

# Anatomy of the AGN in NGC 5548

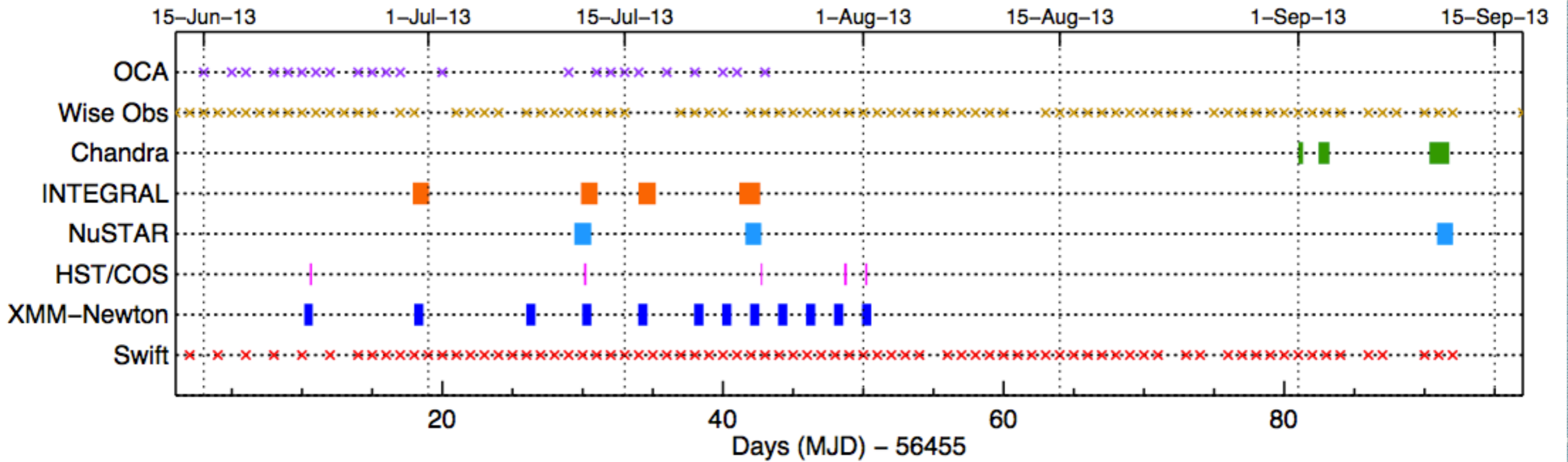
**Francesco Ursini**  
**Univ. Grenoble-Alpes, IPAG**

on behalf of the NGC 5548 consortium (P.I. J. Kaastra)  
<http://www.issibern.ch/teams/ngc5548/>

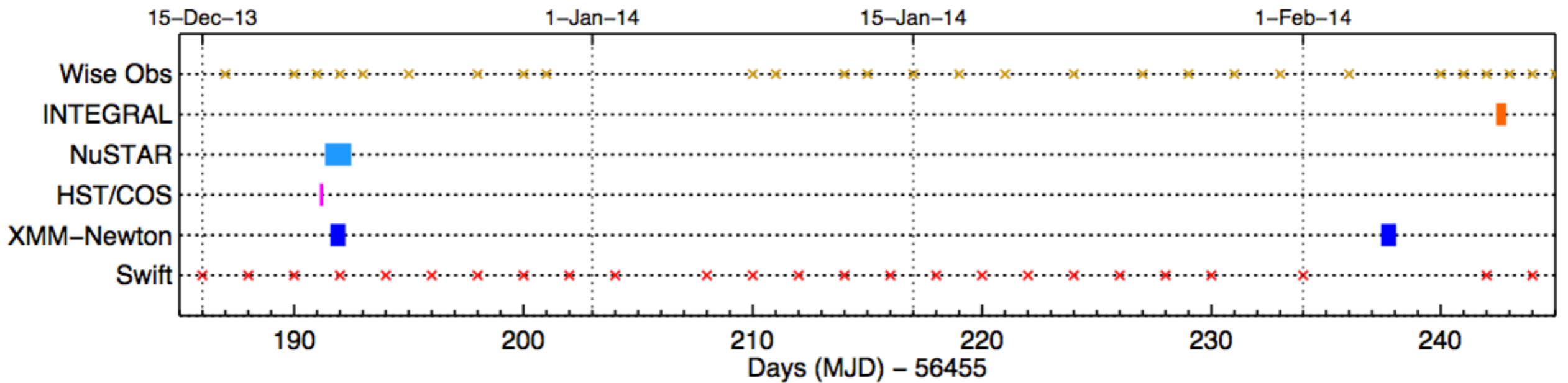
Kaastra et al., “A fast and long-lived outflow from the supermassive black hole in NGC 5548”, 2014, Science

*AGN 11, Trieste, 23-26 September 2014*

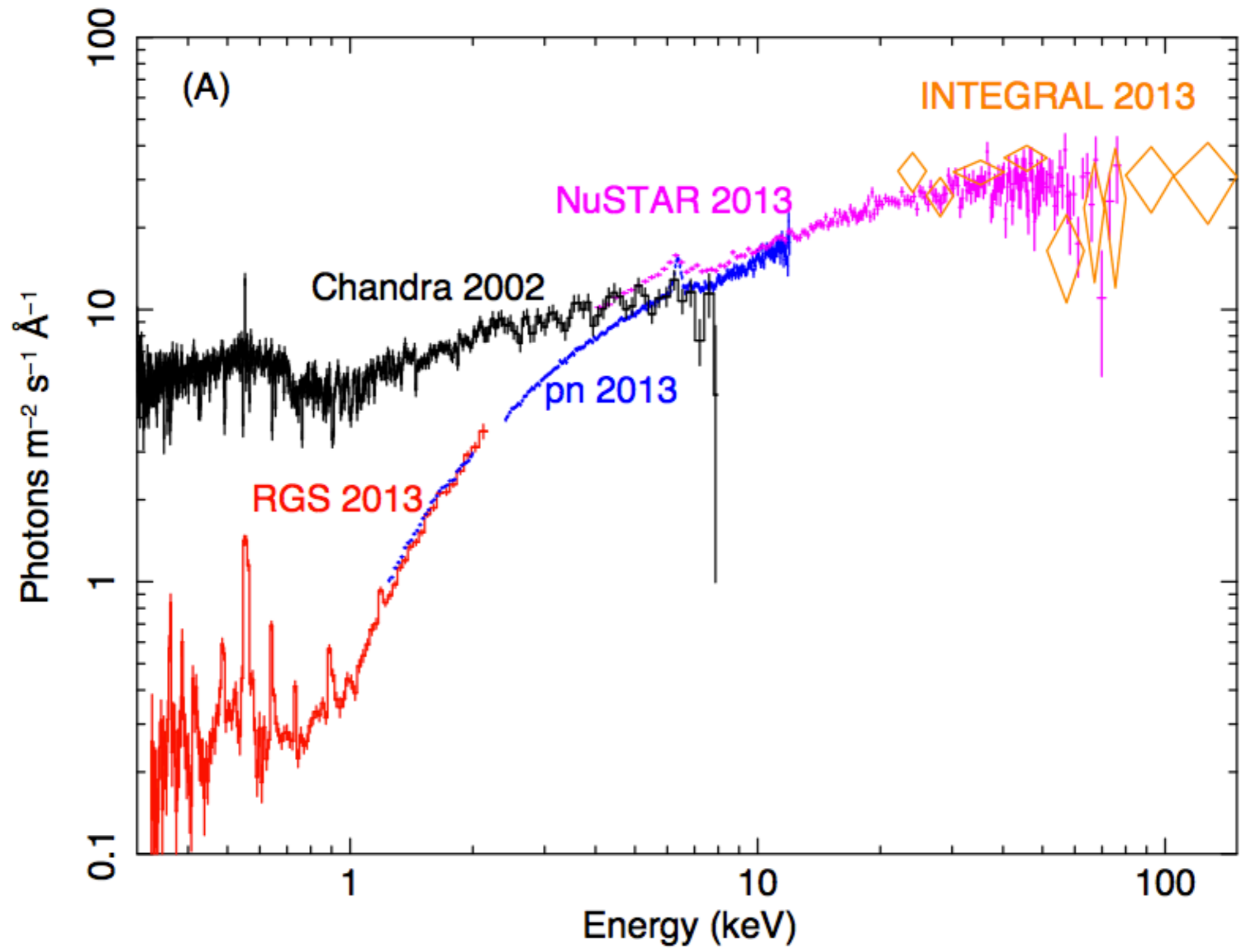
### Summer/fall 2013 campaign on NGC 5548



