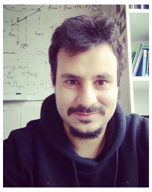

The hard X-ray stable emission in MCG–06-30-15

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Objective

X-ray spectra of Active Galactic Nuclei (AGN) are mainly characterised by two emission components: 1) a variable primary power-law (PL) component and 2) a reflection component due to the interaction of the primary emission with the accretion disc and/or distant neutral material. Many AGNs reveal a large variability driven mainly by the primary. However, the reflection component is thought to be more stable. The aim is to extract the stable component in a *model-independent* fashion by means of a variability analysis.

Method

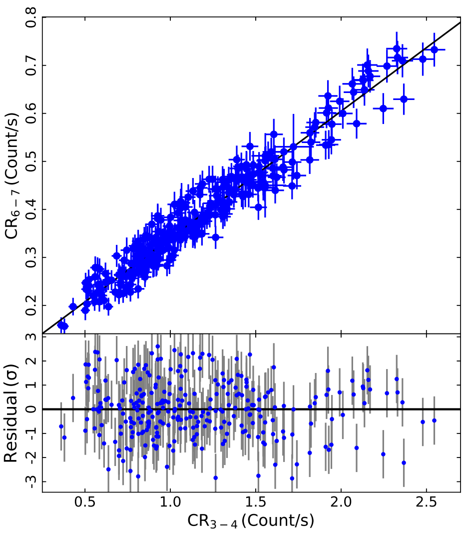
We apply the flux–flux plot (FFP) method to the 3 archival simultaneous *XMM-Newton* & *NuSTAR* observations ($\Delta t_{\rm obs} \simeq 400$ ks) of the Seyfert 1 galaxy MCG–6-30-15.

1. The 3–4 keV band was chosen as a *proxy* of the continuum power-law emission.
2. The 4–40 keV band, hereafter *high-energy band*, was divided into 10 energy sub-bands.
3. Light curves in the 11 sub-bands were binned with a time bin size $\Delta t_{\rm bin} = 1$ ks.
4. We plot the "high-energy" vs the "primary" band count rates (FFP). They are highly correlated, in all energy bands.

FFP analysis

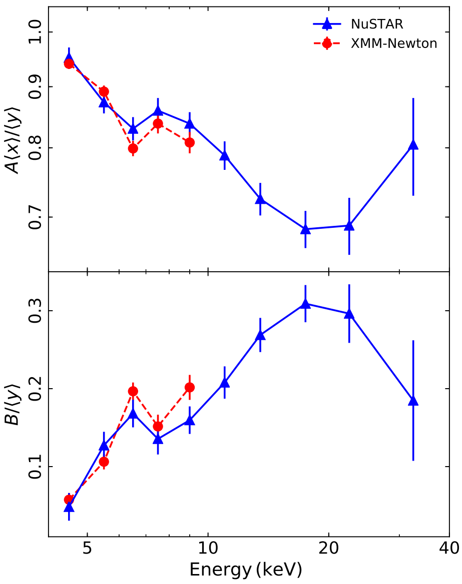
The FFPs are well-fitted with a linear relationship:

$$y = Ax + B; \quad B > 0$$



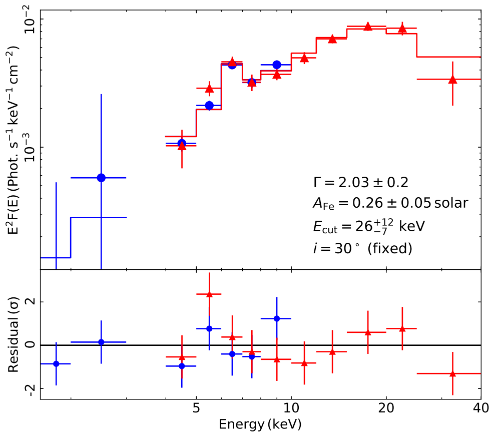
The FFPs extracted from the various observations *all* followed a linear relationship.
⇒ The variaility **cannot** be due to variations of the number and/or the covering factor of absorbing clouds in the LOS.

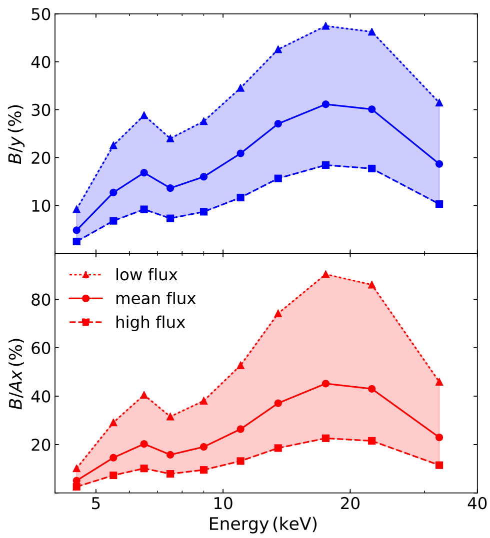
The best-fit A's and B's, from both *XMM-Newton* and *NuSTAR* were consistent.



Constant neutral reflection

The spectrum of the constant component $B(E)$ is well-fitted with a neutral reflection model PEXMON and can account for $\sim 40-50\%$ of the emission in the 15–30 keV band, at the low-flux state of the source.





The variable component

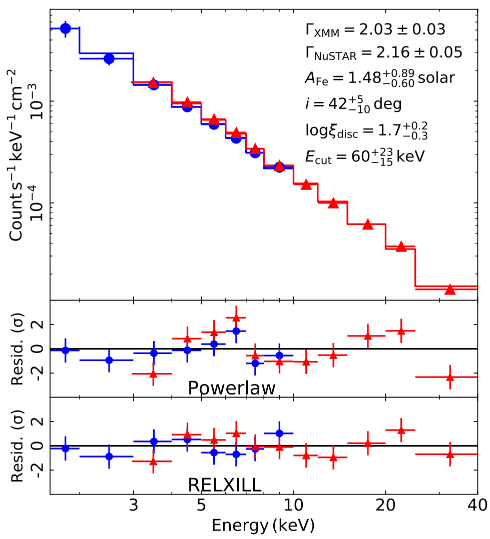
We defined the the average spectrum of the variable component as follows:

$$\langle y\rangle_{\rm var} = A\,\langle x\rangle$$

• By fitting the spectrum with only a power-law model, the fit was bad (χ^2/dof = 30/15) with systematic residuals suggesting the presence of a reflection component (i.e. Fe line in the 6–7 keV range, and an excess at ~ 20 keV).

• The fit improved statistically with a powerlaw plus ionized reflection XILLVER, but the parameters are not constrained.

• Using **relativistic reflection** model (RELXILL) we got χ^2/dof = 10.8/11, with constrains on all the parameters.



Conclusions

Our results show the presence of a stable component in the X-ray spectrum of MCG–6-30-15 that is consistent with a neutral reflection from distant material located at $D > 4.6$ light days. We could also extract the variable spectral component that is consistent with a primary power-law emission (with a constant $\Gamma \sim 2$) plus relativstic reflection varying within less than 1 ks.