The Local Interstellar Medium in Puppis-Vela
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abstract The first study of the local interstellar medium (LISM) toward Puppis-Vela ($l = 245$ to 275, $b = -15$ to $+5$, $d < 200$ pc) is presented in this paper. A study of the locations, sizes, and physical characteristics of local interstellar gas, i.e. “astrophography,” is included, and relies upon the improved distance measurements provided by Hipparcos parallax measurements. All spectra of more distant sight lines contain absorption features due to intervening local gas, and more distant structures can only be studied accurately if components due to the LISM have been isolated. Towards this end, high resolution ($R \approx 95,000$), high signal-to-noise ($S/N \approx 110$ to 250) Na I $5889.951, 5895.924$ spectra of 11 nearby stars in the direction of Puppis-Vela have been obtained with the Coudé Echelle Spectrograph on the 1.4 meter Coudé Auxiliary Telescope at the European Southern Observatory. Toward Puppis-Vela, absorption due to the Local Interstellar Cloud (LIC) was not observed, but components at three distinct velocities were found, and the extent of the local gas producing the features was estimated. The three components have the following locations and velocities: Component A—[$l \approx 276$ to 298, $b \approx -5$ to $+4$, $V_{\text{helio}} = +6$ to $+9$, and $d \approx 104$ pc; Component B—[$l \approx 264$ to 276, $b \approx -7$ to $+3$, $V_{\text{helio}} = +12$ to $+15$, and $d \approx 115$ pc; Component C—[$l \approx 252$ to 271, $b \approx -8$ to $-6$, $V_{\text{helio}} = +21$ to $+23$, and $d \approx 131$ pc. The conclusions regarding the ultraviolet spectrum of $\gamma^2$ Vel ($l = 263$, $b = -8$, $d = 258 \pm 35$ pc) presented by Fitzpatrick & Spitzer (1994) were re-examined in light of this new LISM data, and the ambiguity in their conclusions about several absorption components is resolved. The stars in Puppis-Vela flank the region of the apparent extension of the Local Bubble (or Cavity) known as the $\beta$ CMa tunnel, and measurements of the Na I column density towards the sample stars have been used to modify existing estimates of the extent of the tunnel. A compilation of all existing Na I observations of $< 200$ pc sight lines around the tunnel reveal that low column densities have been exclusively detected within $l \approx 210$ to 250, and $b \approx -21$ to $-9$. Near the Galactic plane, at latitudes $-10 < b < 0$ and $d \approx 150$ pc, the tunnel is confined to $l < 270$, a lower longitude than was previously reported.
Figure 1

- LIC
  - $T \approx 7000$K
  - $n(\text{HI}) \approx 0.1$ cm$^{-3}$

- G
  - $T \approx 5400$K

- V Sun/LSR

- SUN

- $26 \pm 1$ km s$^{-1}$

- Local Bubble or Cavity
  - $T \approx 100-10^4$K
  - $n(\text{HI}) \approx 0.002-500$ cm$^{-3}$

- To Puppis-Vela

- $I=90^\circ$

- $I=0^\circ$
Figure 2
Figure 3
A: Sightlines with $+6 - +9$ km s$^{-1}$ comp.
B: Sightlines with $+12 - +15$ km s$^{-1}$ comp.
C: Sightlines with $+21 - +23$ km s$^{-1}$ comp.
Figure 5