

Measuring the shock-heating rate in the winds of O stars using X-ray line spectra

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We present a new method for measuring the shock-heating rate in O star winds directly from wind-absorption-corrected X-ray emission line luminosities. This analysis method, applied to an ensemble of lines each with different temperature sensitivity, naturally generates a cumulative probability distribution of the wind shock-heating rate. We apply this new technique to the analysis of the Chandra grating spectra of five O stars and find similar results for all the sample stars: (1) roughly a tenth of the wind mass passes through a shock of 2 million K or more; (2) the distribution of shock temperatures is a strongly declining function, consistent with a power-law of index $n = -3$; and (3) there are indications of a cut-off or faster fall-off in the heating rate for shock temperatures above about 10 million K. These results provide direct constraints for hydrodynamic simulations of X-ray production in O star winds.

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Comments:

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