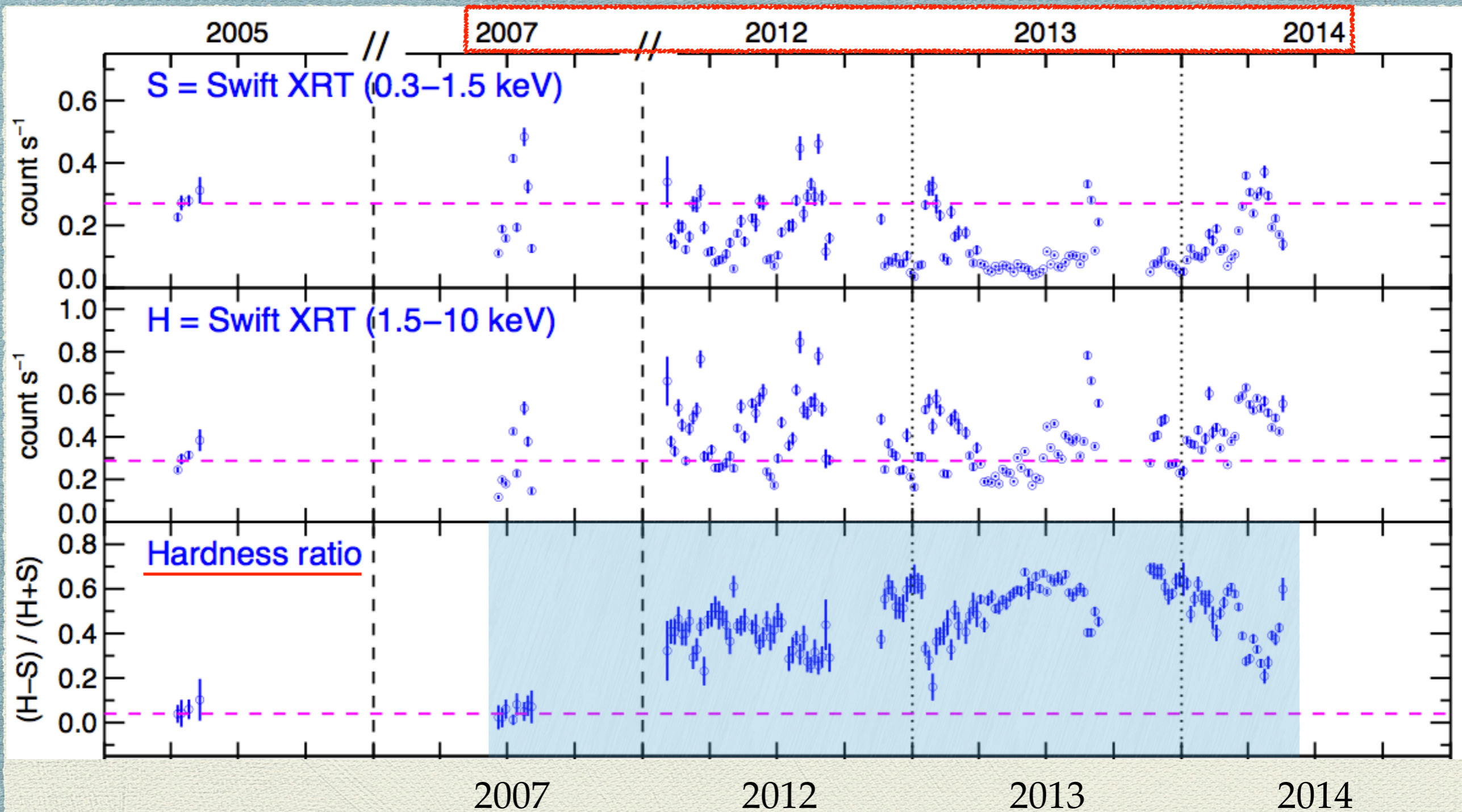
### Winter 2013/2014 campaign on NGC 5548



Timeline of the multi-wavelength campaign on NGC 5548  
main goal: study of the warm absorber...

