PRELIMINARY RESULTS FROM THE APO DIFFUSE INTERSTELLAR BAND SURVEY [a]

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We are in the midst of a long-term survey of the diffuse interstellar bands (DIBs) using the high resolution (R$\sim$37500) echelle spectrograph on the 3.5-meter telescope at Apache Point Observatory (APO). Our aim is to obtain high S/N spectra of a large sample of reddened stars. Three years into this program, we have achieved S/N ratios (at 5780 Å) of > 500 on over 100 stars and > 1000 on over 50 stars, with complete spectral coverage from $\sim$3600–10200 Å.

One early result from this program has been the identification of a set of narrow (FWHM 0.46–0.99 Å) DIBs that appear to be stronger, relative to many broader DIBs, in sightlines with above average C_2 column densities per unit reddening. The lines of sight which show strong "C_2 DIBs" have been observed 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 "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, even the strongest DIBs are barely detectable, despite a relatively large amount of interstellar extinction. In addition, we find that the intensities of most DIBs correlate better with the column density of H ($r \gtrsim 0.5$) than with that of H_2 (mostly $r \lesssim 0.5$).

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^- and l-$C_3H_2^-$ as DIB carriers.

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