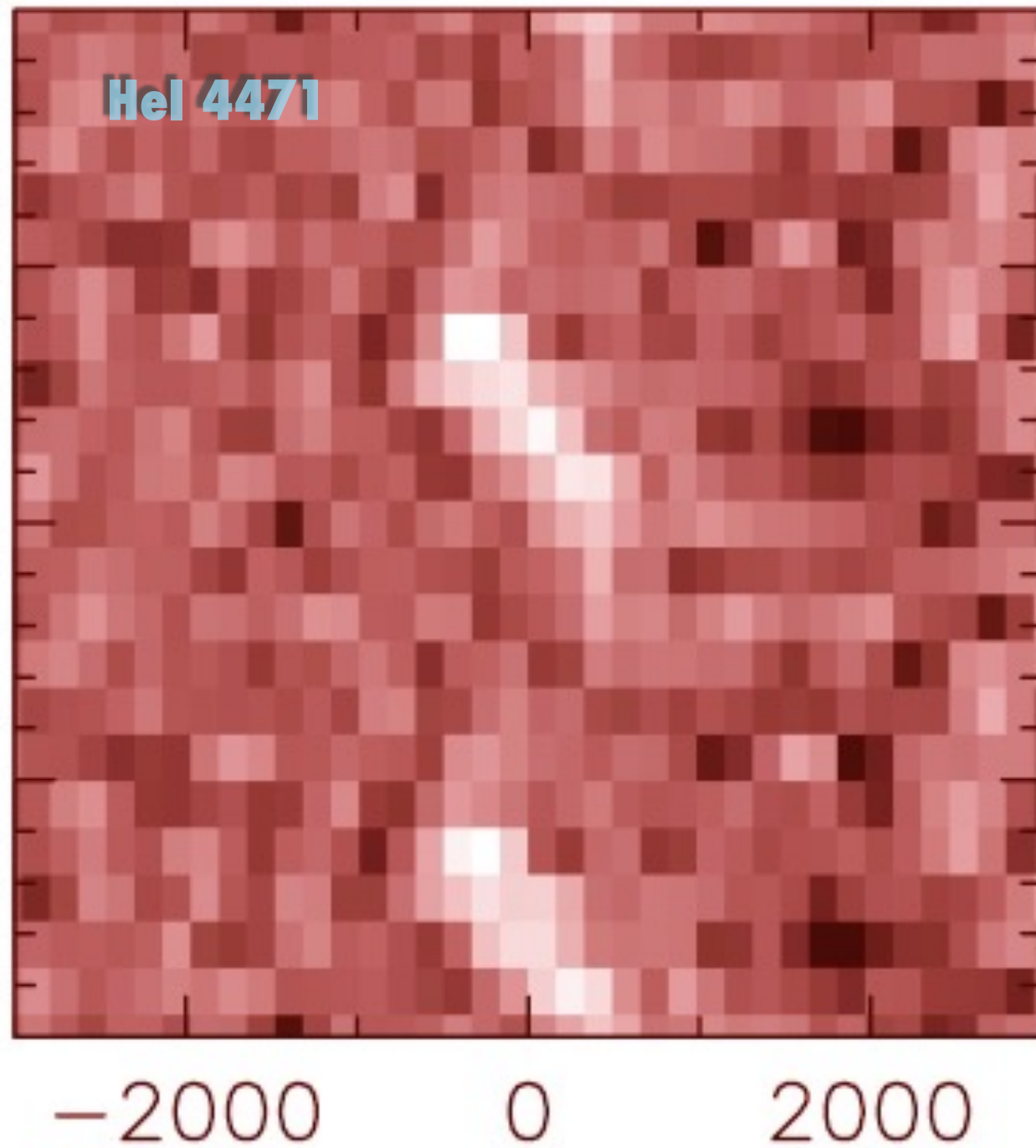# Variability at optical wavelengths on same time scale as X-rays but phase shifted.

m$_g$~21 mag

Orbital period confirmed by Doppler-tomography. HeI and HeII in anti-phase, i.e. from different regions.

HeI 4471

HeII 4686

−2000   0   2000

−2000   0   2000

Line velocity (km s^{-1})

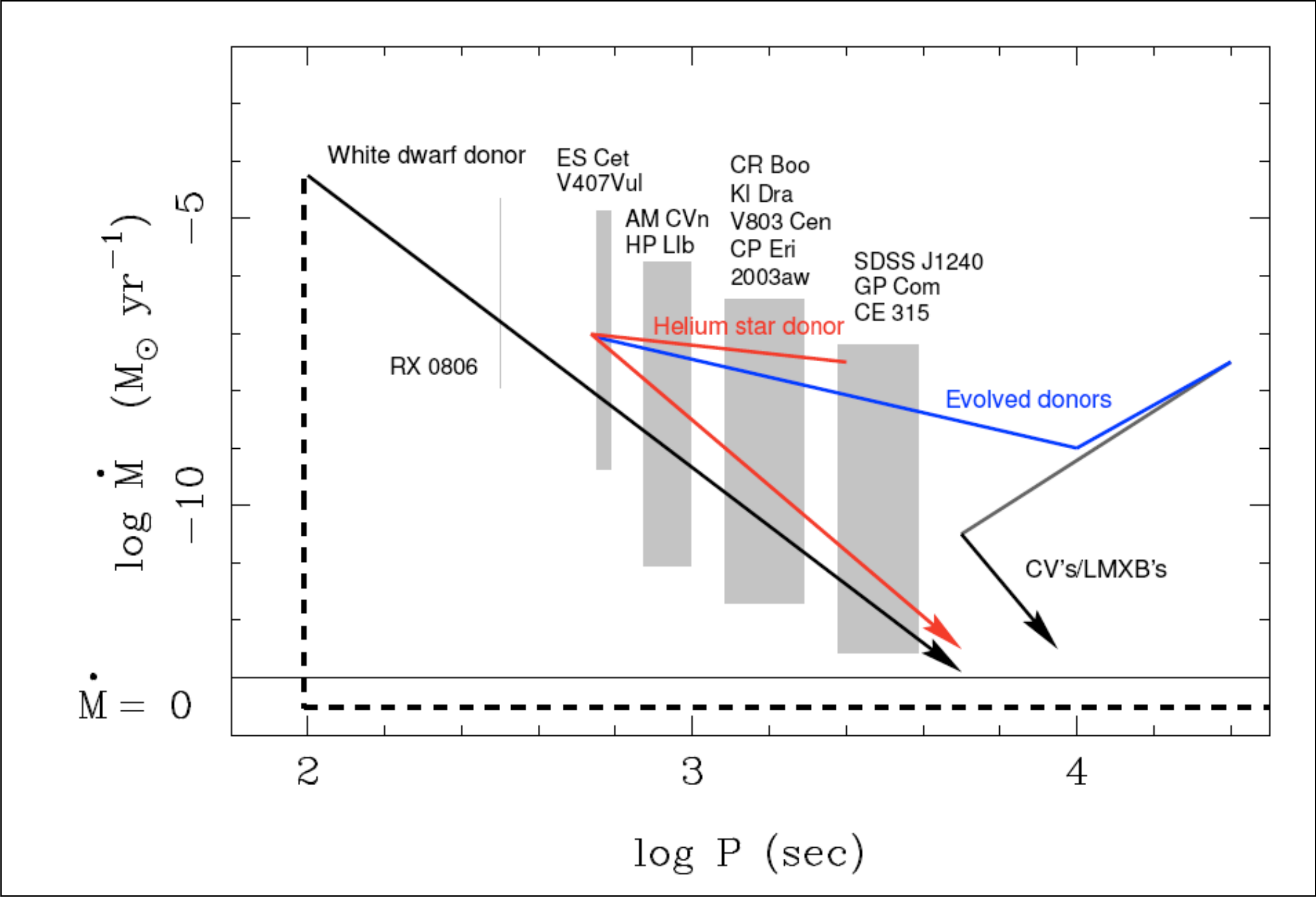(Roelofs, Rau et al. 2010)

