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SUZAKU OBSERVATIONS OF MRK 841 AND THE PROBLEM OF THE SOFT EXCESS IN SEYFERT GALAXIES

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Abstract. We show preliminary results from the study of the first of 2 long (∼50 ks) Suzaku observations of the bright Seyfert 1 galaxy Mrk 841. This source is characterized by a strong soft excess, which has been modelled assuming two different physical interpretations: reflection onto a relativistic ionised disc and absorption by a relativistic wind. Both models give similar results from a statistical point of view, but the high energy data seems to favour an ionized disc reflection interpretation.

1 Introduction

The origin of the soft excess in Seyfert galaxies is still not understood. It has been recently realized that its characteristic temperature (when fitted by a simple black body) is remarkably constant over many range of AGN luminosity and black hole masses (Czerny et al. 2003; Gierlinski & Done 2004; Crummy et al. 2006; Ponti et al. 2006), favouring an origin through atomic processes instead of disc black body emission. Recent studies suggest two appealing explanations. The soft excess: either it is due to ionized reflection from the accretion disc or it may be the result of a strong relativistic ionized wind produced in the inner parts of the accretion disc.

Mkn 841 is a bright Seyfert 1 galaxy (z=0.0364), one of the rare Seyfert 1 detected by OSSE at more than 3 σ (Johnson et al. 1997). It is known for its large spectral variability (e.g. Nandra et al. 1995), its strong soft excess, the first ever detected in a type 1 AGN (Arnaud et al. 1985). Several XMM-Newton observations of this source confirm the presence of the soft excess and iron line complex and reveal their extreme and puzzling spectral and temporal behaviors (Petrucci et al. 2007). Different explanations have been proposed, but they could not be disentangled due to the lack of high energy observations.

2 Observations and Results

Suzaku caught Mrk 841 in similar flux states during the two observations. We show here the results of the XIS and XHD-Pin detectors for the first pointing only, the second observation yielding similar results. In all models used to fit the Suzaku data, we included a primary power law continum, a neutral iron line and reflection component from cold, distant, material.

The soft excess has been modelled assuming different physical precesses. In particular, we explored the possibility that it is due to either a relativistic ionized disc reflection (Ross & Fabian 2005; KDBLUR in Xspec) or to a relativistically smeared ionized absorption (Gierlinski & Done 2004; SWIND1 in Xspec).

Results are shown and described in Figures 1 and 2. From a statistical point of view the two models are equivalent: both scenarios provide a good fit in the 0.5-10 keV band which is where the data has a higher

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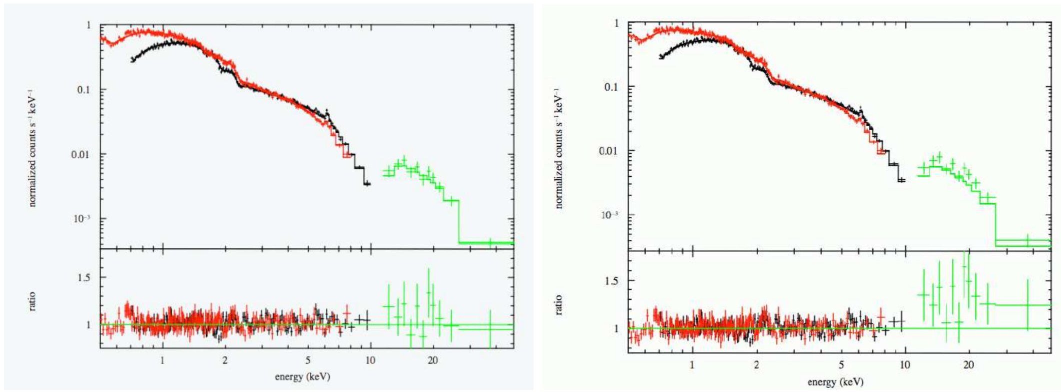

Fig. 1. Left: Suzaku mean spectrum fitted with a disc ionized reflection (Ross & Fabian 2005) convolved with a LAOR kernel (KDBLUR in Xspec) and **Right:** fitted with a relativistic ionized absorption model (Gierlinski & Done 2004) using the SWIND1 model in Xspec. The two models gives similar results from a statistical point of view. Nevertheless, the reflection model better reproduce the pin data.

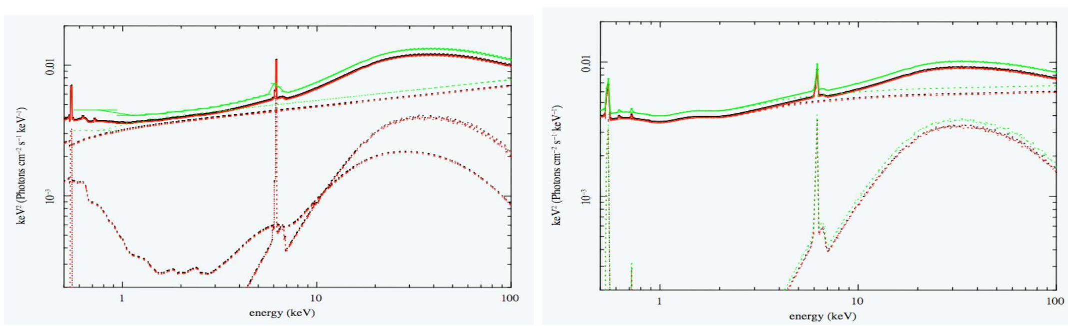

Fig. 2. Both best fit models are composed by a primary power law, a neutral iron line and its associated reflection continuum (assuming cosmic abundances). The soft excess has been modelled assuming a relativistic ionized disc reflection (left panel) or a relativistic smeared ionized absorption (right panel).

statistical weight. However, the high energy residuals in the Suzaku/PIN data seem to favour the reflection model, although no firm conclusion can be achived due to the large statistical and sistematic errors in this spectral range. The best fit parameters indicate that in both physical scenarios extreme relativistic effects must be involved. In particular in the absorption interpretation a smearing of the narrow absorption features of $\sim$0.3 c is required, while in the reflection interpretation a disc reflectivity index of $\sim$3.8 is required.

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