

The X-ray catalog of spectroscopically identified Galactic O stars: Investigating the dependence of X-ray luminosity on stellar and wind parameters

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Abstract

© ESO 2018. The X-ray emission of O-Type stars was first discovered in the early days of the Einstein satellite. Since then many different surveys have confirmed that the ratio of X-ray to bolometric luminosity in O-Type stars is roughly constant, but there is a paucity of studies that account for detailed information on spectral and wind properties of O-stars. Recently a significant sample of O stars within our Galaxy was spectroscopically identified and presented in the Galactic O-Star Spectroscopic Survey (GOSS). At the same time, a large high-fidelity catalog of X-ray sources detected by the XMM-Newton X-ray telescope was released. Here we present the X-ray catalog of O stars with known spectral types and investigate the dependence of their X-ray properties on spectral type as well as stellar and wind parameters. We find that, among the GOSS sample, 127 O-stars have a unique XMM-Newton source counterpart and a Gaia data release 2 (DR2) association. Terminal velocities are known for a subsample of 35 of these stars. We confirm that the X-ray luminosities of dwarf and giant O stars correlate with their bolometric luminosity. For the subsample of O stars with measure terminal velocities we find that the X-ray luminosities of dwarf and giant O stars also correlate with wind parameters. However, we find that these correlations break down for supergiant stars. Moreover, we show that supergiant stars are systematically harder in X-rays compared to giant and dwarf O-Type stars. We find that the X-ray luminosity depends on spectral type, but seems to be independent of whether the stars are single or in a binary system. Finally, we show that the distribution of $\log(LX/Lbol)$ in our sample stars is non-Gaussian, with the peak of the distribution at $\log(LX/Lbol) \approx -6.6$.

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Keywords

Stars: massive, X-rays: stars

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