

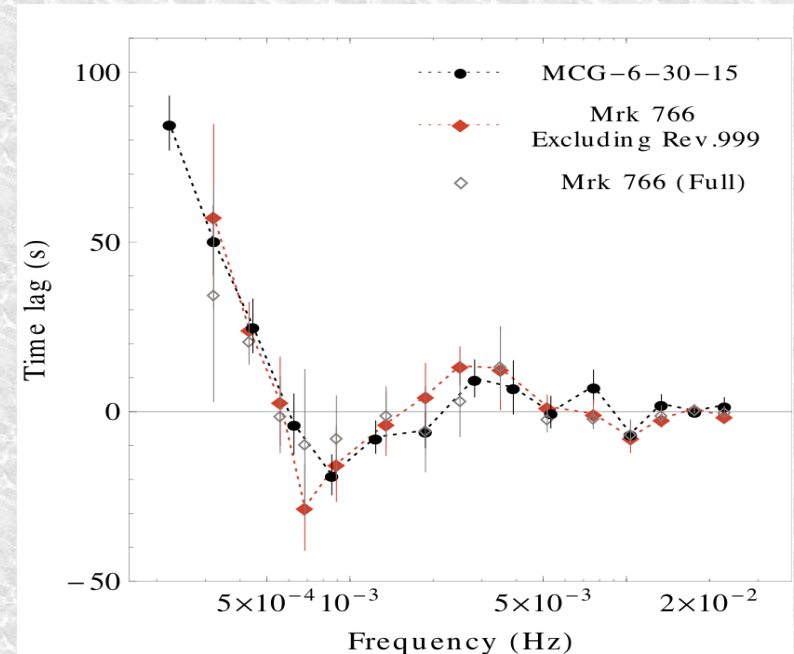
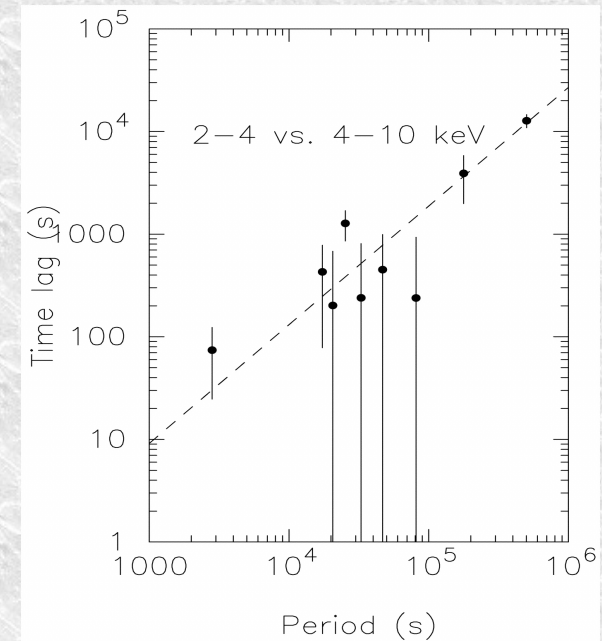
Fast variability of the iron line's  
“red wing” in NGC 4051  
(& MCG-6-3015)

I. Papadakis  
Univ. of Crete

## A) TIME LAGS

“Negative” X-ray time lags  
at frequencies  $> 10^{-3}$  Hz  
have been detected in a  
few AGN so far.

- 1) Fabian et al, 2009 (1H0707-495)
- 2) Emmanoulopoulos et al 2011  
(Mkn766, MCG-6-30-15)
- 3) de Marco et al 2011 (PG1211+143)
- 4) Zoghbi & Fabian 2011 (REJ  
1034+396)
- 5) de Marco et al 2012 (15/32)



In all cases, the results indicate a “delay” of the soft band,

i.e.  $\sim 0.3/05 \text{ keV} - 1/1.5 \text{ keV}$

with respect the “hard band” (i.e.  $1.5/2 - 4/5 \text{ keV}$ ).

The hypothesis is that the “soft excess” is due to reprocessing of X-rays illuminating the disc, and the “short” delays indicate reprocessing from the inner disc.

It is therefore interesting to examine the delay of the

line emitting energy band

with respect to the

continuum.

(Note Zoghbi et al (2012, MNRAS, 422, 129): results from the study of the “iron line vs the continuum” time lags using XMM-Newton data of NGC 4151.)

