23.8 h QPO in the Swift light curve of XMMU J134736.6+173404

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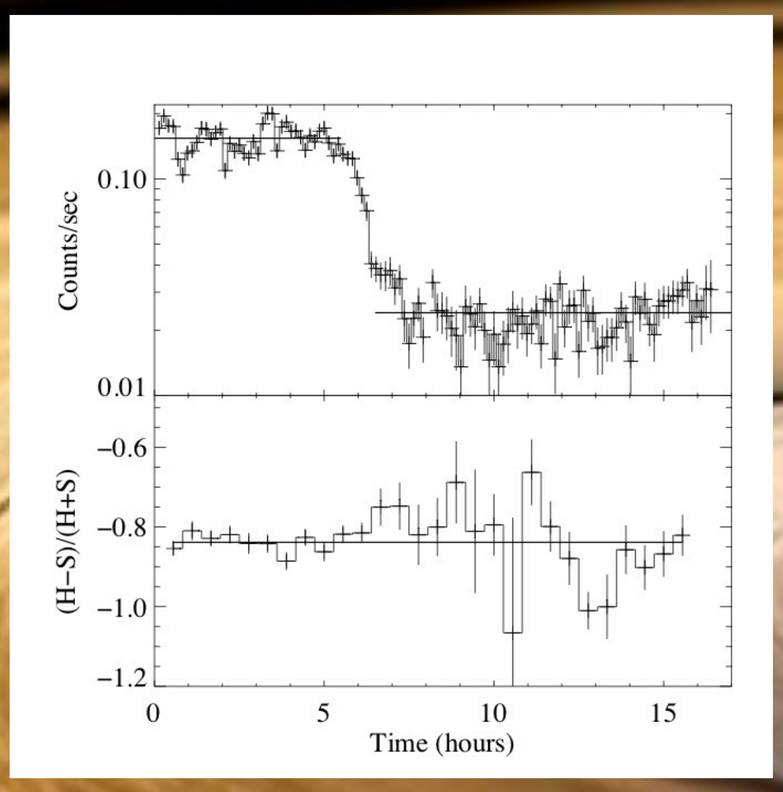
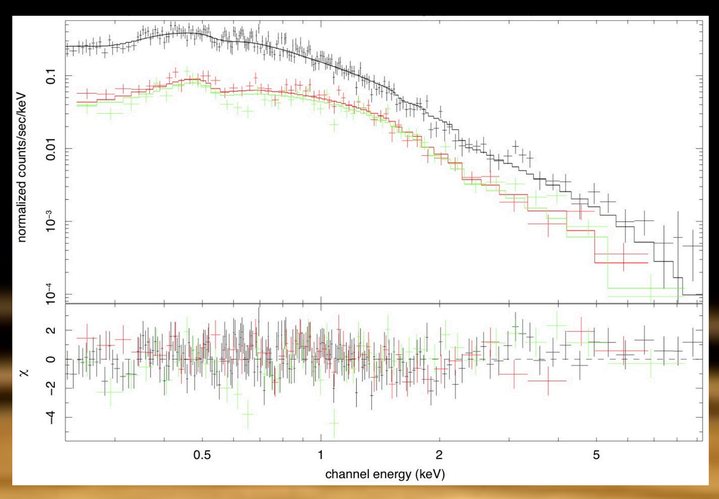
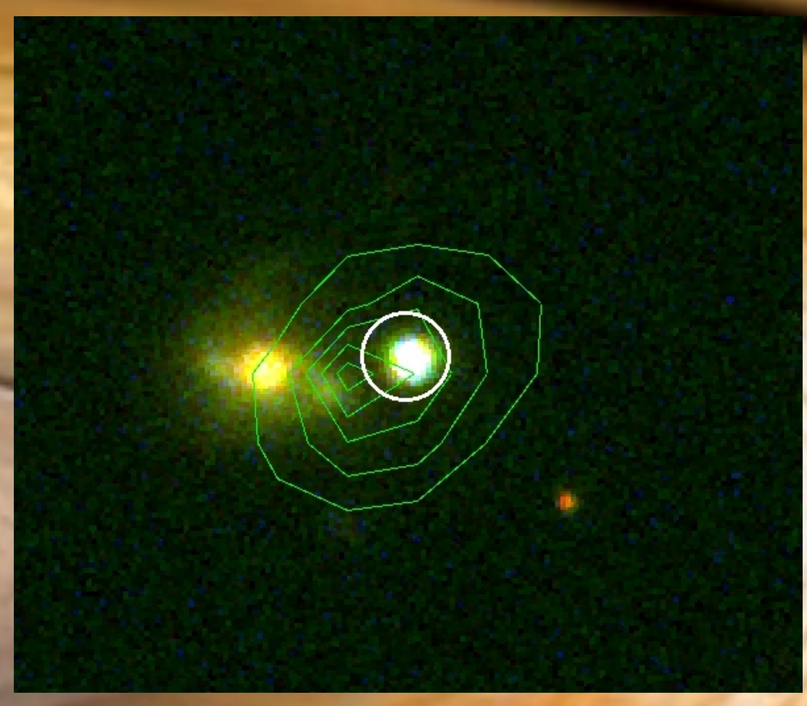
XMMU J134736.6+173404 was observed serendipitously by XMM-Newton in 2003 with a peculiar light curve: high state followed by a sharp flux drop of a factor 6.5 in 1 h. Top: EPIC MOS & pn light curve. Bottom: hardness-ratios (H=2-10 keV, S=0.2-2 keV)

