

Early Results from the APO Diffuse Interstellar Band Survey

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Using the high resolution (~ 8 km/s) echelle spectrograph on the 3.5-meter telescope at Apache Point Observatory (APO), we are conducting a high sensitivity survey of the diffuse interstellar bands (DIBs) in a large sample of reddened stars. Three years into this long-term program, we have achieved signal-to-noise ratios (at 5780 \AA) of > 500 on over 100 stars and > 1000 on over 50 stars, with complete spectral coverage from $\sim 3600\text{--}10200 \text{ \AA}$.

One early result from this program has been the identification of a family of narrow (FWHM $0.46\text{--}0.99 \text{ \AA}$) DIBs that appear to be stronger, relative to many broader DIBs, in sightlines with above average CH and C_2 column densities per unit E(B-V). The lines of sight which show strong “CH/ C_2 DIBs” have been observed by Rachford *et al.*, (2002) to contain a greater fraction of their interstellar absorption in the form of translucent clouds. Many of these DIBs appear in pairs with similar splittings of about 20 cm^{-1} (e.g. 4963.87 & 4969.12 , 4979.58 & 4984.78 , 5170.44 & 5175.99), reminiscent of a spin-orbit interaction in a linear molecule. We have also begun to identify other families of DIBs that show fairly good intensity correlations from star to star, which could indicate common (or at least chemically related) carriers.

Unlike the “CH/ C_2 DIBs,” it appears that most DIBs are prevalent in diffuse gas, where hydrogen is more atomic than molecular. In dense sightlines such as HD 62542 (Snow *et al.*, 2002), even the strongest DIBs are barely detectable, despite a relatively large amount of interstellar extinction. Additionally, we find the intensities of most DIBs correlate well ($r \gtrsim 0.5$) with the column density of H but do not correlate (mostly $r \lesssim 0.5$) with that of H_2 .

We expect that this survey will also provide a valuable resource for comparisons with laboratory spectra of potential DIB carriers. Already our data have been used to exclude C_7^- (McCall *et al.*, 2001) and $I-C_3H_2^-$ (McCall *et al.*, 2002) as DIB carriers.

References:

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