

Global X-ray properties of the O and B stars in Carina

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The key empirical property of the X-ray emission from O stars is a strong correlation between the bolometric and X-ray luminosities. In the framework of the Chandra Carina Complex Project, 129 O and B stars have been detected as X-ray sources; 78 of those, all with spectral type earlier than B3, have enough counts for at least a rough X-ray spectral characterization. This leads to an estimate of the L_x/L_{bol} ratio for an exceptional number of 60 O stars belonging to the same region and triples the number of Carina massive stars studied spectroscopically in X-rays. The derived $\log(L_x/L_{bol})$ is -7.26 for single objects, with a dispersion of only 0.21 dex. Using the properties of hot massive stars listed in the literature, we compare the X-ray luminosities of different types of objects. In the case of O stars, the L_x/L_{bol} ratios are similar for bright and faint objects, as well as for stars of different luminosity classes or spectral types. Binaries appear only slightly harder and slightly more luminous in X-rays than single objects; the differences are not formally significant (at the 1% level), except for the L_x/L_{bol} ratio in the medium (1.0--2.5 keV) energy band. Weak-wind objects have similar X-ray luminosities but they display slightly softer spectra compared to "normal" O stars with the same bolometric luminosity. Discarding three overluminous objects, we find a very shallow trend of harder emission in brighter objects. The properties of the few B stars bright enough to yield some spectral information appear to be different overall (constant X-ray luminosities, harder spectra), hinting that another mechanism for producing X-rays, besides wind shocks, might be at work. However, it must be stressed that the earliest and X-ray brightest amongst these few detected objects are similar to the latest O stars, suggesting a possibly smooth transition between the two processes.

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