Modeling broadband X-ray absorption of massive star winds

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We present a method for computing the net transmission of X-rays emitted by shock-heated plasma distributed throughout a partially optically thick stellar wind from a massive star. We find the transmission by an exact integration of the formal solution, assuming the emitting plasma and absorbing plasma are mixed at a constant mass ratio above some minimum radius, below which there is assumed to be no emission. This model is more realistic than either the slab absorption associated with a corona at the base of the wind or the exospheric approximation that assumes all observed X-rays are emitted without attenuation from above the radius of optical depth unity. Our model is implemented in XSPEC as a pre-calculated table that can be coupled to a user-defined table of the wavelength dependent wind opacity. We provide a default wind opacity model that is more representative of real wind opacities than the commonly used neutral ISM tabulation. Preliminary modeling of textit{Chandra} grating data indicates that the X-ray hardness trend of OB stars with spectral subtype can largely be understood as a wind absorption effect.

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