Evidence of a black hole in the X-ray binary system Cygnus X-3

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Fig. 2 (Left panel) Long term X-ray light curve for Cyg X-3 observed with RXTE/ASM (2-12 keV). Green lines are related to the 6 Beppo Sax ToOs analyzed which are presented here. (Right panel) Details of the same ASM lightcurve taken from 51600 MJD to 51740 MJD. The green and blue lines represent BeppoSax and RXTE observations respectively.
The model used

Wabs*Edges*(BMC+gaussians)

- Edges at ~2.2 keV, ~7.3 keV and ~9 keV
- Multiplicative high-energy cut-off needed in the hard state

The shape of BMC model

\[ F(E) = \frac{C_N}{A + 1} [BB(E) + A \times G(E, E_0) \times BB(E_0)]. \]

Assumed geometry

The source is highly variable, no good fits integrating spectra over a single OP

Spectral transition clearly observed with BeppoSAX
The main results

Clear index evolution as a function of the mass accretion rate found in Cyg X-3

Index evolution seems a peculiar behaviour of XRBs hosting a BH (see talks by Titarchuk & Farinelli)

With the scaling method developed by ST09 and using H1743-322 as reference source (13.3±3.2M⊙) we estimate for Cyg X-3

\[ M = 6.7 \pm 3.2 \, M_\odot \]