Long term X-ray variability of Quasars

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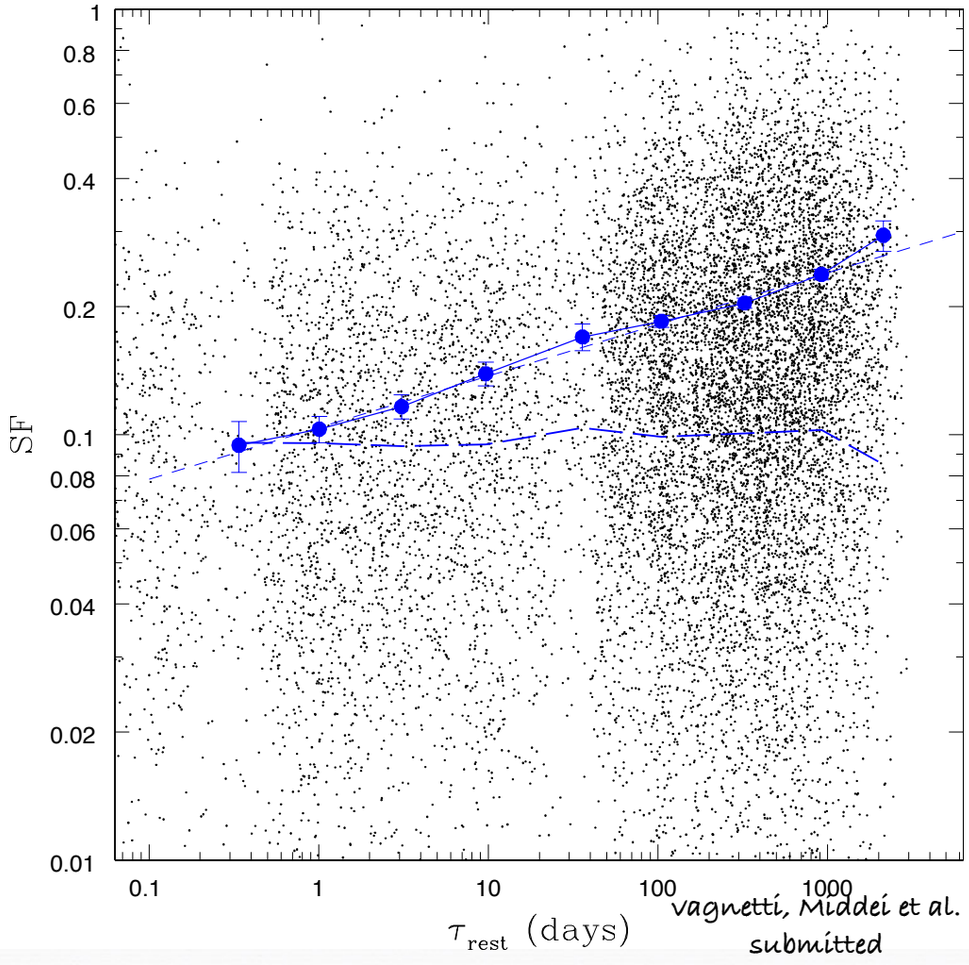
Structure Function (sf), what we know

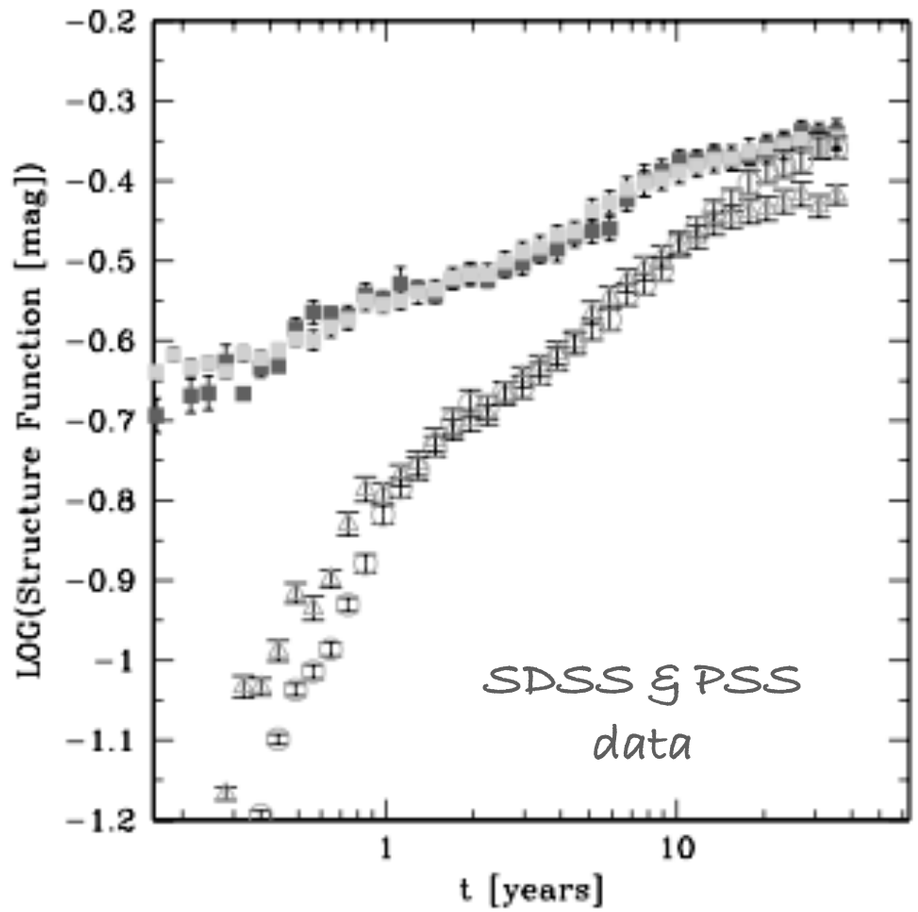
$$SF = \sqrt{< [log\ F(t+\tau) - log\ F(t)]^2 > - \sigma_n^2}$$

