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Variability in the light curve of tidal disruption events†

Zu-Jia Lu[1,2], Da-Bin Lin[1,2], Ling-Hua Xie[1,2] and En-Wei Liang[1,2]

[1]GXU-NAOC Center for Astrophysics and Space Sciences, Department of Physics, Guangxi University, Nanning 530004, China, email: lindabin@gxu.edu.cn; lew@gxu.edu.cn

[2] Guangxi Key Laboratory for Relativistic Astrophysics, Nanning 530004, China

The X-ray light curve of Sw J1644+57 indicates this event would be due to a tidal disruption. The lightcurve shows large amplitude fluctuation. As proposed by Lyubarskii (1997), the aperiodic variability observed in the Galactic X-ray binaries and active galactic nuclei is likely from the fluctuation of the viscous parameter in their disks. We explain the significant fluctuation of the late X-ray lightcurve ($t > 10^6$ seconds) of Sw J1644+57 with this model. We assume the stochastic variations in the viscous parameter featuring as $\alpha(R,t) = \alpha_0[1+\beta(R,t)]$, where the time-scale for varying $\beta(R,t)$ is set as ten times of the dynamic time-scale for disk at the radius R (Janiuk & Misra 2012). Based on the simulation results of Lodato *et al.* (2009), we describe the fallback behavior of the tidal disruption as $\dot{M}_{\rm fb} \propto \{[(t-t_b)/t_{fb}]^{\kappa n} + [(t-t_b)/t_{fb}]^{5n/3}\}^{-1/n}$ for $t > t_b$ and $\dot{M}_{\rm fb} = 0$ for other situations, where $\kappa = 10.0$, $n = 0.5$, $t_{\rm fb} = 10^3\tau$, and $t_b = 10^2\tau$ in which $\tau = 2\pi\left(R_f^3/GM_{\rm BH}\right)^{1/2}$ and $R_f = 5r_g$ is the pericentre distance. Figure 1 compare the power-density spectra (PDS) derived from the observed and our simulated lightcurves. It is found the our simulations are well consistent with the observations.

Keywords. accretion, accretion disks - black hole physics - galaxies: nuclei - X-rays: binaries

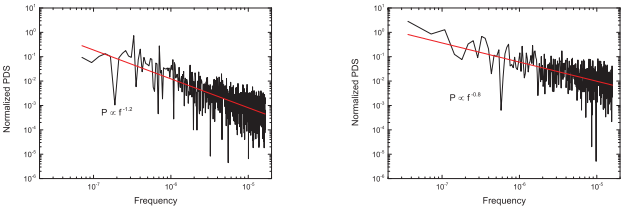

Figure 1. Comparison the power spectrum density of the observed (*left*) and our simulated lightcurves (*right*).

References

Janiuk, A., & Misra, R., 2012, *A&A*, 540, A114
Lyubarskii, Y. E., 1997, *MNRAS*, 292, 679
Lodato, G., King, A. R., Pringle, J. E., 2009, *MNRAS*, 332, 340

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