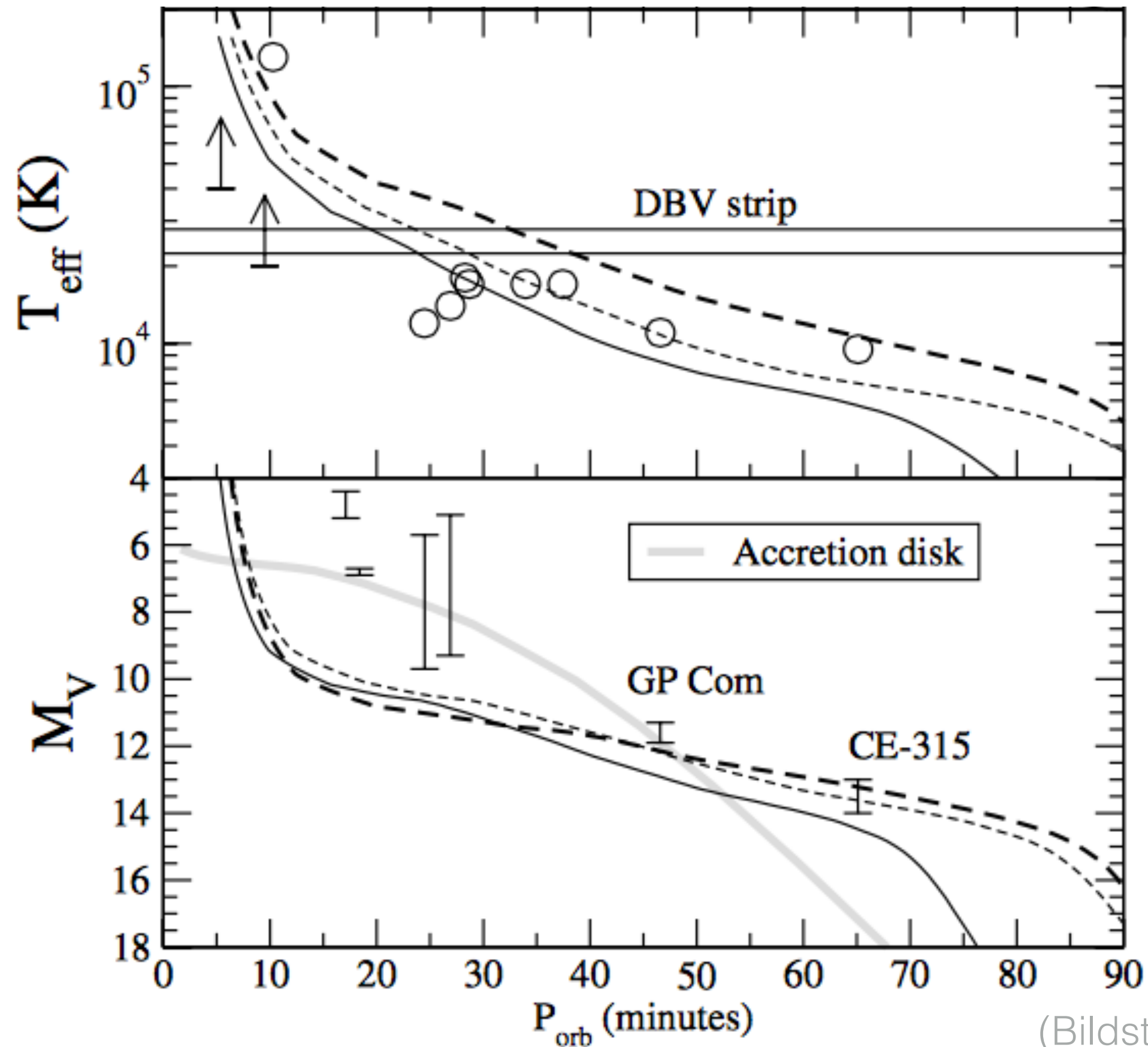# Double White Dwarf system. HeII and X-rays in phase, HeI from irradiated donor star.
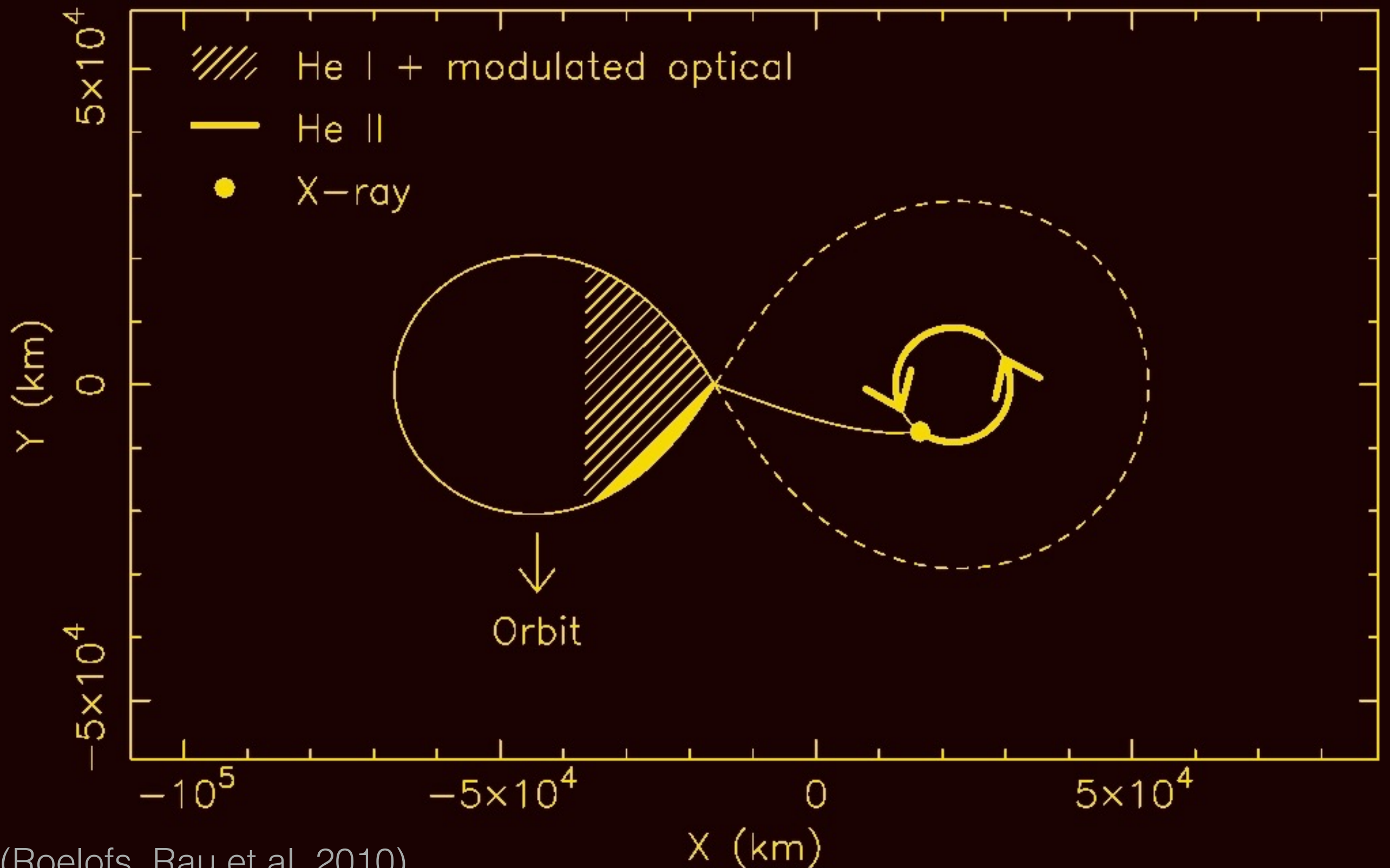
(Roelofs, Rau et al. 2010)