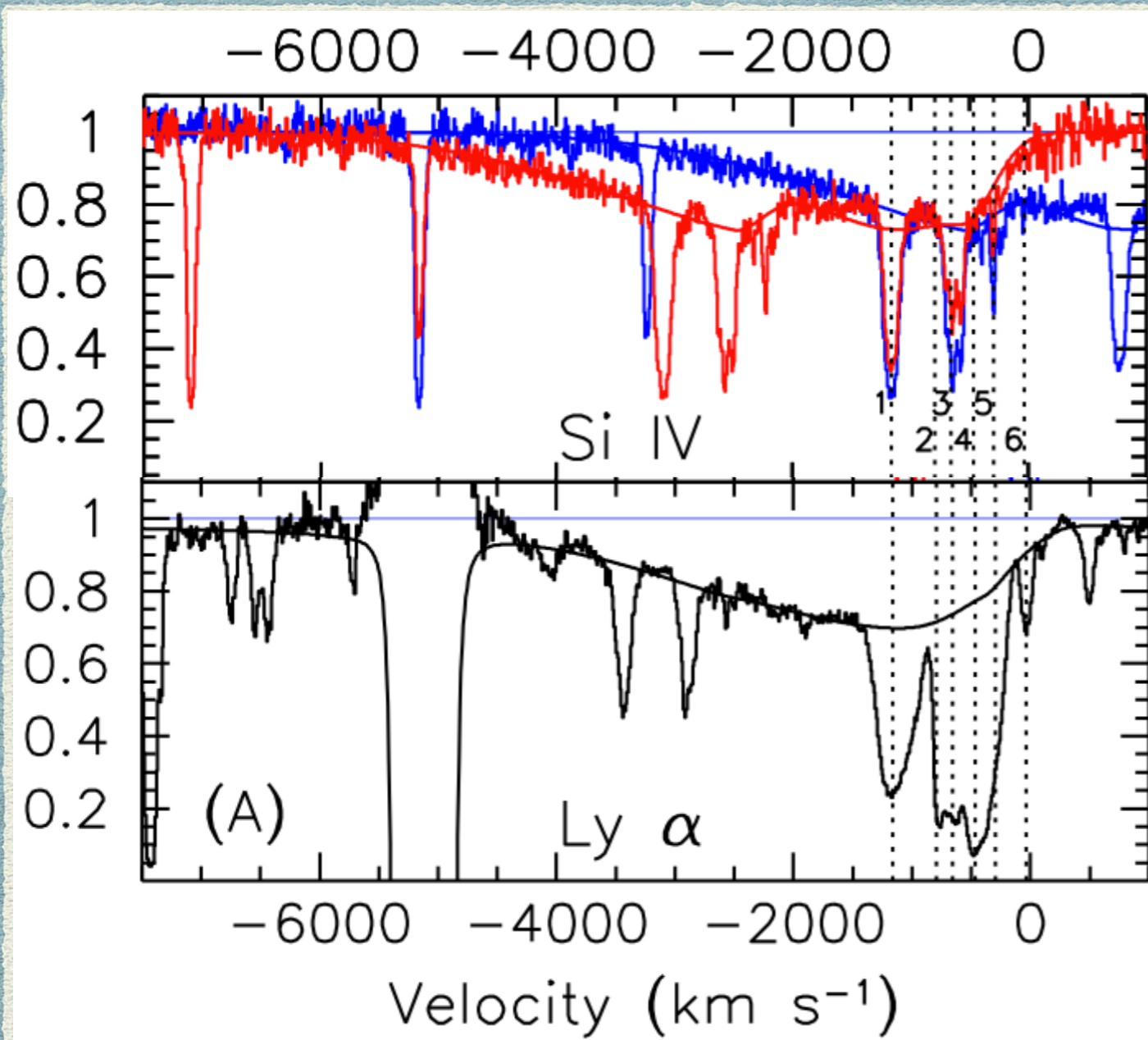


Obscured UV/X-ray spectrum during summer 2013

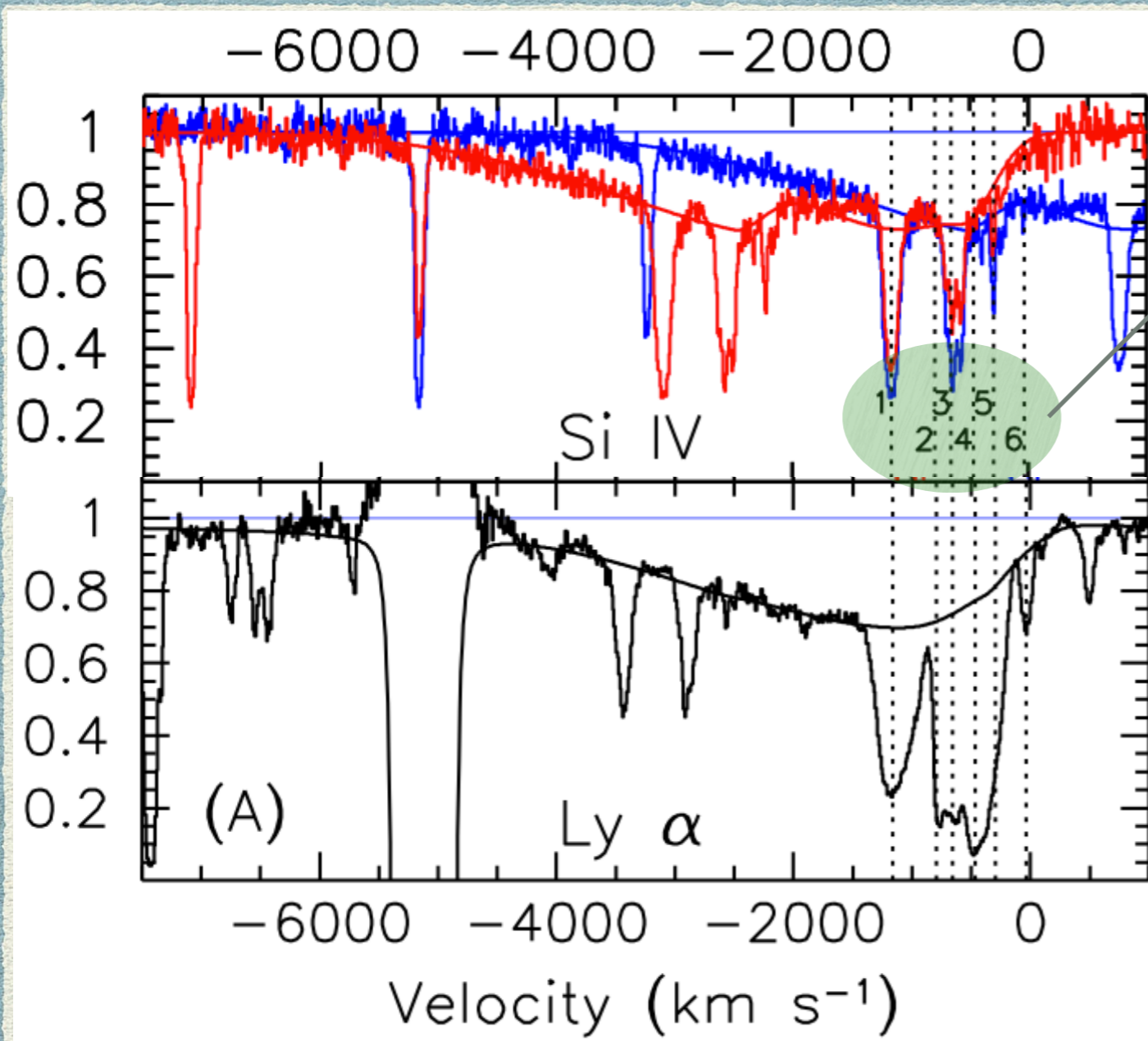


X-ray light curves 2005-2014

long-lasting obscuration



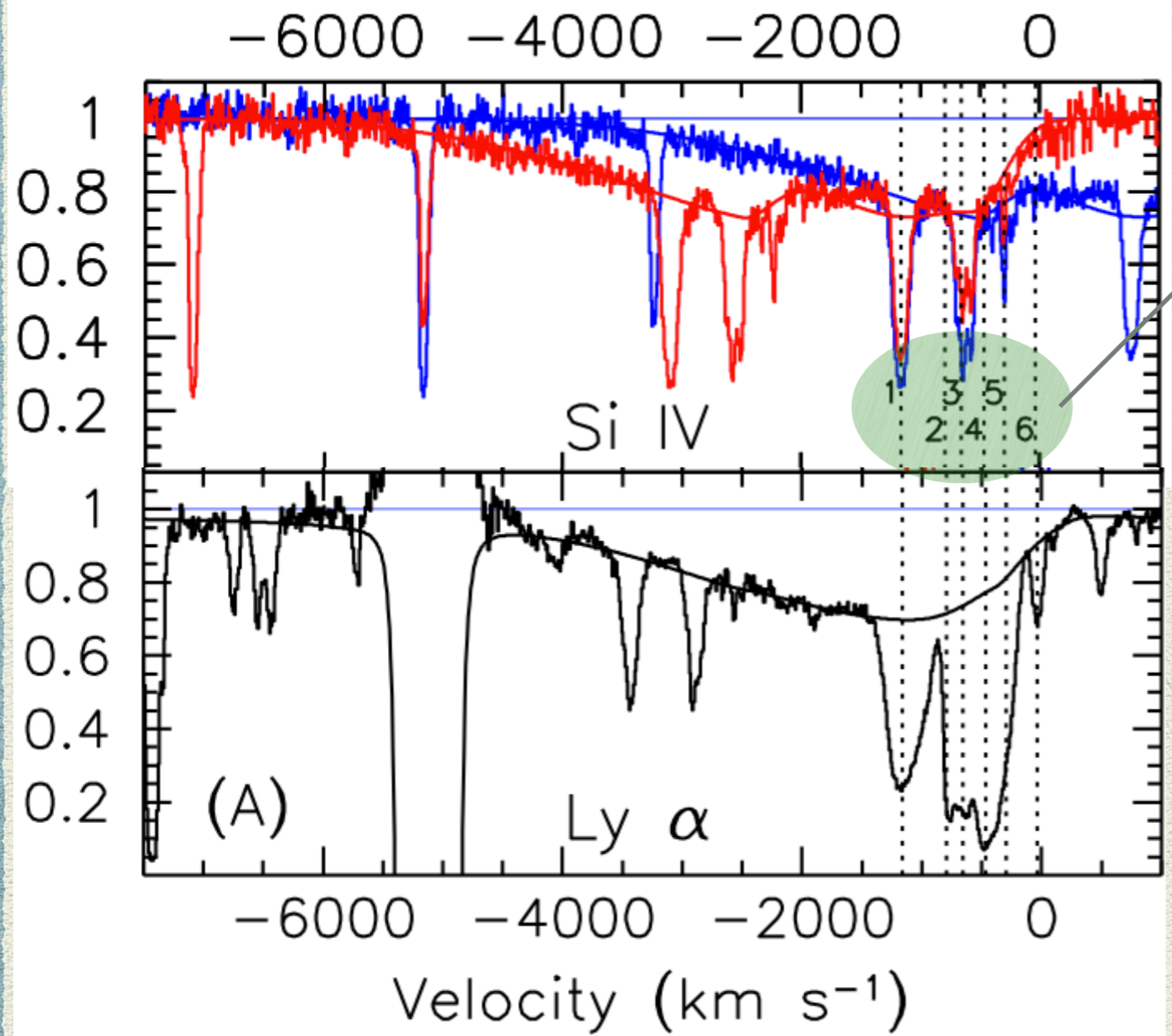
UV absorption lines in the HST/COS spectrum of summer 2013



1-6: WA velocity components

+ broad absorption troughs

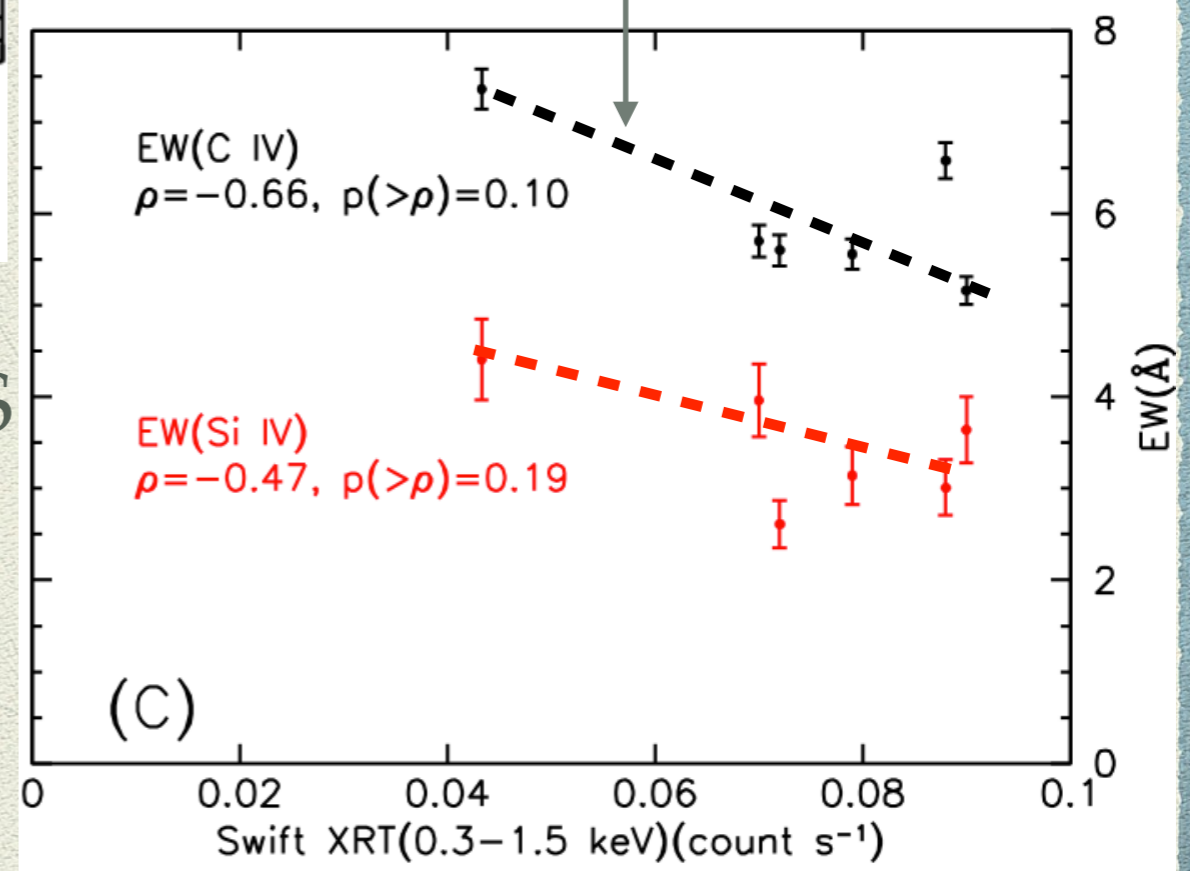
UV absorption lines in the HST/COS spectrum of summer 2013