SF describes ensamble variability as a function of the delay τ

X-rays variability increases up to 5 years (Vagnetti, et al. 2011)



Optical variability still increases on 10s years time scale. (De Vries et al. 2004)



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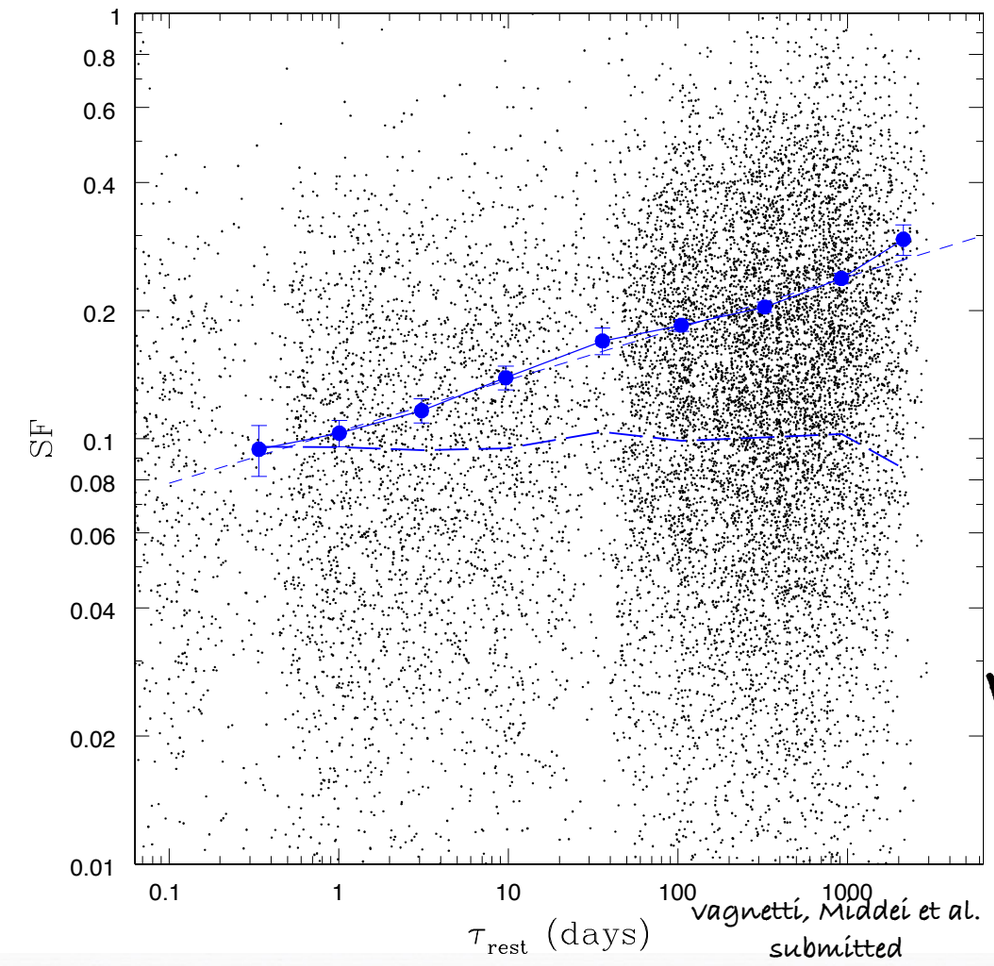
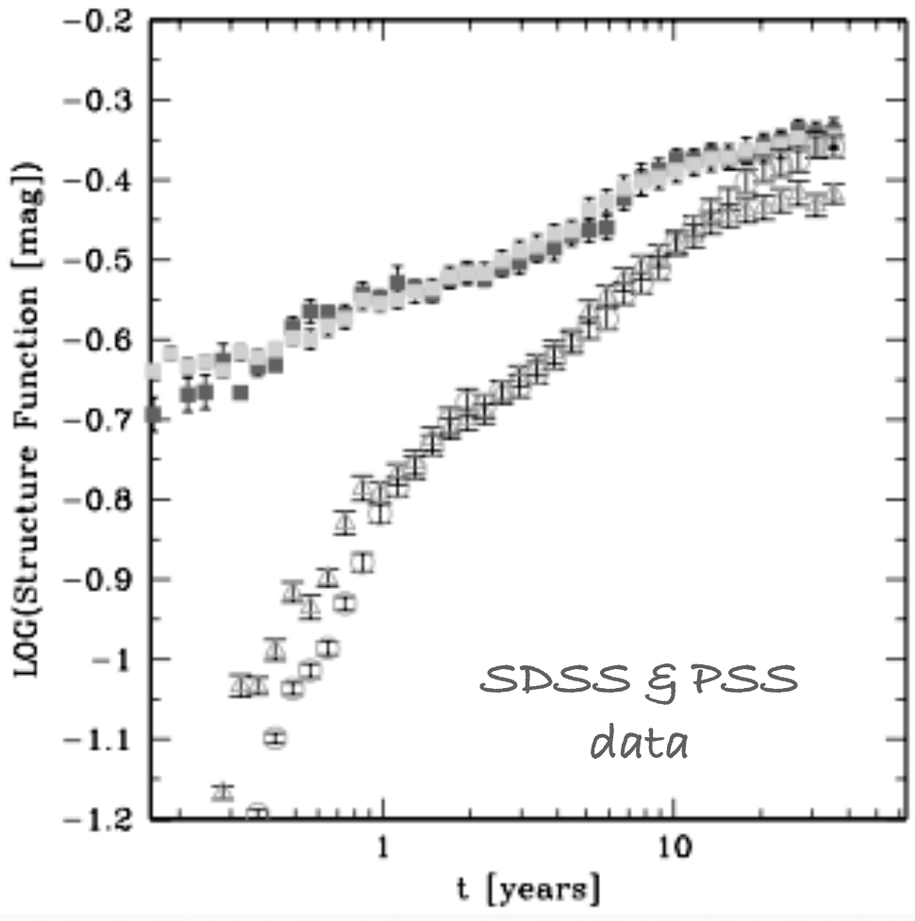
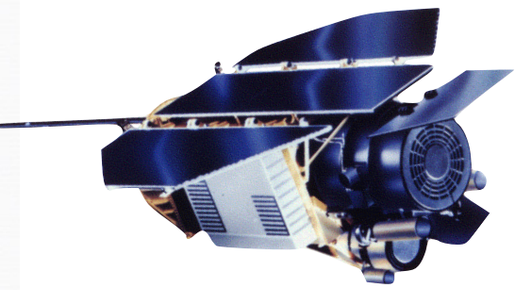