We have started such an investigation using RXTE and XMM data of **NGC 4051** and **MCG -6-30-15**

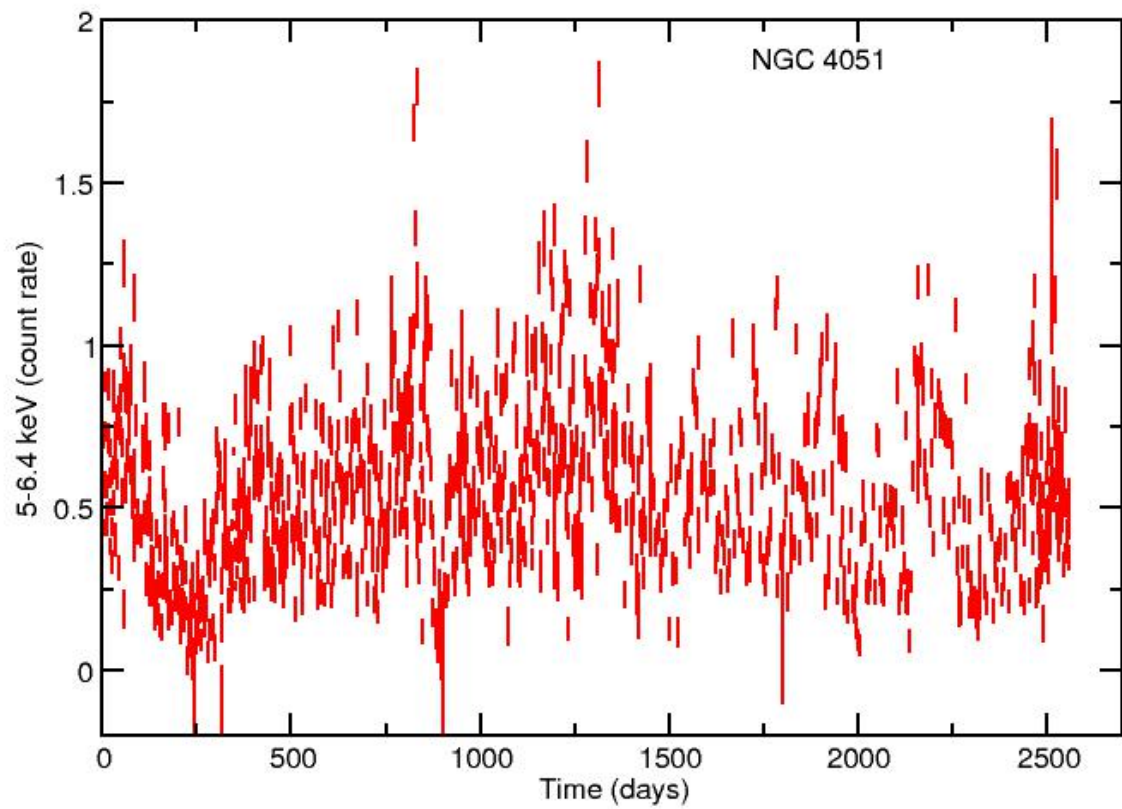
## **I. THE DATA**

**NGC 4051:**

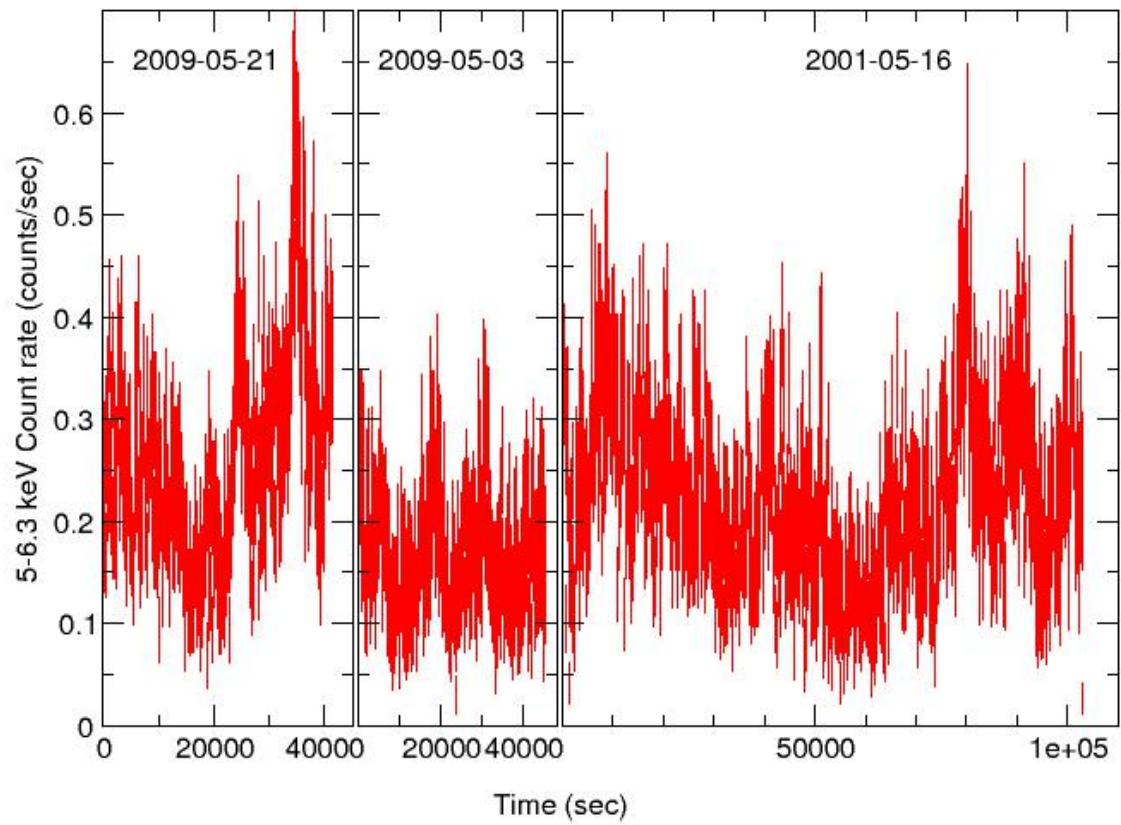
992 RXTE observations ( $T > 500$  sec) after 2000

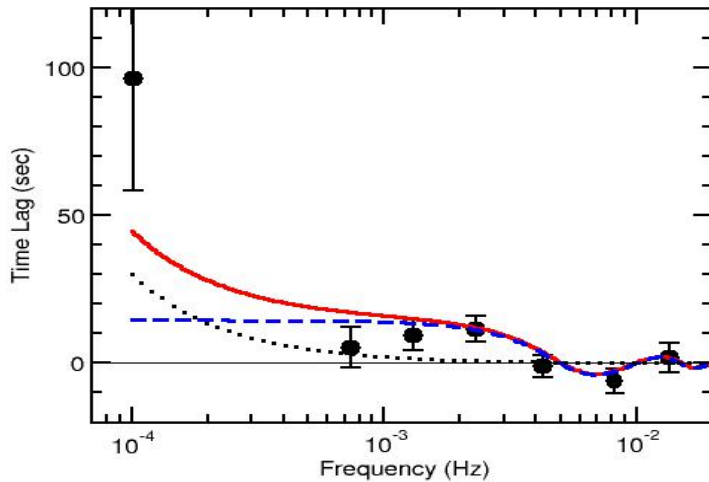
16 XMM observations (2001, and 2009,  $T > 40$  ksec)

We extracted 2-4 and 5-6.3 keV band light curves