Most AM CVn should evolve to longer orbital periods again.
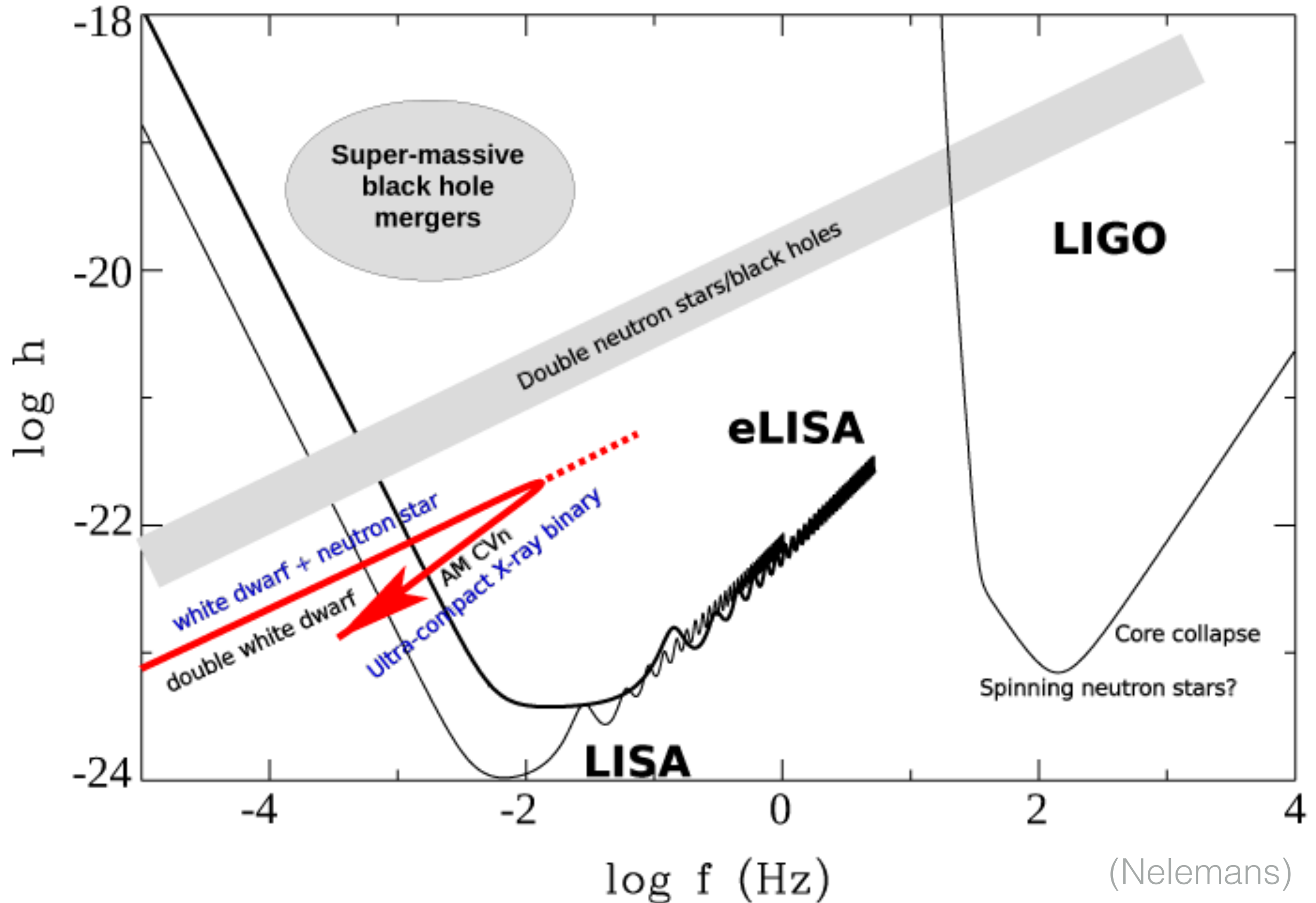

(Nelemans 2005)

The shortest period systems are the hottest and X-ray brightest.
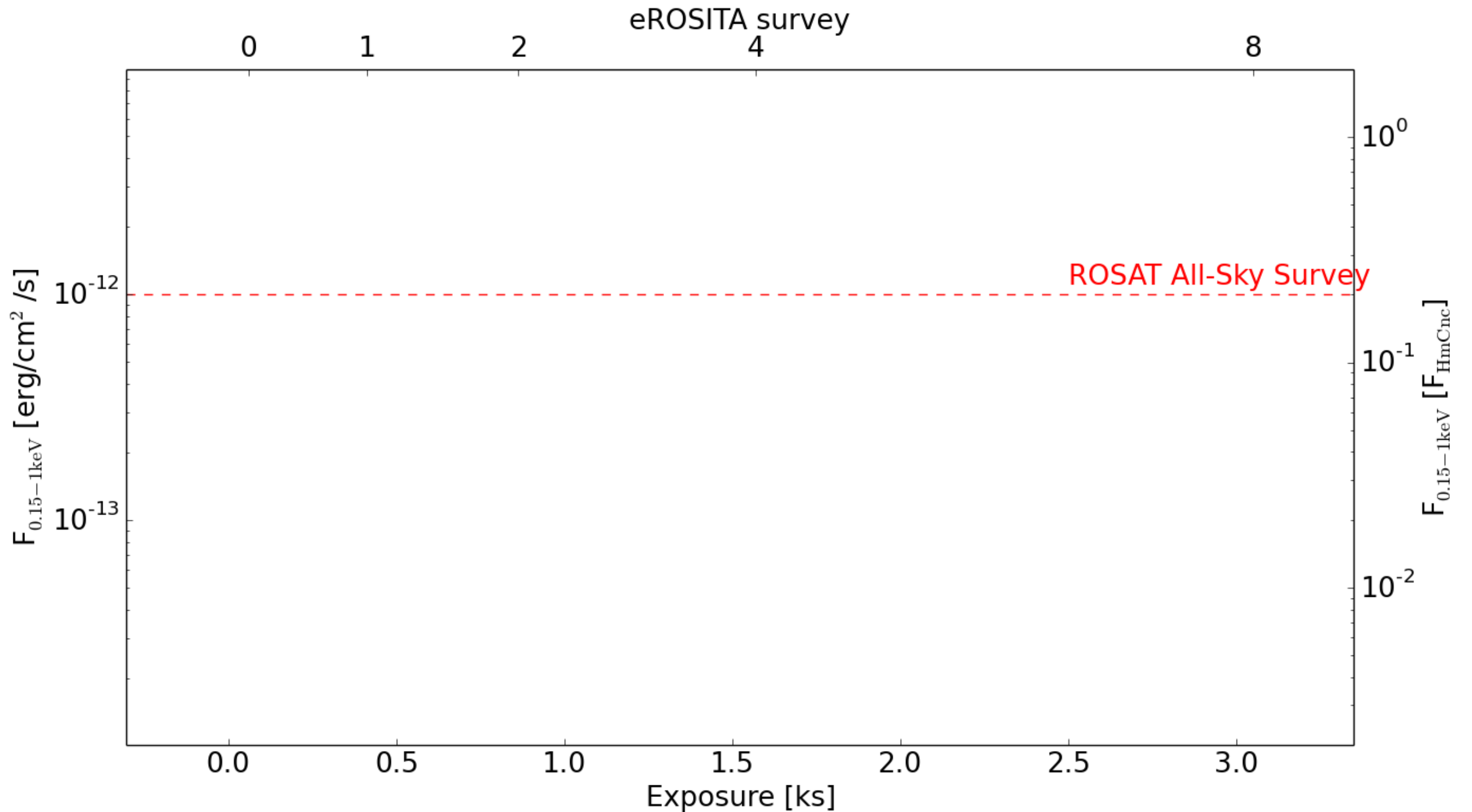