Vagnetti, Middei et al. submitted

X-rays variability behaves on larger time scales? (compatible with those in the Optical?)

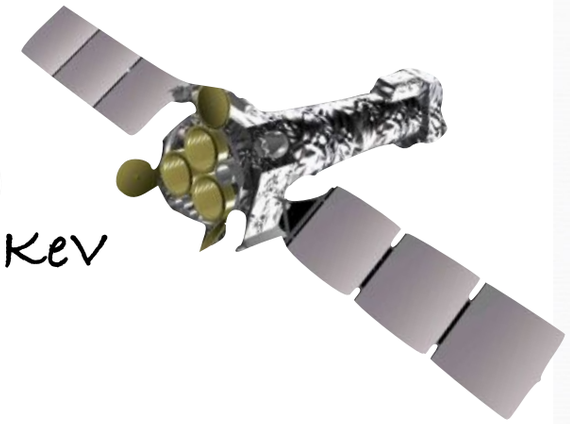


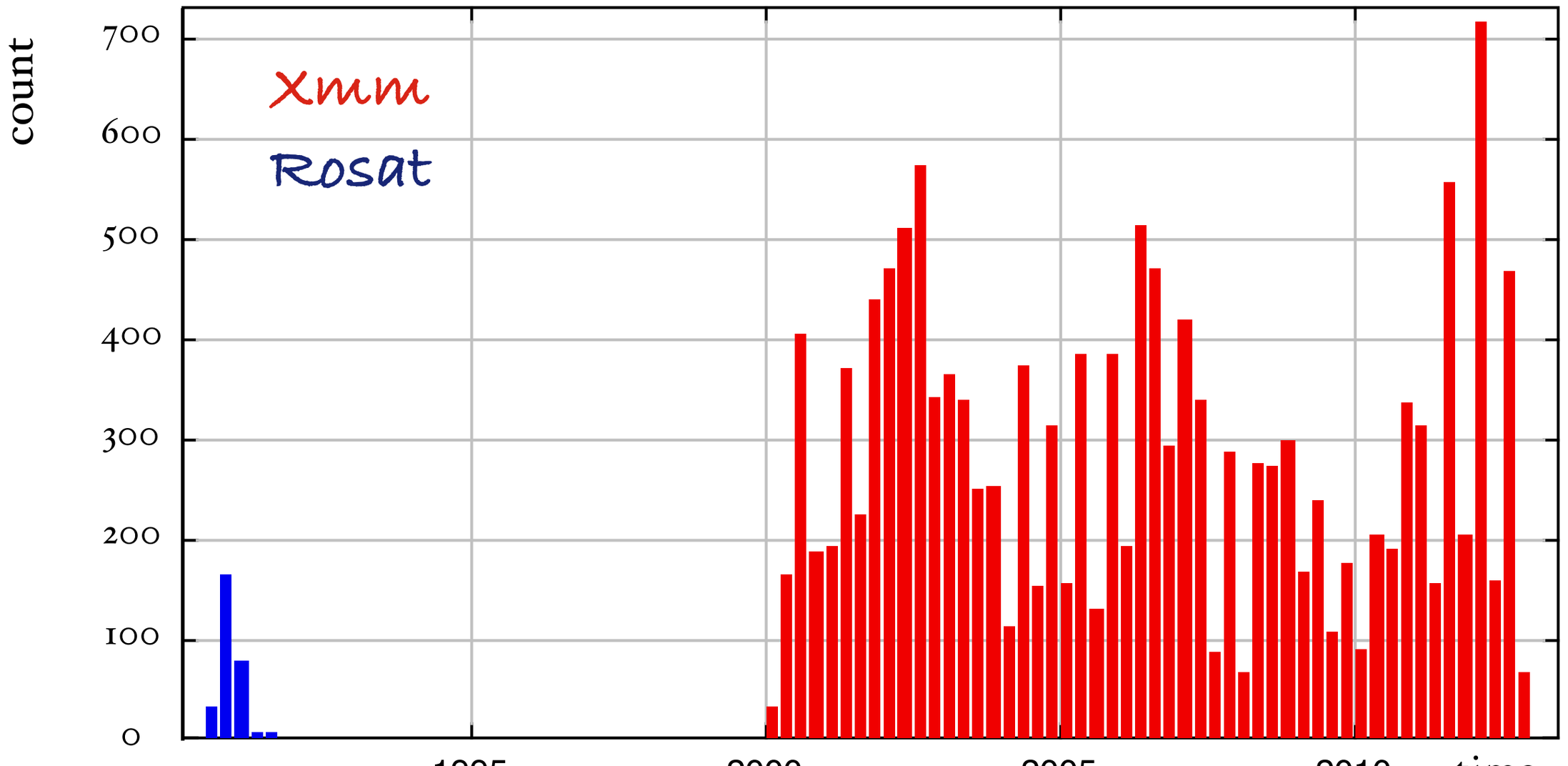
Extending the X-ray SF



1991-1999
Energy band: 0.1-2.4 KeV