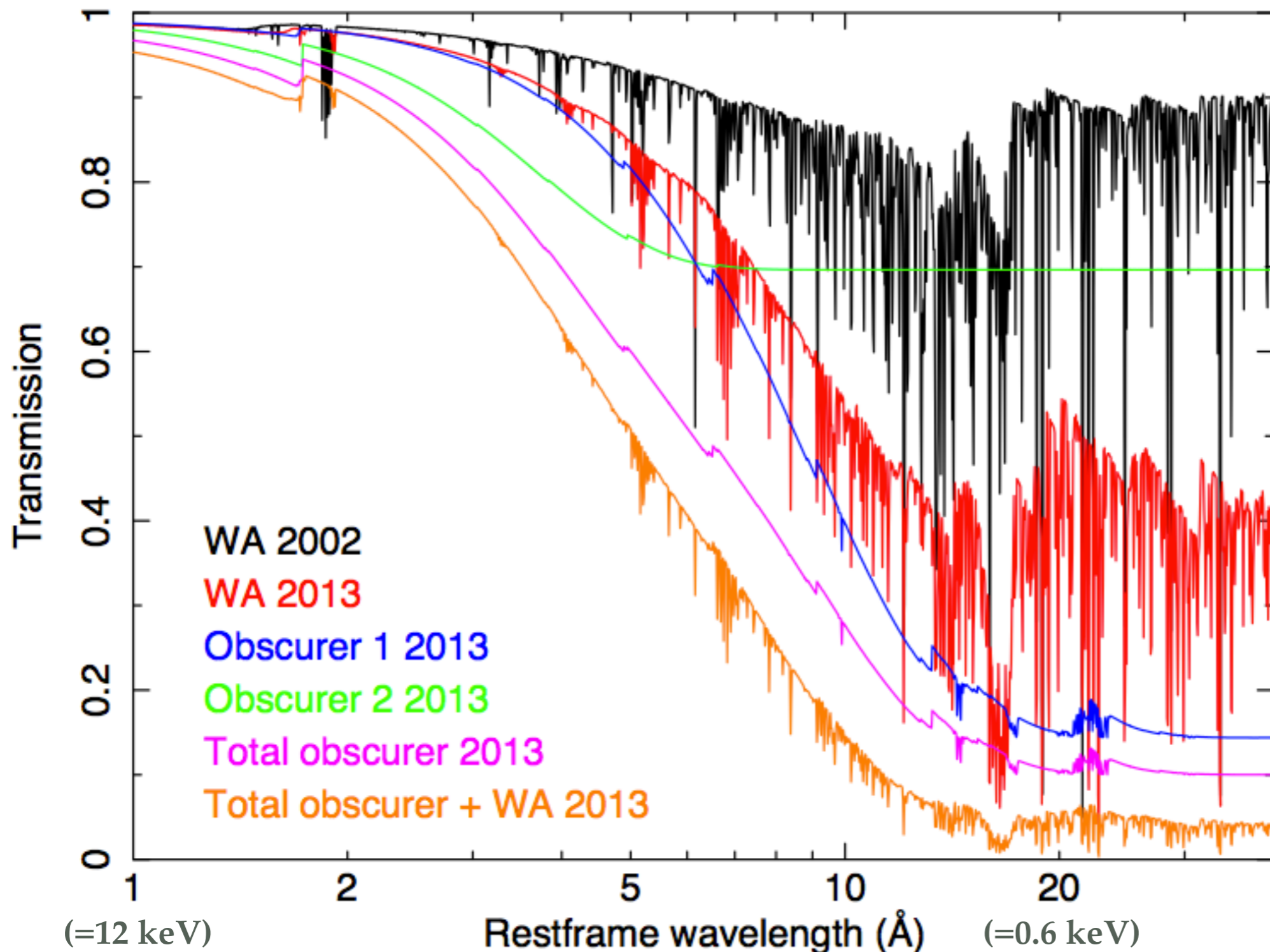
1-6: WA velocity components

+ broad absorption troughs  
correlated with  
X-ray obscuration

UV absorption lines in the HST/COS spectrum of summer 2013



# WA (less ionized) + 2 UV / X-ray obscurers

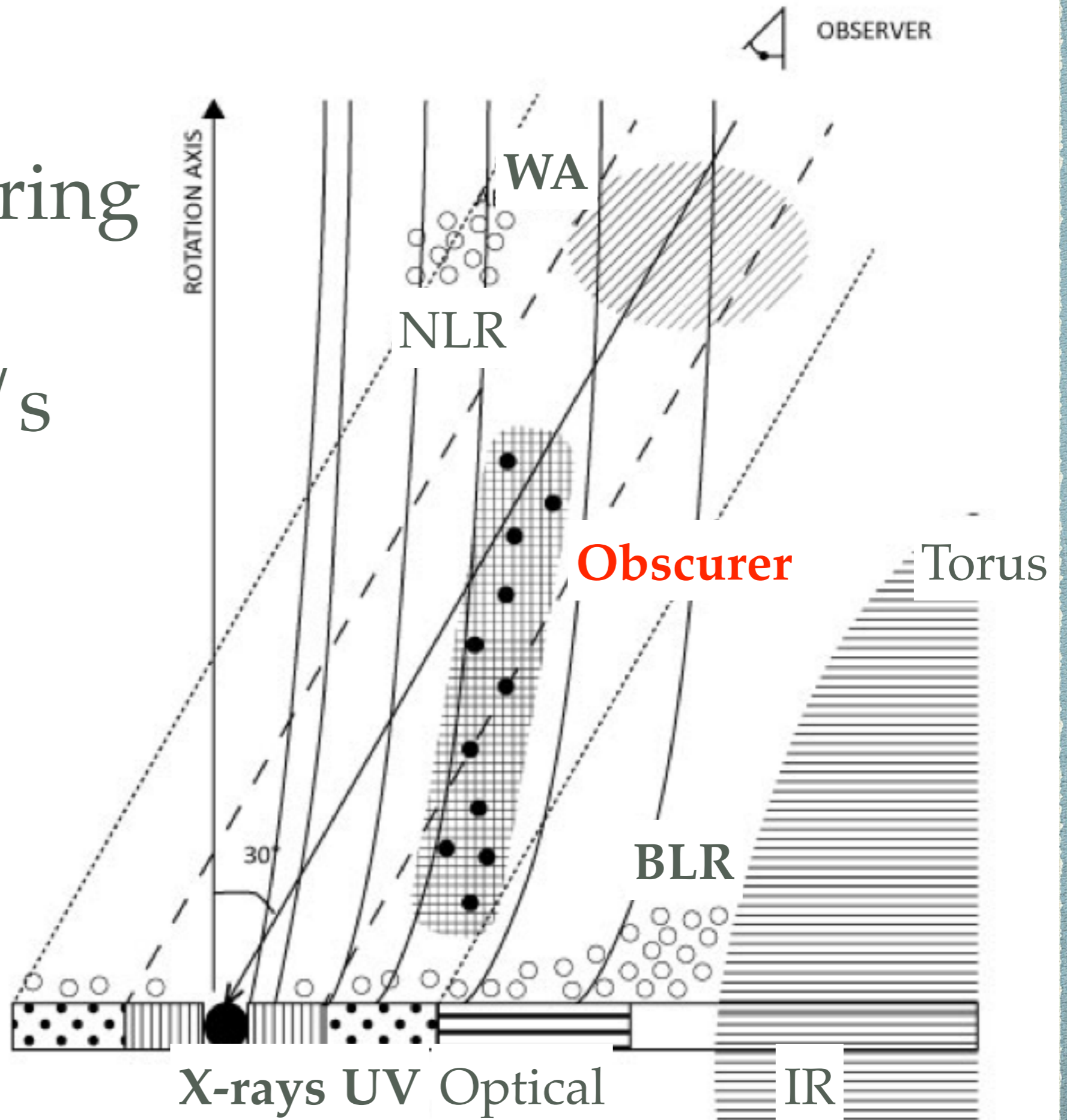


**Obscurer 1:**  
 $nH \sim 10^{22} \text{ cm}^{-2}$   
