CORRELATIONS AMONG DIFFUSE INTERSTELLAR BANDS, ATOMS, AND SMALL MOLECULES[a]

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The survey of the diffuse interstellar bands (DIBs) conducted from 1999 to 2003 at the Apache Point Observatory provides the best dataset yet obtained for studying the correlations among the DIBs and between DIBs and known atomic and molecular species. Already, this dataset has yielded the identification of a set of DIBs ("the C_2 DIBs") that are well-correlated with the abundance of diatomic carbon[b].

Here we present the remarkably good correlation between the equivalent width of the DIB at 5780 Å with the column density of H I, $\langle N(\mathrm{H\ I})/W_\lambda(5780)\rangle = 6.77 \pm 0.21 \times 10^{18}\ \mathrm{cm}^{-2}\ \mathrm{m\AA}^{-1}$, and that between the column densities of CH and H_2, $\langle N(\mathrm{H_2})/N(\mathrm{CH})\rangle = 2.34 \pm 0.08 \times 10^7$, in a large sample of diffuse and translucent cloud sightlines. These correlations have been previously noted by Herbig[c] and by Federman et al.[d], respectively, but the relationships are much clearer and have greatly reduced uncertainties with our expanded dataset.

We also present our continuing work on the search for correlations among the DIBs, in the hopes of finding a set (or vibronic progression) of DIBs that are due to the same molecular carrier. We will discuss the statistics of the correlation coefficients among different pairs of DIBs, and will examine in detail some of the best correlations we have observed.

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[a] Based on observations from the APO 3.5-meter telescope, owned and operated by the Astrophysical Research Consortium.

[b] J. A. Thorburn, L. M. Hobbs, B. J. McCall, T. Oka, D. E. Welty, S. D. Friedman, T. P. Snow, P. Sonnentrucker, and D. G. York, *Astrophys. J.* **584**, 339 (2003)

[c] G. H. Herbig, *Astrophys. J.* **407**, 142 (1993)

[d] S. R. Federman, A. C. Danks, and D. L. Lambert, *Astrophys. J.* **287**, 219 (1984)