Hard X-ray luminosity function of Cataclysmic Variables in Gaia era

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Cataclysmic variables (CVs) are the most numerous sources of hard X-ray radiation in the Milky Way and believed to be responsible for unresolved hard X-ray emission of the Galactic ridge and the central Galactic regions. Quantitative verification of this hypothesis requires, however, robust observational constraints for the observed hard X-ray luminosity function for CVs. Here we report the most stringent constraints of such kind using X-ray information for all CVs detected in the 105-month BAT Catalogue and distance information for a sub-sample of 79 sources based on Gaia EDR3 parallaxes. We derive that the local number density of hard X-ray emitting CVs per solar mass is $1.37^{+0.3}_{-0.16} \times 10^{-5}$ and the corresponding luminosity density per solar mass is $8.95^{+0.15}_{-0.1} \times 10^{26}\,\mathrm{erg\,s^{-1}}\,M_\odot$. The integrated Galactic ridge X-ray emission and nuclear stellar cluster luminosities computed using these values coincide with the observed values in good accuracy. Furthermore, analysis of the differential luminosity functions demonstrates that there are two populations of hard X-ray-emitting CVs. Intermediate polars dominate at luminosities $L > 10^{33}\,\mathrm{erg\,s^{-1}}$, whereas non-magnetic CVs and polars are significant at lower luminosities. Considering the higher abundance of low luminosity systems we find, however, that total contribution of the intermediate polars and other CV types to the observed hard X-ray luminosity is almost equal.