 $cF \sim 0.8$   
 $\log(\xi) = -1.2$

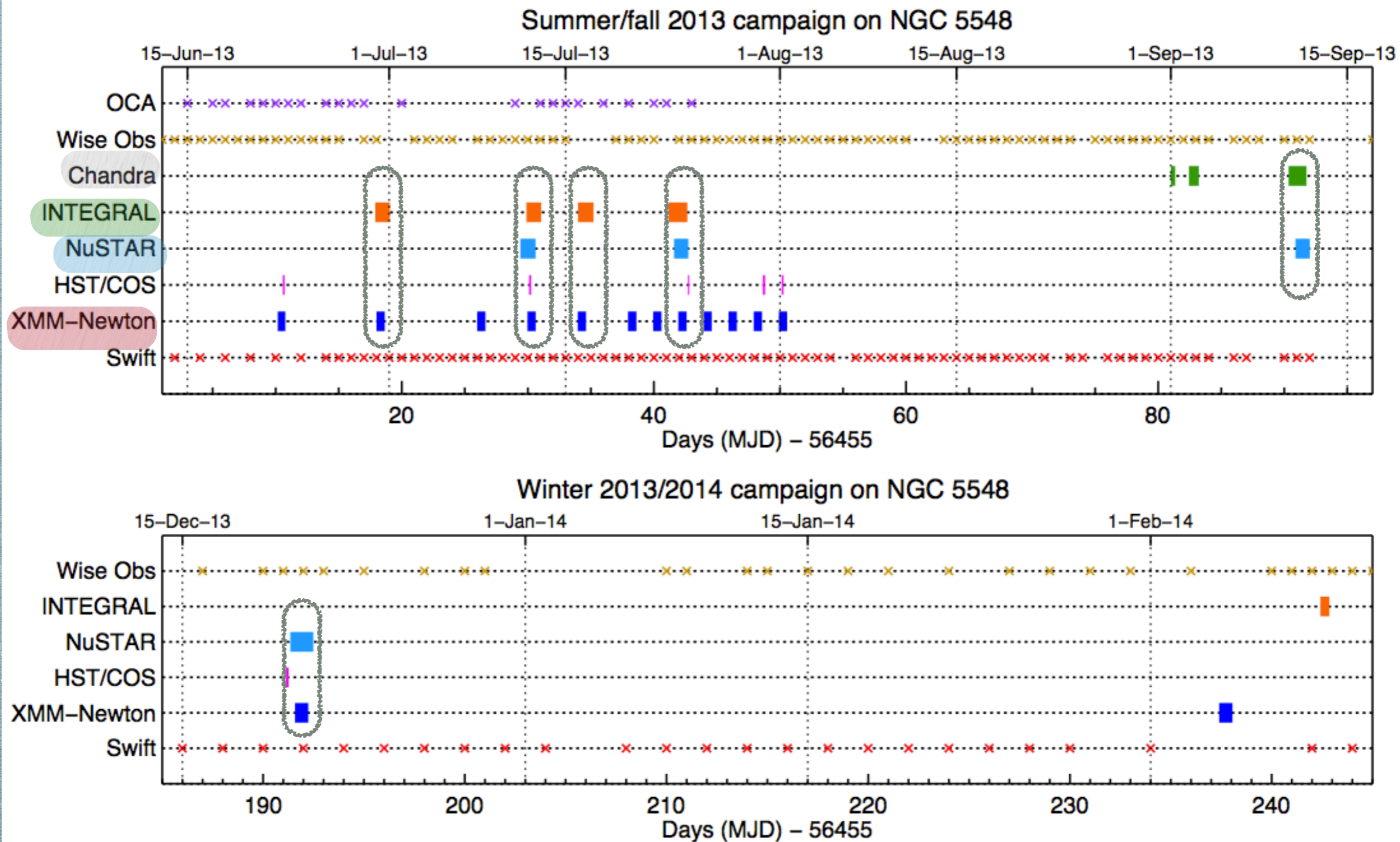
**Obscurer 2:**  
 $nH \sim 10^{23} \text{ cm}^{-2}$   
 $cF \sim 0.3$   
 $\log(\xi) < -4$

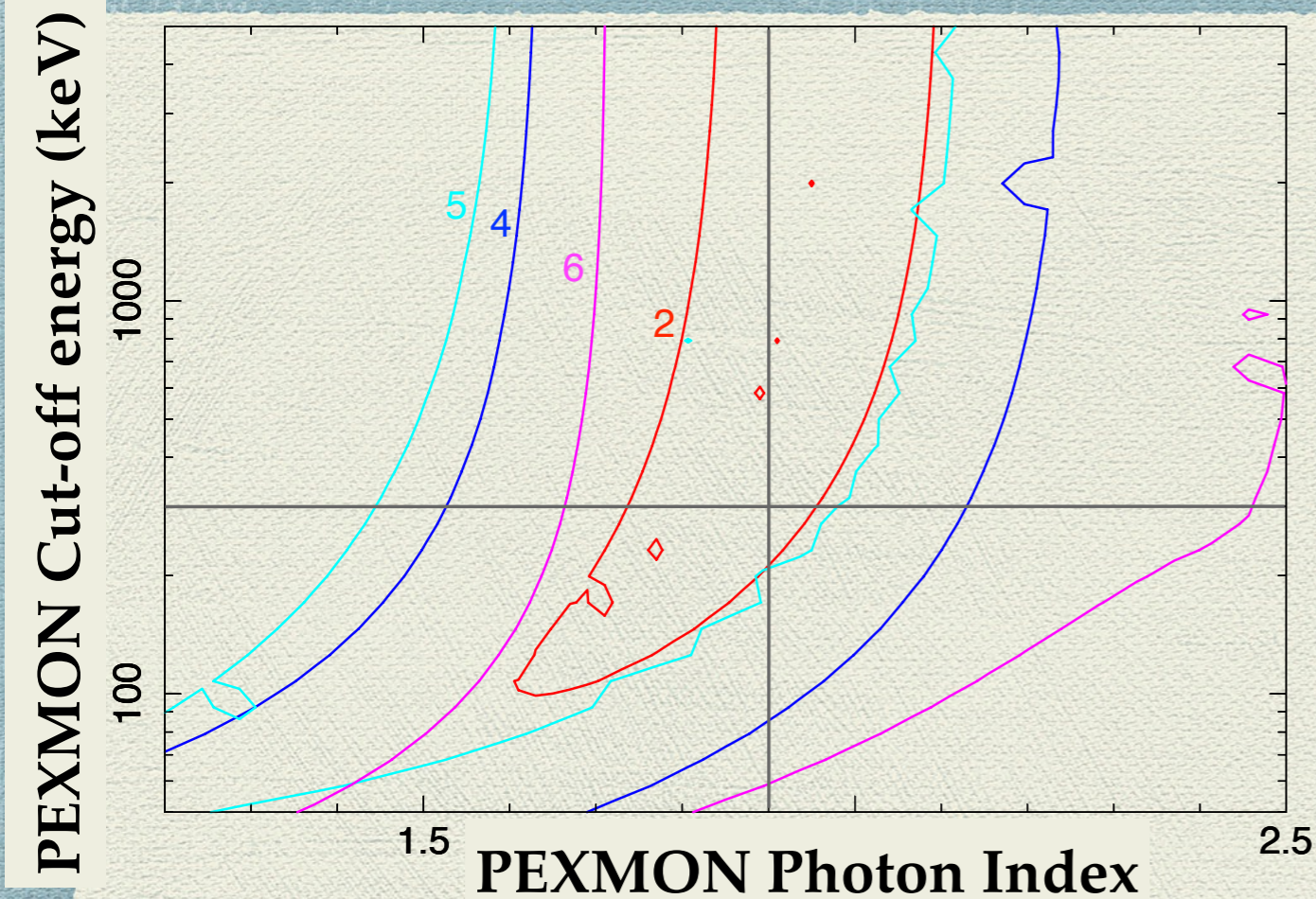


- partial covering
  - velocity  
~ -1000 km/s
  - variability  
over ~ days
- ↓
- Possibly a  
disk wind**

