Luminosity function of X-ray binaries in nearby galaxies

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Abstract

Chandra observations allow us to obtain reliable luminosity function of X-ray binaries in the nearby galaxies. We derive an analytical expression for luminosity function of the X-ray binaries in normal galaxies and examine the processes that give rise to the features in the Log N(>S) – Log S plots. The parameters in the model are the birth rate and the characteristic lifespan of the binaries. The model successfully produces the features in the observed Log N(>S) – Log S plots in various nearby galaxies and in different galactic components of the spiral M81. By means of the model we assess the possibility of using the luminosity break in the Log N(>S) – Log S plot as a distance indicator of the host galaxies as proposed by Sarazin et al. (2001), and as a probe to the previous epochs of star formation as discussed in Wu et al. (2001). The model also predicts the presence of a population of faint, primordial X-ray binaries, which may be detectable in galaxies with low star-formation activities, such as dwarf spheroids.

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