Luminous X-ray Source Populations in M51

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Abstract

We present results of *Chandra* observations of the nearby (8.4 Mpc) spiral galaxy M51 (NGC 5194). M51 is of significant interest for its abundant luminous ($> 10^{39}$ ergs s^{-1}) source populations detected in *ROSAT* images as well as a low-luminosity Seyfert 2 nucleus and outflows from it. *Chandra* observations were performed for 15 ksec in 2000 June and 25 ksec in 2001 June. In the observation in 2000, we detected some 30 discrete sources in M51 in addition to a bright nuclear region and diffuse emission distributed over the galaxy. The luminosities of 20 objects exceed 10^{38} ergs s^{-1}. Five sources among them have luminosities greater than 10^{39} ergs s^{-1}. If we assume a spectral shape of a power law absorbed by the Galactic column, hardness ratios of most objects are consistent with photon indices between 1 and 2 which suggest these objects are black hole binaries or luminous super novae. Two sources have very soft spectra (photon index > 3) and are possibly black holes in the soft state or hot gas heated by collective supernovae. We discuss more detailed spectral results, variability, and luminosity function using the two observations in 2000 and 2001.

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