1999-still working
Energy Band: 0.2-12 KeV





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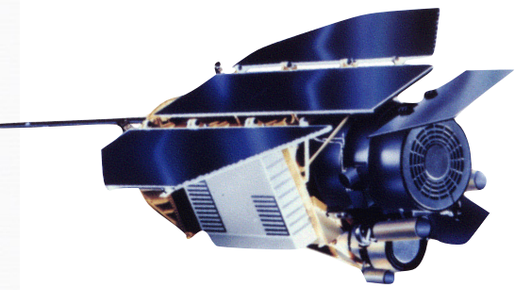

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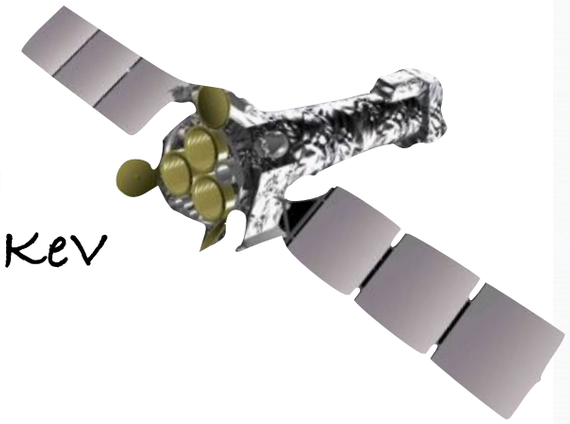
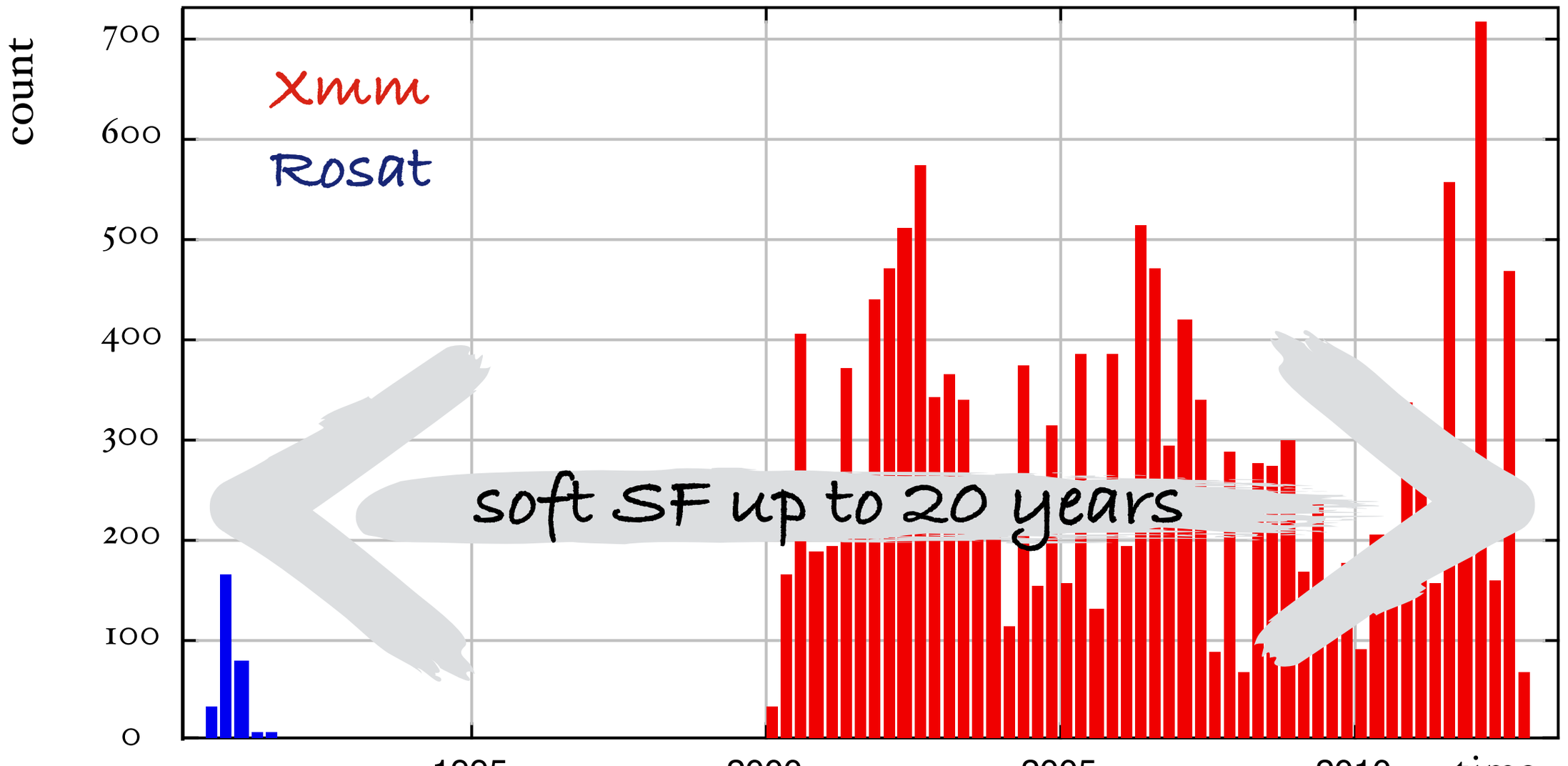




