

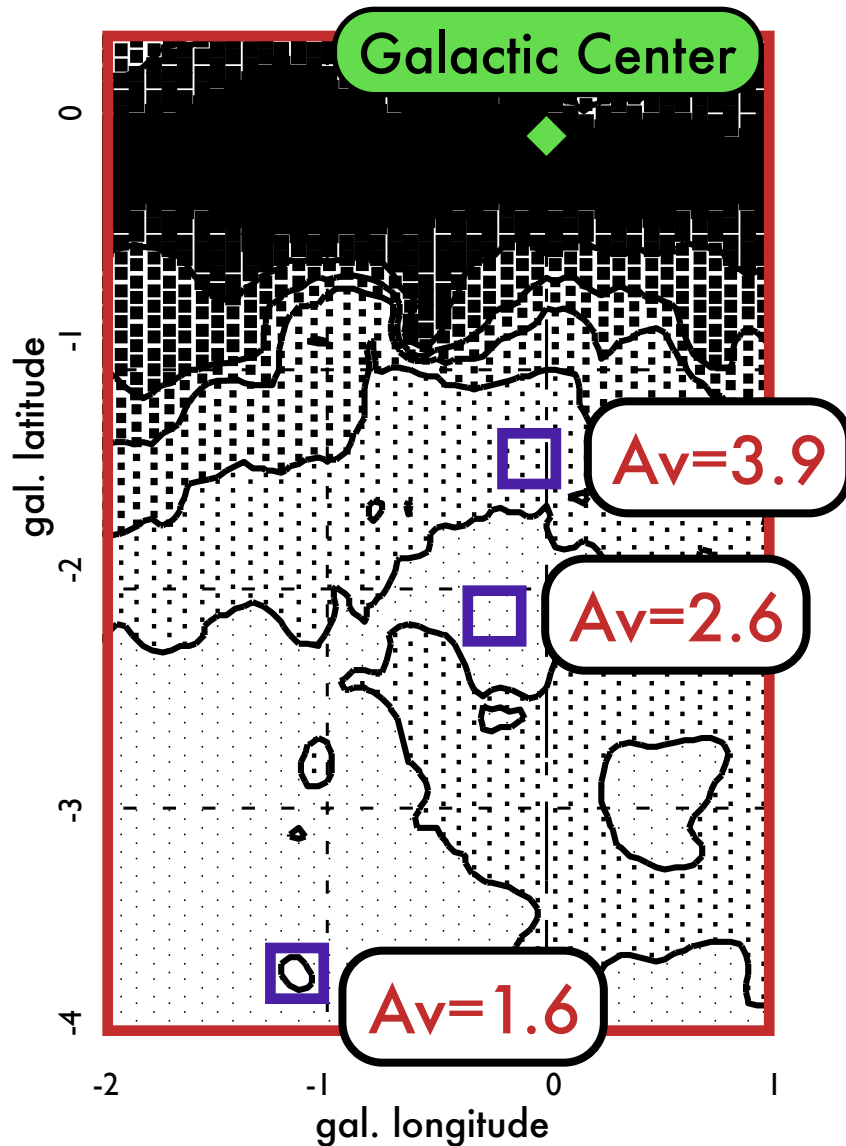
# ChaMPlane discovery of candidate symbiotic binaries in the Bulge

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new candidate symbiotic binaries (giant + wind-accreting companion)

very hard sources with non-typical “symbiotic” optical spectra  
⇒ different class?