(Bildsten et al 2006)

The shortest period AM CVn stars will be the brightest reference sources for space-based gravity wave experiments.
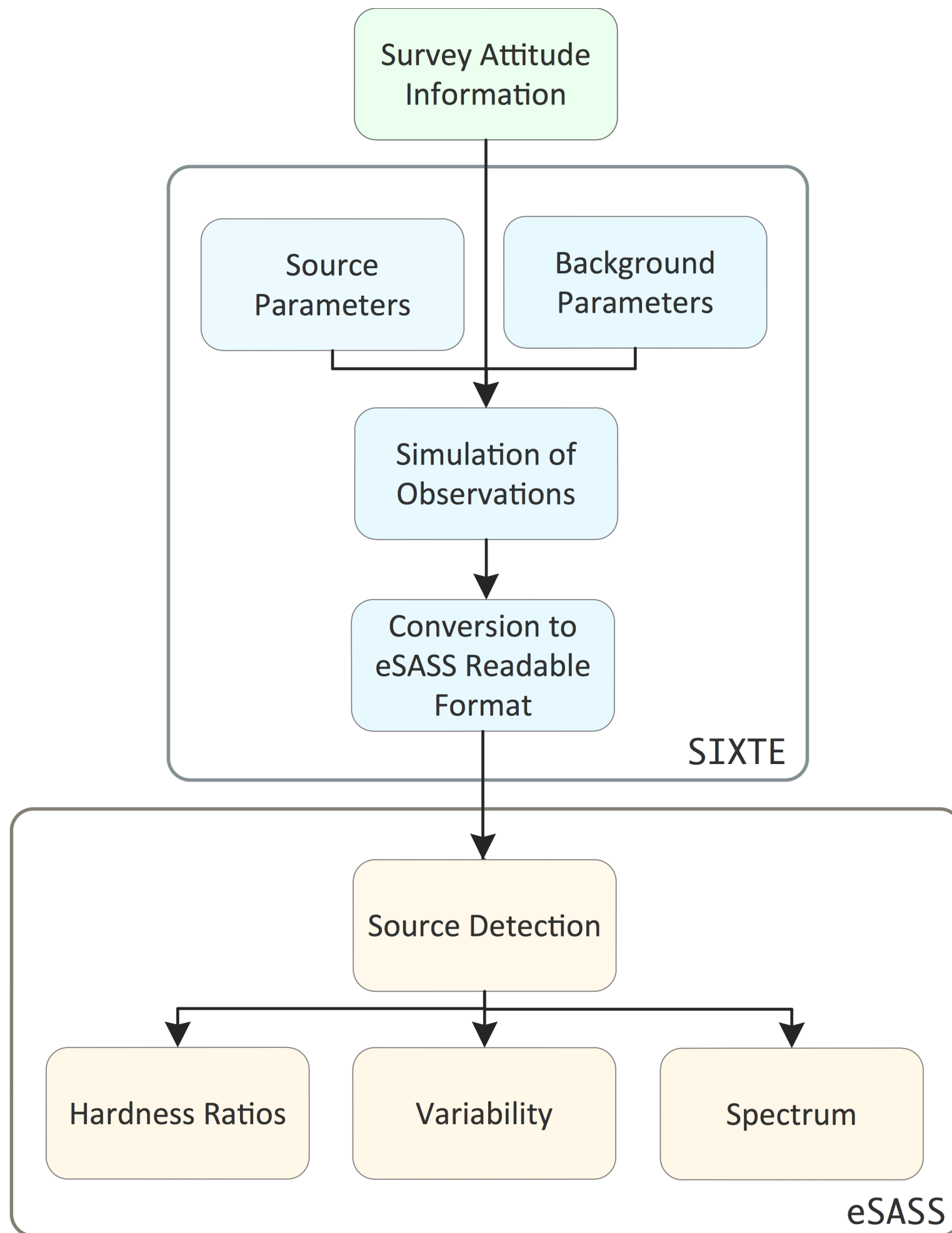

(Nelemans)

