Qeios

Peer Review

Review of: "Time-Resolved Hubble Space Telescope UV Observations of an X-Ray Quasi-Periodic Eruption Source"

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The article presents a joint observation of a QPE source in UV and X-ray and discusses the implications for the origin of the QPEs. I give a few minor comments below.

FUV image

The nuclear source is resolved. It would be better to state the contribution of diffuse emission (however small it is).

Constant UV emission

At first glance at Fig. 1, the first 2 data points of the HST first visit seem ~20% or so higher than the others. A few more words to support the constant flux claim may be helpful.

Extinction correction

Discrepancy between extinction derived from emission lines and that corresponding to the X-ray absorbing column density is often seen. The quiescent emission in UV-X-ray likely creates an inner dust-free zone. It is possible that the X-ray column density includes gas within the dust sublimation radius, in addition to the gas at outer radii with dust. This can make an extinction corresponding to X-ray absorption larger than the extinction derived from the Balmer-line emitting region at larger radii. In this case, I'd think E(B-V)=0.3, which is a direct measure for the effect of dust, is more appropriate for correction of UV luminosity.

The authors' reasoning for their preference for the larger extinction based on X-ray absorption (hence a higher gas to dust ratio) is a little confusing.

Firstly, the presence of extended ionised gas has no direct link to the gas richness of a galaxy. Secondly, the term "gas rich" does not necessarily mean that the gas to dust ratio is high. Gas-rich galaxies are usually also dusty. These points are not strong cases for a high gas-to-dust ratio.

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Nuclear star cluster as the UV source in quiescence

Since the authors have already studied the host galaxy of eRO-QPE2, I trust the argument against a nuclear star cluster for the UV source. However, I was wondering if a star cluster younger than they assumed, say with an age of a few Myr, including many W-R stars, could provide a matched luminosity without violating the mass constraint, since ref24 states that a burst of star formation is still ongoing in this galaxy. How unlikely is it?

X-ray eruption spectra

Section 2.5.2 gives a phase-resolved spectral analysis for X-ray eruptions. The blackbody temperatures of the rise and peak phases are similar to each other, but that of the decay phase is lower. No discussion of these spectral changes can be found. There must be literature discussing the subject; the reader would be interested in the physical interpretation of the spectral evolution of this particular object.

Section 3.3.1

Does the model computation here include relativistic effects? Although the effect may not be large at r>10 rg for the orbiting radius, I would guess that the time dilation could make the probability density distribution extend towards smaller radii.

Declarations

Potential competing interests: No potential competing interests to declare.