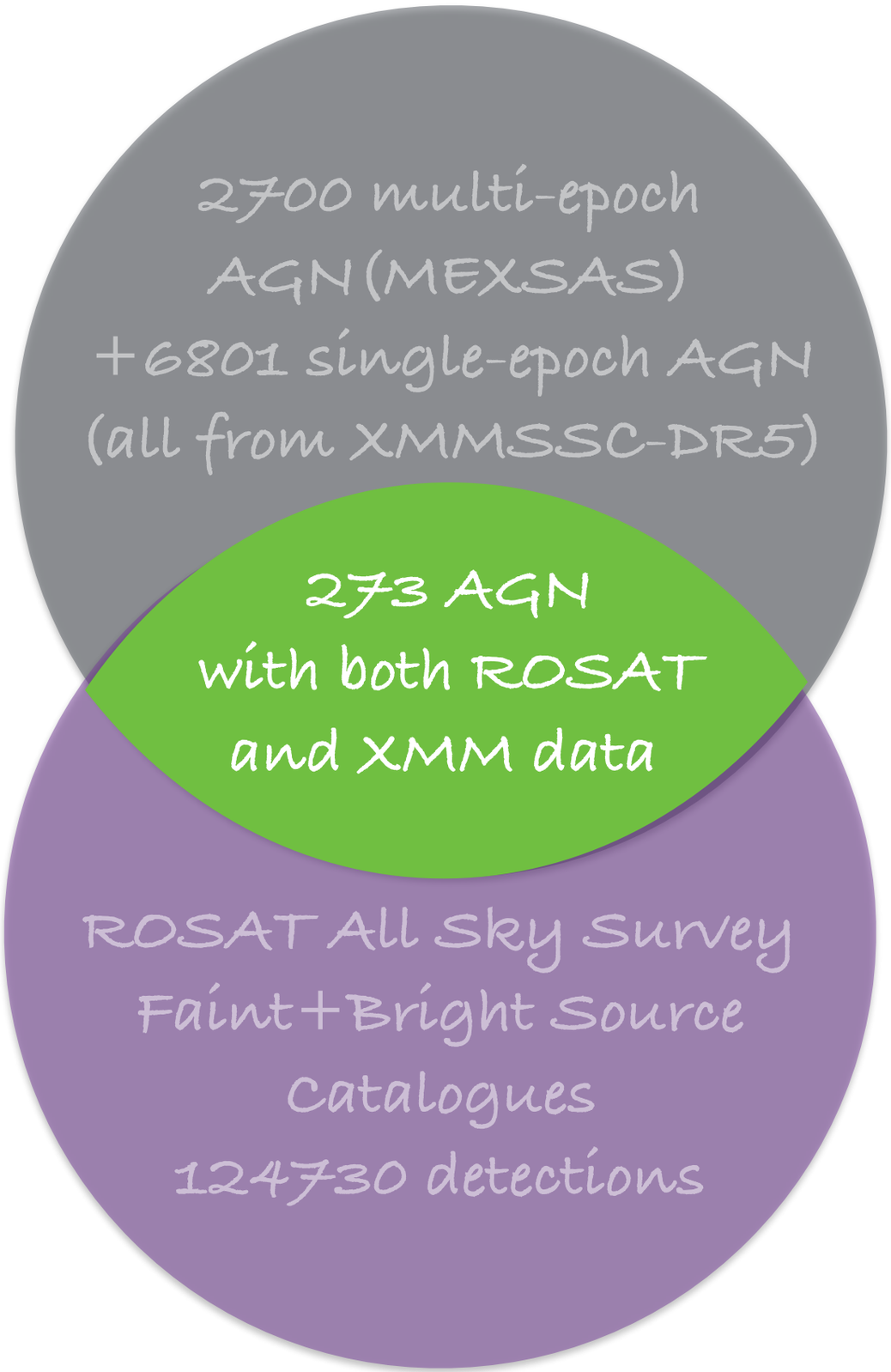
How we obtained the sample

Cross-Correlations

- we adopted a 30 arcsec c.c. radius for the matches
- using a set of false coordinates we only get 5 spurious detections