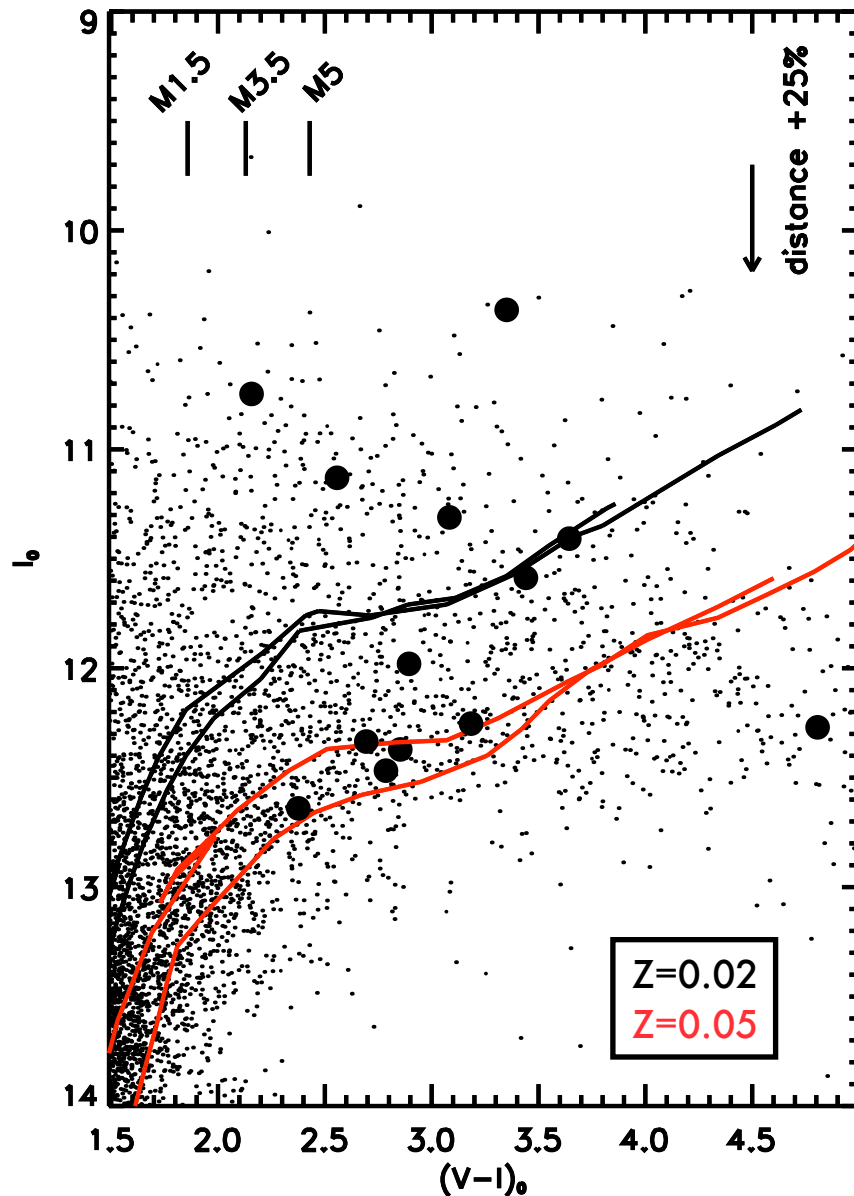
# ChaMPlane Bulge Windows Survey



- ❖ GOALS :  
Bulge sources  
compare with other old populations
- ❖ DATA :  
3x100 ks Chandra/ACIS-I  
HST/ACS