To which flux limit will eROSITA detect (and select) RXJ0806-like* sources in eRASS 0,1, 2, 4 & 8?
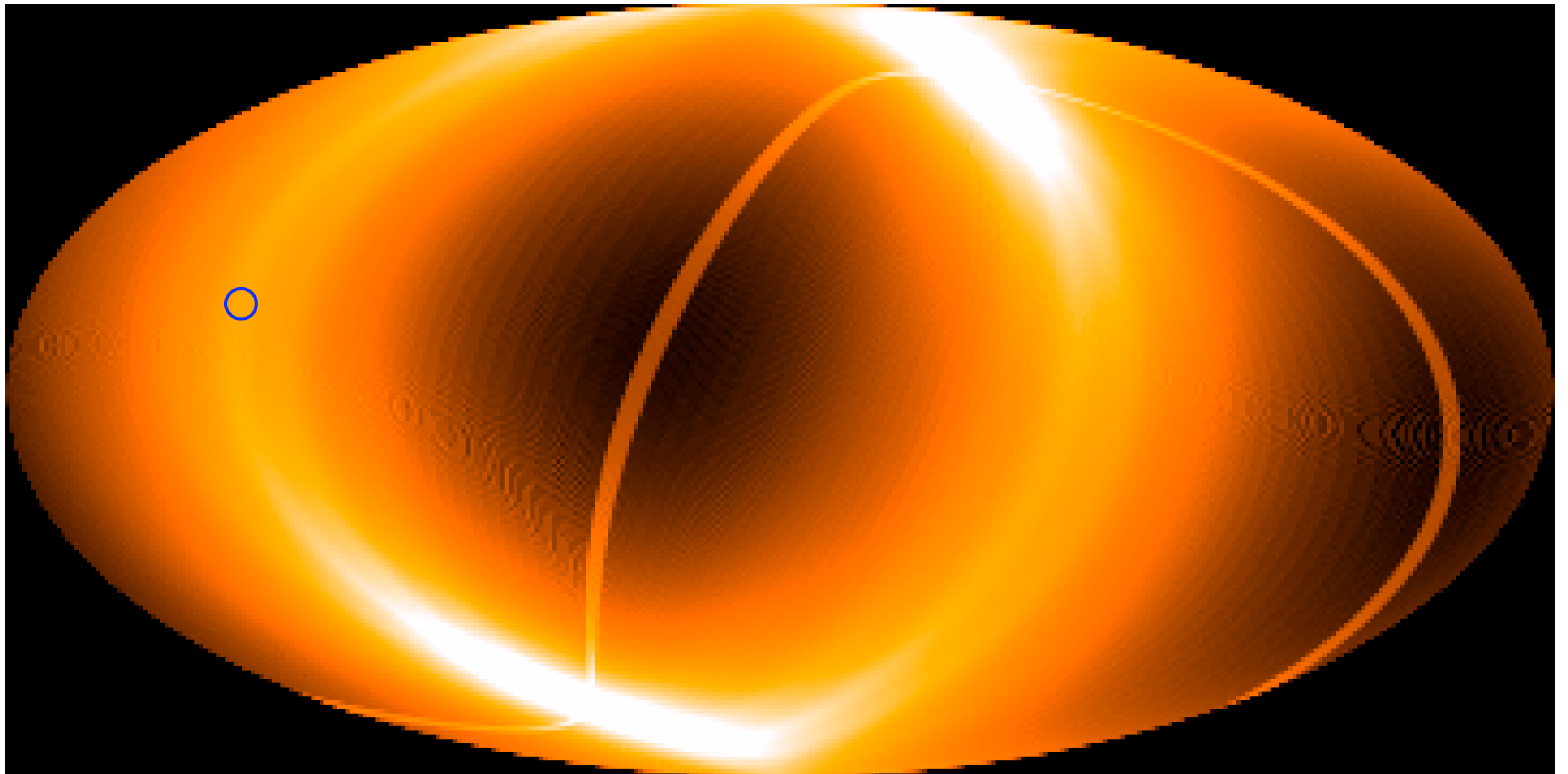

* RXJ0806+1527 & RXJ1914+2456 are in the Russian eROSITA territory

The setup.
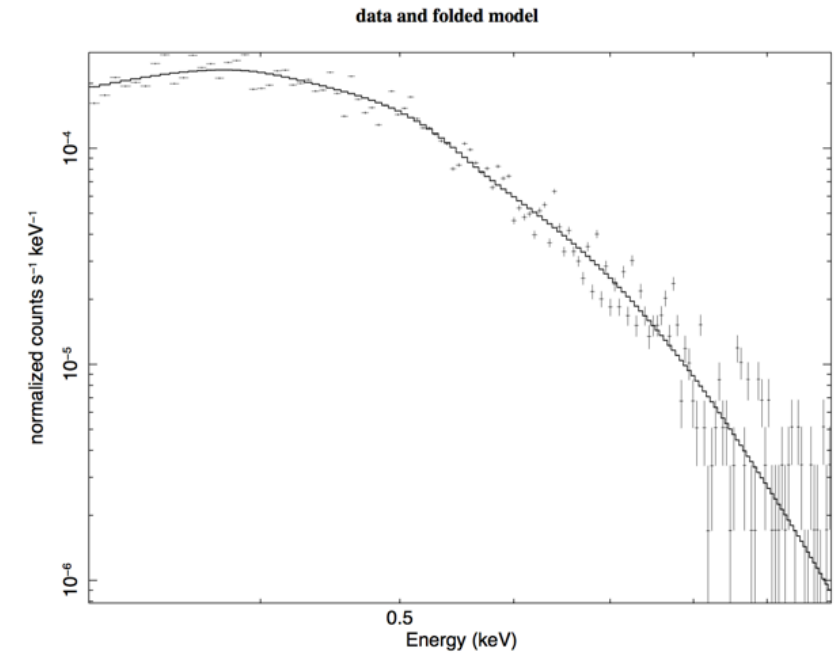
- eRASS_Pc87M55_3dobi_att_remeis.fits

- select time interval of scans over an ~3x3deg area

- ~10 visits per survey, i.e. ~400s per survey, ~3000s overall

Source Parameters

- Point sources
- Spectral model:

  model tbabs*bb
  $N_H = 0.05 \times 10^{22}$ cm^{-2}
  kT=0.065 keV

data and folded model

- various fluxes, i.e. normalisations
- ROSAT HRI light curve
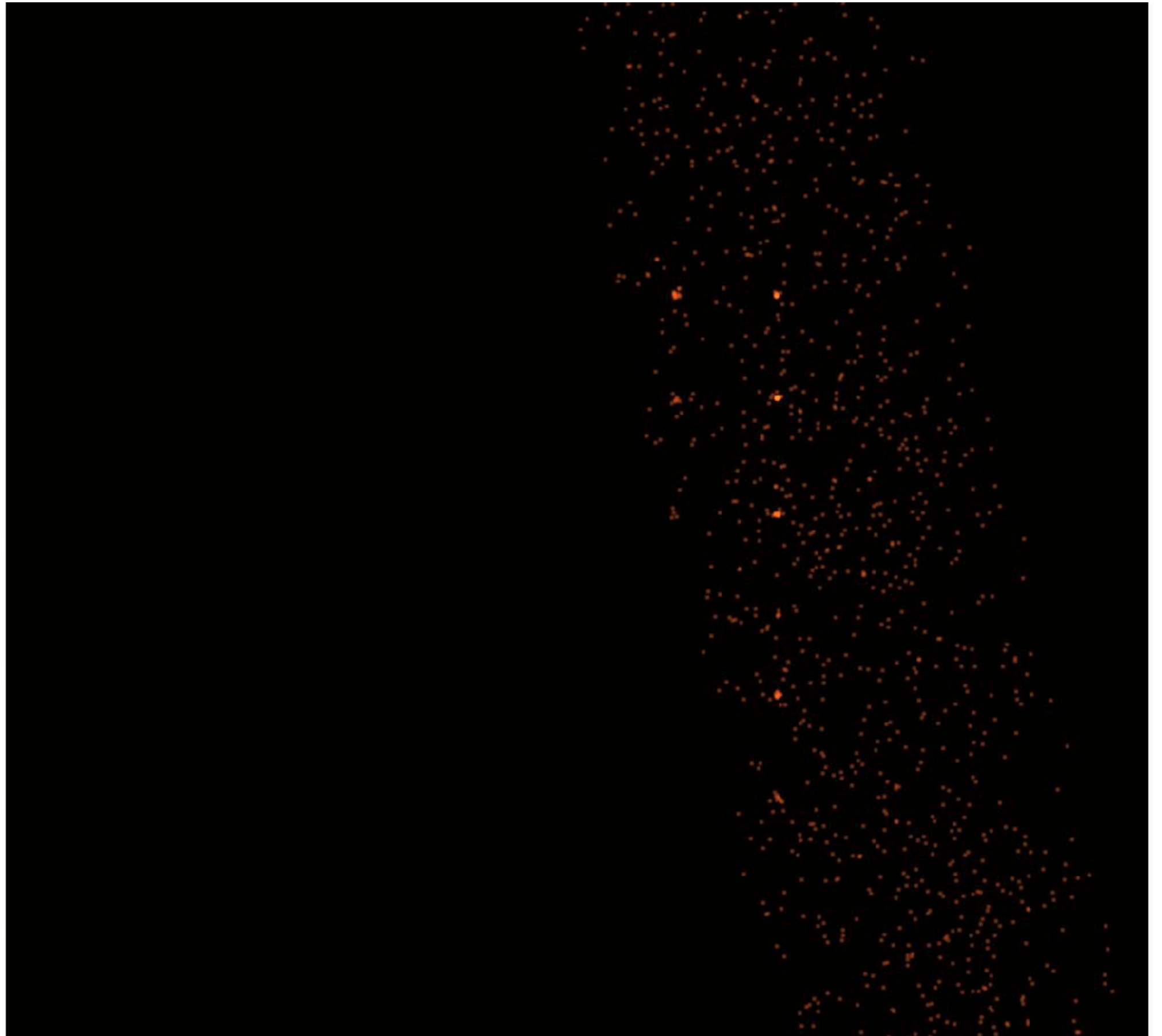
Background Parameters