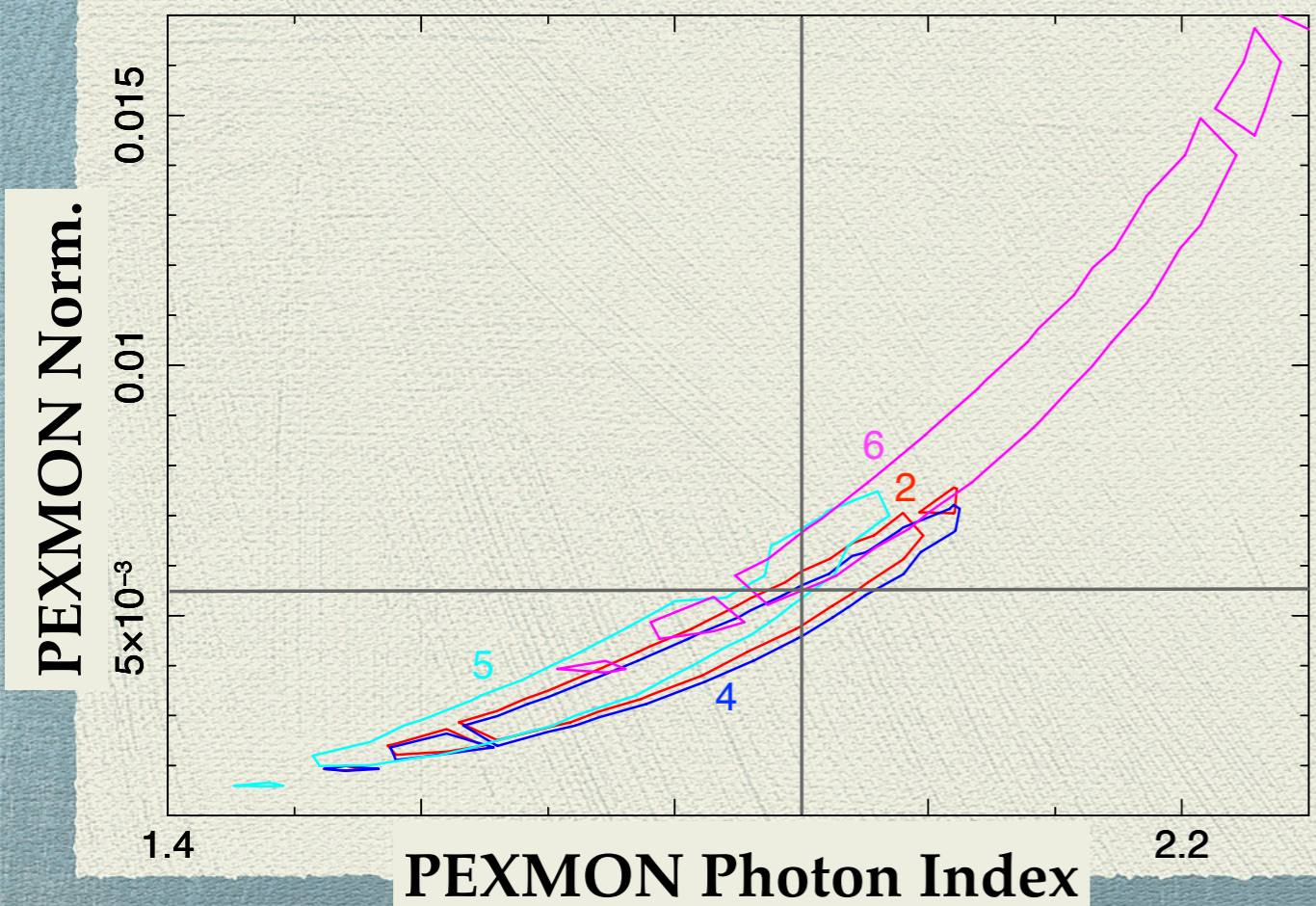


# High-energy view





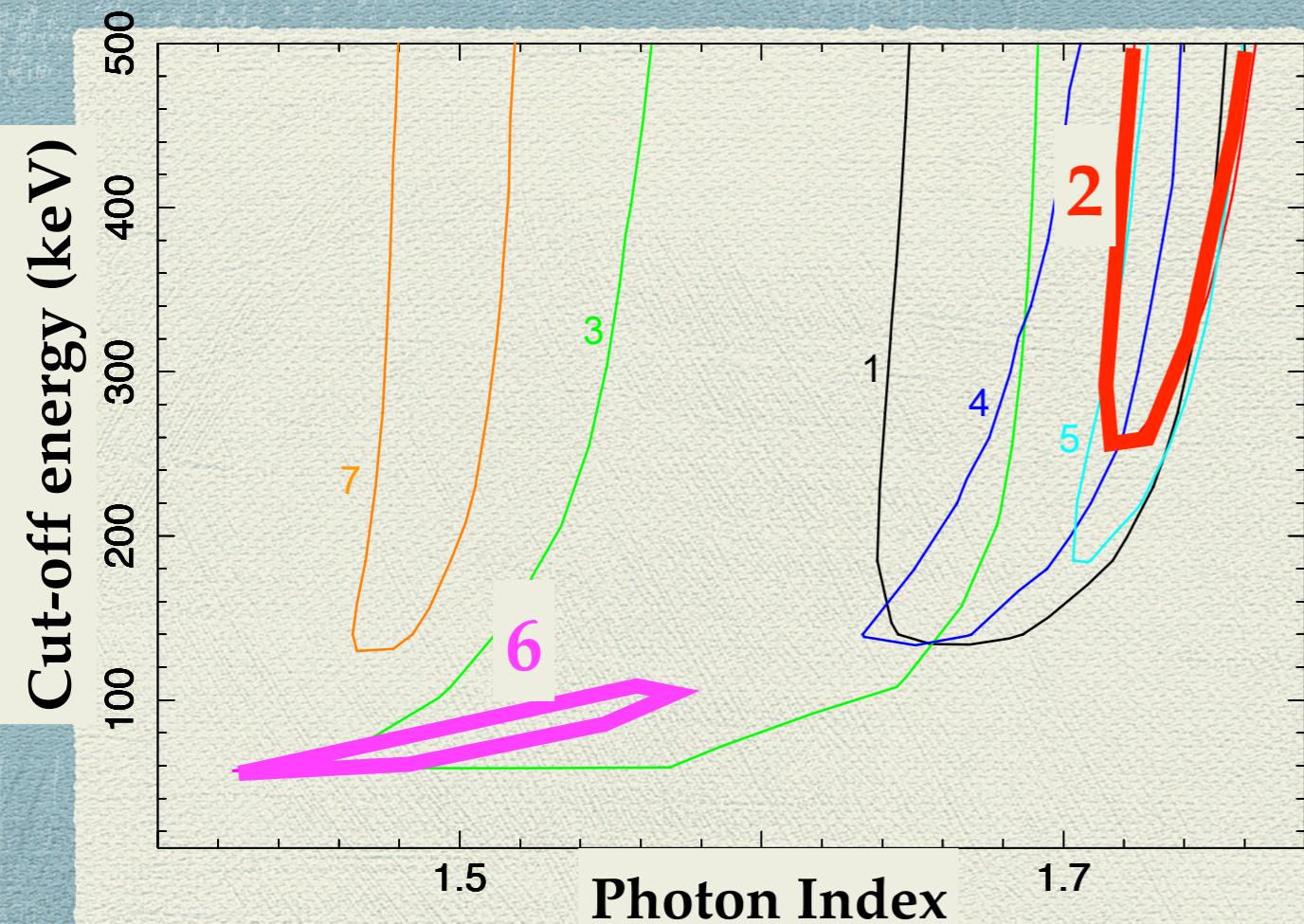
(i) Reflection component:  
 consistent with  
 being constant  
 $\Rightarrow$  distant material  
 ( $>$ light months)



