SPECTRAL EVOLUTION DURING DIPPING OF THE LOW MASS X-RAY BINARY XBT 0748-676

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1. Introduction

XBT 0748-676 is a dipping LMXB source, with dips in X-ray intensity occurring at the orbital period of $\sim$ 3.8 hrs. It is a member of the sub-group of dipping sources also including XB 1916-053 and XB 1254-690 in which the spectral evolution in dipping has previously been modelled by the "absorbed plus unabsorbed" approach, in which the dip spectra are modelled by two terms, each having the same form as used for non-dip emission, one of which is strongly absorbed but one which is not absorbed, which has a normalisation decreasing strongly in dipping. This energy-independent decrease has sometimes been taken to imply electron scattering in the absorber.

Previously we have proposed a physical model for the LMXB dipping sources (Church & Balucińska-Church, 1995) consisting of two components: point-source blackbody emission from the neutron star, plus extended Comptonised emission from the accretion disk corona. This model has been shown to fit well all of the dipping sources to which it has so far been applied (X 1755-338, X 1624-490 and XB 1916-053 (see Church et al. 1997a). In the case of XB 1916-053, dipping often reaches a depth of 100% showing that the extended Comptonising emission region is totally covered by the absorbing region, and in spectral modelling we allowed progressive covering of this term. XBT 0748-676 is similar in that dipping also often reached 100%. In the present work we show that the two-component model with progressive covering of the extended emission also gives a very good explanation of dipping in XBT 0748-676.

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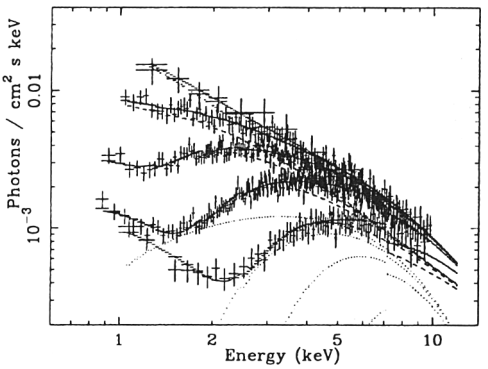

Figure 1. Fits to non-dip and dip data: solid lines - total model, dots - blackbody, dashes - power law.

2. Results

XBT 0748-676 was observed with ASCA on 1993, May 7th for 23 hours. Dipping reached a depth of 100% in the band 1 - 3 keV, and a depth of 80% in the band 3 - 10 keV. Spectral fitting results for GIS2 + GIS3 data are shown in Fig. 1 consisting of simultaneous fitting to non-dip data and 4 levels of dipping selected in intensity bands. The good fits shown were obtained with the 2-component model with $kT_{bb} = 1.99 \pm 0.16$ keV and photon index $\Gamma = 1.70 \pm 0.16$. As dipping develops, the partial covering fraction of the Comptonised emission increases from 0 to $\sim$1, N_H rising to $\sim 1.2 \cdot 10^{23}$ H atom cm^{-2}, while the blackbody N_H rises to $8 \cdot 10^{23}$ H atom cm^{-2}.

3. Conclusions

As we found previously in the case of XB 1916-053, dipping can be explained in XBT 0748-676 using our 2-component model in which the unabsorbed peak in dip spectra is the uncovered extended Comptonised emission. Dipping is due to photoelectric absorption alone without needing electron scattering in the absorber to play an important role in the band 1 - 10 keV. Detailed discussion can be found in Church et al. (1997b)

References

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Church M. J., Bałucińska-Church M., Dotani T. and Asai K., 1997b, ApJ *Submitted*

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