*reddening map (Stanek 1998)*

# Optical ids with OGLE-II: M-giants

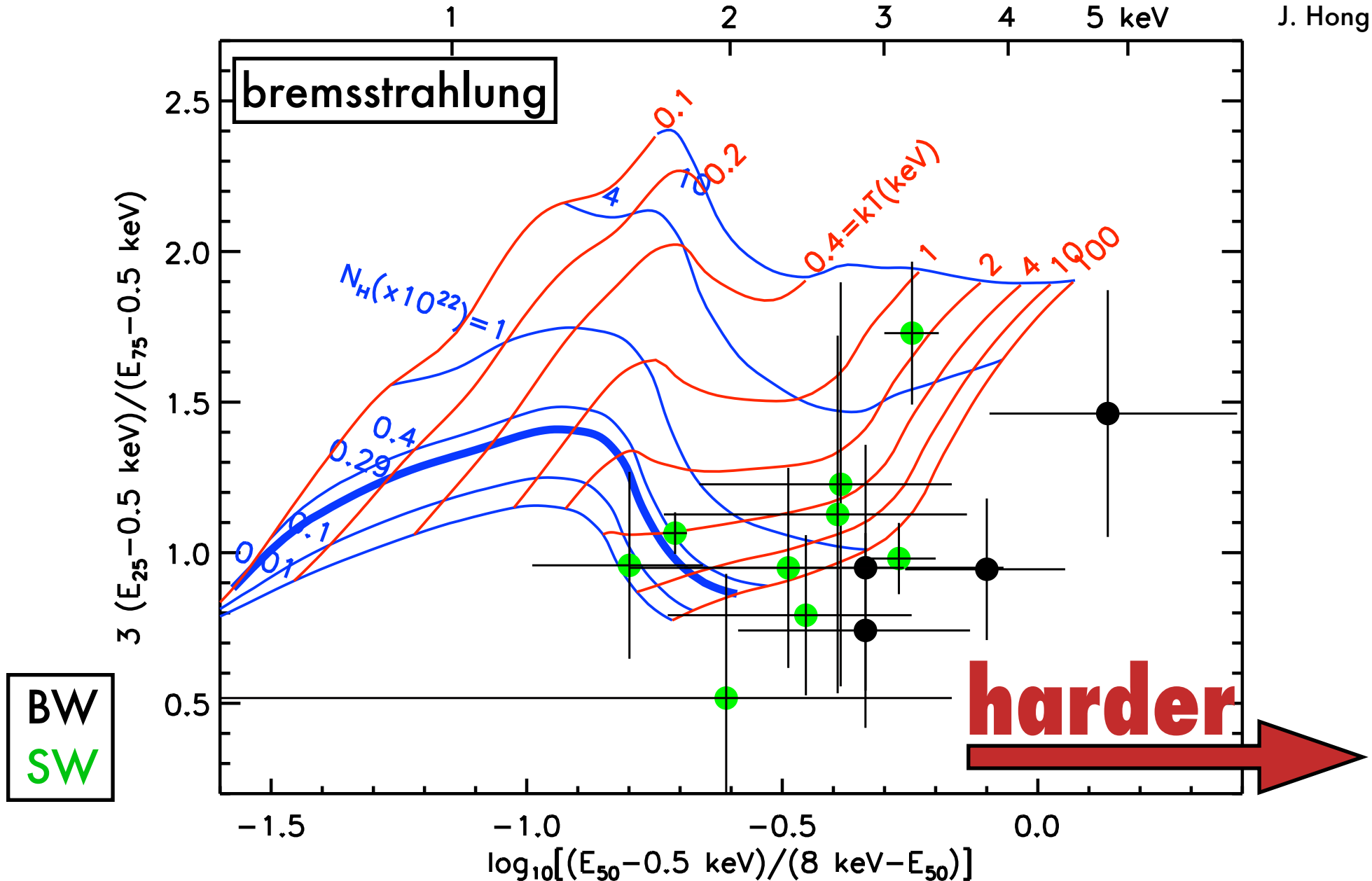


## Optical/nIR properties:

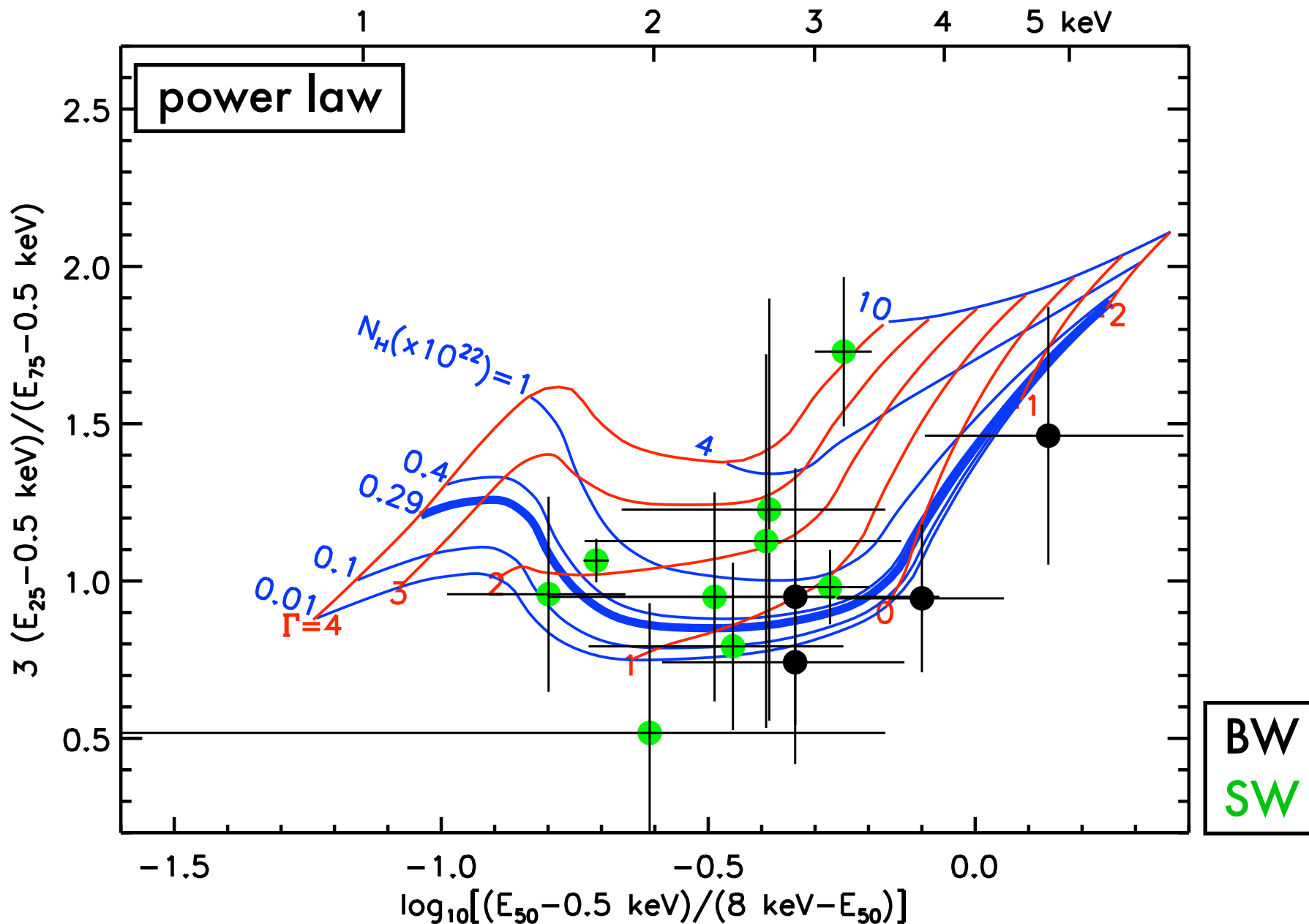
- ❖ (semi-)regular photometric variability
- ❖ mass loss  $\sim 10^{-8} - 10^{-7} M_{\text{sun}}/\text{yr}$
- ❖ high outflow velocities (180 - 200 km/s)
- ❖ low-res spectra: like normal M-star,

