

Chandra X-ray Observations of the Young Stellar Cluster NGC 6193 in the Ara OB1 Association

S.L. Skinner (1), S.A. Zhekov(2,3), F. Palla(4) and C.L.D.R. Barbosa(5)

(1) CASA, 389 UCB, Univ. of Colorado, Boulder, CO 80309-0389 USA

(2) JILA, 440 UCB, Univ. of Colorado, Boulder, CO 80309-0389 USA

(3) On leave from Space Research Inst., Moskovska str. 6, Sofia-1000, Bulgaria

(4) INAF-Osservatorio Astrofisico di Arcetri, Largo E. Fermi 5, 50125 Firenze, Italy

(5) Instituto de Astronomia, Geofisica e Ciencias Atmosfericas, Universidade de Sao Paulo, Rua do Matao 1226, 05508-900 Sao Paulo, SP, Brazil

A 90 ksec Chandra HETG observation of the young stellar cluster NGC 6193 in the southern Ara OB1 association detected 43 X-ray sources in a $2'' \times 2''$ core region centered on the massive O stars HD 150135 (O6.5V) and HD 150136 (O3+O6V). The cluster is dominated by exceptionally bright X-ray emission from the two O stars, which are separated by only $10''$. The X-ray luminosity of HD 150136 is $\log L_{\text{X}} = 33.39$ (ergs s⁻¹), making it one of the most luminous O-star X-ray sources known. All of the fainter X-ray sources in the core region have near-IR counterparts, but existing JHK photometry provides little evidence for near-IR excesses. These core sources have typical mean photon energies $\langle E \rangle \approx 2$ keV and about one-third are variable. It is likely that some are young low-mass stars in the cluster, but cluster membership remains to be determined. Grating spectra show that the X-ray properties of HD 150135 and HD 150136 are similar, but not identical. Both have moderately broadened unshifted emission lines and their emission is dominated by cool plasma at $kT \approx 0.3$ keV, pointing to a wind-shock origin. However, the emission of HD 150136 is slightly hotter and four times more luminous than its optical twin HD 150135. We discuss the possibility that a radiative colliding wind shock contributes to the prodigious X-ray output of the short-period (2.66 d) spectroscopic binary HD 150136. A surprising result is that the X-ray emission of HD 150136 is slowly variable on a timescale of < 1 day. The origin of the variability is not yet known but the observed behavior suggests that it is an occultation effect.

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Comments:

Email: skinnners@casa.colorado.edu