The NuSTAR Hard X-Ray Survey of the Norma Arm Region - DTU Orbit (27/03/2019)

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We present a catalog of hard X-ray sources in a square-degree region surveyed by the Nuclear Spectroscopic Telescope Array (NuSTAR) in the direction of the Norma spiral arm. This survey has a total exposure time of 1.7 Ms, and the typical and maximum exposure depths are 50 ks and 1 Ms, respectively. In the area of deepest coverage, sensitivity limits of $5 \times 10^{-14}$ and $4 \times 10^{-14}$ erg s$^{-1}$ cm$^{-2}$ in the 3–10 and 10–20 keV bands, respectively, are reached. Twenty-eight sources are firmly detected, and 10 are detected with low significance; 8 of the 38 sources are expected to be active galactic nuclei. The three brightest sources were previously identified as a low-mass X-ray binary, high-mass X-ray binary, and pulsar wind nebula. Based on their X-ray properties and multiwavelength counterparts, we identify the likely nature of the other sources as two colliding wind binaries, three pulsar wind nebulae, a black hole binary, and a plurality of cataclysmic variables (CVs). The CV candidates in the Norma region have plasma temperatures of $\approx 10$–$20$ keV, consistent with the Galactic ridge X-ray emission spectrum but lower than the temperatures of CVs near the Galactic center. This temperature difference may indicate that the Norma region has a lower fraction of intermediate polars relative to other types of CVs compared to the Galactic center. The NuSTAR logN–logS distribution in the 10–20 keV band is consistent with the distribution measured by Chandra at 2–10 keV if the average source spectrum is assumed to be a thermal model with $kT$ $\approx 15$ keV, as observed for the CV candidates.

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