# X-ray properties: quantile analysis

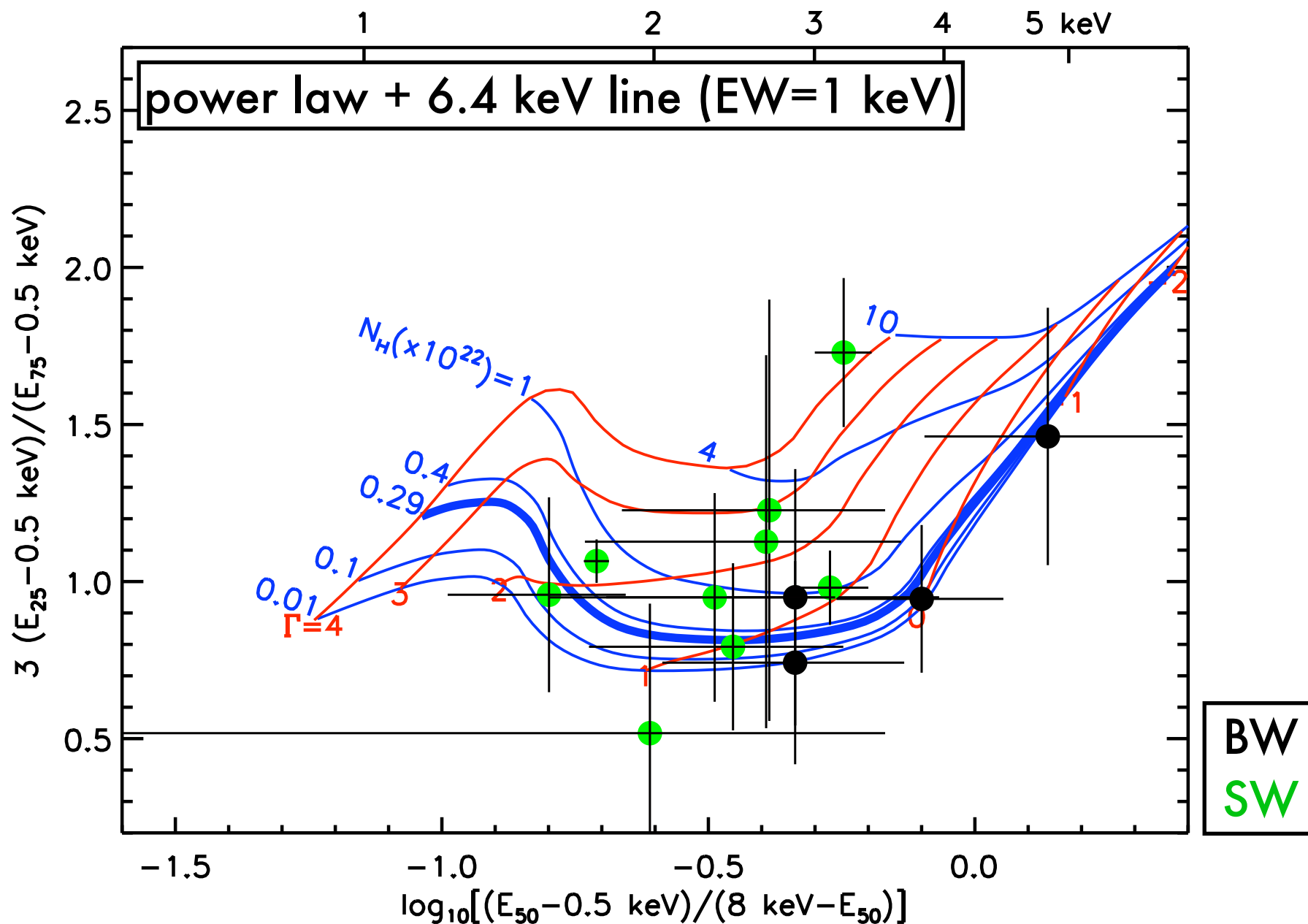
poster 181.04  
J. Hong et al.



# X-ray properties: quantile analysis



# X-ray properties: quantile analysis



# X-ray properties

- ❖ hard spectra:
  - 1.5 - 5.5 keV thermal bremsstrahlung, or
  - power law index between 1 and -1
  - Fe K lines ?
- ❖  $L(0.5-8 \text{ keV}) \approx (2-90) \times (\text{distance}/8.2\text{kpc})^2 10^{31} \text{ erg/s}$
- ❖ source  $N_{\text{H}} \geq \text{field } N_{\text{H}}$

# Source classification

- ❖ single ? M-giants rarely detected in X-rays
- ❖ detached active binaries ? no RS CVn with M-giant
- ❖ wind-accreting symbiotic binaries ?
  - typical X-rays: very soft → a few keV
  - $L_x \sim 10^{29} - 10^{34}$  erg/s (white dwarf),  $\sim 10^{37}$  erg/s (neutron star GX1+4)
  - wind: intrinsic absorption, Fe K lines (e.g. CH Cyg)



# Comparison with symbiotics

- ✓ Lx range, ~few keV spectra
- ✓ intrinsic  $N_{\text{H}}$ , fast wind

BUT typically:

- not very hard in X-rays
- strong optical nebular emission-line spectra

⇒ different class ?

similar properties for RT Cru (INTEGRAL)

poster 32.07/J. Sokoloski et al.

# Summary

- ❖ new candidate symbiotics
- ❖ hard x-rays, optical spectrum: not “typical”
- ❖ think about:
  - what produces hard X-rays ?
  - implications for binary population & evolution