LINE PROFILES IN THE DIFFUSE INTERSTELLAR BANDS

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We present results of an ongoing study of the line profiles of the Diffuse Interstellar Bands (DIBs) using data from a long-term survey with the Astrophysics Research Consortium Echelle Spectrograph (ARCES) on the 3.5-m telescope at Apache Point Observatory. This high resolution, high signal-to-noise (S/N $\approx$ 1000) dataset contains spectra of nearly 200 sightlines, allowing us to compare profiles of the diffuse bands extracted from a large sample of stars with a wide range of interstellar physical properties. We fit three profiles for comparison to each of the DIBs: a Gaussian, a Lorentzian, and a Drude function. Each profile is characteristic of a different physical origin for the observed absorption lines. Results currently indicate that some of the broadest DIBs exhibit Lorentzian profiles, suggesting rapid internal conversion within a molecule is the type of transition producing these features. The narrower DIBs, however, may have a fundamentally different lineshape from their broad counterparts, suggesting an entirely separate formation mechanism for these lines such as a blend of rotational lines within an electronic transition. Our goal is to characterize and understand the physics of the transition mechanisms in the hopes of placing constraints on the carriers of each of the DIBs in the study.

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