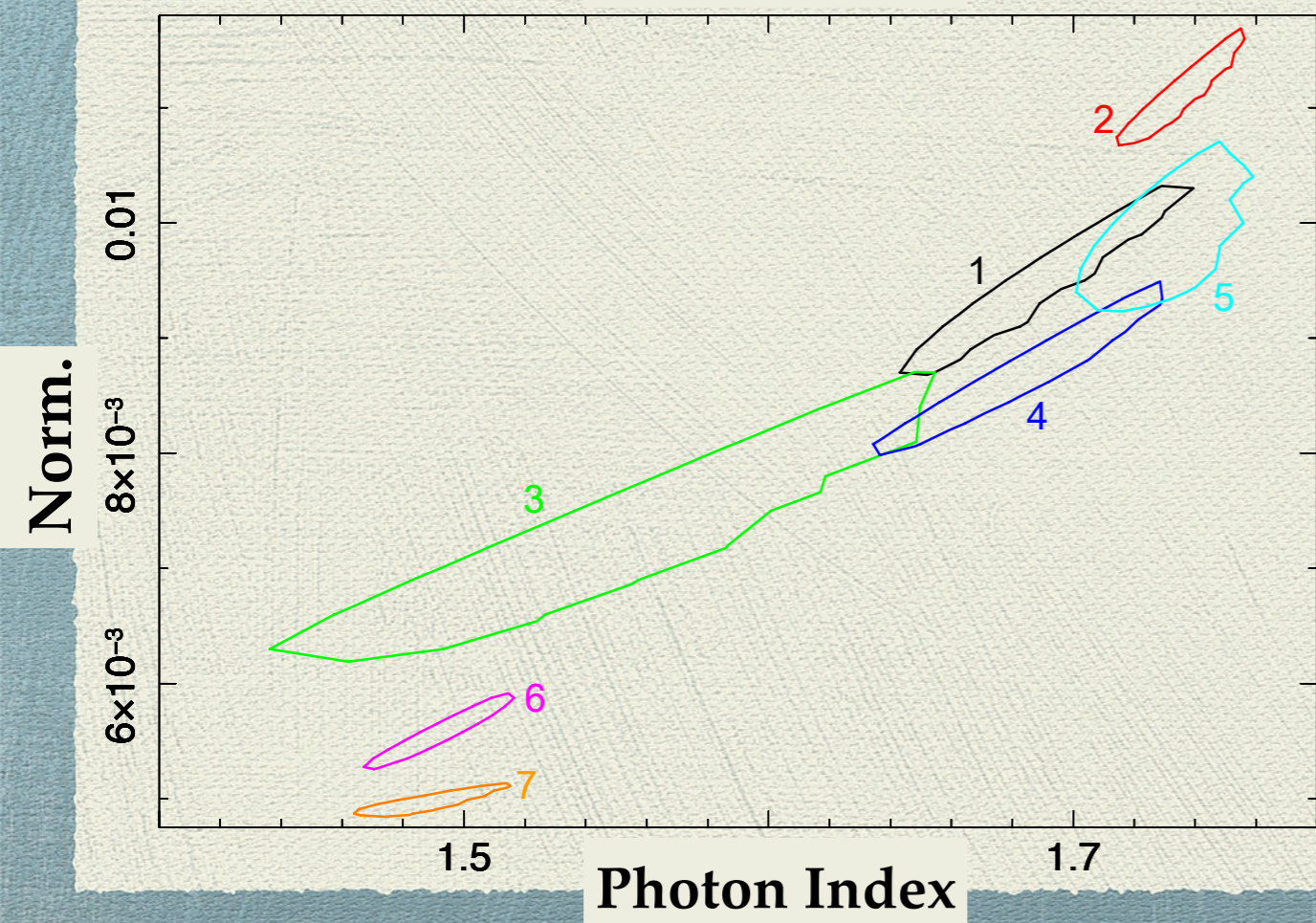
$$\Gamma(\text{pexmon})=1.9,$$

$$E_c(\text{pexmon})=300 \text{ keV},$$

$$\text{Norm}(\text{pexmon})=5.5 \times 10^{-3}$$



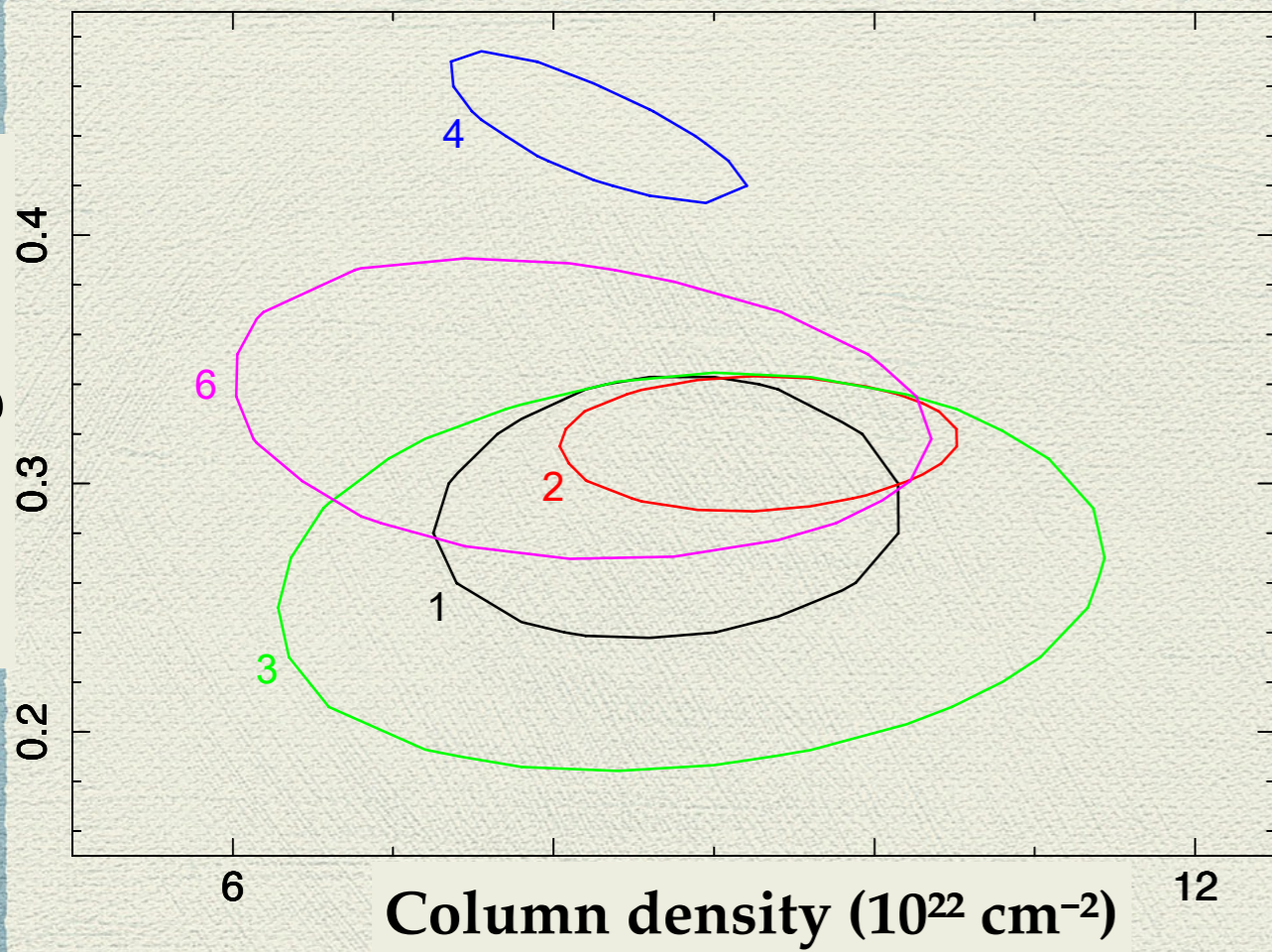
(ii) Primary continuum: variability of  $\Gamma$  and cut-off energy