- Spectral model:

  model apec+(apec*powerlaw)wabs

- Parameters from ROSAT PSPC all-sky online background tool at RXJ0806 position
- Unresolved background only
- No instrumental background

- with SIXTE/erosim

Conversion to eSASS Readable Format

- SIXTE/ero_calevents

Source Detection

- eSASSdevel used

Sequence of Commands
- evtool (filter events)
- expmap (exposure map)
- ermask ()
- erbox (box detection)
- erbackmap ()
- erbox ()
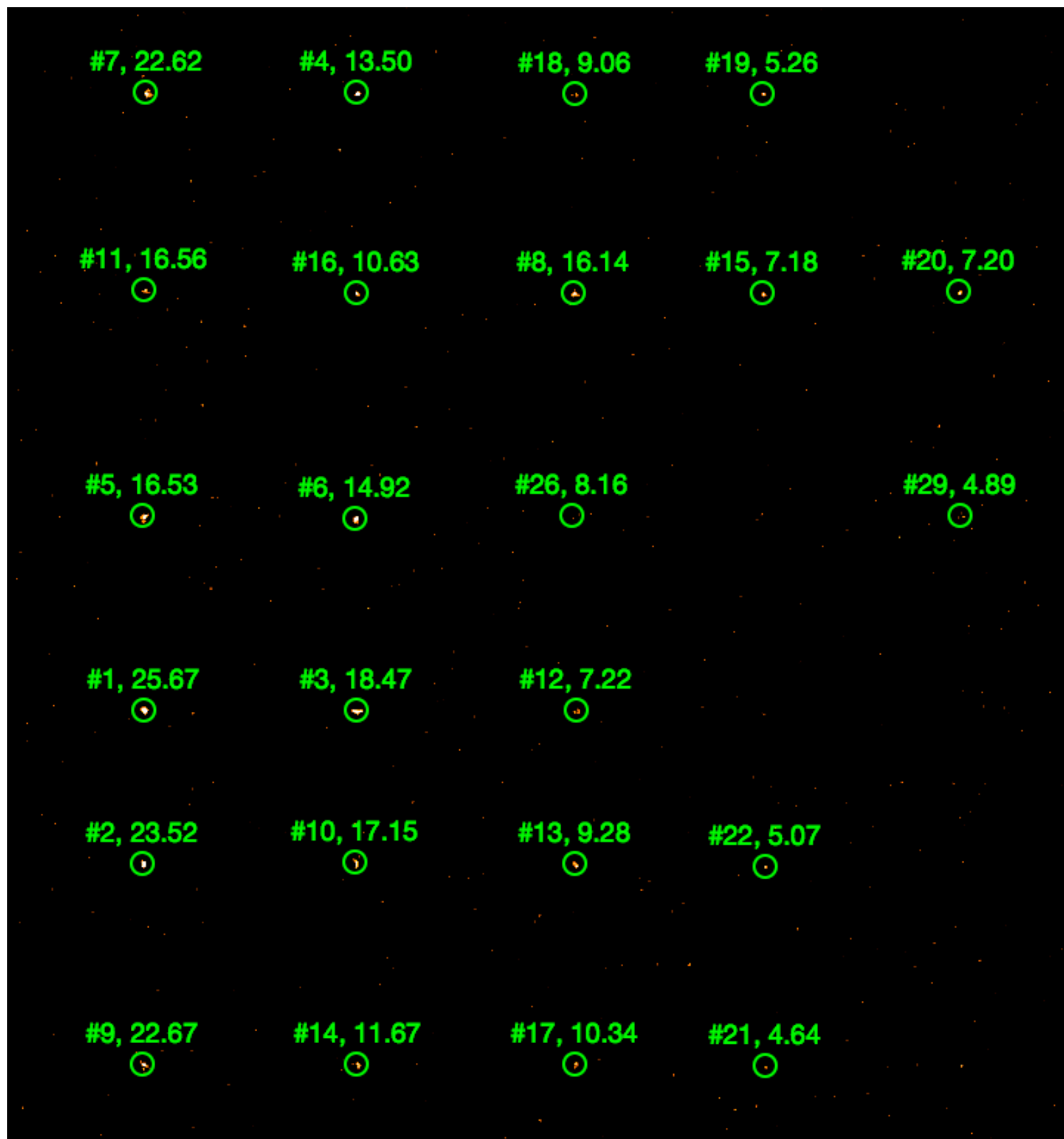- ermldet (Maximum Likelihood based source detection)

