The interactions of winds from massive young stellar objects: X-ray emission, dynamics, and cavity evolution

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2D axis-symmetric hydrodynamical simulations are presented which explore the interaction of stellar and disk winds with surrounding infalling cloud material. The star, and its accompanying disk, blow winds inside a cavity cleared out by an earlier jet. The collision of the winds with their surroundings generates shock heated plasma which reaches temperatures up to ~10^8 K. Attenuated X-ray spectra are calculated from solving the equation of radiative transfer along lines-of-sight. This process is repeated at various epochs throughout the simulations to examine the evolution of the intrinsic and attenuated flux. We find that the dynamic nature of the wind-cavity interaction fuels intrinsic variability in the observed emission on timescales of several hundred years. This is principally due to variations in the position of the reverse shock which is influenced by changes in the shape of the cavity wall. The collision of the winds with the cavity wall can cause clumps of cloud material to be stripped away. Mixing of these clumps into the winds mass-loads the flow and enhances the X-ray emission measure. The position and shape of the reverse shock plays a key role in determining the strength and hardness of the X-ray emission. In some models the reverse shock is oblique to much of the stellar and disk outflows, whereas in others it is closely normal over a wide range of polar angles. For reasonable stellar and disk wind parameters the integrated count rate and spatial extent of the intensity peak for X-ray emission agree with textit{Chandra} observations of the deeply embedded MYSOs S106 IRS4, Mon R2 IRS3 A, and AFGL 2591.(abridged)

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