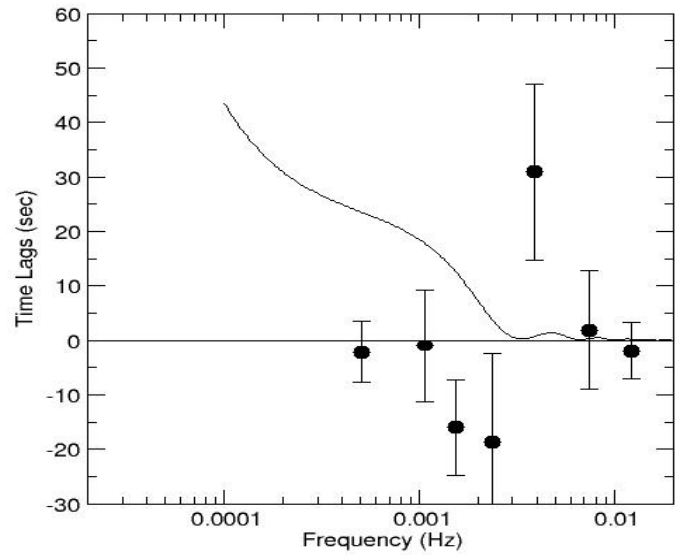






We do find evidence of “extra” positive lags between the continuum and the line flux in NGC 4051.

Assuming a simple “top hat” transfer function, our results suggest a reflector which is located  $\sim 6R_g$  away from the  $\sim 2 \times 10^6$  solar masses BH.



But not in MCG-6-30-15...



## B) THE LINE'S FLUX VARIABILITY.

