

X-Ray Spectroscopy of Stars

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Non-degenerate stars of essentially all spectral classes are soft X-ray sources. Their X-ray spectra have been important in constraining physical processes that heat plasma in stellar environments to temperatures exceeding one million degree. Low-mass stars on the cooler part of the main sequence and their pre-main sequence predecessors define the dominant stellar population in the galaxy by number. Their X-ray spectra are reminiscent, in the broadest sense, of X-ray spectra from the solar corona. The Sun itself as a typical example of a main-sequence cool star has been a pivotal testbed for physical models to be applied to cool stars. X-ray emission from cool stars is indeed ascribed to magnetically trapped hot gas analogous to the solar coronal plasma, although plasma parameters such as temperature, density, and element abundances vary widely. Coronal structure, its thermal stratification and geometric extent can also be interpreted based on various spectral diagnostics. New features have been identified in pre-main sequence stars; some of these may be related to accretion shocks on the stellar surface, fluorescence on circumstellar disks due to X-ray irradiation, or shock heating in stellar outflows. Massive, hot stars clearly dominate the interaction with the galactic interstellar medium: they are the main sources of ionizing radiation, mechanical energy and chemical enrichment in galaxies. High-energy emission permits to probe some of the most important processes at work in these stars, and put constraints on their most peculiar feature: the stellar wind. Medium and high-resolution spectroscopy have shed new light on these objects as well. Here, we review recent advances in our understanding of cool and hot stars through the study of X-ray spectra, in particular high-resolution spectra now available from XMM and Chandra. We address issues related to coronal structure, flares, the composition of coronal plasma, X-ray production in accretion streams and outflows, X-rays from single OB-type stars, massive binaries, magnetic hot objects and evolved WR stars.

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