#7, 22.62   #4, 13.50   #18, 9.06   #19, 5.26

#11, 16.56   #16, 10.63   #8, 16.14   #15, 7.18   #20, 7.20

#5, 16.53   #6, 14.92   #26, 8.16   #29, 4.89

#1, 25.67   #3, 18.47   #12, 7.22

#2, 23.52   #10, 17.15   #13, 9.28   #22, 5.07

#9, 22.67   #14, 11.67   #17, 10.34   #21, 4.64
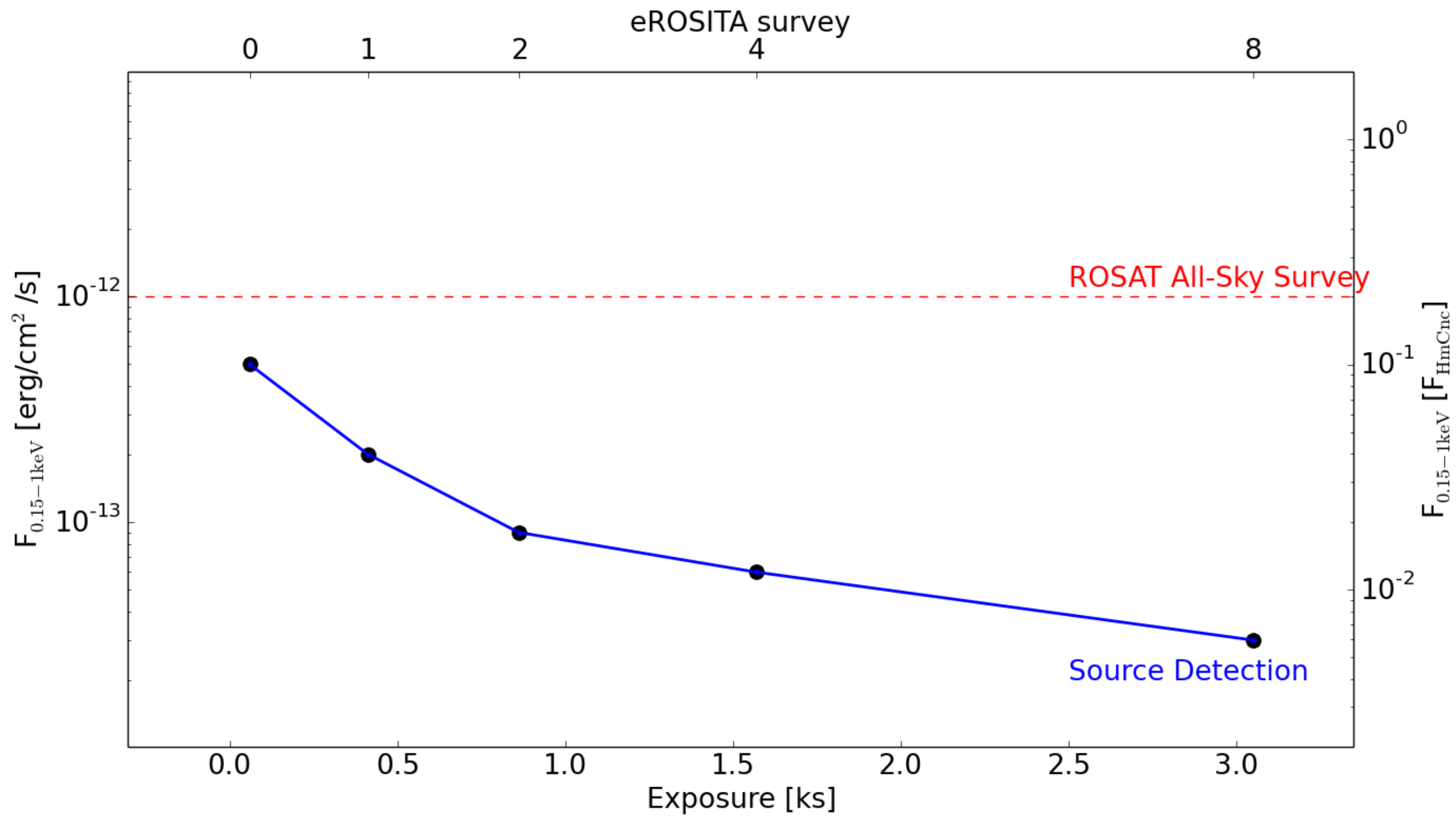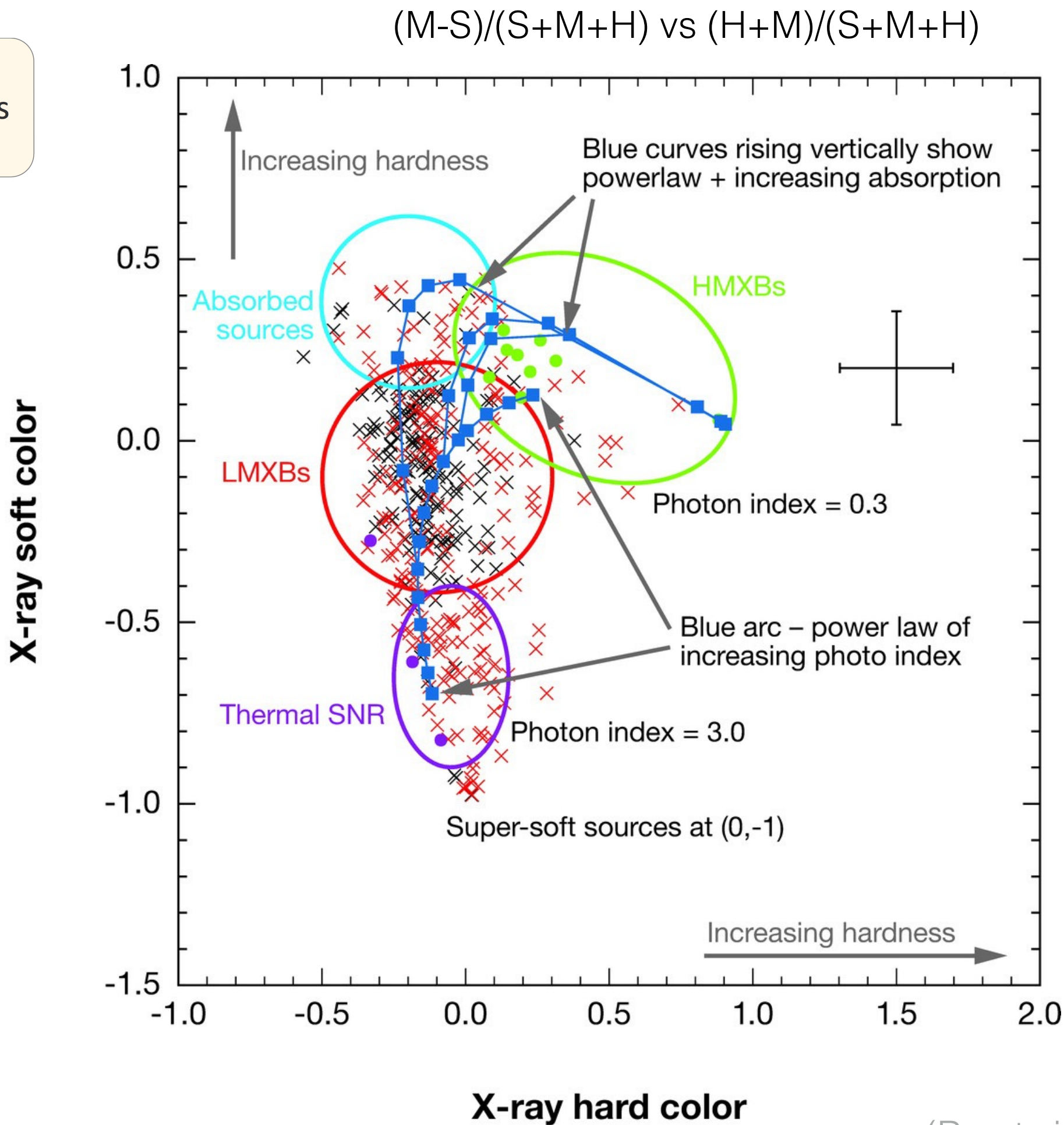
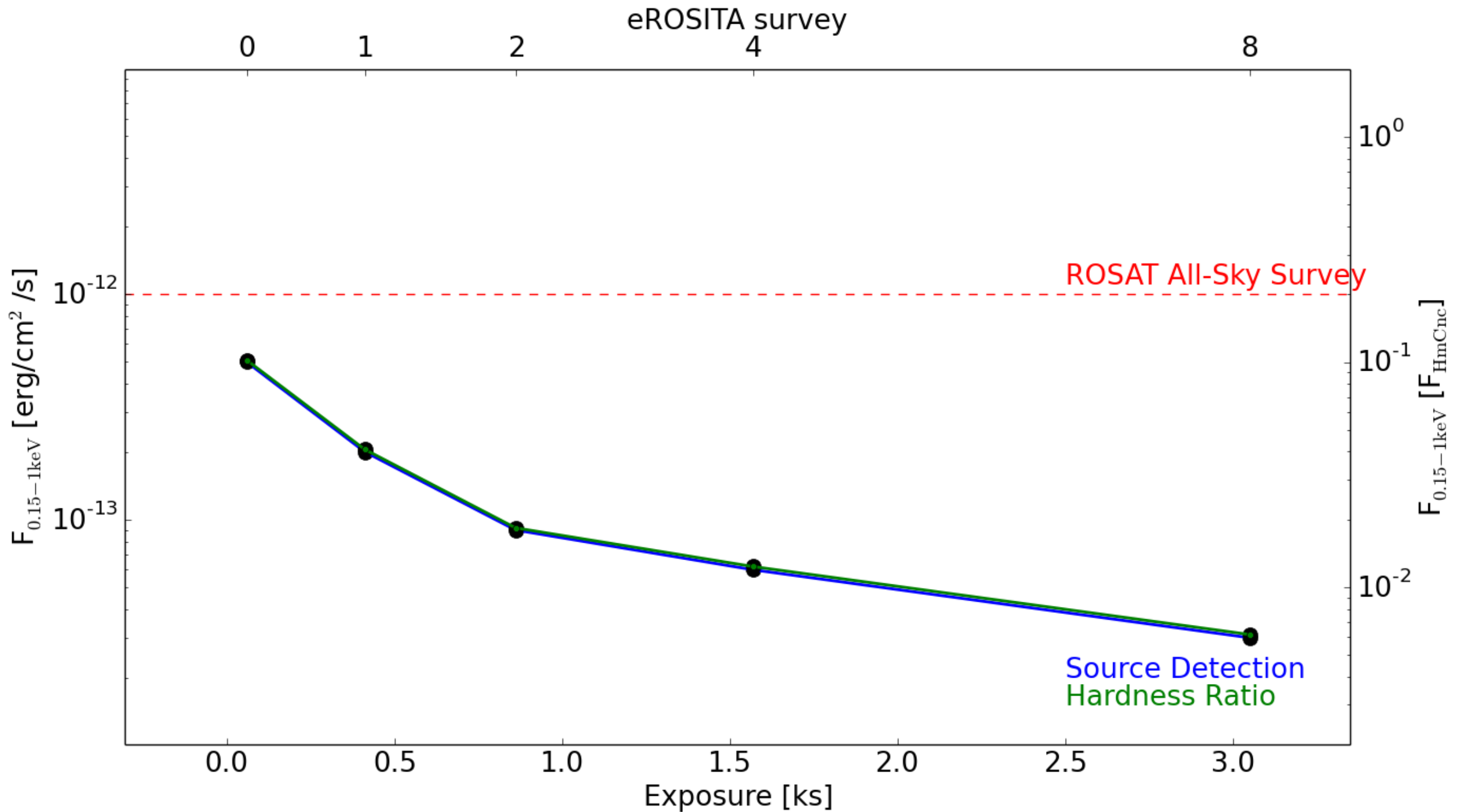# To which flux limit will eROSITA detect (and select) RXJ0806-like* sources in eRASS 0,1, 2, 4 & 8?