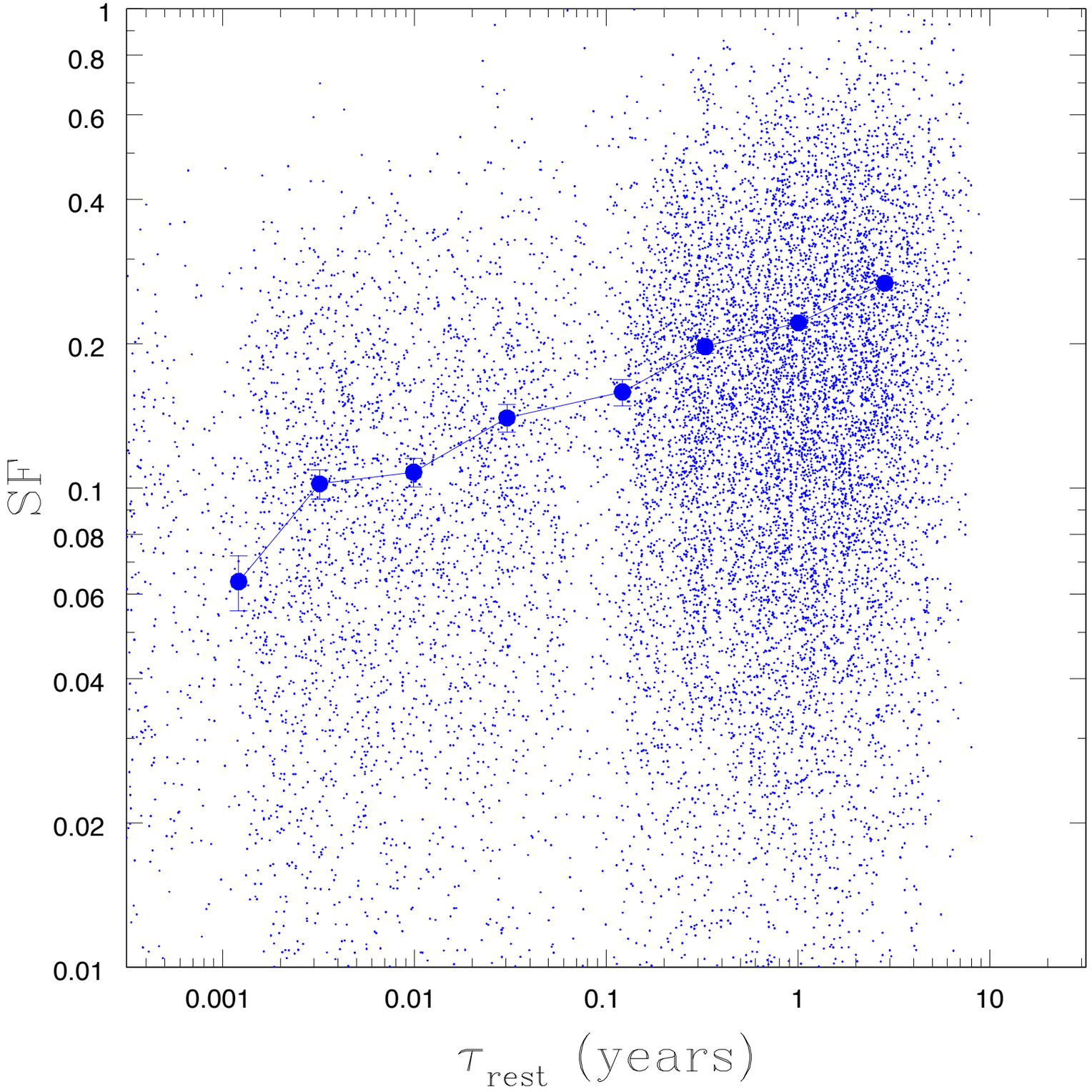
Analisys

- We make comparable observations obtained in 2 different spectral bands SF—> soft Sf
- We consider the 2 different instrumental limiting fluxes
- We cut all the Xmm fluxes below the Rosat detection limit to avoid false effects on SF