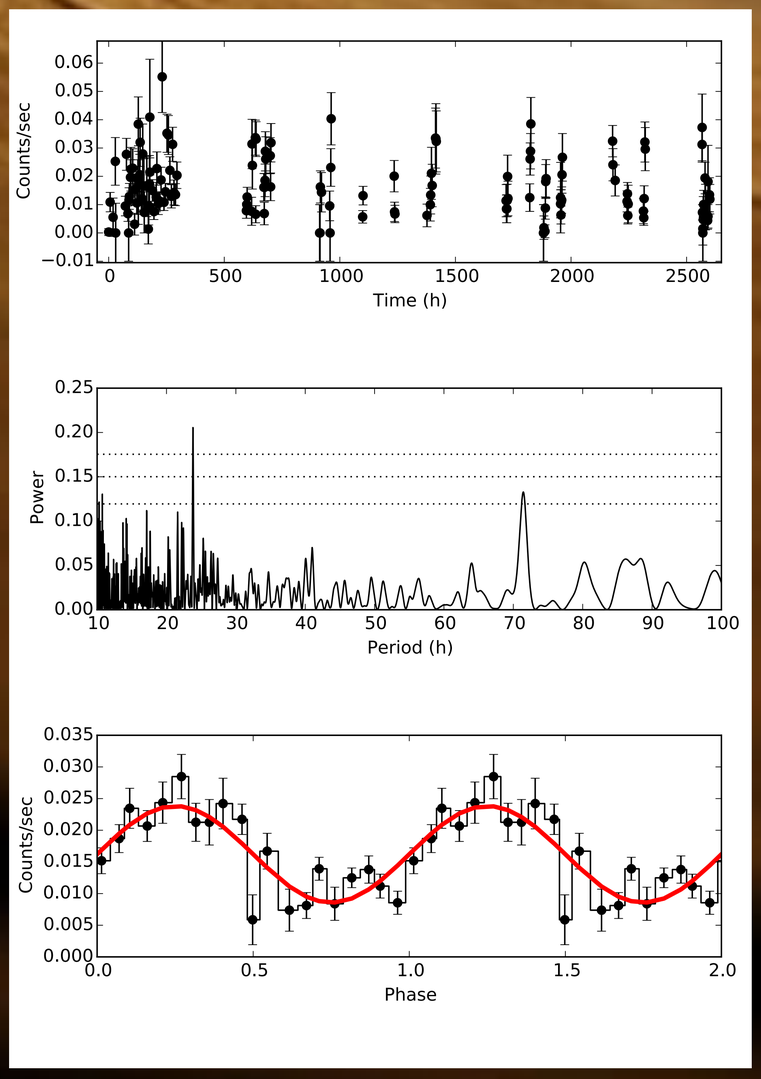


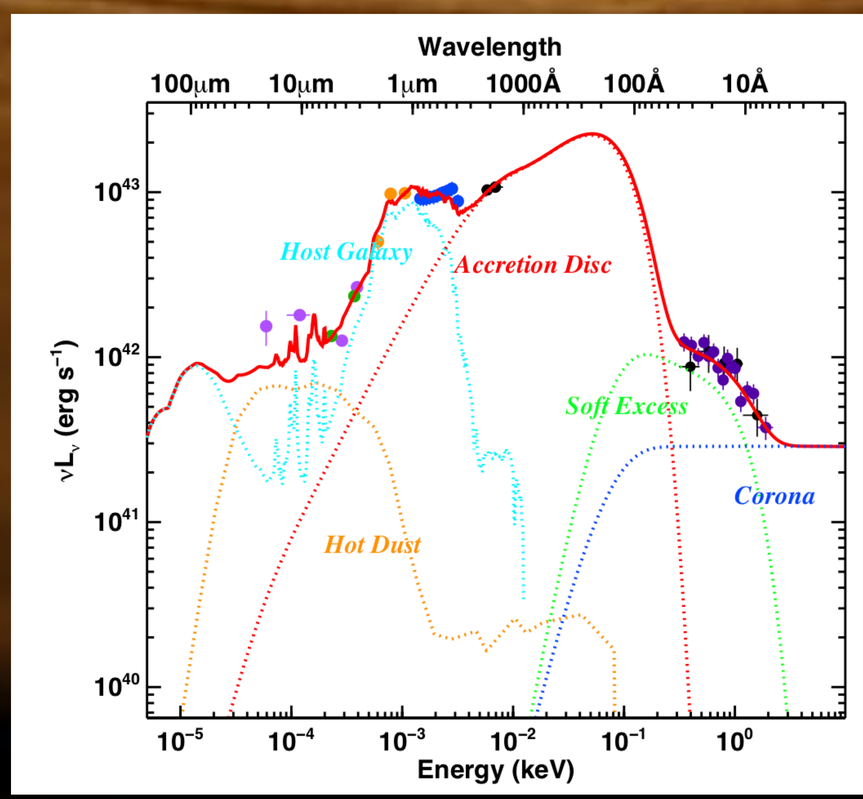


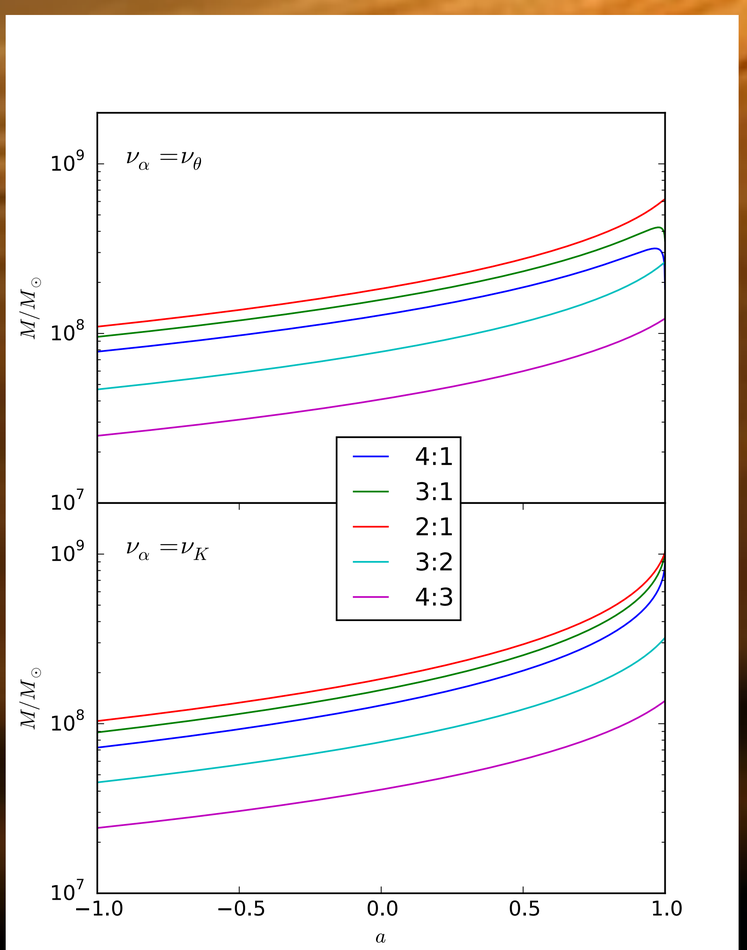
The spectrum is an absorbed power-law model , with Γ~2.7-2.8. The 2003 fluxes and luminosities in high and low states are $F_{(0.2\text{-}10\ keV)}$ = 1.33 vs 0.24 x 10^{-12} erg/s/cm^2 and $L_{(0.2\text{-}10\ keV)}$ = 6.5 vs 1.0 x 10^{42} erg/s

The optical counterpart, here SDSS images in R, G and U band, is a pair of galaxies (right a Seyfert 2 AGN) both located at z=0.045. White circle indicates the source position of a pointed Chandra observation from 2008 with radius of 3″. Green contours are from the 8′ off-axis XMM-Newton observation of 2003.









29 Swift XRT observations were performed in 2008 Feb 6 to May 28, with exposures from 800 to 8000s. Top: Swift LC, Middle: Lomb Scargle periodogram with white-noise confidence levels at 90%, 99%, 99.9%, Bottom: folded light curve
Results: discovery of twin-peak QPO @ 23.82 h & 71.44 h.

Spectral Energy Distribution: Swift XRT (black in X-ray) & UVOT (black in UV), XMM EPIC-pn (purple), SDSS (blue), 2MASS (orange), Spitzer IRAC (green), WISE (magenta)+scaling factors.
Spectral model: OPTXAGNF
BH Mass=$9.8^{+18.4}_{-3.6}$ x10^6 M$\odot$
L=$0.047^{+0.062}_{-0.039}$ L_{Edd}
R_{corona}=$9.9^{+7.2}_{-1.2}$ R_G

Linking the epicyclic frequencies (orbital/Keplerian ν_Φ/ν_K, radial ν_r and vertical ν_θ) to the observed twin-peak QPO frequencies allows to calculate black hole mass-spin relations.
Here mass-spin relations for direct and simple combinational resonances matching the observed 3:1 frequency ratio, for $\nu_\alpha=\nu_\theta$ (top) and $\nu_\alpha=\nu_K$ (bottom)

Background Image Credit: ESA/ATG medialab

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