Smeared Iron Lines in Centaurus X-3

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Abstract

Iron K lines observed in the X-ray spectrum of Cen X-3 are considered to be fluorescent lines in the circum-stellar matter. The plausible candidate of this reprocessing matter is the dense plasma in the Alfven shell. This interpretation is strongly suggested by the delayed iron lines, which is recently discovered by Kohmura and Kitamoto (2001). They derived the distance of $(1.7\pm0.5)\times10^8$ cm to the reprecessing matter from the x-ray emitting region. Also they suggested that the reprocessing matter was distributed from the neutron star to the Alfven shell along the magnetic field.

In this interpretation, one can predict a smearing of the iron lines; the temporal variation of the iron line must be smeared by the geometrical effect. Since the distance of the reprocessing matter is $(1.7\pm0.5)\times10^8$ cm and if the matter spherically covers the x-ray emitting region, higher frequency variations must be smeared out.

Thus we investigated the power spectral density of the Cen X-3 data observed with *RXTE*. The power spectral density derived from the energy band in 5.8-7.2 keV shows a hint of small high frequency component compared with the other energy bands.

Since the iron line component in this energy band is only $\sim$9% and the other x-rays are not reprocessed ones, we investigated the amount of the smearing effect by simulation. We assume that the reprocessor covers the x-ray emitting region spherically. Then the mean delay time is simply derived by r/c, where r is the distance and c is the light velocity. The distribution of the delayed components also expressed by a simple rectangular shape with a width of $2r/c$. Using this simple relation and assumption of the fraction of the reprocessed component, we calculate simulated light-curves from the real data in the energy range above 7.1 keV and study the power spectral densities. The results and the discussion will be presented.

CATEGORY: BLACK HOLE AND NEUTRON STAR BINARIES