The 20 years soft structure function

$$SF = \sqrt{< [log\ F(t+\tau) - log\ F(t)]^2 > - \sigma_n^2}$$



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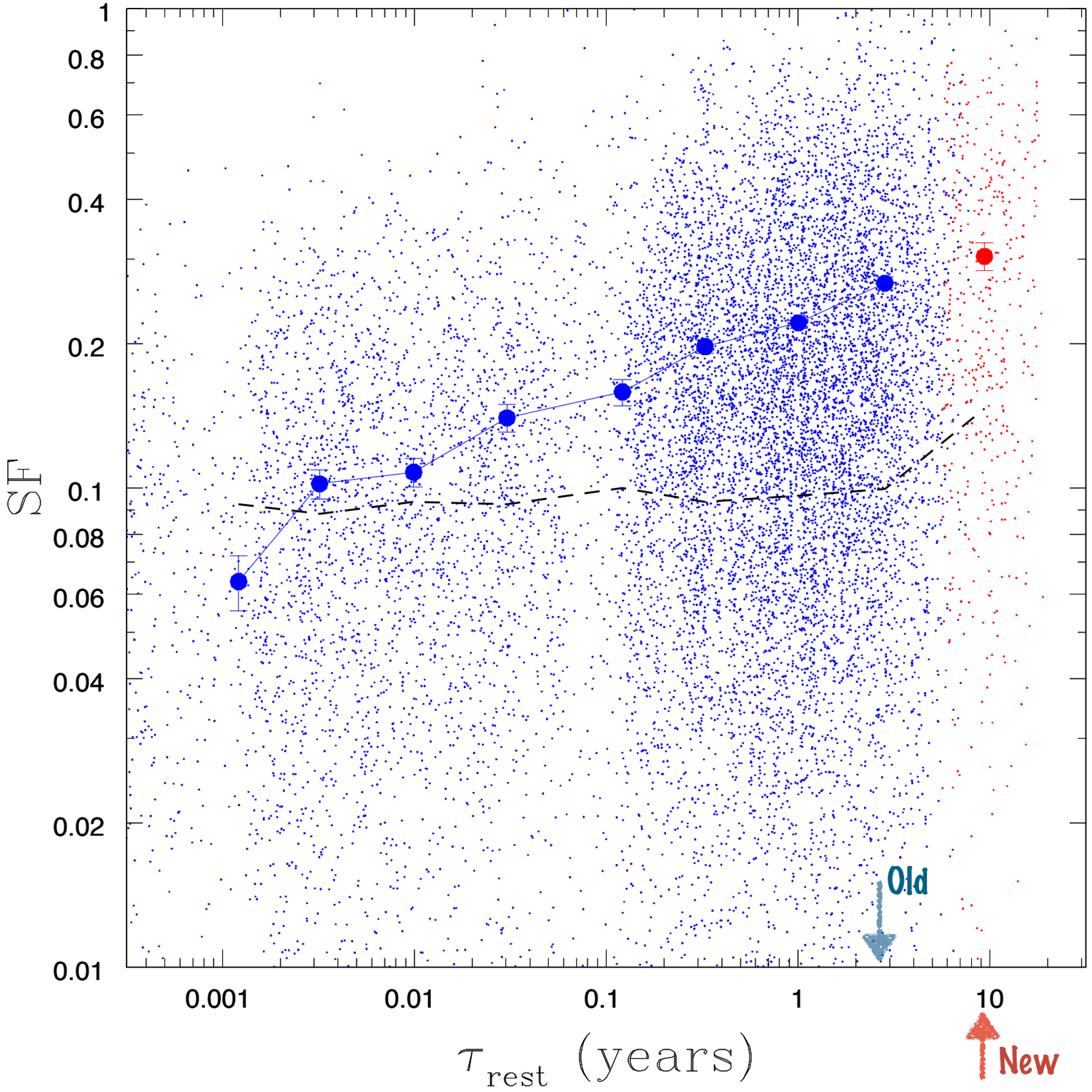

Soft X-ray
Structure Function
still increases
at 20 years rest frame!

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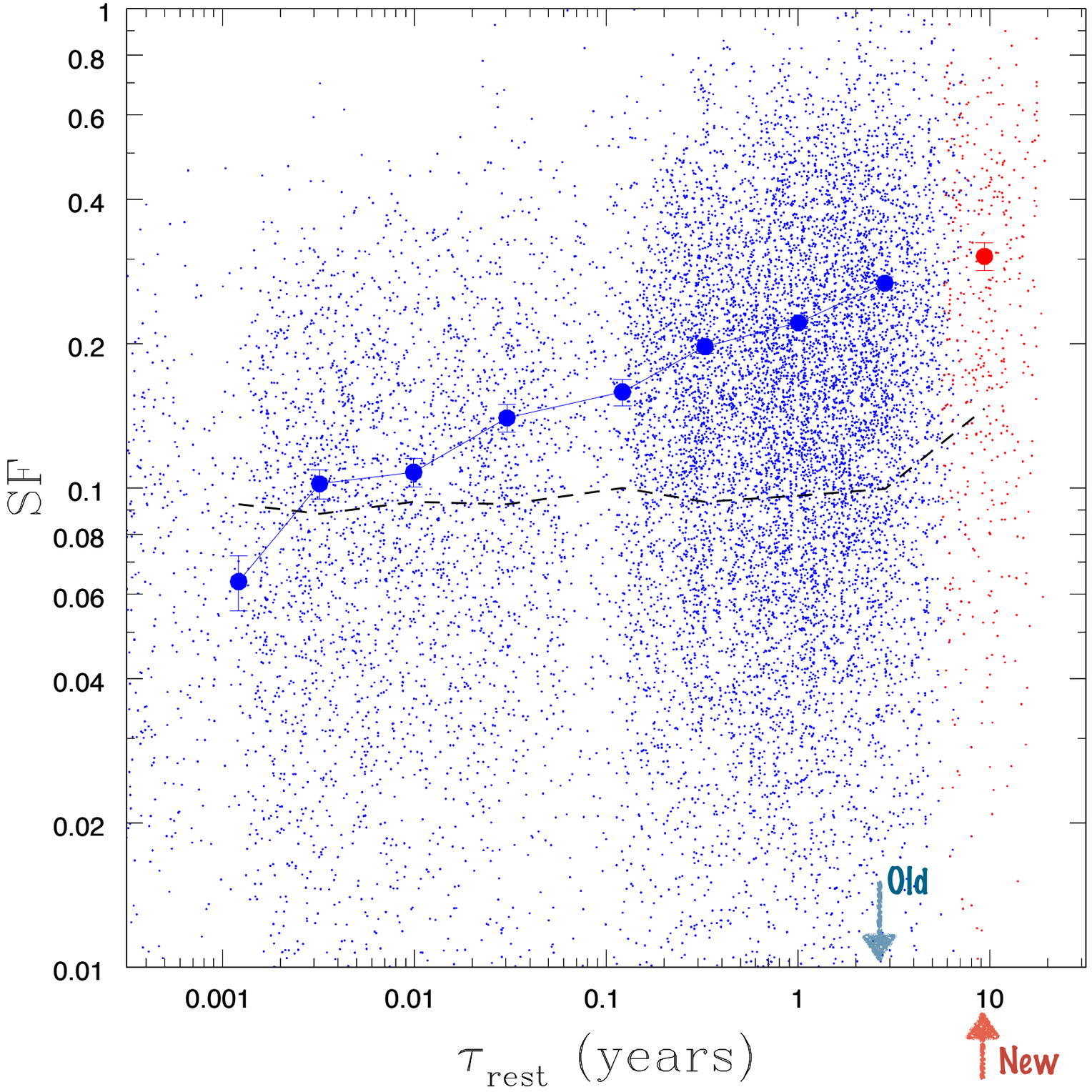

