X-ray Study of Mass-Accretion Flows onto Weakly-Magnetized Neutron Stars

H. Takahashi and K. Makishima

University of Tokyo, Japan, (hirotaka@amalthea.phys.s.u-tokyo.ac.jp)

To investigate the physics of mass accretion onto weakly-magnetized neutron stars, which are often called low-mass X-ray binaries (LMXBs), we analyzed energy spectra of 18 LMXBs observed by the RXTE satellite. While the X-ray luminosity is sufficiently lower than the Eddington limit (2.1×10^{38} erg/s) for a 1.4 $M_{\odot}$ NS, the energy spectra of the sample objects were represented successfully with a combination of a soft multi-color disk (MCD) model and a hard blackbody (BB) emission, of which the temperatures are $\sim$ 1.5 and $\sim$ 2.5 keV, respectively. The former component represents emission from the optically-thick accretion disk, and the latter from the central neutron star. This result confirms the validity of "Eastern" model proposed by Mitsuda et al. (1984). As the accretion rate increases, we observed a continuous decrease in the ratio of the BB luminosity to that of the MCD component. When the mass accretion rate (hence the luminosity) becomes comparable to or even higher than the Eddington limit, we discovered the LMXB spectra to consist of three components; in the increasing order of temperature, they are the MCD component of which the temperature is now decreasing to $\sim$ 0.7 keV, a newly-discovered 1.5 keV BB emission, and the original 2.5 keV BB. We discuss the results considering outflows caused by the increased radiation pressure.