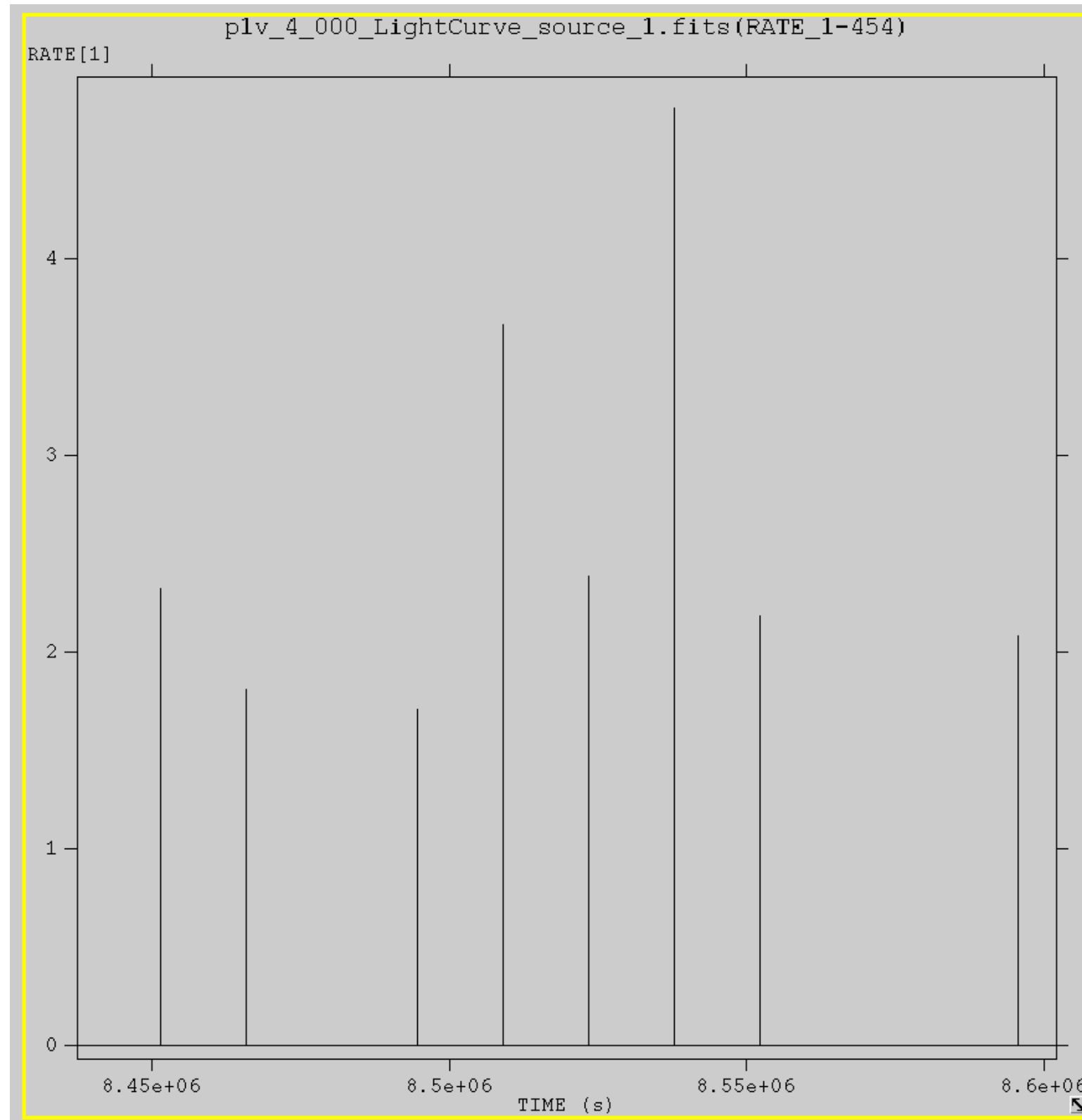Hardness Ratios

(M-S)/(S+M+H) vs (H+M)/(S+M+H)

(Prestwich et al. 2003)

To which flux limit will eROSITA detect (and select) RXJ0806-like* sources in eRASS 0,1, 2, 4 & 8?

- *srctool* used to extract exposure corrected light curves
- chi-square test of being constant

To which flux limit will eROSITA detect (and select) RXJ0806-like* sources in eRASS 0,1, 2, 4 & 8?