Soft X-ray
Structure Function
still increases
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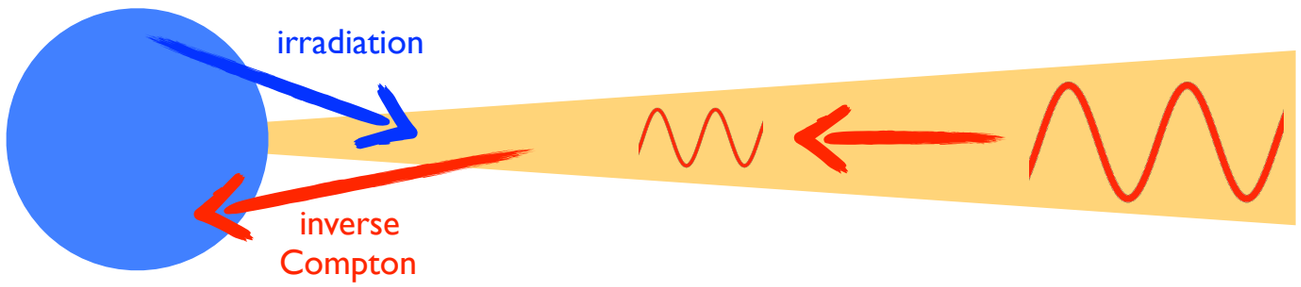
Similar results
already obtained
in the optical band!

Comments

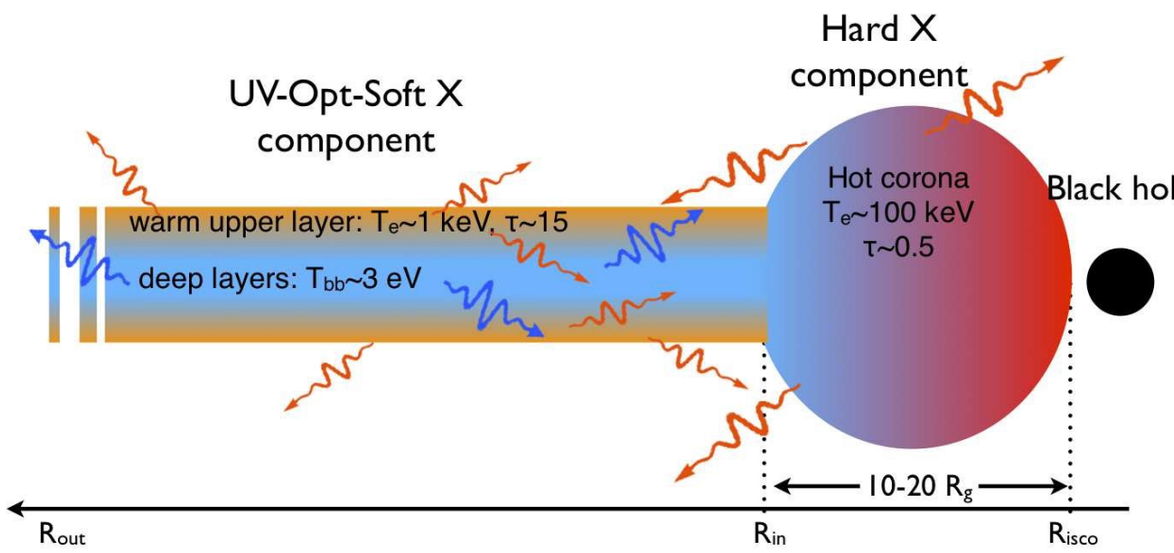
soft X-rays SF increases on 20 years scale!
How does it can be explained considering the different origins for the optical and X-ray emissions?

large time scale optical variability affects the X-ray variations



(Lyubarskii 1997, Arévalo 2006)

An extended emitting component (warm corona)



(Petrucci et al. 2012)

Thanks for your attention

more information soon available (Middei et al. in prep)