MOLECULAR INTERSTELLAR ABSORPTION TOWARD THE PLEIADES STAR CLUSTER

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High resolution, high signal to noise absorption-line observations were used to study the electronic transitions of CN, CH^+, and CH along twenty lines of sight toward members of the Pleiades star cluster. The data are part of a larger investigation which seeks a detailed understanding of the interaction occurring between the stars of this cluster and the surrounding interstellar gas. Mean Doppler parameters indicate that toward most of the Pleiades CH is associated with the production of CH^+ rather than CN and thus traces low-density material. An analysis of radial velocities reveals a kinematic distinction between molecular gas and the atomic gas traced by Ca II. Weak molecular components are found with velocities in the local standard of rest of $\sim$ +7 km s^{-1}, in agreement with the velocities of strong atomic absorption components. The strongest molecular components have velocities of $\sim$ +9.5 km s^{-1}, consistent with the velocity of a diffuse molecular cloud seen toward HD 23512. Gas density estimates from column densities of rotationally excited H_2 molecules ($n \sim 50-100$ cm^{-3}) can reproduce the UV radiation field for three cluster stars. The densities derived from CH/CH^+ column density ratios are an order of magnitude below these, but are in agreement with a value inferred from C I level populations ($n \leq 3.5$ cm^{-3}). Thus, either stratification is occurring in the constituents of molecular gas along the line of sight or a time-dependent model of CH^+ formation is needed to extract physical conditions in these clouds.