In one observation (#6), we find the measure

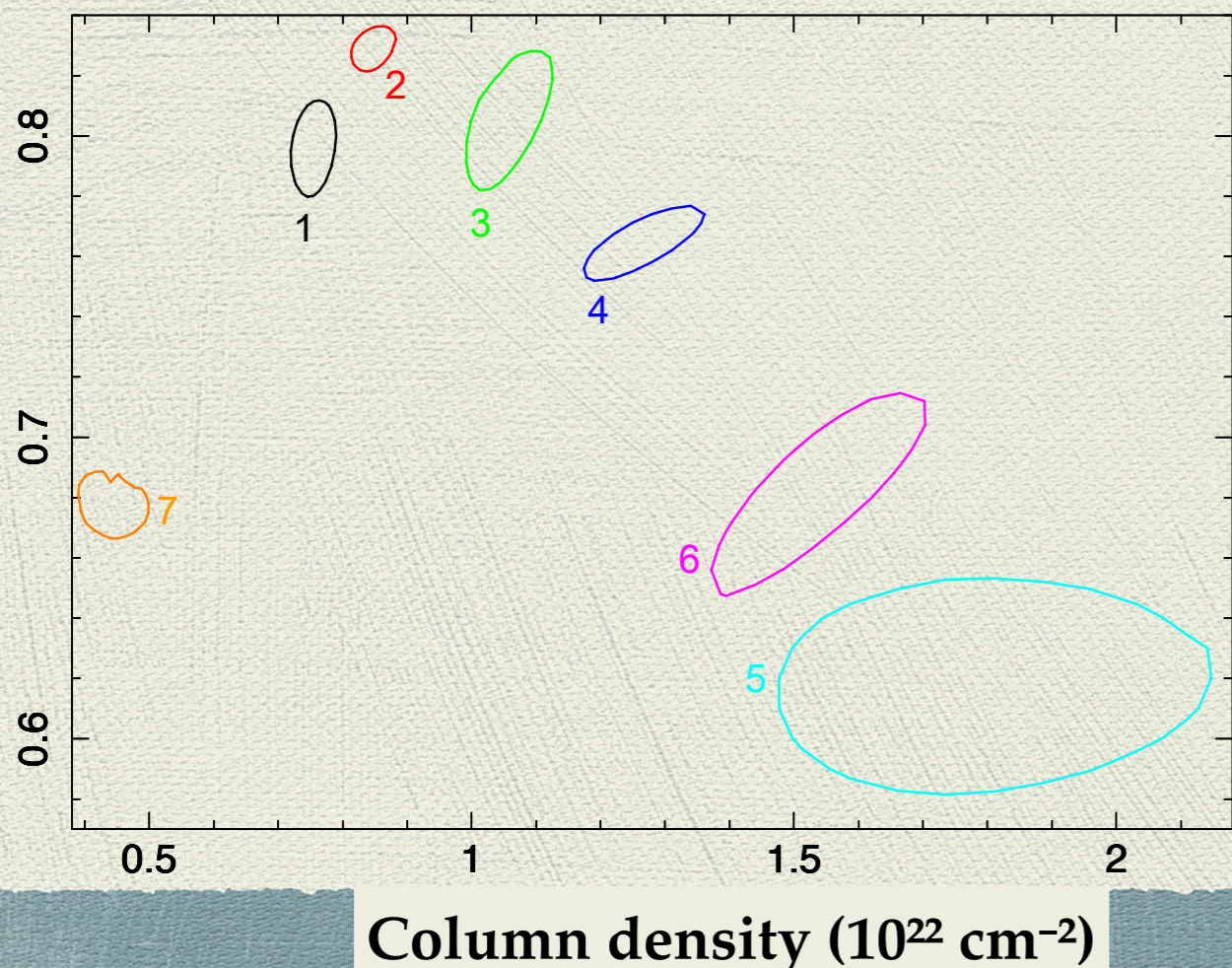
$$E_c = 70^{+40}_{-10} \text{ keV}$$

Covering fraction



(iii) Absorption  
variability

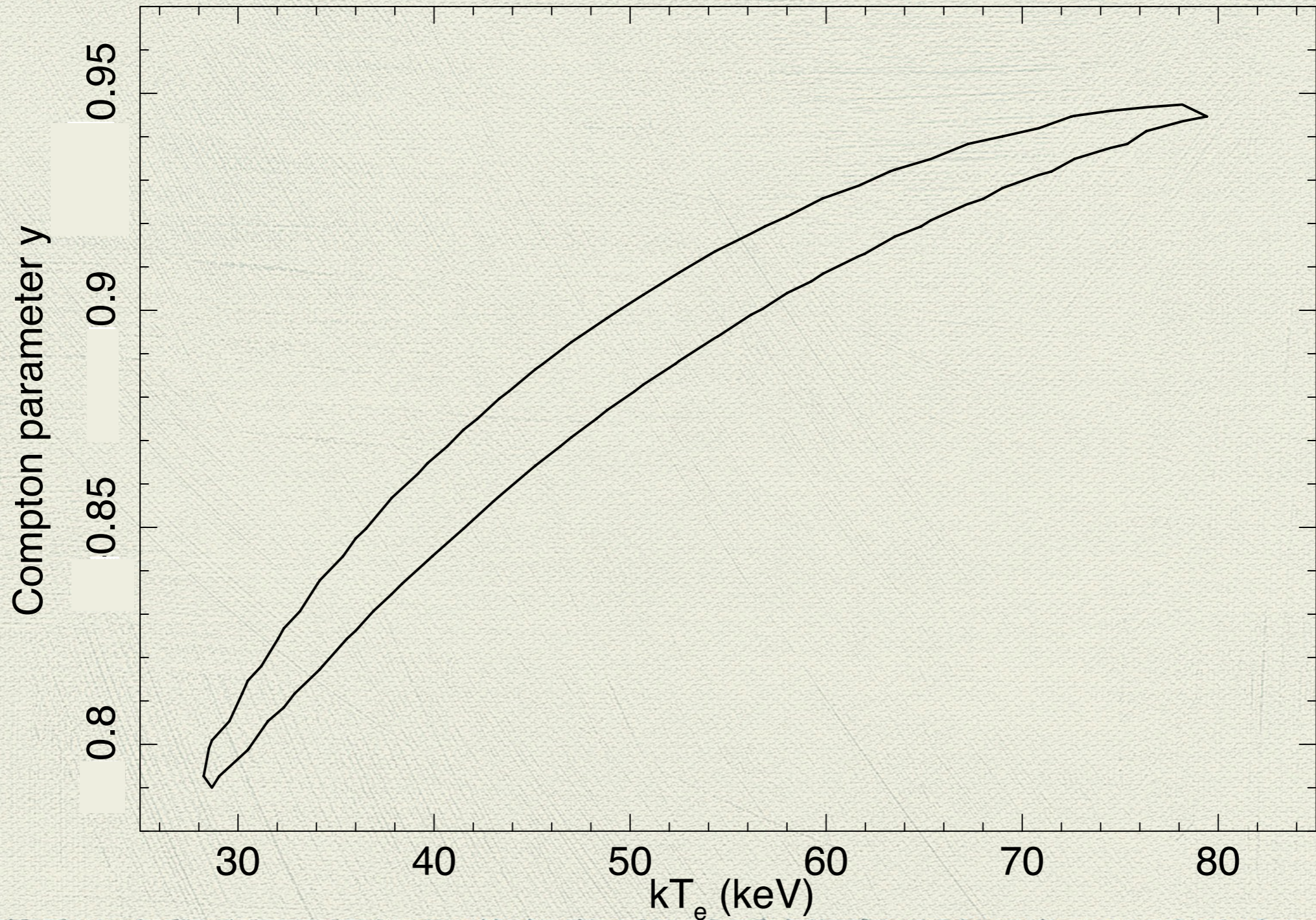
Covering fraction



(iv) Test of Comptonization model (compps) on average X-ray spectrum:

$$kT = 40^{+40}_{-10} \text{ keV}$$

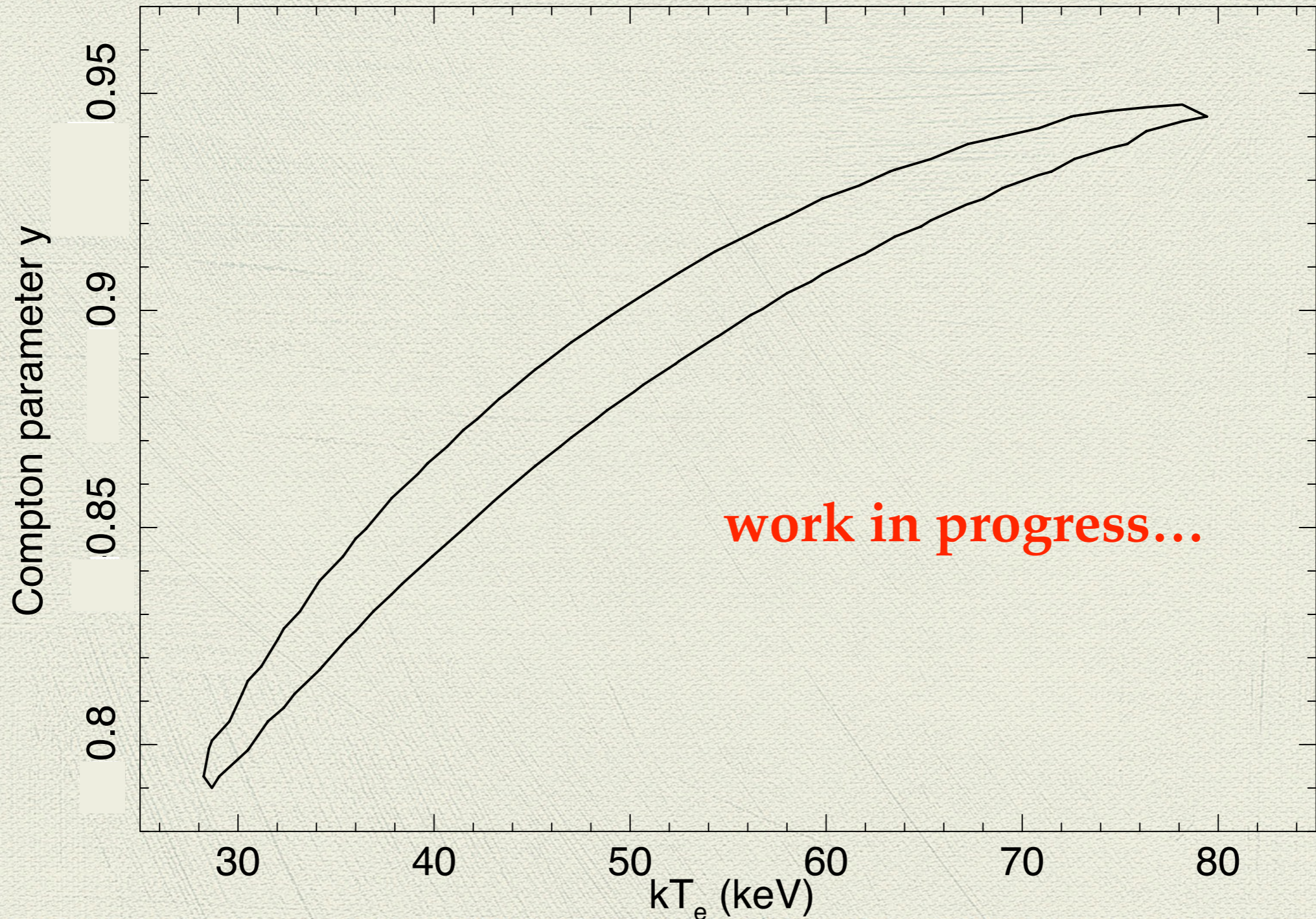
$$\tau = 2.7^{+0.7}_{-1.2}$$



(iv) Test of Comptonization model (compps) on average X-ray spectrum:

$$kT = 40^{+40}_{-10} \text{ keV}$$

$$\tau = 2.7^{+0.7}_{-1.2}$$



See Kaastra et al. (2014); some papers in preparation:

- ◆ Mehdipour et al.: global model for the broadband SED
- ◆ Mehdipour et al.: long-term variability
- ◆ Ursini et al.: the high-energy view with XMM, NuSTAR and INTEGRAL
- ◆ Cappi et al.: EPIC data analysis
- ◆ Di Gesu et al.: short-term variability
- ◆ Ursini et al.: test of Comptonization models

A nice movie by the Lead Level Artist of Assassin's Creed™:

<https://www.youtube.com/watch?v=67S-F95igvU>