

During recent optical observations of stars in the globular cluster M13 (Bates et al. 1995), detections were made of an intermediate velocity cloud (IVC) having a local standard of rest (LSR) velocity of about $-70$ km s$^{-1}$. A field of $\sim 2^\circ \times 2^\circ$ about the direction of M13 ($\ell = 59^\circ$, $\delta = +41^\circ$) has since been observed at 1420 MHz using the 76–m single-dish Lovell Telescope (LT) at Jodrell Bank and also using the Synthesis Telescope (ST) at the Dominion Radio Astrophysical Observatory in order to better investigate the structure and chemical composition of the IVC. A two-component structure of the gas was observed by the LT with both wide velocity features over a large area and narrow localized velocity features present. The wide velocity feature has a velocity dispersion (FWHM) of $\sim 30.0$ km s$^{-1}$ (corresponding to a kinetic temperature of about 24,000 K in the absence of turbulence) and an angular extent of $\sim 0.5 \times 1.5^\circ$. The peak brightness temperature was found to be 0.35 K and the column density was calculated to be $\sim 7 \times 10^{18}$ cm$^{-2}$ for an optically thin gas. The narrow component was better observed using the SRT, and was found to have a velocity dispersion (FWHM) of $\sim 4$ km s$^{-1}$ (corresponding to a kinetic temperature of $\sim 1000$ K in the absence of turbulence) and a column density of $\sim 10^{19}$ cm$^{-2}$. The “cloudlets” have an angular size comparable to the angular resolution of 2′ for the SRT, so smaller scale structure may be present.

Optical observations of four cluster stars, L598, L629, I–48 and II–67 in Na i indicate the presence of a large column density or of velocity gradients over the smallest observed angular separation of 10′. Na i IVC velocity profiles only show narrow features, and as the positions of these optical targets coincide with the positions of cloudlets, a realistic Na i/H i ratio for the cloudlets is found to be $4.6 \times 10^{-8}$. An observation of an IVC feature in the Ca ii K line of the star III–33 (Barnard 29) is well fitted by a Gaussian of FWHM equal to 33 km s$^{-1}$, and may be linked to the warmer gas component. This would give a value for the Ca ii/H i ratio of $1.4 \times 10^{-7}$. The results are consistent with a two-phase model (Wakker & Schwarz 1991) with small, cool, dense cloudlets that are pressure contained by a warm gas component.

REFERENCES


A New Puzzle Regarding the Diffuse Interstellar Lines, Anne B. Underhill, University of British Columbia.

In the case of five O stars out of fourteen, the average difference between the line-of-sight velocity component shown by the diffuse interstellar lines (DIBs) and that shown by the interstellar Na i lines exceeds $\pm 10$ km s$^{-1}$. For nine O stars this difference is in the range $\pm 6$ km s$^{-1}$. What does this mean? Because the typical standard deviation for a DIB velocity from three DIBs is $3.8$ km s$^{-1} \pm 1.2$ km s$^{-1}$ while that for a Na i line velocity from two interstellar lines is $1.8$ km s$^{-1} \pm 1.3$ km s$^{-1}$, the large differences between their velocities are meaningful. They imply that the grains carrying the DIBs move with the interstellar Na atoms along the lines of sight to only some O stars.